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COMPREHENSIVE PLAN REPORT ON THE MISSISSIPPI COASTAL IMPROVEMENTS PROGRAM (MsCIP)

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY, THE DEPARTMENT OF DEFENSE

TRANSMITTING

RECOMMENDATION FOR THE AUTHORIZATION OF THE COMPREHENSIVE PLAN REPORT ON THE MISSISSIPPI COASTAL IMPROVEMENTS PROGRAM (MsCIP)

PART 3 OF 3

JANUARY 26, 2010.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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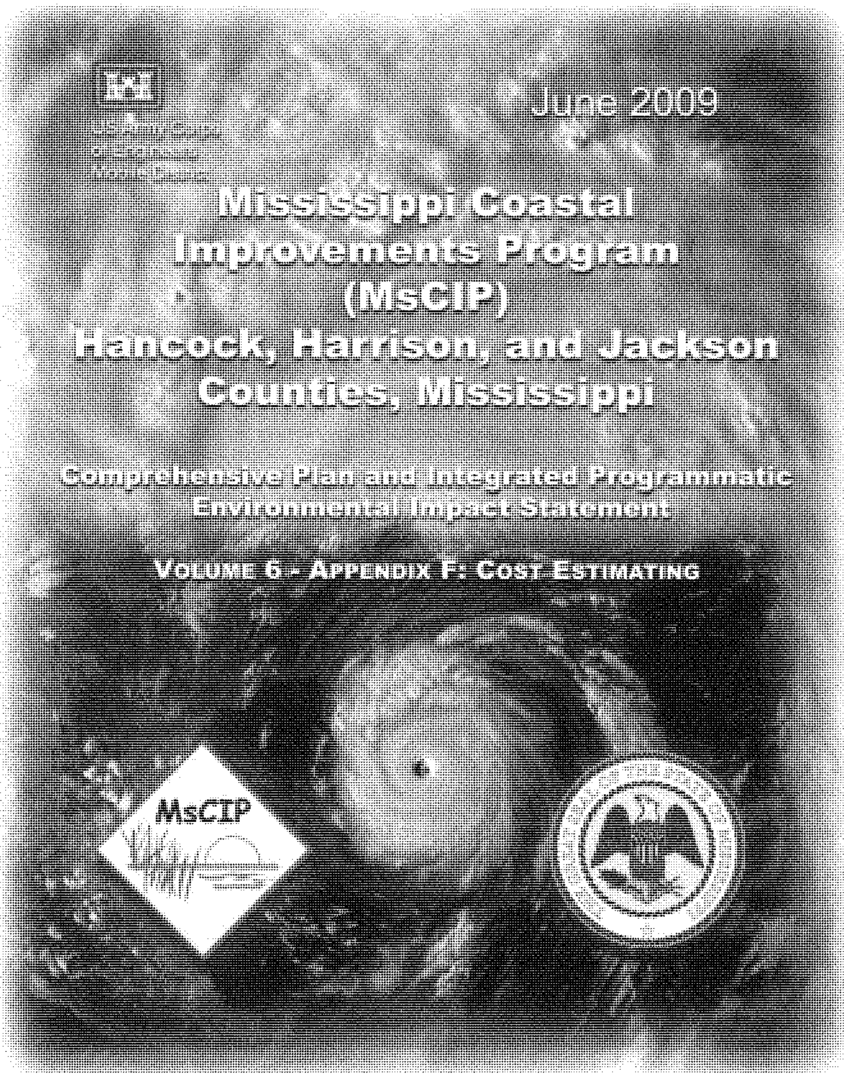
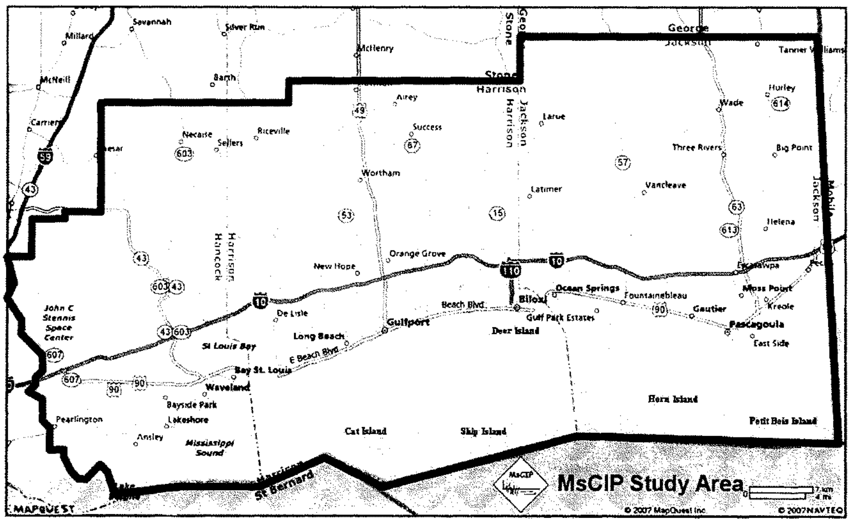

June 2009
Mississippi Coastal Improvements Program (MsCIP)
Hancock, Harrison, and Jackson Counties, Mississippi
Comprehensive Plan and Integrated Programmatic Environmental Impact Statement
VOLUME 6 - APPENDIX F: COST ESTIMATING
MsCIP

FOREWORD

This document is one of a number of technical appendices to the *Mississippi Coastal Improvements Program (MsCIP) Hancock, Harrison and Jackson Counties, Mississippi Comprehensive Plan and Integrated Feasibility Report and Environmental Impact Statement.*

The *Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan Integrated Feasibility Report and Environmental Impact Statement* provides systems-based solutions and recommendations that address: hurricane and storm damage reduction, ecosystem restoration and fish and wildlife preservation, reduction of damaging saltwater intrusion, and reduction of coastal erosion. The recommendations contained in the Main Report/EIS also provide measures that aid in: greater coastal environmental and societal resiliency, regional economic re-development, and measures to reduce long-term risk to the public and property, as a consequence of hurricanes and coastal storms. The recommendations cover a comprehensive package of projects and activities, that treat the environment, wildlife, and people, as an integrated system that requires a multi-tiered and phased approach to recovery and risk reduction, irrespective of implementation authority or agency.



The MsCIP Study Area

The purpose of the Comprehensive Plan Report is to present, to the Congress of the United States, the second of two packages of recommendations (i.e., the first being the "interim" recommendations funded in May 2007, and this "final" response, as directed by the Congress), directed at recovery of vital water and related land resources damaged by the hurricanes of 2005, and development of recommendations for long-term risk reduction and community and environmental resiliency, within the three-county, approximately 70 mile-long coastal zone, including Mississippi Sound and its barrier islands, of the State of Mississippi.

This appendix, the Main Report/EIS, and all other appendices and supporting documentation, were subject to Independent Technical Review (ITR) and an External Peer Review (EPR). Both review processes will have been conducted in accordance with the Corps "Peer Review of Decision Documents" process, has been reviewed by Corps staff outside the originating office, conducted by a Regional and national team of experts in the field, and coordinated by the National Center of Expertise in Hurricane and Storm Damage Protection, North Atlantic Division, U.S. Army Corps of Engineers.

The report presents background on the counties that comprise the Mississippi coastline most severely impacted by the Hurricanes of 2005, their pre-hurricane conditions, a summary of the effects of the 2005 hurricane season, problem areas identified by stakeholders and residents of the study area, a summary of the approach used in analyzing problems and developing recommendations directed at assisting the people of the State of Mississippi in recovery, recommended actions and projects that would assist in the recovery of the physical and human environments, and identification of further studies and immediate actions most needed in a comprehensive plan of improvements for developing a truly resilient future for coastal Mississippi.

This appendix contains detailed technical information used in the analysis of existing and future without-project conditions, in the development of problem-solving measures, and in the analysis, evaluation, comparison, screening, and selection of alternative plans, currently presented as tentatively-selected recommendations contained in the Main Report/EIS.

Each appendix functions as a complete technical document, but is meant to support one particular aspect of the feasibility study process. However, because of the complexity of the plan formulation process used in this planning study, the information contained herein should not be used without parallel consideration and integration of all other appendices, and the Main Report/EIS that summarizes all findings and recommendations.

This appendix, Cost Estimating for Engineering, Environmental, Nonstructural, contains two parts. In Part 1, the estimates that are Comparative-Level "Parametric Type" and are based on Historical Data, Recent Pricing, and Estimator's Judgment. The estimates are structured and priced as a general prime supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Total Project Cost (Oct 07) without escalation. There are no formulated alternative plans in Part 1 of the Cost Appendix, only options and measures. Part 2 of the Cost Appendix contains updated and revised cost estimates for the recommended alternatives contained in the Comprehensive Plan. As required by Headquarters Memorandum dated 3 July 2007 and E&C Bulletin dated 10 September 2007, construction projects with estimated costs over 40 million dollars were subjected to a Cost Risk Analysis. The only recommended alternative subject to these criteria was the Comprehensive Barrier Island Restoration Plan.

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Part 2 - Recommended Alternatives

COST APPENDIX

PART 1
Rough Order of Magnitude (ROM) Costs

PART 1

ROM COSTS FOR STUDY OPTIONS AND MEASURES

Part 1 of the Cost Appendix was used as the basis for the selected alternatives presented in Part 2 of this Appendix. The costs shown in Part 1 are based on October, 2007 pricing. The costs for the structural and environmental alternatives were completed by Mobile District and the costs for the nonstructural alternatives were completed by Huntington District.

Costs for Hazardous, Toxic and Radiological Waste issues were not specifically identified for the Cost Appendix, either Part 1 or 2. The higher than typical contingency of 25% was used to cover these unknowns due to the vast number of properties involved and the uncertainties associated with project footprints, there were no specific costs for assessments made for HTRW investigations and remediations. In discussions with the HTRW technical team in SAM, we developed an estimate based on a percentage that would be added to the usual cost contingencies for each project. This estimate is based on the mix of residential, commercial and industrial properties. HTRW concerns in the nonstructural measures particularly affect the acquisition and demolition of structures in the high-hazard zones and eligible structures where elevation would exceed 13 feet in height above the ground surface. HTRW concerns could also affect elevation of eligible homes where contaminated materials may be present in foundation components or HVAC units to be relocated. The presence of asbestos and underground storage tanks on residential and commercial properties is possible given the ages of many of the structures and the presence of numerous service stations and other commercial establishments (vehicle repair, dry cleaning, chemical distributors, etc.) that would possibly contain contaminants. A preliminary Phase I HTRW assessment will be conducted for all structures that are determined to be eligible for these nonstructural measures during the Detailed Project Report (DPR) phase. Costs and schedules for the Phase I HTRW assessment for homes and businesses would be included in the DPR PMP. Structures determined to contain hazardous materials will not be addressed by the program until the identified HTRW concerns are addressed by the owner or the local sponsor. A preliminary Phase I HTRW assessment will also be conducted during initial Engineering and Design for all properties included in the alternatives recommended in Part 2.

BASIS of COST ESTIMATE and RATIONALE

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

Mississippi Coastal Improvements Program "MsCIP"

25-Jul-08

Joseph H. Ellsworth

Estimates are Comparative-Level "Parametric Type" and are based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a general prime supported by major subcontractors. Bidding conditions for these estimates are considered normal and construction duration schedules are considered to be reasonable and not unduly compressed. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Total Project Cost (Oct 07) without escalation. There are no formulated alternative plans in the cost appendix at this stage...only OPTIONS and MEASURES. It is my understanding that we will move forward with recommended alternatives after this submital. At this time we will prepare Fully Funded Project Cost Estimates using MII & CEDEP. The structural cost estimates are structured and listed as per the "Engineering Appendix Table of Contents" by Line of Denfense. The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts.

Estimate Format is an Excel spreadsheet hyper-linked through-out the report. Format is structured by Line of Defense Level 1-4 and presented as per the Table of Contents.

Price Level of Estimate is Oct 07

Project Life (see Economics Appendix)

Quantities listed within the estimates represent Major Elements of the Project Scope and were furnished by the Project Delivery Team. Where quantities were not available, assumptions were made based on historical information and Estimator's judgment.All approach & associated quantities fro Railway/Vehicle Gates are included in each Line of Defense OPTION.

Markups for both prime and subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance. .

Construction Contingency was was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. Even though ER 110-2-1302 identifies Contingencies at 20% for projects greater than $10,000,000 for recon/feasibility phase, it was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Real Estate Cost (01 feature account) was prepared by the Savannah District COE.

Planning, Engineering & Design (30 feature account) was developed and assigned at 8% by the PDT. This is the percentage that has historically been used or these types of civil works projects. 8% was used in the Interim MsCIP projects which was reviewed and included in the Chief's Report.

BASIS of COST ESTIMATE and RATIONALE

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

Mississippi Coastal Improvements Program "MsCIP"

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Construction Management (31 feature account) was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these type of civil works projects. 6% was used in the Interim MsCIP projects which was reviewed and included in the Chief's Report.

Dredging Barrier Island Sand Borrow unit prices were derived from CEDEP and compared to Historical Data. Estimates were review and coordinated with Mobile District Operations Divison personnel. CEDEP estimates are available upon request. These estimates were not included in the Cost appendix.

Unit Prices, for such items as sitework, earthwork, stone protection, concrete, reinforcing, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems. Major Cost Items are listed below with an explanation as to unit price derivation:

POC's Listed are all Cost Engineering Personnel that worked on the report in the Cost Appendix.

Joseph H. Ellsworth	Lead Cost Engineer	CESAM	251-690-2628
Gary A. Payton	Cost Engineer	CESAM	251-694-3890
George F. Rush	Civil Engineer -Dredging	CESAM	251-694-3715
Michael A. McKown	Structural Engineer -GeoTech	CESAM	251-690-2681
Lloyd Oliver	Structural Engineer -Gates,Barriers	CESAM	251-694-3736
Richard W. Harvey	Mechical Engineer - Pump Stations	CESAM	251-694-3732
John R.Thomas	Real Estate Specialist	CESAS	912-652-5031
Donald A. Whitmore	Civil Engineer - Non-Structural Estimates	CELRH	304-399-6941
Jennifer L. Jacobson	Environmentalist	CESAM	251-690-2724

Beach & Dune Planting (Sea Oats & Grass) and **Fencing** are based on recent cost provided by the Local sponsor, Harrison County Public Works, Ms. Quantities were derived from using historical photographs of the barrier islands and estimating that beach & dune area. The Corps worked with the National Park Service and also the State of Mississippi, Department of Marine Resources in order to come up with this required acre estimates. Sea oats are typically concentrated on the top of the dune and some on the slopes; thus, the team estimated that only approximately 140 plants would be planted per acre.

Sea Grass Planting -The State of Mississippi, Department of Marine Resources estimated that the total historical seagrass beds coverage adjacent to the barrier islands possibly accounted for about 8,800 acres. The immediate areas surrounding the barriers islands have changed since that historical estimate in pre-1969; thus, in collaboration with the State of Mississippi, Department of Marine Resources, it was estimated that about 4,400 acres was now suitable for seagrass restoration.

Maritime Forest Planting cost at $10,000 per acre was derived from the spacings and cost of plants. It is estimated that the larger plants will be planted on between 40- and 50- foot centers while the smaller understory species will be planted at between 10- and 15-foot centers. The larger trees are estimated to cost between $100 and $150 per plant while the smaller species range from $3 to $15 per plant (prices include labor). Some of the species that will be planted within the coastal maritime forests include the following: live and laurel oaks, loblolly and slash pines, red bays, saw palmetto, sand live oak, cabbage palm, yaupon, sea grape, and prickly pear.

BASIS of COST ESTIMATE and RATIONALE

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

Mississippi Coastal Improvements Program "MsCIP"

25-Jul-08

Joseph H. Ellsworth

Structure Demolition is based on historical data updated to current price levels. Disposal Fees are based on current local disposal area charges.

Flap Gates & Cutoff Values cost are based on quotes from Waterman Industries Inc. including material and installation.

ATFP, Signage, Pavement Marking, Traffic Control is based on historical data and is estimated at 5 percentage of direct cost.

Anti-Terrorism / Force Protection for the Surge Barriers are based on historical data and is estimated at 3 percentage of direct cost.

Pump Stations were priced by the Mobile District Structural & Mechanical Engineers .

Structural Gates (Pass Thrus, Sector, Sluice, Roller) unit prices were provided by the New Orleans District, COE

Foundation Piles are based on quotes from Southern Prestress for piling and Jordan Piling for installation.

Riprap Stone was derived as follows ($45/ton in-place + 1.21 contractor markup + 1.65 tn/cy conversion = $90/cy in place) Unit cost based on recent construction projects along Gulf Coast are based on quotes from Southern Prestress for piling and Jordan Piling for installation.

EXCLUSIONS

COST RISK ANALYSIS for development of Contingency.

At this phase of the plan formulation process, there were no assessments made for HTRW investigations nor remediation costs based on the vast number of properties potentially involved and the uncertainties associated with project footprints. Also, the cost of escalation will be addressed as projects are selected to proceed to feasibility level of design. The identification of a major HTRW site within a project footprint could certainly have a cost impact, but none are known to exist at this time. Likewise, depending on the time that a project is funded for further study to feasibility level, the effects of escalation could be a major factor based on fuel costs or other items that can change drastically outside the usual inflation rate.

Estimate *Excludes* Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage. These are items which are not supported by the Project Policy (Federal or Non-Federal Cost).

Relocations (Cemeteries), Historical Preservation, & Recreation are items which are not supported by the Project Policy (Federal or Non-Federal Cost).

06 Account, Preservation - Mitigation-Tidal quantites were based on impacts of new footprint plus mitigated factor which was determined and coordinated by other agencies. Unit cost were derived and based on historical data.

LOD2 Beach Sand Dune Borrow is purchased washed Sand materials trucked from Upland Commerical Source, w/i 10 miles of project site. Unit price is based on recent cost from local suppliers for the Pascagoula, Ms. projects. Price represents sand material (beach quality) fob job site.

BASIS of COST ESTIMATE and RATIONALE

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

Mississippi Coastal Improvements Program "MsCIP"

25-Jul-08

Joseph H. Ellsworth

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost

Mobilization & Demobilization (except dredging) are derived within the estimate at 2.5 % +- of construction cost excluding the Misc Items cost.

Pump Stations will be constructed in the dry and streamflow diversion quantities have been incorporated into the various ring level estimates.

Operational & Maintenance Cost were based on Historical Lock & Dam records and protated for the size of subject barrier, which equates to approximately 2 percent. The PD Team agreed percentage used for the recon study is fair and reasonable. Subsequent estimate submitals will re-evaluate assumptions, percentage, and cost for O&M. LOD2 O & M cost were determined by the Economist, Jeremy LaDart. It reflects total O & M as 8 times the initial structural contract cost.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	(revised) 25-Jul-08
LOCATION: Mississippi	SHEET NO. 1	OF	8
	PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton	
WORK ITEM: *Preliminary Concept Estimate*	BASIS of ESTIMATE: info furnished per Project Delivery Team		
	FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION		ESTIMATED AMOUNT
	MEASURES	
Line of Defense 1	***OffShore Barrier Islands***	
Option "A"	***Restore Island Footprint***	$ 942,200,000
Option "B"	***Replenish Sand in Littoral Zone*** ***(River Sand Source)***	$ 1,013,800,000
Option "C1 & C2"	***Replenish Sand in Littoral Zone*** ***(Off-Shore & Inland River Sand Source)***	$ 147,400,000
Option "D"	***Environmental Restoration*** ***(2' Dune with Beach Sand)***	$ 14,200,000
Option "E"	***Environmental Restoration*** ***(6' Dune with Off-shore Sand)***	$ 39,200,000
Option "F"	***Environmental Restoration*** ***(Sea Grass Planting)***	$ 264,500,000
Option "G"	***Restoration of Ship Island Breach***	$ 181,400,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

					(revised)
PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	2	OF	8
		PREPARED: Joseph H Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM:	***Preliminary Concept Estimate***	BASIS of ESTIMATE: info furnished per Project Delivery Team			
		FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls			

DESCRIPTION	ESTIMATED AMOUNT

Line of Defense 2 ***Beach / Dune Construction***

Options ***Hancock County***

Option "A"	**elevation 10**	**with 40' Crest width**	$ 8,070,000
Option "B"	**elevation 8**	**with 50' Crest width**	$ 6,100,000
Option "C"	**elevation 10**	**with 20' Crest width**	$ 4,960,000
Option "D"	**elevation 8**	**with 30' Crest width**	$ 4,030,000
Option "E"	**elevation 10**	**with 40' Crest width with Planting & Fencing**	$ 8,400,000
Option "F"	**elevation 8**	**with 50' Crest width with Planting & Fencing**	$ 6,440,000
Option "G"	**elevation 10**	**with 20' Crest width with Planting & Fencing**	$ 5,300,000
Option "H"	**elevation 8**	**with 30' Crest width with Planting & Fencing**	$ 4,360,000
Option "I"	**elevation 10**	**with 55' Crest width with Fencing (Comparison Dune)**	$ 19,100,000
Option "J"	**elevation 10**	**with 55' Crest width with Planting & Fencing (Comparison Dune)**	$ 19,450,000
Option "K"		**60 foot wide by 2-foot berm with Plants & Fencing**	$ 4,640,000

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

(revised)

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION			ESTIMATED AMOUNT

Line of Defense 2 ***Beach / Dune Construction***

Options ***Harrison County***

Option "A"	**elevation 15**	**with 35' Crest width**	$ 21,840,000
Option "B"	**elevation 13**	**with 45' Crest width**	$ 18,600,000
Option "C"	**elevation 15**	**with 25' Crest width**	$ 18,100,000
Option "D"	**elevation 13**	**with 15' Crest width**	$ 10,400,000
Option "E"	**elevation 15**	**with 35' Crest width with Planting & Fencing**	$ 22,970,000
Option "F"	**elevation 13**	**with 45' Crest width with Planting & Fencing**	$ 19,760,000
Option "G"	**elevation 15**	**with 25' Crest width with Planting & Fencing**	$ 19,210,000
Option "H"	**elevation 13**	**with 15' Crest width with Planting & Fencing**	$ 11,520,000
Option "I"	**elevation 15**	**with 55' Crest width with Fencing (Comparison Dune)**	$ 40,290,000
Option "J"	**elevation 15**	**with 55' Crest width with Planting & Fencing (Comparison Dune)**	$ 41,460,000
Option "K"		**60 foot wide by 2-foot berm w / Plants & Fencing**	$ 9,680,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

					(revised)
PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	4	OF	8
		PREPARED: Joseph H. Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM:	***Preliminary Concept Estimate***	BASIS of ESTIMATE: info furnished per Project Delivery Team			
		FILE NAME:			
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls			

DESCRIPTION	ESTIMATED AMOUNT

Line of Defense 2 ***Beach / Dune Construction***

Options		***Jackson County***	
Option "A"	elevation 10	with 40' Crest width	$ 1,910,000
Option "B"	elevation 8	with 50' Crest width	$ 1,450,000
Option "C"	elevation 10	with 20' Crest width	$ 1,180,000
Option "D"	elevation 8	with 30' Crest width	$ 960,000
Option "E"	elevation 10	with 40' Crest width with Planting & Fencing	$ 1,990,000
Option "F"	elevation 8	with 50' Crest width with Planting & Fencing	$ 1,530,000
Option "G"	elevation 10	with 20' Crest width with Planting & Fencing	$ 1,260,000
Option "H"	elevation 8	with 30' Crest width with Planting & Fencing	$ 1,040,000
Option "I"	elevation 10	with 55' Crest width with Fencing (Comparison Dune)	$ 4,490,000
Option "J"	elevation 10	with 55' Crest width with Planting & Fencing (Comparison Dune)	$ 4,570,000
Option "K"		60 foot wide by 2-foot berm w / Plants & Fencing	$ 1,110,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

				(revised)
PROJECT: Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION: Mississippi	SHEET NO.	5	OF	8
	PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton		
WORK ITEM: ***Preliminary Concept Estimate***	BASIS of ESTIMATE: info furnished per Project Delivery Team			
	FILE NAME:			
	mscip-comprehensive-study-compbined-cost-est-25jul08.xls			

DESCRIPTION	ESTIMATED AMOUNT

Line of Defense 3 ***Elevated Roadway, Seawalls, & Ring Levees***

Jackson County		**Ring Levee** - elev. 20	Option "A"	**Pascagoula / Moss Point**		$ 699,000,000
"	"	**Ring Levee** - elev. 30	Option "B"	" " "		$ 916,000,000
"	"	**Ring Levee-Washington**- elev. 20	Option "C"	" "	Alt Alignment	$ 671,600,000
"	"	**Ring Levee-Washington**- elev. 30	Option "D"	" "	Alt Alignment	$ 849,900,000
"	"	**Ring Levee - Moss Pt.** - elev. 20	Option "E"	" "	Alt Alignment	$ 874,400,000
"	"	**Ring Levee - Moss Pt.** - elev. 30	Option "F"	" "	Alt Alignment	$ 1,013,200,000
"	"	**Ring Levee- Moss/Wash** - elev. 20	Option "G"	" "	Alt Alignment	$ 921,400,000
"	"	**Ring Levee- Moss/Wash** - elev. 30	Option "H"	" "	Alt Alignment	$ 1,057,700,000
"	"	**Ring Levee** - elev. 20	Option "A"	**Gautier**		$ 348,300,000
"	"	**Ring Levee** - elev. 30	Option "B"	"		$ 450,100,000
"	"	**Ring Levee** - elev. 20	Option "A"	**BelleFontaine**		$ 137,600,000
"	"	**Ring Levee** - elev. 30	Option "B"	" "		$ 191,900,000
"	"	**Ring Levee** - elev. 20	Option "C"	" "	Alt Alignment	$ 103,900,000
"	"	**Ring Levee** - elev. 30	Option "D"	" "	Alt Alignment	$ 142,900,000
"	"	**Ring Levee** - elev. 20	Option "A"	**Gulf Park Estates**		$ 149,200,000
"	"	**Ring Levee** - elev. 30	Option "B"	" " "		$ 220,600,000
"	"	**Ring Levee** - elev. 20	Option "C"	" " "	Alt Alignment	$ 158,900,000
"	"	**Ring Levee** - elev. 30	Option "D"	" " "	Alt Alignment	$ 208,700,000
"	"	**Ring Levee** - elev. 20	Option "A"	**Ocean Springs**		$ 152,100,000
"	"	**Ring Level** - elev. 30	Option "B"	" "		$ 327,000,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

(revised)

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION				ESTIMATED AMOUNT
Line of Defense 3	***Elevated Roadway, Seawalls, & Ring Levees***			
Hancock County	**Ring Levee** - elev. 20	Option "A"	**Pearlington**	$ 104,800,000
" "	**Ring Levee** - elev. 30	Option "B"	"	$ 120,200,000
	Ring Levee - elev. 20	Option "A"	**Bay St. Louis**	$ 283,000,000
	Ring Levee - elev. 30	Option "B"	"	$ 382,900,000
Jackson County	**Rdwy-Seawall** - elev. 11		**Ocean Springs**	$ 67,500,000
Harrison County	**Rdwy-Seawall** - elev. 16		**Elevated US Hwy 90**	$ 1,989,200,000
Hancock County	**Rdwy-Seawall** - elev. 11 & **Saddle Dikes** -elev. 16		**Beach Blvd**	$ 328,000,000

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

					(revised)
PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	7	OF	8
		PREPARED: Joseph H. Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM:	***Preliminary Concept Estimate***	BASIS of ESTIMATE: info furnished per Project Delivery Team			
		FILE NAME:			
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls			

DESCRIPTION			ESTIMATED AMOUNT
Line of Defense 4 ***Inland Barrier & Surge Barrier***			
Jackson County	Inland Barrier - elev. 20	Option "A"	$ 126,900,000
" "	Inland Barrier - elev. 30	Option "B"	$ 224,800,000
" "	Inland Barrier - elev. 40	Option "C"	$ 266,000,000
Back Bay of Biloxi	Surge Barrier - elev. 20	Option "A"	$ 989,800,000
" " " "	Surge Barrier - elev. 30	Option "B"	$ 1,267,100,000
" " " "	Surge Barrier - elev. 40	Option "C"	$ 1,810,700,000
Harrison County	Inland Barrier - elev. 20	Option "A"	$ 435,800,000
" "	Inland Barrier - elev. 30	Option "B"	$ 731,600,000
" "	Inland Barrier - elev. 40	Option "C"	$ 947,100,000
" "	Levee for Roadway(75') - elev. 20	Option "D"	$ 205,400,000
" "	Levee for Roadway(75') - elev. 30	Option "E"	$ 768,300,000
" "	Menge Ave(15' +) - elev. 20	Option "F" Alt Route	$ 140,400,000
" "	Menge Ave(15'+) - elev. 30	Option "G" Alt Route	$ 317,100,000
" "	Menge Ave(15'+) - elev. 40	Option "H" Alt Route	$ 506,300,000
"	Levee for Rdwy(75') with Menge Ave Alt - elev. 20	Option "I" Alt Route	$ 178,600,000
"	Levee for Rdwy(75') with Menge Ave Alt - elev. 30	Option "J" Alt Route	$ 462,900,000
St. Louis Bay	Surge Barrier - elev. 20	Option "A"	$ 1,628,000,000
" " "	Surge Barrier - elev. 30	Option "B"	$ 1,963,600,000
" " "	Surge Barrier - elev. 40	Option "C"	$ 2,362,200,000
Hancock County	Inland Barrier - elev. 20	Option "A"	$ 379,400,000
" "	Inland Barrier - elev. 30	Option "B"	$ 852,200,000
" "	Inland Barrier - elev. 40	Option "C"	$ 790,800,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

(revised)

PROJECT: Mississippi Coastal Improvements Program "MsCIP" ITEM NO. DATE 25-Jul-08
LOCATION: Mississippi SHEET NO. 8 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION				ESTIMATED AMOUNT
Line of Defense 5	***Retreat and / or Relocation of Critical Facilities***			N / A
Line of Defense 3	***Ring Levees***			
Harrison County	Ring Levee - elev. 17	Option "A"	Forrest Heights	$ 6,100,000
Harrison County	Ring Levee - elev. 21	Option "B"	Forrest Heights	$ 11,400,000
Line of Defense 1	***Emergency Beach Nourishment***			
Ship Island	Fort Mass & French Warehouse			$ 1,430,000
Line of Defense 3	***Buffer Zones***	***Jackson County***		
	Moss Point	Option "E"	elevation 20	$ 422,170,000
	" "	Option "F"	elevation 30	$ 419,000,000
	Washington Ave	Option "C"	elevation 20	$ 71,870,000
	" "	Option "D"	elevation 30	$ 63,770,000
	Moss Pt. - Washington Ave	Option "G"	elevation 20	$ 493,530,000
	" "	Option "H"	elevation 30	$ 482,550,000
	BelleFontaine	Option "C"	elevation 20	$ 3,120,000
	" "	Option "D"	elevation 30	$ 1,690,000
	Gulf Park Estates	Option "C"	elevation 20	$ 9,410,000
	" "	Option "D"	elevation 30	$ 7,610,000

Notes: Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Estimate Excludes: Project Escalation, Relocations, HTRW, & Historical Preservation

COMPREHENSIVE PLAN *STRUCTURAL* *" Annual O & M " COST*

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 7
		PREPARED Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Preliminary Concept Estimate***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
		FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		ESTIMATED AMOUNT
	MEASURES	
Line of Defense 1	***OffShore Barrier Islands***	***Annual O & M Cost***
Option "A"	***Restore Island Footprint***	N / A
Option "B"	***Replenish Sand in Littoral Zone*** *(River Sand Source)*	N / A
Option "C1 & C2"	***Replenish Sand in Littoral Zone*** *(Off-Shore & Inland River Sand Source)*	N / A
Option "D"	***Environmental Restoration*** *(2' Dune with Beach Sand)*	N / A
Option "E"	***Environmental Restoration*** *(6' Dune with Off-shore Sand)*	N / A
Option "F"	***Environmental Restoration*** *(Sea Grass Planting)*	N / A
Option "G"	***Restoration of Ship Island Breach***	N / A

COMPREHENSIVE PLAN STRUCTURAL " Annual O & M " COST

PROJECT: Mississippi Coastal Improvements Program "MsCIP" ITEM NO. DATE 25-Jul-08
LOCATION: Mississippi SHEET NO. 2 OF 7
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	ESTIMATED AMOUNT

Line of Defense 2 ***Beach / Dune Construction***

Options		***Hancock County***	***Annual O & M Cost***
Option "A"	elevation 10	with 40' Crest width	$ 2,167,694
Option "B"	elevation 8	with 50' Crest width	$ 1,638,530
Option "C"	elevation 10	with 20' Crest width	$ 1,332,313
Option "D"	elevation 8	with 30' Crest width	$ 1,082,504
Option "E"	elevation 10	with 40' Crest width with Planting & Fencing	$ 2,256,336
Option "F"	elevation 8	with 50' Crest width with Planting & Fencing	$ 1,729,857
Option "G"	elevation 10	with 20' Crest width with Planting & Fencing	$ 1,423,640
Option "H"	elevation 8	with 30' Crest width with Planting & Fencing	$ 1,171,146
Option "I"	elevation 10	with 55' Crest width with Fencing (Comparison Dune)	$ 5,130,478
Option "J"	elevation 10	with 55' Crest width with Planting & Fencing (Comparison Dune)	$ 5,224,492
Option "K"		60 foot wide by 2-foot berm with Plants & Fencing	N / A

COMPREHENSIVE PLAN STRUCTURAL " Annual O & M " COST

PROJECT: Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	25-Jul-08
LOCATION: Mississippi	SHEET NO. 3	OF	7
	PREPARED Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate***	BASIS of ESTIMATE:	info furnished per Project Delivery Team	
	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION	ESTIMATED AMOUNT

Line of Defense 2 ***Beach / Dune Construction***

Options		***Harrison County***	***Annual O & M Cost***
Option "A"	elevation 15	with 35' Crest width	$ 5,866,473
Option "B"	elevation 13	with 45' Crest width	$ 4,996,172
Option "C"	elevation 15	with 25' Crest width	$ 4,861,867
Option "D"	elevation 13	with 15' Crest width	$ 2,793,559
Option "E"	elevation 15	with 35' Crest width with Planting & Fencing	$ 6,170,004
Option "F"	elevation 13	with 45' Crest width with Planting & Fencing	$ 5,307,761
Option "G"	elevation 15	with 25' Crest width with Planting & Fencing	$ 5,160,025
Option "H"	elevation 13	with 15' Crest width with Planting & Fencing	$ 3,094,403
Option "I"	elevation 15	with 55' Crest width with Fencing (Comparison Dune)	$ 10,822,354
Option "J"	elevation 15	with 55' Crest width with Planting & Fencing (Comparison Dune)	$ 11,136,629
Option "K"		60 foot wide by 2-foot berm w / Plants & Fencing	N / A

COMPREHENSIVE PLAN STRUCTURAL " Annual O & M " COST

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 7
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	ESTIMATED AMOUNT

Line of Defense 2 ***Beach / Dune Construction***

Options		***Jackson County***	***Annual O & M Cost***
Option "A"	**elevation 10**	**with 40' Crest width**	$ 513,048
Option "B"	**elevation 8**	**with 50' Crest width**	$ 389,487
Option "C"	**elevation 10**	**with 20' Crest width**	$ 316,961
Option "D"	**elevation 8**	**with 30' Crest width**	$ 257,867
Option "E"	**elevation 10**	**with 40' Crest width with Planting & Fencing**	$ 534,537
Option "F"	**elevation 8**	**with 50' Crest width with Planting & Fencing**	$ 410,975
Option "G"	**elevation 10**	**with 20' Crest width with Planting & Fencing**	$ 338,450
Option "H"	**elevation 8**	**with 30' Crest width with Planting & Fencing**	$ 279,356
Option "I"	**elevation 10**	**with 55' Crest width with Fencing (Comparison Dune)**	$ 1,206,065
Option "J"	**elevation 10**	**with 55' Crest width with Planting & Fencing (Comparison Dune)**	$ 1,227,554
Option "K"		**60 foot wide by 2-foot berm w / Plants & Fencing**	N / A

(Beach O&M based on renourishment of the beach 5 times, annualied over a 50 year period of analysis)

COMPREHENSIVE PLAN STRUCTURAL " Annual O & M " COST

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 7
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Preliminary Concept Estimate*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
Elevated Roadway, Seawalls, & Ring Levees mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION				Current Contract Cost	% of CCC	ESTIMATED AMOUNT Annual O & M Cost
Line of Defense 3						
Jackson County						
Ring Levee - elev. 20	Option "A"	**Pascagoula / Moss Pt**		$285,948,174	2% =	$5,719,000
Ring Levee - elev. 30	Option "B"	" " "		$415,448,288	2% =	$8,309,000
Ring Levee-Washington- elev. 20	Option "C"	" "	Alt Alignment	$232,894,798	2% =	$4,658,000
Ring Levee-Washington- elev. 30	Option "D"	" "	Alt Alignment	$335,373,647	2% =	$6,707,000
Ring Levee - Moss Pt. - elev. 20	Option "E"	" "	Alt Alignment	$188,044,474	2% =	$3,761,000
Ring Levee - Moss Pt. - elev. 30	Option "F"	" "	Alt Alignment	$271,125,478	2% =	$5,423,000
Ring Levee- Moss/Wash - elev. 20	Option "G"	" "	Alt Alignment	$176,833,476	2% =	$3,537,000
Ring Levee- Moss/Wash - elev. 30	Option "H"	" "	Alt Alignment	$259,843,786	2% =	$5,197,000
Ring Levee - elev. 20	Option "A"	**Gautier**		$ 187,184,083	2% =	$3,744,000
Ring Levee - elev. 30	Option "B"	"		$ 245,193,309	2% =	$4,904,000
Ring Levee - elev. 20	Option "A"	**BelleFontaine**		$ 68,568,586	2% =	$1,371,000
Ring Levee - elev. 30	Option "B"	" "		$ 96,935,648	2% =	$1,939,000
Ring Levee - elev. 20	Option "C"	" "	Alt Alignment	$ 49,425,113	2% =	$ 989,000
Ring Levee - elev. 30	Option "D"	" "	Alt Alignment	$ 70,690,128	2% =	$1,414,000
Ring Levee - elev. 20	Option "A"	**Gulf Park Estates**		$ 74,939,535	2% =	$1,499,000
Ring Levee - elev. 30	Option "B"	" " "		$ 120,191,295	2% =	$2,404,000
Ring Levee - elev. 20	Option "C"	" " "	Alt Alignment	$ 64,751,081	2% =	$1,295,000
Ring Levee - elev. 30	Option "D"	" " "	Alt Alignment	$ 95,315,466	2% =	$1,906,000
Ring Levee - elev. 20	Option "A"	**Ocean Springs**		$ 70,713,680	2% =	$1,414,000
Ring Level - elev. 30	Option "B"	" "		$ 126,584,199	2% =	$2,532,000

COMPREHENSIVE PLAN STRUCTURAL " Annual O & M " COST

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 6	OF 7
		PREPARED Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Preliminary Concept Estimate***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
		FILE NAME:	
	Elevated Roadway, Seawalls, & Ring Levees		mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION — ESTIMATED AMOUNT

Line of Defense 3

			Current Contract Cost	% of CCC	Annual O & M Cost
Hancock County					
Ring Levee - elev. 20	Option "A"	Pearlington	$ 66,011,422	2% =	$1,320,000
Ring Levee - elev. 30	Option "B"	"	$ 76,319,443	2% =	$1,526,000
Ring Levee - elev. 20	Option "A"	Bay St. Louis	$ 100,079,223	2% =	$2,002,000
Ring Levee - elev. 30	Option "B"	"	$ 140,170,843	2% =	$2,803,000
Jackson County					
Rdwy-Seawall - elev. 11		**Ocean Springs**	$14,357,317	2% =	$ 287,000
Harrison County					
Rdwy-Seawall - elev. 16		**Elevated US Hwy 90**	$979,288,421	2% =	$ 19,586,000
Hancock County					
Rdwy-Seawall - elev. 11 & **Saddle Dikes** -elev. 16		**Beach Blvd**	$191,534,042	2% =	$3,831,000
Harrison County					
Forrest Height Levee - elev 17			$ 2,080,512	2% =	$ 42,000
Forrest Height Levee - elev 21			$ 5,681,732	2% =	$ 114,000

COMPREHENSIVE PLAN STRUCTURAL " Annual O & M " COST

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 7	OF 7
		PREPARED Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Preliminary Concept Estimate***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
		FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION					ESTIMATED AMOUNT
Line of Defense 4	***Inland Barrier & Surge Barrier***		Current Contract Cost	% of CCC	Annual O & M Cost
Jackson County	Inland Barrier - elev. 20	Option "A"	$ 40,932,861	2% =	$ 819,000
" "	Inland Barrier - elev. 30	Option "B"	$ 101,393,987	2% =	$2,028,000
" "	Inland Barrier - elev. 40	Option "C"	$ 121,881,692	2% =	$2,438,000
Back Bay of Biloxi	Surge Barrier - elev. 20	Option "A"	$ 688,501,037	2% =	$ 13,770,000
" " " "	Surge Barrier - elev. 30	Option "B"	$ 882,298,560	2% =	$ 17,646,000
" " " "	Surge Barrier - elev. 40	Option "C"	$ 1,262,153,433	2% =	$ 25,243,000
Harrison County	Inland Barrier - elev. 20	Option "A"	$ 100,337,751	2% =	$2,007,000
" "	Inland Barrier - elev. 30	Option "B"	$ 290,259,173	2% =	$5,805,000
" "	Inland Barrier - elev. 40	Option "C"	$ 417,147,087	2% =	$8,343,000
" "	Levee for Roadway(75') - elev. 20	Option "D"	$ 93,388,290	2% =	$1,868,000
" "	Levee for Roadway(75') - elev. 30	Option "E"	$ 293,549,934	2% =	$5,871,000
" "	Menge Ave(15' +) - elev. 20	Option "F" Alt Route	$ 90,015,267	2% =	$1,800,000
" "	Menge Ave(15'+) - elev. 30	Option "G" Alt Route	$ 202,610,598	2% =	$4,052,000
" "	Menge Ave(15'+) - elev. 40	Option "H" Alt Route	$ 328,203,779	2% =	$6,564,000
"	Levee for Rdwy(75') with Menge Ave Alt - elev. 20	Option "I" Alt Route	$ 103,651,509	2% =	$2,073,000
"	Levee for Rdwy(75') with Menge Ave Alt - elev. 30	Option "J" Alt Route	$ 300,794,161	2% =	$6,016,000
St. Louis Bay	Surge Barrier - elev. 20	Option "A"	$ 1,133,702,062	2% =	$ 22,674,000
" " "	Surge Barrier - elev. 30	Option "B"	$ 1,368,223,293	2% =	$ 27,364,000
" " "	Surge Barrier - elev. 40	Option "C"	$ 1,646,791,696	2% =	$ 32,936,000
Hancock County	Inland Barrier - elev. 20	Option "A"	$ 169,496,737	2% =	$3,390,000
" "	Inland Barrier - elev. 30	Option "B"	$ 446,696,402	2% =	$8,934,000
" "	Inland Barrier - elev. 40	Option "C"	$ 378,122,578	2% =	$7,562,000
Line of Defense 5	***Retreat and / or Relocation of Critical Facilities***				N / A

Notes:

Price Level, Oct 07

Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment

Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"

Quantities listed within the Estimate represent Major Elements of the Project

Estimate Excludes: Project Escalation, Relocations, HTRW, & Historical Preservation Cost

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "A" FILE NAME: scip-comprehensive-study-compbined-cost-est-25jul08.xls
Restore Island Footprint (Horn, Petit Bois, Ship, & Cat Island)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT

Assumed Quantity	Off-Shore Borrow Quantity (cy)	Haul Distance, r/t (mi)		Access Channel & Storage Area Quantity (cy)	Haul Distance, r/t (mi)	
14% Petit Bois	9,300,000	90		2,000,000	20	
31% Horn	21,240,000	84		4,650,000	5	
32% Ship	21,240,000	90		4,800,000	20	
23% Cat	14,600,000	114		3,450,000	30	
100%	66,380,000	93	miles rt, weighted av	14,900,000	18	miles rt, weighted avg

In-Place Material on Island

Quantity (cy)	Pumping Distance (avg lf)	Pumping Distance (max lf)		Island Surface Area Quantity (acr)
5,880,000	12,000	18000	Petit Bois	231
13,000,000	12,000	18000	Horn	535
13,500,000	15,000	25000	Ship	540
9,660,000	30,000	55000	Cat	390
42,040,000				1,696

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mob, Prep Work, Demob - Pipeline Dredge Plant with Booster, Initially	1	ea	1,750,000	$1,750,000
Intermediate Mob & Preparatory Work, Pipeline Dredge Plant	7	ea	150,000	1,050,000
Intermediate Mob & Preparatory Work, Pipeline Dredge Plant with Booster	7	ea	175,000	1,225,000
Mobilization, Preparatory Work, Demobilization - Hopper Dredge Plant	2	ea	750,000	1,500,000
Mobilization, Preparatory Work, Demobilization - Land Base Equipment	1	job	allow	1,000,000
Dredge Access Channels & Storage Area (by Hopper Dredge)	14,900,000	cy	2.90	43,210,000
Sand Borrow (by Hopper) (reference CEDEP for Cost Derivation) with allowed Overflow	66,380,000	cy	6.75	448,065,000
Assumed location of sand is St. Bernard Shoals				
Avg. Haul Distance approx. 94 miles r/t, weight avg.				
Average Water depth at Borrow Area, 60 ft.				
Sand Placement (by Pipeline Dredge from Storage Area, in-place)				
Petit Bois w/o Booster 12,000 lf avg	5,880,000	cy	1.50	8,820,000
Horn w/o Booster 12,000 lf avg	13,000,000	cy	1.50	19,500,000
Ship w/ Booster 15,000 lf avg	13,500,000	cy	2.50	33,750,000
Cat w/2ea Boosters 30,000 lf avg	9,660,000	cy	4.00	38,640,000
	42,040,000	cy		

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	2	OF	10
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 1***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Option "A"	FILE NAME:	scip-comprehensive-study-comphined-cost-est-25jul08.xls		
	Restore Island Footprint (Horn, Petit Bois, Ship, & Cat Island)				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Maritime Forest Planting	340	acr	10,000	$3,400,000
Emerging Marsh Planting	644	acr	57,600	37,094,400
Beach & Dune Planting, Sea Oats, (figure 7,260 plants/acr 34 acr)	246,840	plants	1.50	370,260
Grading-Shaping - Land Base Equipment, Marshbuggies, dosers, etc.	1,696	acr	10,000	16,960,000
GIS Support During Construction	5	yrs	200,000	1,000,000
Control & Placement Surveys	5	yrs	200,000	1,000,000

Current Contract Cost, Oct 07			$ 658,334,660
CONTINGENCY		**25.0%**	164,583,665
			$ 822,918,325
01 Account, Lands & Damage	PCA	**LS**	25,000
09 Account, Aids to Navigation		**LS**	100,000
			$ 823,043,325
30 Account, Plan, Engr.& Design		**8.0%**	65,843,466
			$ 888,886,791
31 Account, Constr. Management		**6.0%**	53,333,207
			$ 942,219,998
ESCALATION		**0.0%**	
			$ 942,219,998
			rounded
TOTAL PROJECT COST, Oct 07			$ 942,200,000

Notes: Dredging Cost Estimates derived using CEDEP
Estimates Excludes Permanent Intrastructure including Island Landings

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "B" FILE NAME:
Replenish Sand in Littoral Zone (River Sand Source) mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Sand Borrow, from Tenn-Tom Upland Disposals, by barge & crane	18,905,200	cy	23.31	$440,680,212
from BWT Upland Disposals, by barge & crane	12,675,000	cy	16.14	204,574,500
Barge Pump off / Dispersement	31,580,200	cy	2.00	63,160,400
			Current Contract Cost, Oct 07	$ 708,415,112
CONTINGENCY			**25.0%**	177,103,778
				$ 885,518,890
01 Account, Lands & Damage		PCA	**LS**	25,000
				$ 885,543,890
30 Account, Plan, Engr.& Design			**8.0%**	70,843,511
				$ 956,387,401
31 Account, Constr. Management			**6.0%**	57,383,244
				$ 1,013,770,645
ESCALATION			**0.0%**	0
				$ 1,013,770,645 rounded
			TOTAL PROJECT COST, FY-07	$ 1,013,800,000

Notes: Sand Borrow Unit Cost furnished by Operations Division

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	4	OF	10
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 1***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Option "C1 & C2"	FILE NAME:	scip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Replenish Sand in Littoral Zone (Off-Shore & Inland River Sand Source)				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Option C1				
Mobilization, Preparatory Work, Demobilization - Hopper Dredge Plant	1	ea	750,000	750,000
Sand Borrow (by Hopper) (reference CEDEP for Cost Derivation) with allowed Overflow	5,000,000	cy	9.00	45,000,000
Assumed location of sand is St. Bernard Shoals				
Avg. Haul Distance approx. 90 miles r/t, weight avg.				
Average Water depth at Borrow Area, 60 ft.				
Dredge Pump-Off				
			Subtotal	$ 45,750,000
Option C2				
Mobilization & Demobilization - Pump off / Spreader Barage Equip	1	job	allow	225,000
Sand Borrow, from Tenn-Tombigbee River Upland Disposals	4,000,000	cy	11.50	$46,000,000
Barge Pump off / Dispersement	4,000,000	cy	2.50	10,000,000
			Subtotal	$ 56,225,000

Option C1 placement:

Placement Area	*Off-Shore Borrow Quantity (cy)*	*Haul Distance, r/t (miles), weighted avg.*	*Pumping Distance (avg lf)*	*Pumping Distance (max lf)*
East End Ship Island	5,000,000	90	5,000	6,000

Option C2 placement:

Placement Area	*Tombigbee River Borrow Quantity (cy)*	*Haul Distance, r/t (miles), weighted avg.*
East End Petit Bois Island	5,000,000	150

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "C1 & C2" FILE NAME: scip-comprehensive-study-compbined-cost-est-25jul08.xls
Replenish Sand in Littoral Zone (Off-Shore & Inland River Sand Source)

DESCRIPTION		Quantity	Unit	Unit Price		ESTIMATED AMOUNT
GIS Support During Construction		2.50	yrs	200,000		500,000
Control & Placement Surveys		2.50	yrs	200,000		500,000
		Current Contract Cost, Oct 07			$	102,975,000
	CONTINGENCY			**25.0%**		25,743,750
					$	128,718,750
	01 Account, Lands & Damage		PCA	**LS**		25,000
					$	128,743,750
	30 Account, Plan, Engr.& Design			**8.0%**		10,299,500
					$	139,043,250
	31 Account, Constr. Management			**6.0%**		8,342,595
					$	147,385,845
	ESCALATION			**0.0%**		0
					$	147,385,845 rounded
		TOTAL PROJECT COST, Oct 07			$	147,400,000

Notes: Sand Borrow Unit Cost furnished by Operations Division

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "D" FILE NAME: scip-comprehensive-study-cnmpbioed-cost-est-25jul08.xls
Environmental Restoration (2' Dune with Beach Sand)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization - Land Base Equipment	1	job	allow	$20,000
Dredge Access Channels	30,000	cy	5.00	150,000
Construct 2' Dume with Beach Sand- Land Base Equipment, Marshbuggies, dosers, etc.	106,770	cy	15.00	1,601,550
Maritime Forest Planting	755	acr	10,000	7,550,000
Beach & Dune Planting, Sea Oats, (figure 7,260 plants/acr 51.3 acr)	372,440	plants	1.50	558,660

Current Contract Cost, Oct 07			$	9,880,210
CONTINGENCY		**25.0%**		2,470,053
			$	12,350,263
01 Account, Lands & Damage	PCA	**LS**		25,000
			$	12,375,263
30 Account, Plan, Engr.& Design		**8.0%**		990,021
			$	13,365,284
31 Account, Constr. Management		**6.0%**		801,917
				$14,167,201
ESCALATION		**0.0%**		0
			$	14,167,201
				rounded
TOTAL PROJECT COST, Oct 07			$	14,200,000

Notes: Planting Unit Cost furnished by Planning Division

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	7	OF	10
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 1***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Option "E"	FILE NAME:	scip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Environmental Restoration (6' Dune with Off-shore Sand)				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization - Hopper Dredge Plant	1	ea	allow	$750,000
Mobilization, Preparatory Work, Demobilization - Land Base Equipment	1	job	allow	20,000
Dredge Access Channels & Storage Area (by Hopper Dredge)	200,000	cy	5.00	1,000,000
Sand Borrow (by Hopper) (reference CEDEP for Cost Derivation)				
with allowed Overflow	640,500	cy	6.75	4,323,375
Assumed location of sand is St. Bernard Shoals				
Avg. Haul Distance approx. 94 miles r/t, weight avg.				
Average Water depth at Borrow Area, 60 ft.				
Barge Pump off / Dispersement	640,500	cy	2.00	1,281,000
Construct 6' Dune with Beach Sand- Land Base Equipment, Marshbuggies, dosers, trucks,etc.	640,500	cy	18.00	11,529,000
Maritime Forest Planting	755	acr	10,000	7,550,000
Beach & Dune Planting, Sea Oats, (figure 30 miles 21,120 plants / π	633,600	plants	1.50	950,400

		Current Contract Cost, Oct 07		$27,403,775
CONTINGENCY		**25.0%**		6,850,944
			$	34,254,719
01 Account, Lands & Damage	PCA	**LS**		25,000
			$	34,279,719
30 Account, Plan, Engr.& Design		**8.0%**		2,742,378
			$	37,022,096
31 Account, Constr. Management		**6.0%**		2,221,326
			$	39,243,422
ESCALATION		**0.0%**		0
			$	39,243,422
				rounded
	TOTAL PROJECT COST, Oct 07		$	39,200,000

Notes: Planting Unit Cost furnished by Planning Division

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 8 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "F" FILE NAME: scip-comprehensive-study-compbined-cost-est-25jul08.xls
Environmental Restoration (Sea Grass Planting)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Sea Grass Planting	4,400	acr	42,000	184,800,000
			Current Contract Cost, Oct 07	$184,800,000
CONTINGENCY			**25.0%**	46,200,000
				$ 231,000,000
01 Account, Lands & Damage		PCA	**LS**	25,000
				$ 231,025,000
30 Account, Plan, Engr.& Design			**8.0%**	18,482,000
				$ 249,507,000
31 Account, Constr. Management			**6.0%**	14,970,420
				$ 264,477,420
ESCALATION			**0.0%**	0
				$ 264,477,420
				rounded
	TOTAL PROJECT COST, Oct 07			$ 264,500,000

Notes: Planting Unit Cost furnished by Planning Division

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: Mississippi Coastal Improvements Program "MsCIP" ITEM NO. DATE 25-Jul-08
LOCATION: Mississippi SHEET NO. 9 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "G" FILE NAME: scip-comprehensive-study-compbined-cost-est-25jul08.xls
Restoration of Ship Island Breach

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT

Assumed Quantity	*Off-Shore Borrow Quantity (cy)*	*Haul Distance, r/t (mi)*
100% Ship	13,000,000	90

In-Place Material on Island

Quantity (cy)	*Pumping Distance (avg lf)*	*Pumping Distance (max lf)*		*Island Surface Area Quantity (acr)*
13,000,000	5,000	6,000	Ship Island Breach	600

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization - Hopper Dredge Plant	2	ea	750,000	1,500,000
Mobilization, Preparatory Work, Demobilization - Land Base Equipment	1	job	allow	1,000,000
Sand Borrow (by Hopper) (reference CEDEP for Cost Derivation) with allowed Overflow Assumed location of sand is St. Bernard Shoals Avg. Haul Distance approx. 90 miles r/t, weight avg. Average Water depth at Borrow Area, 60 ft. Dredge Pump-Off	13,000,000	cy	9.00	117,000,000
Beach & Dune Planting (sea oats)	477,500	plants	1.50	716,250
Grading-Shaping - Land Base Equipment, Marshbuggies, dosers, etc.	600	acr	10,000	6,000,000
GIS Support During Construction	1.25	yrs	200,000	250,000
Control & Placement Surveys	1.25	yrs	200,000	250,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 10 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Option "G" FILE NAME: scip-comprehensive-study-compbined-cost-est-25jul08 xls
Restoration of Ship Island Breach

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Current Contract Cost, Oct 07				$126,716,250
CONTINGENCY			**25.0%**	31,679,063
				$158,395,313
01 Account, Lands & Damage		PCA	**LS**	25,000
				$ 158,420,313
30 Account, Plan, Engr.& Design			**8.0%**	12,673,625
				$ 171,093,938
31 Account, Constr. Management			**6.0%**	10,265,636
				$ 181,359,574
ESCALATION			**0.0%**	0
				$ 181,359,574 rounded
TOTAL PROJECT COST, Oct 07				$ 181,400,000

Notes: Planting Unit Cost furnished by Planning Division

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "A" elevation 10 with 40' Crest width				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$110,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	457,700	cy	8.00	3,661,600
Sand (dune) Construction, Grade & Shape	457,700	cy	4.00	1,830,800
Misc Site Items	1	ls	allow	13,700
	Current Contract Cost, Oct 07			$5,616,100
CONTINGENCY			**25.0%**	1,404,025
				$7,020,125
01 Account, Lands & Damage		PCA	**LS**	25,000
				7,045,125
				$7,045,125
30 Account, Plan, Engr.& Design			**8.0%**	563,610
				$7,608,735
31 Account, Constr. Management			**6.0%**	456,524
				$8,065,259
ESCALATION			**0.0%**	
				$8,065,259
				rounded
	TOTAL PROJECT COST, Oct 07		$	8,070,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "B" elevation 8 with 50' Crest width				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$83,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	345,671	cy	8.00	2,765,368
Sand (dune) Construction, Grade & Shape	345,671	cy	4.00	1,382,684
Misc Site Items	1	ls	allow	10,400
	Current Contract Cost, Oct 07			$4,241,452
CONTINGENCY			**25.0%**	1,060,363
				$5,301,815
01 Account, Lands & Damage		PCA	**LS**	25,000
				5,326,815
				$5,326,815
30 Account, Plan, Engr.& Design			**8.0%**	426,145
				$5,752,960
31 Account, Constr. Management			**6.0%**	345,178
				$6,098,138
ESCALATION			**0.0%**	
				$6,098,138
				rounded
	TOTAL PROJECT COST, Oct 07		$	6,100,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	3	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-comphined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County ***Option "C"*** ***elevation 10*** ***with 20' Crest width***				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$67,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	280,812	cy	8.00	2,246,496
Sand (dune) Construction, Grade & Shape	280,812	cy	4.00	1,123,248
Misc Site Items	1	ls	allow	8,400
Current Contract Cost, Oct 07				$3,445,144
CONTINGENCY			**25.0%**	861,286
				$4,306,430
01 Account, Lands & Damage		PCA	**LS**	25,000
				4,331,430
				$4,331,430
30 Account, Plan, Engr.& Design			**8.0%**	346,514
				$4,677,944
31 Account, Constr. Management			**6.0%**	280,677
				$4,958,621
ESCALATION			**0.0%**	
				$4,958,621
				rounded
TOTAL PROJECT COST, Oct 07			$	4,960,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 33
PREPARED: Joseph E. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "D" elevation 8 with 30' Crest width					
Mobilization, Preparatory Work, Demobilization		1	job	allow	$55,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles		227,745	cy	8.00	1,821,960
Sand (dune) Construction, Grade & Shape		227,745	cy	4.00	910,980
Misc Site Items		1	ls	allow	6,800
		Current Contract Cost, Oct 07			$2,794,740
	CONTINGENCY			**25.0%**	698,685
					$3,493,425
	01 Account, Lands & Damage		PCA	**LS**	25,000
					3,518,425
					$3,518,425
	30 Account, Plan, Engr.& Design			**8.0%**	281,474
					$3,799,899
	31 Account, Constr. Management			**6.0%**	227,994
					$4,027,893
	ESCALATION			**0.0%**	
					$4,027,893 rounded
		TOTAL PROJECT COST, Oct 07		$	4,030,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	5	OF	33
		PREPARED:	Joseph F. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08 xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "E" elevation 10 with 40' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$114,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	457,700	cy	8.00	3,661,600
Sand (dune) Construction, Grade & Shape	457,700	cy	4.00	1,830,800
Plants (sea oats on one toe, 3 rows of plants on 18" centers)	79,600	plants	1.50	119,400
Fencing (one toe)	39,800	lf	2.80	111,440
Misc Site Items	1	ls	allow	14,300
	Current Contract Cost, Oct 07			$5,851,540
CONTINGENCY			**25.0%**	1,462,885
				$7,314,425
01 Account, Lands & Damage		PCA	**LS**	25,000
				7,339,425
				$7,339,425
30 Account, Plan, Engr.& Design			**8.0%**	587,154
				$7,926,579
31 Account, Constr. Management			**6.0%**	475,595
				$8,402,174
ESCALATION			**0.0%**	
				$8,402,174
				rounded
	TOTAL PROJECT COST, Oct 07		$	8,400,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "F" elevation 8 with 50' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$88,000
Construct Sand (dune), Upland Borrow Site	345,671	cy	8.00	2,765,368
Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles				
Sand (dune) Construction, Grade & Shape	345,671	cy	4.00	1,382,684
Plants (sea oats on one toe, 3 rows on 18" centers)	79,600	plants	1.50	119,400
Fencing (one toe)	39,800	lf	2.80	111,440
Misc Site Items	1	ls	allow	10,900
	Current Contract Cost, Oct 07			$4,477,792
CONTINGENCY			**25.0%**	1,119,448
				$5,597,240
01 Account, Lands & Damage		PCA	**LS**	25,000
				5,622,240
				$5,622,240
30 Account, Plan, Engr.& Design			**8.0%**	449,779
				$6,072,019
31 Account, Constr. Management			**6.0%**	364,321
				$6,436,340
ESCALATION			**0.0%**	
				$6,436,340
				rounded
	TOTAL PROJECT COST, Oct 07		$	6,440,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage
Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI") Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 7 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "G" elevation 10 with 20' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$72,000
Construct Sand (dune), Upland Borrow Site	280,812	cy	8.00	2,246,496
Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles				
Sand (dune) Construction, Grade & Shape	280,812	cy	4.00	1,123,248
Plants (sea oats on one toe, 3 rows on 18" centers)	79,600	plants	1.50	119,400
Fencing (one toe)	39,800	lf	2.80	111,440
Misc Site Items	1	ls	allow	9,000
	Current Contract Cost, Oct 07			$3,681,584
CONTINGENCY			**25.0%**	920,396
				$4,601,980
01 Account, Lands & Damage		PCA	**LS**	25,000
				4,626,980
				$4,626,980
30 Account, Plan, Engr.& Design			**8.0%**	370,158
				$4,997,138
31 Account, Constr. Management			**6.0%**	299,828
				$5,296,967
ESCALATION			**0.0%**	
				$5,296,967
				rounded
	TOTAL PROJECT COST, Oct 07		$	5,300,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 8 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "H" elevation 8 with 30' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$59,000
Construct Sand (dune), Upland Borrow Site	227,745	cy	8.00	1,821,960
Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles				
Sand (dune) Construction, Grade & Shape	227,745	cy	4.00	910,980
Plants (sea oats on one toe, 3 rows on 18" centers)	79,600	plants	1.50	119,400
Fencing (one toe)	39,800	lf	2.80	111,440
Misc Site Items	1	ls	allow	7,400
Current Contract Cost, Oct 07				$3,030,180
CONTINGENCY			**25.0%**	757,545
				$3,787,725
01 Account, Lands & Damage		PCA	**LS**	25,000
				3,812,725
				$3,812,725
30 Account, Plan, Engr.& Design			**8.0%**	305,018
				$4,117,743
31 Account, Constr. Management			**6.0%**	247,065
				$4,364,808
ESCALATION			**0.0%**	
				$4,364,808
				rounded
TOTAL PROJECT COST, Oct 07			$	4,360,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage
Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 9 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County ***Option "I"*** ***elevation 10*** ***with 55' Crest width with Fencing (Comparison Dune)***				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$261,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	1,067,598	cy	8.00	8,540,784
Sand (dune) Construction, Grade & Shape	1,067,598	cy	4.00	4,270,392
Fencing (both toes+A37)	79,600	lf	2.80	222,880
Misc Site Items	1	ls	allow	32,600
Current Contract Cost, Oct 07				$13,327,656
CONTINGENCY			**25.0%**	3,331,914
				$16,659,570
01 Account, Lands & Damage		PCA	**LS**	25,000
				16,684,570
				$16,684,570
30 Account, Plan, Engr.& Design			**8.0%**	1,334,766
				$18,019,336
31 Account, Constr. Management			**6.0%**	1,081,160
				$19,100,496
ESCALATION			**0.0%**	
				$19,100,496
				rounded
TOTAL PROJECT COST, Oct 07			$	19,100,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	10	OF	33
		PREPARED:	Joseph E. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "J" elevation 10 ***with 55' Crest width with Planting & Fencing (Comparison Dune)***				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$265,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	1,067,598	cy	8.00	8,540,784
Sand (dune) Construction, Grade & Shape	1,067,598	cy	4.00	4,270,392
Plants (sea oats on both toes, 3 rows on 18" centers)	159,200	plants	1.50	238,800
Fencing (both toes)	79,600	lf	2.80	222,880
Misc Site Items	1	ls	allow	33,200
	Current Contract Cost, Oct 07			$13,571,056
CONTINGENCY			**25.0%**	3,392,764
				$16,963,820
01 Account, Lands & Damage		PCA	**LS**	25,000
				16,988,820
				$16,988,820
30 Account, Plan, Engr.& Design			**8.0%**	1,359,106
				$18,347,926
31 Account, Constr. Management			**6.0%**	1,100,876
				$19,448,801
ESCALATION			**0.0%**	
				$19,448,801
				rounded
	TOTAL PROJECT COST, Oct 07		$	19,450,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: Mississippi Coastal Improvements Program "MsCIP	ITEM NO.	DATE	25-Jul-08
LOCATION: Mississippi	SHEET NO. 11	OF	33
	PREPARED: Joseph F. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team	
Beach / Dune Construction	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Hancock County Option "K" 60 foot wide by 2-foot berm with Plants & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$63,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	194,578	cy	8.00	1,556,624
Sand (dune) Construction, Grade & Shape	194,578	cy	4.00	778,312
Plants (sea oats on entire berm on 30" centers)	398,000	plants	1.50	597,000
Fencing (both toes)	79,600	lf	2.80	222,880
Misc Site Items	1	ls	allow	7,900
	Current Contract Cost, Oct 07			$3,225,716
CONTINGENCY			**25.0%**	806,429
				$4,032,145
01 Account, Lands & Damage		PCA	**LS**	25,000
				4,057,145
				$4,057,145
30 Account, Plan, Engr.& Design			**8.0%**	324,572
				$4,381,717
31 Account, Constr. Management			**6.0%**	262,903
				$4,644,620
ESCALATION			**0.0%**	
				$4,644,620
				rounded
	TOTAL PROJECT COST, Oct 07		$	4,640,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"). Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP	ITEM NO.		DATE	25-Jul-06
LOCATION:	Mississippi	SHEET NO.	12	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Cary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul06.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "A" elevation 15 with 35' Crest width				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipme	1	job	allow	74,000
Construct Sand (dune), Dredged from near Shore Borrow Site	2,698,656	cy	5.50	14,842,608
Misc Site Items	1	ls	allow	37,100
	Current Contract Cost, Oct 07			$15,243,708
CONTINGENCY			**25.0%**	3,810,927
				$19,054,635
01 Account, Lands & Damage		PCA	**LS**	25,000
				$19,079,635
30 Account, Plan, Engr.& Design			**8.0%**	1,526,371
				$20,606,006
31 Account, Constr. Management			**6.0%**	1,236,360
				$21,842,366
ESCALATION			**0.0%**	
				$21,842,366
				rounded
	TOTAL PROJECT COST, Oct 07		$	21,840,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	13	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "B" elevation 13 with 45' Crest width				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipme	1	job	allow	63,000
Construct Sand (dune), Dredged from near Shore Borrow Site	2,293,764	cy	5.50	12,615,702
Misc Site Items	1	ls	allow	31,500
	Current Contract Cost, Oct 07			$13,000,202
CONTINGENCY			**25.0%**	3,250,051
				$16,250,253
01 Account, Lands & Damage		PCA	**LS**	25,000
				$16,275,253
30 Account, Plan, Engr.& Design			**8.0%**	1,302,020
				$17,577,273
31 Account, Constr. Management			**6.0%**	1,054,636
				$18,631,909
ESCALATION			**0.0%**	
				$18,631,909
				rounded
	TOTAL PROJECT COST, Oct 07		$	18,600,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	14	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est-25jul08.xls		

Harrison County ***Option "C"*** ***elevation 15*** ***with 25' Crest width***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipmei	1	job	allow	61,000
Construct Sand (dune), Dredged from near Shore Borrow Site	2,223,782	cy	5.50	12,230,801
Misc Site Items	1	ls	allow	30,600
	Current Contract Cost, Oct 07			$12,612,401
CONTINGENCY			**25.0%**	3,153,100
				$15,765,501
01 Account, Lands & Damage		PCA	**LS**	25,000
				$15,790,501
30 Account, Plan, Engr & Design			**8.0%**	1,263,240
				$17,053,741
31 Account, Constr. Management			**6.0%**	1,023,224
				$18,076,966
ESCALATION			**0.0%**	0
				$18,076,966
				rounded
	TOTAL PROJECT COST, Oct 07		$	18,100,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	15	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County ***Option "D"*** ***elevation 13*** ***with 15' Crest width***				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipme	1	job	allow	34,000
Construct Sand (dune), Dredged from near Shore Borrow Site	1,254,041	cy	5.50	6,897,226
Misc Site Items	1	ls	allow	17,200
Current Contract Cost, Oct 07				$7,238,426
CONTINGENCY			**25.0%**	1,809,606
				$9,048,032
01 Account, Lands & Damage		PCA	**LS**	25,000
				$9,073,032
30 Account, Plan, Engr.& Design			**8.0%**	725,843
				$9,798,874
31 Account, Constr. Management			**6.0%**	587,932
				$10,386,807
ESCALATION			**0.0%**	0
				$10,386,807
				rounded
TOTAL PROJECT COST, Oct 07			$	10,400,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	16	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "E" elevation 15 with 35' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipme	1	job	allow	78,000
Construct Sand (dune), Dredged from near Shore Borrow Site	2,698,656	cy	5.50	14,842,608
Plants (sea oats on one toe, 3 rows of plants on 18" centers)	269,928	plants	1.50	404,892
Fencing (one toe)	134,964	lf	2.80	377,899
Misc Site Items	1	ls	allow	39,100
	Current Contract Cost, Oct 07			$16,032,499
CONTINGENCY			**25.0%**	4,008,125
				$20,040,624
01 Account, Lands & Damage		PCA	**LS**	25,000
				20,065,624
				$20,065,624
30 Account, Plan, Engr.& Design			**8.0%**	1,605,250
				$21,670,874
31 Account, Constr. Management			**6.0%**	1,300,252
				$22,971,126
ESCALATION			**0.0%**	
				$22,971,126
				rounded
	TOTAL PROJECT COST, Oct 07		$	22,970,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage
Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al
Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	17	OF	33
		PREPARED:	Joseph E. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

Harrison County Option "F" elevation 13 with 45' Crest width with Planting & Fencing

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipmei	1	job	allow	67,000
Construct Sand (dune), Dredged from near Shore Borrow Site	2,293,764	cy	5.50	12,615,702
Plants (sea oats on one toe, 3 rows on 18" centers)	269,928	plants	1.50	404,892
Fencing (one toe)	134,964	lf	2.80	377,899
Misc Site Items	1	ls	allow	33,500
		Current Contract Cost, Oct 07		$13,788,993
CONTINGENCY			**25.0%**	3,447,248
				$17,236,242
01 Account, Lands & Damage		PCA	**LS**	25,000
				17,261,242
				$17,261,242
30 Account, Plan, Engr.& Design			**8.0%**	1,380,899
				$18,642,141
31 Account, Constr. Management			**6.0%**	1,118,528
				$19,760,669
ESCALATION			**0.0%**	
				$19,760,669
				rounded
	TOTAL PROJECT COST, Oct 07		$	19,760,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

Unit Cost for Fencing & Grassing furnish by Harrison Couoty & Brown & Mitchel Inc. ("BMI"). Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 18	OF 33
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Beach / Dune Construction	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "G" elevation 15 with 25' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipme	1	job	allow	65,000
Construct Sand (dune). Dredged from near Shore Borrow Site	2,223,782	cy	5.50	12,230,801
Plants (sea oats on one toe, 3 rows on 18" centers)	269,928	plants	1.50	404,892
Fencing (one toe)	134,964	lf	2.80	377,899
Misc Site Items	1	ls	allow	32,500
			Current Contract Cost, Oct 07	$13,401,092
CONTINGENCY			**25.0%**	3,350,273
				$16,751,365
01 Account, Lands & Damage		PCA	**LS**	25,000
				16,776,365
				$16,776,365
30 Account, Plan, Engr.& Design			**8.0%**	1,342,109
				$18,118,474
31 Account, Constr. Management			**6.0%**	1,087,108
				$19,205,583
ESCALATION			**0.0%**	
				$19,205,583
				rounded
			TOTAL PROJECT COST, Oct 07 $	19,210,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"). Bobby Weaver 228-896-0055

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 19 OF 33
PREPARED: Joseph F. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "H" elevation 13 with 15' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipmei	1	job	allow	38,000
Construct Sand (dune), Dredged from near Shore Borrow Site	1,254,041	cy	5.50	6,897,226
Plants (sea oats on one toe, 3 rows on 18" centers)	269,928	plants	1.50	404,892
Fencing (one toe)	134,964	lf	2.80	377,899
Misc Site Items	1	ls	allow	19,200
	Current Contract Cost, Oct 07			$8,027,217
CONTINGENCY			**25.0%**	2,006,804
				$10,034,021
01 Account, Lands & Damage		PCA	**LS**	25,000
				10,059,021
				$10,059,021
30 Account, Plan, Engr.& Design			**8.0%**	804,722
				$10,863,743
31 Account, Constr. Management			**6.0%**	651,825
				$11,515,567
ESCALATION			**0.0%**	
				$11,515,567
				rounded
	TOTAL PROJECT COST, Oct 07		$	11,520,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage
Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc ("BMI"), Bobby Weaver 228-896-0055
Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 20 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbioed-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County ***Option "I"*** ***elevation 15*** ***with 55' Crest width with Fencing (Comparison Dune)***				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipme	1	job	allow	138,000
Construct Sand (dune), Dredged from near Shore Borrow Site	4,888,008	cy	5.50	26,884,044
Fencing (both toes)	269,928	lf	2.80	755,798
Misc Site Items	1	ls	allow	69,100
	Current Contract Cost, Oct 07			$28,136,942
CONTINGENCY			**25.0%**	7,034,236
				$35,171,178
01 Account, Lands & Damage		PCA	**LS**	25,000
				35,196,178
				$35,196,178
30 Account, Plan, Engr.& Design			**8.0%**	2,815,694
				$38,011,872
31 Account, Constr. Management			**6.0%**	2,280,712
				$40,292,585
ESCALATION			**0.0%**	
				$40,292,585
				rounded
	TOTAL PROJECT COST, Oct 07		$	40,290,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 21 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "J" elevation 15 ***with 55' Crest width with Planting & Fencing (Comparison Dune)***				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipmei	1	job	allow	142,000
Construct Sand (dune), Dredged from near Shore Borrow Site	4,888,008	cy	5.50	26,884,044
Plants (sea oats on both toes, 3 rows on 18" centers)	539,856	plants	1.50	809,784
Fencing (both toes+A1155)	269,928	lf	2.80	755,798
Misc Site Items	1	ls	allow	71,100
	Current Contract Cost, Oct 07			$28,952,726
CONTINGENCY			**25.0%**	7,238,182
				$36,190,908
01 Account, Lands & Damage		PCA	**LS**	25,000
				36,215,908
				$36,215,908
30 Account, Plan, Engr.& Design			**8.0%**	2,897,273
				$39,113,181
31 Account, Constr. Management			**6.0%**	2,346,791
				$41,459,971
ESCALATION			**0.0%**	
				$41,459,971
				rounded
	TOTAL PROJECT COST, Oct 07		$	41,460,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage
Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc ("BMI"), Bobby Weaver 228-896-0055
Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 22	OF	33
	PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 2***	BASIS of ESTIMATE: info furnished per Project Delivery Team		
Beach / Dune Construction	FILE NAME:		
	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Option "K" 60 foot wide by 2-foot berm w / Plants & Fencing				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipmei	1	job	allow	32,000
Construct Sand (dune), Dredged from near Shore Borrow Site	659,824	cy	5.50	3,629,032
Plants (sea oats on entire berm on 30" centers)	1,349,641	plants	1.50	2,024,462
Fencing (both toes)	269,928	lf	2.80	755,798
Misc Site Items	1	ls	allow	16,000
	Current Contract Cost, Oct 07			$6,747,292
CONTINGENCY			**25.0%**	1,686,823
				$8,434,115
01 Account, Lands & Damage		PCA	**LS**	25,000
				8,459,115
				$8,459,115
30 Account, Plan, Engr.& Design			**8.0%**	676,729
				$9,135,844
31 Account, Constr. Management			**6.0%**	548,151
				$9,683,995
ESCALATION			**0.0%**	
				$9,683,995
				rounded
	TOTAL PROJECT COST, Oct 07		$	9,680,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"). Bobby Weaver 228-896-0055

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	23	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County ***Option "A"*** ***elevation 10*** ***with 40' Crest width***				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$26,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	107,019	cy	8.00	856,152
Sand (dune) Construction, Grade & Shape	107,019	cy	4.00	428,076
Misc Site Items	1	ls	allow	3,200
	Current Contract Cost, Oct 07			$1,313,428
CONTINGENCY			**25.0%**	328,357
				$1,641,785
01 Account, Lands & Damage		PCA	**LS**	25,000
				1,666,785
				$1,666,785
30 Account, Plan, Engr.& Design			**8.0%**	133,343
				$1,800,128
31 Account, Constr. Management			**6.0%**	108,008
				$1,908,135
ESCALATION			**0.0%**	
				$1,908,135
				rounded
	TOTAL PROJECT COST, Oct 07		$	1,910,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 24 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County ***Option "B"*** ***elevation 8*** ***with 50' Crest width***				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$19,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	80,824	cy	8.00	646,592
Sand (dune) Construction, Grade & Shape	80,824	cy	4.00	323,296
Misc Site Items	1	ls	allow	2,400
	Current Contract Cost, Oct 07			$991,288
CONTINGENCY			**25.0%**	247,822
				$1,239,110
01 Account, Lands & Damage		PCA	**LS**	25,000
				1,264,110
				$1,264,110
30 Account, Plan, Engr.& Design			**8.0%**	101,129
				$1,365,239
31 Account, Constr. Management			**6.0%**	81,914
				$1,447,153
ESCALATION			**0.0%**	
				$1,447,153
				rounded
	TOTAL PROJECT COST, Oct 07		$	1,450,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	25	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "C" elevation 10 with 20' Crest width				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$16,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	65,659	cy	8.00	525,272
Sand (dune) Construction, Grade & Shape	65,659	cy	4.00	262,636
Misc Site Items	1	ls	allow	2,000
	Current Contract Cost, Oct 07			$805,908
CONTINGENCY			**25.0%**	201,477
				$1,007,385
01 Account, Lands & Damage		PCA	**LS**	25,000
				1,032,385
				$1,032,385
30 Account, Plan, Engr.& Design			**8.0%**	82,591
				$1,114,976
31 Account, Constr. Management			**6.0%**	66,899
				$1,181,874
ESCALATION			**0.0%**	
				$1,181,874
				rounded
	TOTAL PROJECT COST, Oct 07		$	1,180,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 26	OF	33
	PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM ***Line of Defense 2***	BASIS of ESTIMATE: info furnished per Project Delivery Team		
Beach / Dune Construction	FILE NAME:		
	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "D" elevation 8 with 30' Crest width				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$13,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	53,251	cy	8.00	426,008
Sand (dune) Construction, Grade & Shape	53,251	cy	4.00	213,004
Misc Site Items	1	ls	allow	1,600
	Current Contract Cost, Oct 07			$653,612
CONTINGENCY			**25.0%**	163,403
				$817,015
01 Account, Lands & Damage		PCA	**LS**	25,000
				842,015
				$842,015
30 Account, Plan, Engr.& Design			**8.0%**	67,361
				$909,376
31 Account, Constr. Management			**6.0%**	54,563
				$963,939
ESCALATION			**0.0%**	
				$963,939
				rounded
	TOTAL PROJECT COST, Oct 07		$	960,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas and Storm Drainage

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	27	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "E" elevation 10 with 40' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$27,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	107,019	cy	8.00	856,152
Sand (dune) Construction, Grade & Shape	107,019	cy	4.00	428,076
Plants (sea oats on one toe, 3 rows of plants on 18" centers)	18,612	plants	1.50	27,918
Fencing (one toe)	9,306	lf	2.80	26,057
Misc Site Items	1	ls	allow	3,300
	Current Contract Cost, Oct 07			$1,368,503
CONTINGENCY			**25.0%**	342,126
				$1,710,629
01 Account, Lands & Damage		PCA	**LS**	25,000
				1,735,629
				$1,735,629
30 Account, Plan, Engr.& Design			**8.0%**	138,850
				$1,874,479
31 Account, Constr. Management			**6.0%**	112,469
				$1,986,948
ESCALATION			**0.0%**	
				$1,986,948
				rounded
	TOTAL PROJECT COST, Oct 07		$	1,990,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 28 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-comphined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "F" elevation 8 with 50' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$20,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	80,824	cy	8.00	646,592
Sand (dune) Construction, Grade & Shape	80,824	cy	4.00	323,296
Plants (sea oats on one toe, 3 rows on 18" centers)	18,612	plants	1.50	27,918
Fencing (one toe)	9,306	lf	2.80	26,057
Misc Site Items	1	ls	allow	2,600
		Current Contract Cost, Oct 07		$1,046,463
CONTINGENCY			**25.0%**	261,616
				$1,308,079
01 Account, Lands & Damage		PCA	**LS**	25,000
				1,333,079
				$1,333,079
30 Account, Plan, Engr.& Design			**8.0%**	106,646
				$1,439,725
31 Account, Constr. Management			**6.0%**	86,383
				$1,526,108
ESCALATION			**0.0%**	
				$1,526,108
				rounded
TOTAL PROJECT COST, Oct 07			$	1,530,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas. and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"). Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 29 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "G" elevation 10 with 20' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$17,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	65,659	cy	8.00	525,272
Sand (dune) Construction, Grade & Shape	65,659	cy	4.00	262,636
Plants (sea oats on one toe, 3 rows on 18" centers)	18,612	plants	1.50	27,918
Fencing (one toe)	9,306	lf	2.80	26,057
Misc Site Items	1	ls	allow	2,100
Current Contract Cost, Oct 07				$860,983
CONTINGENCY			**25.0%**	215,246
				$1,076,229
01 Account, Lands & Damage		PCA	**LS**	25,000
				1,101,229
				$1,101,229
30 Account, Plan, Engr.& Design			**8.0%**	88,098
				$1,189,327
31 Account, Constr. Management			**6.0%**	71,360
				$1,260,686
ESCALATION			**0.0%**	
				$1,260,686
				rounded
TOTAL PROJECT COST, Oct 07			$	1,260,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 30 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "H" elevation 8 with 30' Crest width with Planting & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$14,000
Construct Sand (dune), Upland Borrow Site	53,251	cy	8.00	426,008
Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles				
Sand (dune) Construction, Grade & Shape	53,251	cy	4.00	213,004
Plants (sea oats on one toe, 3 rows on 18" centers)	18,612	plants	1.50	27,918
Fencing (one toe)	9,306	lf	2.80	26,057
Misc Site Items	1	ls	allow	1,700
	Current Contract Cost, Oct 07			$708,687
CONTINGENCY			**25.0%**	177,172
				$885,859
01 Account, Lands & Damage		PCA	**LS**	25,000
				910,859
				$910,859
30 Account, Plan, Engr.& Design			**8.0%**	72,869
				$983,727
31 Account, Constr. Management			**6.0%**	59,024
				$1,042,751
ESCALATION			**0.0%**	
				$1,042,751
				rounded
	TOTAL PROJECT COST, Oct 07		$	1,040,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi Coastal Improvements Program "MsCIP** SHEET NO. 31 OF 33
PREPARED: Joseph H Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County ***Option "I"*** ***elevation 10***	***with 55' Crest width with Fencing (Comparison Dune)***				
Mobilization, Preparatory Work, Demobilization		1	job	allow	$61,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles		249,625	cy	8.00	1,997,000
Sand (dune) Construction, Grade & Shape		249,625	cy	4.00	998,500
Fencing (both toes)		18,612	lf	2.80	52,114
Misc Site Items		1	ls	allow	7,600
		Current Contract Cost, Oct 07			$3,116,214
	CONTINGENCY			**25.0%**	779,053
					$3,895,267
	01 Account, Lands & Damage		PCA	**LS**	25,000
					3,920,267
					$3,920,267
	30 Account, Plan, Engr.& Design			**8.0%**	313,621
					$4,233,888
	31 Account, Constr. Management			**6.0%**	254,033
					$4,487,922
	ESCALATION			**0.0%**	
					$4,487,922
					rounded
		TOTAL PROJECT COST, Oct 07		$	4,490,000

Notes:
Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage
Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	32	OF	33
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 2***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "J" elevation 10 ***with 55' Crest width with Planting & Fencing (Comparison Dune)***				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$62,000
Construct Sand (dune), Upland Borrow Site Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles	249,625	cy	8.00	1,997,000
Sand (dune) Construction, Grade & Shape	249,625	cy	4.00	998,500
Plants (sea oats on both toes, 3 rows on 18" centers)	37,224	plants	1.50	55,836
Fencing (both toes)	18,612	lf	2.80	52,114
Misc Site Items	1	ls	allow	7,800
	Current Contract Cost, Oct 07			$3,173,250
CONTINGENCY			**25.0%**	793,312
				$3,966,562
01 Account, Lands & Damage		PCA	**LS**	25,000
				3,991,562
				$3,991,562
30 Account, Plan, Engr.& Design			**8.0%**	319,325
				$4,310,887
31 Account, Constr. Management			**6.0%**	258,653
				$4,569,540
ESCALATION			**0.0%**	
				$4,569,540
				rounded
	TOTAL PROJECT COST, Oct 07		$	4,570,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 33 OF 33
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 2*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Option "K" 60 foot wide by 2-foot berm w / Plants & Fencing				
Mobilization, Preparatory Work, Demobilization	1	job	allow	$15,000
Construct Sand (dune), Upland Borrow Site	45,496	cy	8.00	363,968
Sand, Washed, Trucked from Upland Commerical Source, w/i 10 miles				
Sand (dune) Construction, Grade & Shape	45,496	cy	4.00	181,984
Plants (sea oats on entire berm on 30" centers)	93,060	plants	1.50	139,590
Fencing (both toes)	18,612	lf	2.80	52,114
Misc Site Items	1	ls	allow	1,800
	Current Contract Cost, Oct 07			$754,456
CONTINGENCY			**25.0%**	188,614
				$943,070
01 Account, Lands & Damage		PCA	**LS**	25,000
				968,070
				$968,070
30 Account, Plan, Engr.& Design			**8.0%**	77,446
				$1,045,515
31 Account, Constr. Management			**6.0%**	62,731
				$1,108,246
ESCALATION			**0.0%**	
				$1,108,246
				rounded
	TOTAL PROJECT COST, Oct 07		$	1,110,000

Notes:

Estimate Excludes Cost for Boardwalks, Seawalls, Comfort Stations, Parking Bays, Flag/Display/Recreational Areas, and Storm Drainage

Unit Cost for Fencing & Grassing furnish by Harrison County & Brown & Mitchel Inc. ("BMI"), Bobby Weaver 228-896-0055

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO.	1	OF	4
	PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
Hancock County ***Option "A"***	FILE NAME:			
Ring Levee - elev. 20 ***Bay St. Louis***	mscip-comprehensive-study-compbined-cost-est-25jul08.xls			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,330,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	24,867	sy	4.50	111,902
8" Water line removal	6,480	lf	8.00	51,840
6" Sewer line removal	6,480	lf	8.00	51,840
2" Gas line removal	6,480	lf	3.00	19,440
Electrical line removal - 3 phase 1440v	6,480	lf	11.00	71,280
24" Storm Drain removal	6,480	lf	11.00	71,280
Demolished structures (avg. 1,500 sf/ea 123 ea)	184,500	sf	3.00	553,500
Disposal Fee - off site	6,833	cy	2.50	17,083
NEW WORK:				
Compacted Fill (levee)	442,170	cy	15.00	6,632,550
Compacted Fill (crossovers)	8,117	cy	15.00	121,755
New Asphalt 2" (Cross overs) 432 cy figure 2.0 tons/cy	864	tons	70.00	60,480
Base material 12" (cross overs)	2,588	cy	34.50	89,286
Riprap (24")	181,796	cy	90.00	16,361,640
24 " gabion mattress cages, galv-pvc type	299,963	sy	32.00	9,598,816
Filter Fabric	299,963	sy	2.00	599,926
Grassing (seeding)	23	acres	2,150	49,450
Clearing and Grubbing, off-site disposal	119	acres	5,000	595,000
Crushed Aggregate 6" Thick(Levee wearing surface)	9,214	cy	45.00	414,630
Guardrail	5,120	lf	21.00	107,520
New 8" Water line	3,000	lf	41	123,000
New 6" Sewer Line	3,000	lf	48	144,000
New 2"Gas Line	3,000	lf	20	60,000
New Electrical Line - 3 phase 1440v	3,000	lf	44.00	132,000
New 24" Storm Drain	3,000	lf	68.00	204,000
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	9	pass-thrus		3,186,197
Concrete Box Culverts	5,925	cy	700	4,147,500
6 rebar (box culverts)	208	tons	925	192,400
			Subtotal $	**46,098,315**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***Option "A"*** FILE NAME:
Ring Levee - elev. 20 ***Bay St. Louis*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$ 46,098,315**
Flap Gates (12w x 4h)	30	ea	43,200	1,296,000
Flap Gates (8w x 4h)	20	ea	28,800	576,000
Flap Gates (10w x 4h)	8	ea	36,000	288,000
Flap Gates (7w x 4h)	7	ea	25,200	176,400
Flap Gates (7w x 3h)	18	ea	18,900	340,200
Cutoff valves (12w x4h)	30	ea	100,800	3,024,000
Cutoff valves (8w x4h)	20	ea	67,200	1,344,000
Cutoff valves (10w x4h)	8	ea	84,000	672,000
Cutoff valves (7w x4h)	7	ea	58,800	411,600
Cutoff valves (7w x3h)	18	ea	44,100	793,800
Pump stations, 42" to 60" pump size (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				36,651,084
Ditch Excavation	313,152	cy	12.00	3,757,824
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	4,650,000
			Current Contract Cost, Oct 07	$ 100,079,223
CONTINGENCY			**25.0%**	25,019,806
				$ 125,099,029
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	120,246,000
06 Account, Preservation - Mitigation-Tidal (5 acr $200,000/acr)				1,000,000
06 Account, Preservation - Mitigation-Non-Tidal (152 acr $5,500/acr)				836,000
				$ 247,206,029
30 Account, Plan, Engr.& Design			**8.0%**	19,776,482
				$ 266,982,511
31 Account, Constr. Management			**6.0%**	16,018,951
				$ 283,001,462
ESCALATION			**0.0%**	0
				$ 283,001,462
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 283,000,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***Option "B"*** FILE NAME:
Ring Levee - elev. 30 ***Bay St. Louis*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$3,260,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	36,060	sy	4.50	162,270
8" Water line removal	11,055	lf	8.00	88,440
6" Sewer line removal	11,055	lf	8.00	88,440
2" Gas line removal	11,055	lf	3.00	33,165
Electric line removal - 3 phase 1440v	11,055	lf	11.00	121,605
24" Storm Drain removal	11,055	lf	11.00	121,605
Demolished structures (avg. 1,500 sf/ea 186 ea)	279,000	sf	3.00	837,000
Disposal Fee - off site	10,333	cy	2.50	25,833
NEW WORK:				
Compacted Fill (levee)	2,104,864	cy	15.00	31,572,960
New Asphalt 2" (at Tunnels) 571 cy figure 2.0 tons/cy	1,142	tons	70.00	79,940
Base material 12" (cross overs)	3,423	cy	34.50	118,094
Riprap (12")	171,027	cy	90.00	15,392,430
24 " gabion mattress cages, galv-pvc type	564,388	sy	32.00	18,060,416
Filter Fabric	564,388	sy	2.00	1,128,776
Grassing (seeding)	64	acres	2,150	137,600
Clearing and Grubbing, off-site disposal	217	acres	5,000	1,085,000
Crushed Aggregate 6" Thick(Levee wearing surface)	11,379	cy	45.00	512,055
New 8" Water line	5,610	lf	41	230,010
New 6" Sewer Line	5,610	lf	48	269,280
New 2"Gas Line	5,610	lf	20	112,200
New Electrical Line - 3 phase 1440v	5,610	lf	44.00	246,840
New 24" Storm Drain	5,610	lf	68.00	381,480
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	9	pass-thrus		5,048,096
Concrete Box Culverts	5,925	cy	700	4,147,500
6 rebar (box culverts)	208	tons	925	192,400
			Subtotal $	**83,453,435**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***Option "B"*** FILE NAME:
Ring Levee - elev. 30 ***Bay St. Louis*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward	**$ 83,453,435**
Flap Gates (12w x 4h)		30	ea	43,200	1,296,000
Flap Gates (8w x 4h)		20	ea	28,800	576,000
Flap Gates (10w x 4h)		8	ea	36,000	288,000
Flap Gates (7w x 4h)		7	ea	25,200	176,400
Flap Gates (7w x 3h)		18	ea	18,900	340,200
Cutoff valves (12w x4h)		30	ea	100,800	3,024,000
Cutoff valves (8w x4h)		20	ea	67,200	1,344,000
Cutoff valves (10w x4h)		8	ea	84,000	672,000
Cutoff valves (7w x4h)		7	ea	58,800	411,600
Cutoff valves (7w x3h)		18	ea	44,100	793,800
Pump stations, 42" to 60" pump size	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				37,517,584
Ditch Excavation		313,152	cy	12.00	3,757,824
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow	6,520,000
				Current Contract Cost, Oct 07	$ 140,170,843
	CONTINGENCY			**25.0%**	35,042,711
					$ 175,213,554
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	156,364,000
	06 Account, Preservation - Mitigation-Tidal (7 acr $200,000/acr)				1,400,000
	06 Account, Preservation - Mitigation-Non-Tidal (273 acr $5,500/acr)				1,501,500
					$ 334,504,054
	30 Account, Plan, Engr.& Design			**8.0%**	26,760,324
					$ 361,264,378
	31 Account, Constr. Management			**6.0%**	21,675,863
					$ 382,940,241
	ESCALATION			**0.0%**	0
					$ 382,940,241
					rounded
				TOTAL PROJECT COST, Oct 07	**$ 382,900,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME:
Ring Levee - elev. 20 ***Gulf Park Estates*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,740,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	16,347	sy	4.50	73,562
8" Water line removal	5,600	lf	8.00	44,800
6" Sewer line removal	5,600	lf	8.00	44,800
2" Gas line removal	5,600	lf	3.00	16,800
Electrical line removal - 3 phase 1440v	5,600	lf	11.00	61,600
24" Storm Drain removal	5,600	lf	11.00	61,600
Demolished structures (avg. 1,500 sf/ea 60 ea)	90,000	sf	3.00	270,000
Disposal Fee - off site	3,333	cy	2.50	8,333
NEW WORK:				
Compacted Fill (levee)	796,003	cy	15.00	11,940,045
Compacted Fill (cross overs)	348	cy	15.00	5,225
New Asphalt 2" (Cross overs) 163 cy figure 2.0 tons/cy	326	tons	70.00	22,820
Base material 12" (cross overs)	1,212	cy	34.50	41,814
Riprap (24")	162,150	cy	90.00	14,593,500
24 " gabion mattress cages, galv-pvc type	267,548	sy	32.00	8,561,536
Filter Fabric	267,548	sy	2.00	535,096
Grassing (seeding)	27	acres	2,150	58,050
Clearing and Grubbing, off-site disposal	105	acres	5,000	525,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,311	cy	45.00	283,995
Guardrail	720	lf		
New 8" Water line	1,820	lf	41	74,620
New 6" Sewer Line	1,820	lf	48	87,360
New 2"Gas Line	1,820	lf	20	36,400
New Electrical Line - 3 phase 1440v	1,820	lf	44.00	80,080
New 24" Storm Drain	1,820	lf	68.00	123,760
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	11	pass-thrus		3,438,529
2-lane Gate (9ft height)	1	ea	32,000	32,000
Concrete Box Culverts	2,815	cy	700	1,970,500
6 rebar (box culverts)	97	tons	925	89,725
			Subtotal $	**44,821,549**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME:
Ring Levee - elev. 20 ***Gulf Park Estates*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$ 44,821,549**
Flap Gates (8w x 4h)	19	ea	28,800	547,200
Flap Gates (5w x 3h)	6	ea	13,500	81,000
Flap Gates (10w x 4h)	17	ea	36,000	612,000
Cutoff valves (8w x 4h)	19	ea	67,200	1,276,800
Cutoff valves (5w x 3h)	6	ea	31,500	189,000
Cutoff valves (10w x 4h)	17	ea	84,000	1,428,000
Pump stations, 42" to 60" pump size (8 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				21,071,378
Ditch Excavation	119,384	cy	12.00	1,432,608
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	3,480,000
			Current Contract Cost, Oct 07	$ 74,939,535
CONTINGENCY			**25.0%**	18,734,884
				$ 93,674,419
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				31,458,000
06 Account, Preservation - Mitigation-Tidal (23 acr $200,000/acr)				4,600,000
06 Account, Preservation - Mitigation-Non-Tidal (97 acr $5,500/acr)				533,500
				$ 130,290,919
30 Account, Plan, Engr.& Design			**8.0%**	10,423,274
				$ 140,714,192
31 Account, Constr. Management			**6.0%**	8,442,852
				$ 149,157,044
ESCALATION			**0.0%**	0
				$ 149,157,044 rounded
			TOTAL PROJECT COST, Oct 07	**$ 149,200,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "B"*** FILE NAME:
Ring Levee - elev. 30 ***Gulf Park Estates*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,800,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	23,054	sy	4.50	103,743
8" Water line removal	7,995	lf	8.00	63,960
6" Sewer line removal	7,995	lf	8.00	63,960
2" Gas line removal	7,995	lf	3.00	23,985
Electric line removal - 3 phase 1440v	7,995	lf	11.00	87,945
24" Storm Drain removal	7,995	lf	11.00	87,945
Demolished structures (avg. 1,500 sf/ea 64 ea)	96,000	sf	3.00	288,000
Disposal Fee - off site	3,556	cy	2.50	8,889
NEW WORK:				
Compacted Fill (levee)	2,254,986	cy	15.00	33,824,790
New Asphalt 2" (Cross overs) 193 cy figure 2.0 tons/cy	386	tons	70.00	27,020
Base material 12" (cross overs)	1,156	cy	34.50	39,882
Riprap (12")	125,876	cy	90.00	11,328,840
24 " gabion mattress cages, galv-pvc type	415,394	sy	32.00	13,292,608
Filter Fabric	415,394	sy	2.00	830,788
Grassing (seeding)	54	acres	2,150	116,100
Clearing and Grubbing, off-site disposal	155	acres	5,000	775,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,503	cy	45.00	292,635
New 8" Water line	2,535	lf	41	103,935
New 6" Sewer Line	2,535	lf	48	121,680
New 2"Gas Line	2,535	lf	20	50,700
New Electrical Line - 3 phase 1440v	2,535	lf	44.00	111,540
New 24" Storm Drain	2,535	lf	68.00	172,380
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	13	pass-thrus		6,925,159
Concrete Box Culverts	2,815	cy	700	1,970,500
6 rebar (box culverts)	97	tons	925	89,725
			Subtotal $	**73,601,709**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "B"*** FILE NAME:
Ring Levee - elev. 30 ***Gulf Park Estates*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward	**$ 73,601,709**
Flap Gates (8w x 4h)		19	ea	28,800	547,200
Flap Gates (5w x 3h)		6	ea	13,500	81,000
Flap Gates (10w x 4h)		17	ea	36,000	612,000
Cutoff valves (8w x 4h)		19	ea	67,200	1,276,800
Cutoff valves (5w x 3h)		6	ea	31,500	189,000
Cutoff valves (10w x 4h)		17	ea	84,000	1,428,000
Pump stations, 42" to 60" pump size (8 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				35,432,978
Ditch Excavation		119,384	cy	12.00	1,432,608
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow	5,590,000
				Current Contract Cost, Oct 07	$ 120,191,295
	CONTINGENCY			**25.0%**	30,047,824
					$ 150,239,119
	01 Account, Lands & Damage		PCA	LS	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			LS	34,051,000
	06 Account, Preservation - Mitigation-Tidal (38 acr $200,000/acr)				7,600,000
	06 Account, Preservation - Mitigation-Non-Tidal (136 acr $5,500/acr)				748,000
					$ 192,663,119
	30 Account, Plan, Engr.& Design			**8.0%**	15,413,049
					$ 208,076,168
	31 Account, Constr. Management			**6.0%**	12,484,570
					$ 220,560,738
	ESCALATION			**0.0%**	0
					$ 220,560,738
					rounded
		TOTAL PROJECT COST, Oct 07			**$ 220,600,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 5	OF	8
	PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 3***	BASIS of ESTIMATE: info furnished per Project Delivery Team		
Jackson County ***Option "C"***	FILE NAME:		
Ring Levee - elev. 20 ***Gulf Park Estates***	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,510,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	37,185	sy	4.50	167,333
8" Water line removal	6,160	lf	8.00	49,280
6" Sewer line removal	6,160	lf	8.00	49,280
2" Gas line removal	6,160	lf	3.00	18,480
Electrical line removal - 3 phase 1440v	6,160	lf	11.00	67,760
24" Storm Drain removal	6,160	lf	11.00	67,760
Demolished structures (avg. 1,500 sf/ea 152 ea)	228,000	sf	3.00	684,000
Disposal Fee - off site	8,444	cy	2.50	21,111
NEW WORK:				
Compacted Fill (levee)	473,133	cy	15.00	7,096,995
Compacted Fill (cross overs)	5,758	cy	15.00	86,370
New Asphalt 2" (Cross overs) 501 cy figure 2.0 tons/cy	1,002	tons	70.00	70,140
Base material 12" (cross overs)	3,005	cy	34.50	103,673
Riprap (24")	135,841	cy	90.00	12,225,690
24 " gabion mattress cages, galv-pvc type	224,137	sy	32.00	7,172,384
Filter Fabric	224,137	sy	2.00	448,274
Grassing (seeding)	19	acres	2,150	40,850
Clearing and Grubbing, off-site disposal	89	acres	5,000	445,000
Crushed Aggregate 6" Thick(Levee wearing surface)	[illegible]	cy	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New Electrical Line - 3 phase 1440v	2,660	lf	44.00	117,040
New 24" Storm Drain	2,660	lf	68.00	180,880
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	11	pass-thrus		2,887,747
Concrete Box Culverts	2,455	cy	700	1,718,500
6 rebar (box culverts)	85	tons	925	78,625
			Subtotal $	**35,977,452**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "C"*** FILE NAME:
Ring Levee - elev. 20 ***Gulf Park Estates*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$ 35,977,452**
Flap Gates (8w x 4h)	17	ea	28,800	489,600
Flap Gates (5w x 3h)	6	ea	13,500	81,000
Flap Gates (10w x 4h)	9	ea	36,000	324,000
Flap Gates (7w x 3h)	4	ea	18,900	75,600
Flap Gates (6w x 3h)	3	ea	16,200	48,600
Cutoff valves (8w x 4h)	17	ea	67,200	1,142,400
Cutoff valves (5w x 3h)	6	ea	31,500	189,000
Cutoff valves (10w x 4h)	9	ea	84,000	756,000
Cutoff valves (7w x 3h)	4	ea	44,100	176,400
Cutoff valves (6w x 3h)	3	ea	37,800	113,400
Pump stations, 42" to 60" pump size (9 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				21,742,146
Ditch Excavation	52,957	cy	12.00	635,484
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	3,000,000
			Current Contract Cost, Oct 07	$ 64,751,081
CONTINGENCY			**25.0%**	16,187,770
				$ 80,938,851
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				55,002,000
06 Account, Preservation - Mitigation-Tidal (13 acr $200,000/acr)				2,600,000
06 Account, Preservation - Mitigation-Non-Tidal (38 acr $5,500/acr)				209,000
				$ 138,774,851
30 Account, Plan, Engr.& Design			**8.0%**	11,101,988
				$ 149,876,839
31 Account, Constr. Management			**6.0%**	8,992,610
				$ 158,869,450
ESCALATION			**0.0%**	0
				$ 158,869,450 rounded
			TOTAL PROJECT COST, Oct 07	**$ 158,900,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 7 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "D"*** FILE NAME:
Ring Levee - elev. 30 ***Gulf Park Estates*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,220,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	40,813	sy	4.50	183,659
8" Water line removal	8,190	lf	8.00	65,520
6" Sewer line removal	8,190	lf	8.00	65,520
2" Gas line removal	8,190	lf	3.00	24,570
Electric line removal - 3 phase 1440v	8,190	lf	11.00	90,090
24" Storm Drain removal	8,190	lf	11.00	90,090
Demolished structures (avg. 1,500 sf/ea 169 ea)	253,500	sf	3.00	760,500
Disposal Fee - off site	9,389	cy	2.50	23,472
NEW WORK:				
Compacted Fill (levee)	1,663,941	cy	15.00	24,959,115
New Asphalt 2" (Cross overs) 208 cy figure 2.0 tons/cy	416	tons	70.00	29,120
Base material 12" (cross overs)	1,245	cy	34.50	42,953
Riprap (12")	107,785	cy	90.00	9,700,650
12 " gabion mattress cages	355,690	sy	32.00	11,382,080
Filter Fabric	355,690	sy	2.00	711,380
Grassing (seeding)	43	acres	2,150	92,450
Clearing and Grubbing, off-site disposal	138	acres	5,000	690,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,443	cy	45.00	289,935
New 8" Water line	2,730	lf	41	111,930
New 6" Sewer Line	2,730	lf	48	131,040
New 2"Gas Line	2,730	lf	20	54,600
New Electrical Line - 3 phase 1440v	2,730	lf	44.00	120,120
New 24" Storm Drain	2,730	lf	68.00	185,640
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	15	pass-thrus		6,817,897
Concrete Box Culverts	2,455	cy	700	1,718,500
6 rebar (box culverts)	85	tons	925	78,625
			Subtotal	**$ 60,639,455**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 8	OF 8
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County ***Option "D"***	FILE NAME:	
	Ring Levee - elev. 30 ***Gulf Park Estates***		mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$ 60,639,455**
Flap Gates (8w x 4h)	17	ea	28,800	489,600
Flap Gates (5w x 3h)	6	ea	13,500	81,000
Flap Gates (10w x 4h)	9	ea	36,000	324,000
Flap Gates (7w x 3h)	4	ea	18,900	75,600
Flap Gates (6w x 3h)	3	ea	16,200	48,600
Cutoff valves (8w x 4h)	17	ea	67,200	1,142,400
Cutoff valves (5w x 3h)	6	ea	31,500	189,000
Cutoff valves (10w x 4h)	9	ea	84,000	756,000
Cutoff valves (7w x 3h)	4	ea	44,100	176,400
Cutoff valves (6w x 3h)	3	ea	37,800	113,400
Pump stations, 42" to 60" pump size (9 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				26,214,528
Ditch Excavation	52,957	cy	12.00	635,484
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	4,430,000
			Current Contract Cost, Oct 07	$ 95,315,466
CONTINGENCY			**25.0%**	23,828,867
				$ 119,144,333
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	58,603,000
06 Account, Preservation - Mitigation-Tidal (21 acr $200,000/acr)				4,200,000
06 Account, Preservation - Mitigation-Non-Tidal (59 acr $5,500/acr)				324,500
				$ 182,296,833
30 Account, Plan, Engr.& Design			**8.0%**	14,583,747
				$ 196,880,580
31 Account, Constr. Management			**6.0%**	11,812,835
				$ 208,693,415
ESCALATION			**0.0%**	0
				$ 208,693,415 rounded
			TOTAL PROJECT COST, Oct 07	**$ 208,700,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME:
Ring Levee - elev. 20 ***BelleFontaine*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,590,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	12,587	sy	4.50	56,642
8" Water line removal	4,420	lf	8.00	35,360
6" Sewer line removal	4,420	lf	8.00	35,360
2" Gas line removal	4,420	lf	3.00	13,260
Electrical line removal - 3 phase 1440v	4,420	lf	11.00	48,620
24" Storm Drain removal	4,420	lf	11.00	48,620
Demolished structures (avg. 1,500 sf/ea 30 ea)	45,000	sf	3.00	135,000
Disposal Fee - off site	1,667	cy	2.50	4,167
NEW WORK:				
Compacted Fill (levee)	733,150	cy	15.00	10,997,250
New Asphalt 2" (Cross overs) 163 cy figure 2.0 tons/cy	326	tons	70.00	22,820
Base material 12" (cross overs)	978	cy	34.50	33,741
Riprap (24")	166,583	cy	90.00	14,992,470
24 " gabion mattress cages, galv-pvc type	249,875	sy	32.00	7,996,000
Filter Fabric	249,875	sy	2.00	499,750
Grassing (seeding)	27	acres	2,150	58,050
Clearing and Grubbing, off-site disposal	106	acres	5,000	530,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,674	cy	45.00	300,330
New 8" Water line	1,430	lf	41	58,630
New 6" Sewer Line	1,430	lf	48	68,640
New 2"Gas Line	1,430	lf	20	28,600
New Electrical Line - 3 phase 1440v	1,430	lf	44.00	62,920
New 24" Storm Drain	1,430	lf	68.00	97,240
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	10	pass-thrus		2,448,878
2-lane gate (5' height)	3	ea	18,000	54,000
2-lane gate (7' height)	2	ea	25,000	50,000
Concrete Box Culverts	2,608	cy	700	1,825,600
6 rebar (box culverts)	90	tons	925	83,250
			Subtotal	**$ 42,175,197**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME:
Ring Levee - elev. 20 ***BelleFontaine*** mscip-compreheosive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price		ESTIMATED AMOUNT
				Subtotal, brought forward	**$**	**42,175,197**
Flap Gates (8w x 4h)		17	ea	28,800		489,600
Flap Gates (7w x 3h)		13	ea	18,900		245,700
Flap Gates (5w x 3h)		5	ea	13,500		67,500
Flap Gates (10w x 4h)		7	ea	36,000		252,000
Cutoff valves (8w x 4h)		17	ea	28,800		489,600
Cutoff valves (7w x 3h)		13	ea	44,100		573,300
Cutoff valves (5w x 3h)		5	ea	31,500		157,500
Cutoff valves (10w x 4h)		7	ea	84,000		588,000
Pump stations, 42" to 60" pump size (7 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					18,878,217
Ditch Excavation		121,831	cy	12.00		1,461,972
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow		3,190,000
		Current Contract Cost, Oct 07			$	68,568,586
	CONTINGENCY			**25.0%**		17,142,146
					$	85,710,732
	01 Account, Lands & Damage		PCA	**LS**		25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)					19,365,886
	06 Account, Preservation - Mitigation-Tidal (71 acr		$200,000/acr)			14,200,000
	06 Account, Preservation - Mitigation-Non-Tidal (164 acr			$5,500/aci		902,000
					$	120,203,618
	30 Account, Plan, Engr.& Design			**8.0%**		9,616,289
					$	129,819,908
	31 Account, Constr. Management			**6.0%**		7,789,194
					$	137,609,102
	ESCALATION			**0.0%**		0
					$	137,609,102
						rounded
		TOTAL PROJECT COST, Oct 07			**$**	**137,600,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO. 3	OF	8
		PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE: info furnished per Project Delivery Team		
	Jackson County *Option "B"*	FILE NAME:		
	Ring Levee - elev. 30 ***BelleFontaine***	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,250,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	18,560	sy	4.50	83,520
8" Water line removal	6,460	lf	8.00	51,680
6" Sewer line removal	6,460	lf	8.00	51,680
2" Gas line removal	6,460	lf	3.00	19,380
Electric line removal - 3 phase 1440v	6,460	lf	11.00	71,060
24" Storm Drain removal	6,460	lf	11.00	71,060
Demolished structures (avg. 1,500 sf/ea 38 ea)	57,000	sf	3.00	171,000
Disposal Fee - off site	2,111	cy	2.50	5,278
NEW WORK:				
Compacted Fill (levee)	2,172,884	cy	15.00	32,593,260
New Asphalt 2" (Cross overs) 326 cy figure 2.0 tons/cy	652	tons	70.00	45,640
Base material 12" (cross overs)	889	cy	34.50	30,671
Riprap (12")	124,299	cy	90.00	11,186,910
24 " gabion mattress cages, galv-pvc type	410,186	sy	32.00	13,125,952
Filter Fabric	410,186	sy	2.00	820,372
Grassing (seeding)	53	acres	2,150	113,950
Clearing and Grubbing, off-site disposal	156	acres	5,000	780,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,674	cy	45.00	300,330
New 8" Water line	1,900	lf	41	77,900
New 6" Sewer Line	1,900	lf	48	91,200
New 2"Gas Line	1,900	lf	20	38,000
New Electrical Line - 3 phase 1440v	1,900	lf	44.00	83,600
New 24" Storm Drain	1,900	lf	68.00	129,200
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	10	pass-thrus		4,723,764
Concrete Box Culverts	2,608	cy	700	1,825,600
6 rebar (box culverts)	90	tons	925	83,250
			Subtotal $	**68,824,256**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "B"*** FILE NAME:
Ring Levee - elev. 30 ***BelleFontaine*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**68,824,256**
Flap Gates (8w x 4h)		17	ea	28,800	489,600
Flap Gates (5w x 3h)		5	ea	13,500	67,500
Flap Gates (10w x 4h)		7	ea	36,000	252,000
Flap Gates (7w x 3h)		13	ea	18,900	245,700
Cutoff valves (8w x 4h)		17	ea	67,200	1,142,400
Cutoff valves (5w x 3h)		5	ea	31,500	157,500
Cutoff valves (10w x 4h)		7	ea	84,000	588,000
Cutoff valves (7w x 3h)		13	ea	44,100	573,300
Pump stations, 42" to 60" pump size (7 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				18,623,420
Ditch Excavation		121,831	cy	12.00	1,461,972
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow	4,510,000
		Current Contract Cost, Oct 07		$	96,935,648
	CONTINGENCY			**25.0%**	24,233,912
				$	121,169,560
	01 Account, Lands & Damage	PCA		**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	25,773,853
	06 Account, Preservation - Mitigation-Tidal (97 acr			$200,000/acr)	19,400,000
	06 Account, Preservation - Mitigation-Non-Tidal (233 acr			$5,500/aci	1,281,500
				$	167,649,913
	30 Account, Plan, Engr.& Design			**8.0%**	13,411,993
				$	181,061,906
	31 Account, Constr. Management			**6.0%**	10,863,714
				$	191,925,620
	ESCALATION			**0.0%**	0
				$	191,925,620
					rounded
		TOTAL PROJECT COST, Oct 07		**$**	**191,900,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "C"*** FILE NAME:
Ring Levee - elev. 20 ***BelleFontaine*** mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,150,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	25,281	sy	4.50	113,765
8" Water line removal	5,460	lf	8.00	43,680
6" Sewer line removal	5,460	lf	8.00	43,680
2" Gas line removal	5,460	lf	3.00	16,380
Electrical line removal - 3 phase 1440v	5,460	lf	11.00	60,060
24" Storm Drain removal	5,460	lf	11.00	60,060
Demolished structures (avg. 1,500 sf/ea 54 ea)	81,000	sf	3.00	243,000
Disposal Fee - off site	3,000	cy	2.50	7,500
NEW WORK:				
Compacted Fill (levee) 35,612LF	615,618	cy	15.00	9,234,270
Compacted Fill (crossovers)	902	cy	15.00	13,530
New Asphalt 2" (Cross overs) 255 cy figure 2.0 tons/cy	510	tons	70.00	35,700
Base material 12" (cross overs)	1,530	cy	34.50	52,785
Riprap (24")	156,180	cy	90.00	14,056,200
24 " gabion mattress cages, galv-pvc type	257,696	sy	32.00	8,246,272
Filter Fabric	257,696	sy	2.00	515,392
Grassing (seeding)	24	acres	2,150	51,600
Clearing and Grubbing, off-site disposal	101	acres	5,000	505,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,595	cy	45.00	296,775
Guardrail	640	lf	21.00	13,440
New 8" Water line	1,950	lf	41	79,950
New 6" Sewer Line	1,950	lf	48	93,600
New 2"Gas Line	1,950	lf	20	39,000
New Electrical Line - 3 phase 1440v	1,950	lf	44.00	85,800
New 24" Storm Drain	1,950	lf	68.00	132,600
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	13	pass-thrus		3,011,078
Concrete Box Culverts	2,476	cy	700	1,733,200
6 rebar (box culverts)	86	tons	925	79,550
			Subtotal $	**40,013,867**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO. 6	OF	8
		PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	*Line of Defense 3*	BASIS of ESTIMATE: info furnished per Project Delivery Team		
	Jackson County *Option "C"*	FILE NAME:		
	Ring Levee - elev. 20 ***BelleFontaine***	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**40,013,867**
Flap Gates (8w x 4h)	15	ea	28,800	432,000
Flap Gates (7w x 3h)	13	ea	18,900	245,700
Flap Gates (5w x 3h)	5	ea	13,500	67,500
Flap Gates (10w x 4h)	7	ea	36,000	252,000
Cutoff valves (8w x 4h)	15	ea	28,800	432,000
Cutoff valves (7w x 3h)	13	ea	44,100	573,300
Cutoff valves (5w x 3h)	5	ea	31,500	157,500
Cutoff valves (10w x 4h)	7	ea	84,000	588,000
Pump stations, 42" to 60" pump size (7 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				3,011,078
Ditch Excavation	113,514	cy	12.00	1,362,168
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	2,290,000
			Current Contract Cost, Oct 07	$ 49,425,113
CONTINGENCY			**25.0%**	12,356,278
				$ 61,781,391
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				26,711,082
06 Account, Preservation - Mitigation-Tidal (7 acr $200,000/acr)				1,400,000
06 Account, Preservation - Mitigation-Non-Tidal (158 acr $5,500/acı				869,000
				$ 90,786,473
30 Account, Plan, Engr.& Design			**8.0%**	7,262,918
				$ 98,049,391
31 Account, Constr. Management			**6.0%**	5,882,963
				$ 103,932,354
ESCALATION			**0.0%**	0
				$ 103,932,354
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 103,900,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 7	OF 8
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County ***Option "D"***	FILE NAME:	
	Ring Levee - elev. 30 ***BelleFontaine***		mscip-comprehensive-study-comphined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,640,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	32,561	sy	4.50	146,525
8" Water line removal	7,980	lf	8.00	63,840
6" Sewer line removal	7,980	lf	8.00	63,840
2" Gas line removal	7,980	lf	3.00	23,940
Electric line removal - 3 phase 1440v	7,980	lf	11.00	87,780
24" Storm Drain removal	7,980	lf	11.00	87,780
Demolished structures (avg. 1,500 sf/ea 68 ea)	102,000	sf	3.00	306,000
Disposal Fee - off site	3,778	cy	2.50	9,444
NEW WORK:				
Compacted Fill (levee)	1,960,375	cy	15.00	29,405,625
New Asphalt 2" (Cross overs) 193 cy figure 2.0 tons/cy	386	tons	70.00	27,020
Base material 12" (cross overs)	1,156	cy	34.50	39,882
Riprap (12")	117,962	cy	90.00	10,616,580
12 " gabion mattresses cages	389,274	sy	16.00	6,228,384
Filter Fabric	389,274	sy	2.00	778,548
Grassing (seeding)	49	acres	2,150	105,350
Clearing and Grubbing, off-site disposal	150	acres	5,000	750,000
Crushed Aggregate 6" Thick(Levee wearing surface)	6,595	cy	45.00	296,775
New 8" Water line	2,470	lf	41	101,270
New 6" Sewer Line	2,470	lf	48	118,560
New 2"Gas Line	2,470	lf	20	49,400
New Electrical Line - 3 phase 1440v	2,470	lf	44.00	108,680
New 24" Storm Drain	2,470	lf	68.00	167,960
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	11	pass-thrus		4,968,013
Concrete Box Culverts	2,476	cy	700	1,733,200
6 rebar (box culverts)	86	tons	925	79,550
			Subtotal $	**58,003,946**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 8 OF 8
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "D"*** FILE NAME:
Ring Levee - elev. 30 ***BelleFontaine*** mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward $	**58,003,946**
Flap Gates (8w x 4h)		15	ea	28,800	432,000
Flap Gates (5w x 3h)		13	ea	13,500	175,500
Flap Gates (10w x 4h)		5	ea	36,000	180,000
Flap Gates (7w x 3h)		7	ea	18,900	132,300
Cutoff valves (8w x 4h)		15	ea	67,200	1,008,000
Cutoff valves (5w x 3h)		13	ea	31,500	409,500
Cutoff valves (10w x 4h)		5	ea	84,000	420,000
Cutoff valves (7w x 3h)		7	ea	44,100	308,700
Pump stations, 42" to 60" pump size (7 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				4,968,013
Ditch Excavation		113,514	cy	12.00	1,362,168
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow	3,290,000
		Current Contract Cost, Oct 07			$ 70,690,128
	CONTINGENCY			**25.0%**	17,672,532
					$ 88,362,660
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	33,260,332
	06 Account, Preservation - Mitigation-Tidal (10 acr $200,000/acr)				2,000,000
	06 Account, Preservation - Mitigation-Non-Tidal (213 acr			$5,500/acı	1,171,500
					$ 124,819,492
	30 Account, Plan, Engr.& Design			**8.0%**	9,985,559
					$ 134,805,051
	31 Account, Constr. Management			**6.0%**	8,088,303
					$ 142,893,354
	ESCALATION			**0.0%**	0
					$ 142,893,354
					rounded
		TOTAL PROJECT COST, Oct 07			**$ 142,900,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 16
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 20 ***Pascagoula / Moss Point***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	6,650,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	62,668	sy	4.50	282,006
8" Water line removal	19,170	lf	8.00	153,360
6" Sewer line removal	19,170	lf	8.00	153,360
2" Gas line removal	19,170	lf	3.00	57,510
Electric line removal - 3 phase 1440v	19,170	lf	11.00	210,870
24" Storm Drain removal	19,170	lf	11.00	210,870
Demolished structures (avg. 1,500 sf/ea 474 ea)	711,000	sf	3.00	2,133,000
Disposal Fee - off site	26,333	cy	2.50	65,833
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee)	2,734,259	cy	15.00	41,013,885
Compacted Fill (cross overs)	2,210	cy	15.00	33,150
New Asphalt 2" (Cross overs) 1,332 cy figure 2.0 tons/cy	2,664	ton	70.00	186,480
Base material 12" (cross overs)	7,993	cy	34.50	275,759
Riprap (24")	594,809	cy	90.00	53,532,810
24" gabion mattress cages, galv-pvc type	981,435	sy	32.00	31,405,920
Filter Fabric	981,435	sy	2.00	1,962,870
Grassing (seeding)	97	acres	2,150	208,550
Clearing and Grubbing, off-site disposal	384	acres	5,000	1,920,000
Crushed Aggregate 6" Thick(Levee wearing surface)	23,632	cy	45.00	1,063,440
Guardrail	2,670	lf	21.00	56,070
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	68	pass-thrus		18,625,110
New 8" Water line	10,935	lf	41	448,335
New 6" Sewer Line	10,935	lf	48	524,880
New 2"Gas Line	10,935	lf	20	218,700
New Electrical Line - 3 phase 1440v	10,935	lf	44.00	481,140
New 24" Storm Drain	10,935	lf	68.00	743,580
Concrete Box Culverts	26,958	cy	700	18,870,600
6 rebar (box culverts)	934	tons	925	863,950
Flap Gates (8w x 4h)	71	ea	28,800	2,044,800
Flap Gates (12w x 4h)	18	ea	43,200	777,600
Flap Gates (7w x 3h)	68	ea	18,900	1,285,200
Flap Gates (6w x 3h)	15	ea	16,200	243,000
			Subtotal	**$186,712,638**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	2	OF	16
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County — ***Option "A"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Ring Levee - elev. 20 — ***Pascagoula / Moss Point***				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
		Subtotal, brought forward		**$186,712,638**
Flap Gates (10w x 4h)	30	ea	36,000	1,080,000
Cutoff valves (8w x 4h)	71	ea	67,200	4,771,200
Cutoff valves (12w x 4h)	18	ea	100,800	1,814,400
Cutoff valves (7w x 3h)	68	ea	67,200	4,569,600
Cutoff valves (6w x 3h)	15	ea	37,800	567,000
Cutoff valves (10w x 4h)	30	ea	84,000	2,520,000
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				55,189,536
Ditch Excavation	208,575	cy	12.00	2,502,900
Boat Gate, PG-1 (reference backup file for cost derivation)				12,920,900
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	13,300,000
		Current Contract Cost, Oct 07		$285,948,174
CONTINGENCY			**25.0%**	71,487,043
				$357,435,217
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				237,004,000
06 Account, Preservation - Mitigation-Tidal (75 acr $200,000/acr)				15,000,000
06 Account, Preservation - Mitigation-Non-Tidal (210 acr $5,500/acr)				1,155,000
				$610,619,217
30 Account, Plan, Engr.& Design			**8.0%**	48,849,537
				$659,468,755
31 Account, Constr. Management			**6.0%**	39,568,125
				$699,036,880
ESCALATION			**0.0%**	0
				$ 699,036,880
				rounded
		TOTAL PROJECT COST, Oct 07		**$ 699,000,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	3	OF	16
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County *Option "B"*	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Ring Levee - elev. 30 ***Pascagoula / Moss Point***				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$9,660,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	91,281	sy	4.50	410,765
8" Water line removal	28,345	lf	8.00	226,760
6" Sewer line removal	28,345	lf	8.00	226,760
2" Gas line removal	28,345	lf	3.00	85,035
Electric line removal - 3 phase 1440v	28,345	lf	11.00	311,795
24" Storm Drain removal	28,345	lf	11.00	311,795
Demolished structures (avg. 1,500 sf/ea 557 ea)	835,500	cy	3.00	2,506,500
Disposal Fee - off site	30,944	cy	2.50	77,361
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee) off-site borrow	7,997,069	cy	15.00	119,956,035
New Asphalt 2" (Cross overs) 1,349 cy figure 2.0 tons/cy	2,698	ton	70.00	188,860
Base material 12" (cross overs)	8,091	cy	34.50	279,140
Riprap (12")	516,876	cy	90.00	46,518,840
24" gabion mattress cages, galv-pvc type	1,705,692	sy	32.00	54,582,144
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Crushed Aggregate 6" Thick(Levee wearing surface)	23,860	cy	45.00	1,073,700
New 8" Water line	15,135	lf	41	620,535
New 6" Sewer Line	15,135	lf	48	726,480
New 2"Gas Line	15,135	lf	20	302,700
New Electrical Line - 3 phase 1440v	15,135	lf	44.00	665,940
New 24" Storm Drain	15,135	lf	68.00	1,029,180
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	79	pass-thrus		38,767,028
Concrete Box Culverts	26,958	cy	700	18,870,600
6 rebar (box culverts)	934	tons	925	863,950
Flap Gates (8w x 4h)	71	ea	28,800	2,044,800
Flap Gates (12w x 4h)	18	ea	43,200	777,600
Flap Gates (7w x 3h)	68	ea	18,900	1,285,200
Flap Gates (6w x 3h)	15	ea	16,200	243,000
Flap Gates (10w x 4h)	30	ea	36,000	1,080,000
Cutoff valves (8w x 4h)	71	ea	67,200	4,771,200
Cutoff valves (12w x 4h)	18	ea	100,800	1,814,400
			Subtotal	**$316,911,536**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	4	OF	16
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County — ***Option "B"***	FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls		
	Ring Levee - elev. 30 — ***Pascagoula / Moss Point***				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$316,911,536**
Cutoff valves (7w x 3h)	68	ea	44,100	2,998,800
Cutoff valves (6w x 3h)	15	ea	37,800	567,000
Cutoff valves (10w x 4h)	30	ea	84,000	2,520,000
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				55,710,072
Ditch Excavation	208,575	cy	12.00	2,502,900
Boat Gate, PG-1 (reference backup file for cost derivation)				14,917,980
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	19,320,000
			Current Contract Cost, Oct 07	$415,448,288
CONTINGENCY			**25.0%**	103,862,072
				$519,310,360
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				256,517,000
06 Account, Preservation - Mitigation-Tidal (113 acr		$200,000/acr)		22,600,000
06 Account, Preservation - Mitigation-Non-Tidal (308 acr		$5,500/acr)		1,694,000
				$800,146,360
30 Account, Plan, Engr.& Design			**8.0%**	64,011,709
				$864,158,068
31 Account, Constr. Management			**6.0%**	51,849,484
				$916,007,552
ESCALATION			**0.0%**	0
				$ 916,007,552
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 916,000,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	5	OF	16
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County ***Option "C"***	FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls		
	Ring Levee-Washington- elev. 20	***Pascagoula / Moss Point***			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	5,420,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	62,707	sy	4.50	282,182
8" Water line removal	19,035	lf	8.00	152,280
6" Sewer line removal	19,035	lf	8.00	152,280
2" Gas line removal	19,035	lf	3.00	57,105
Electric line removal - 3 phase 1440v	19,035	lf	11.00	209,385
24" Storm Drain removal	19,035	lf	11.00	209,385
Demolished structures (avg. 1,500 sf/ea 580 ea)	870,000	sf	3.00	2,610,000
Disposal Fee - off site	32,222	cy	2.50	80,556
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee)	2,609,183	cy	15.00	39,137,745
Compacted Fill (cross overs)	2,210	cy	15.00	33,150
New Asphalt 2" (Cross overs) 1,421 cy figure 2.0 tons/cy	2,842	ton	70.00	198,940
Base material 12" (cross overs)	8,526	cy	34.50	294,147
Riprap (24")	581,405	cy	90.00	52,326,450
24 " gabion mattress cages, galv-pvc type	953,318	sy	32.00	30,506,176
Filter Fabric	959,318	sy	2.00	1,918,636
Grassing (seeding)	94	acres	2,150	202,100
Clearing and Grubbing, off-site disposal	377	acres	5,000	1,885,000
Crushed Aggregate 6" Thick(Levee wearing surface)	23,431	cy	45.00	1,054,395
Guardrail	2,670	lf	21.00	56,070
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	76	pass-thrus		19,908,310
New 8" Water line	10,935	lf	41	448,335
New 6" Sewer Line	10,935	lf	48	524,880
New 2"Gas Line	10,935	lf	20	218,700
New Electrical Line - 3 phase 1440v	10,935	lf	44.00	481,140
New 24" Storm Drain	10,935	lf	68.00	743,580
Concrete Box Culverts	26,415	cy	700	18,490,500
6 rebar (box culverts)	913	tons	925	844,525
Flap Gates (8w x 4h)	48	ea	28,800	1,382,400
Flap Gates (12w x 4h)	38	ea	43,200	1,641,600
Flap Gates (7w x 3h)	63	ea	18,900	1,190,700
Flap Gates (6w x 3h)	3	ea	16,200	48,600
			Subtotal	**$182,719,252**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 16
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "C"*** FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Ring Levee-Washington- elev. 20 ***Pascagoula / Moss Point***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$182,719,252**
Flap Gates (10w x 4h)	32	ea	36,000	1,152,000
Cutoff valves (8w x 4h)	48	ea	67,200	3,225,600
Cutoff valves (12w x 4h)	38	ea	100,800	3,830,400
Cutoff valves (7w x 3h)	63	ea	67,200	4,233,600
Cutoff valves (6w x 3h)	3	ea	37,800	113,400
Cutoff valves (10w x 4h)	32	ea	84,000	2,688,000
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				21,725,635
Ditch Excavation	198,076	cy	12.00	2,376,912
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	10,830,000
		Current Contract Cost, Oct 07		$232,894,798
CONTINGENCY			25.0%	58,223,700
				$291,118,498
01 Account, Lands & Damage		PCA	LS	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				278,147,000
06 Account, Preservation - Mitigation-Tidal (81 acr $200,000/acr)				16,200,000
06 Account, Preservation - Mitigation-Non-Tidal (213 acr $5,500/acr)				1,171,500
				$586,661,998
30 Account, Plan, Engr.& Design			8.0%	46,932,960
				$633,594,957
31 Account, Constr. Management			6.0%	38,015,697
				$671,610,655
ESCALATION			0.0%	0
				$ 671,610,655
				rounded
		TOTAL PROJECT COST, Oct 07		**$ 671,600,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 7	OF	16
	PREPARED: Joseph P. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team	
Jackson County ***Option "D"***	FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls	
Ring Levee-Washington- elev. 30	***Pascagoula / Moss Point***		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	7,800,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	91,547	sy	4.50	411,962
8" Water line removal	28,145	lf	8.00	225,160
6" Sewer line removal	28,145	lf	8.00	225,160
2" Gas line removal	28,145	lf	3.00	84,435
Electric line removal - 3 phase 1440v	28,145	lf	11.00	309,595
24" Storm Drain removal	28,145	lf	11.00	309,595
Demolished structures (avg. 1,500 sf/ea 685 ea)	1,027,500	sf	3.00	3,082,500
Disposal Fee - off site	38,056	cy	2.50	95,139
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee)	7,739,200	cy	15.00	116,088,000
New Asphalt 2" (Cross overs) 1,421 cy figure 2.0 tons/cy	2,876	ton	70.00	201,320
Base material 12" (cross overs)	8,628	cy	34.50	297,666
Riprap (24")	507,933	cy	90.00	45,713,970
12 " gabion mattress cages, galv-pvc type	1,676,179	sy	16.00	26,818,864
Filter Fabric	1,676,179	sy	2.00	3,352,358
Grassing (seeding)	183	acres	2,150	393,450
Clearing and Grubbing, off-site disposal	553	acres	5,000	2,765,000
Crushed Aggregate 6" Thick(Levee wearing surface)	23,658	cy	45.00	1,064,610
Guardrail	2,670	lf	21.00	56,070
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	87	pass-thrus		42,707,625
New 8" Water line	16,335	lf	41	669,735
New 6" Sewer Line	16,335	lf	48	784,080
New 2"Gas Line	16,335	lf	20	326,700
New Electrical Line - 3 phase 1440v	16,335	lf	44.00	718,740
New 24" Storm Drain	16,335	lf	68.00	1,110,780
Concrete Box Culverts	26,415	cy	700	18,490,500
6 rebar (box culverts)	913	tons	925	844,525
Flap Gates (8w x 4h)	48	ea	28,800	1,382,400
Flap Gates (12w x 4h)	38	ea	43,200	1,641,600
Flap Gates (7w x 3h)	63	ea	18,900	1,190,700
Flap Gates (6w x 3h)	3	ea	16,200	48,600
			Subtotal	**$279,220,838**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 8	OF 16
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	*Line of Defense 3*	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County *Option "D"*	FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls
	Ring Levee-Washington- elev. 30	*Pascagoula / Moss Point*	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$279,220,838**
Flap Gates (10w x 4h)	32	ea	36,000	1,152,000
Cutoff valves (8w x 4h)	48	ea	67,200	3,225,600
Cutoff valves (12w x 4h)	38	ea	100,800	3,830,400
Cutoff valves (7w x 3h)	63	ea	67,200	4,233,600
Cutoff valves (6w x 3h)	3	ea	37,800	113,400
Cutoff valves (10w x 4h)	32	ea	84,000	2,688,000
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				22,932,896
Ditch Excavation	198,076	cy	12.00	2,376,912
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	15,600,000
			Current Contract Cost, Oct 07	$335,373,647
CONTINGENCY			**25.0%**	83,843,412
				$419,217,058
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				297,899,000
06 Account, Preservation - Mitigation-Tidal (118 acr $200,000/acr)				23,600,000
06 Account, Preservation - Mitigation-Non-Tidal (308 acr $5,500/acr)				1,694,000
				$742,435,058
30 Account, Plan, Engr.& Design			**8.0%**	59,394,805
				$801,829,863
31 Account, Constr. Management			**6.0%**	48,109,792
				$849,939,655
ESCALATION			**0.0%**	0
				$ 849,939,655
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 849,900,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	25-Jul-08
LOCATION: Mississippi	SHEET NO. 9	OF	16
	PREPARED: Joseph F. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team	
Jackson County ***Option "E"***	FILE NAME:	mscip-comprehensive-study-compbined-cost est-25jul08.xls	
Ring Levee - Moss Pt. - elev. 20	***Pascagoula / Moss Point***		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	4,370,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	67,895	sy	4.50	305,528
8" Water line removal	17,550	lf	8.00	140,400
6" Sewer line removal	17,550	lf	8.00	140,400
2" Gas line removal	17,550	lf	3.00	52,650
Electric line removal - 3 phase 1440v	17,550	lf	11.00	193,050
24" Storm Drain removal	17,550	lf	11.00	193,050
Demolished structures (avg. 1,500 sf/ea 482 ea)	723,000	sf	3.00	2,169,000
Disposal Fee - off site	26,778	cy	2.50	66,944
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee) 105,085LF	1,694,854	cy	15.00	25,422,810
Compacted Fill (cross overs)	22,032	cy	15.00	330,480
New Asphalt 2" (Cross overs) 2140 cy figure 2.0 tons/cy	4,296	ton	70.00	300,720
Base material 12" (cross overs)	12,884	cy	34.50	444,498
Riprap (24")	440,512	cy	90.00	39,646,080
24" gabion mattress cages	726,844	sy	32.00	23,259,008
Filter Fabric	726,844	sy	2.00	1,453,688
Grassing (seeding)	65	acres	2,150	139,750
Clearing and Grubbing, off-site disposal	285	acres	5,000	1,425,000
Crushed Aggregate 6" Thick(Levee wearing surface)	19,318	cy	45.00	869,310
Guardrail	18,270	lf	21.00	383,670
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	43	pass-thrus		11,861,400
New 8" Water line	10,415	lf	41	427,015
New 6" Sewer Line	10,415	lf	48	499,920
New 2"Gas Line	10,415	lf	20	208,300
New Electrical Line - 3 phase 1440v	10,415	lf	44.00	458,260
New 24" Storm Drain	10,415	lf	68.00	708,220
Concrete Box Culverts	14,540	cy	700	10,178,000
6 rebar (box culverts)	502	tons	925	464,350
Flap Gates (10w x 4h)	50	ea	36,000	1,800,000
Flap Gates (7w x 3h)	51	ea	18,900	963,900
Flap Gates 6w x 3h)	15	ea	16,200	243,000
Flap Gates (8w x 4h)	41	ea	28,800	1,180,800
			Subtotal	**$130,309,200**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 10	OF 16
		PREPARED: Joseph R. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County *Option "E"*	FILE NAME:	mscip comprehensive study combined cost-est-25jul08.xls
	Ring Levee - Moss Pt. - elev. 20	***Pascagoula / Moss Point***	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$130,309,200**
Flap Gates (6w x 4h)	9	ea	21,600	194,400
Flap Gates (5w x 3h)	3	ea	13,500	40,500
Flap Gates (7w x 4h)	5	ea	58,800	294,000
Cutoff valves (10w x 4h)	50	ea	84,000	4,200,000
Cutoff valves (7w x 3h)	51	ea	44,100	2,249,100
Cutoff valves (6w x 3h)	15	ea	37,800	567,000
Cutoff valves (8w x4h)	41	ea	67,200	2,755,200
Cutoff valves (6w x 4h)	9	ea	50,400	453,600
Cutoff valves (5w x3h)	3	ea	31,500	94,500
Cutoff valves (7w x 4h)	5	ea	58,800	294,000
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				$22,931,722
Ditch Excavation	166,696	cy	12.00	2,000,352
Boat Gate, PG-1 (reference backup file for cost derivation)				12,920,900
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	8,740,000
			Current Contract Cost, Oct 07	$188,044,474
CONTINGENCY			**25.0%**	47,011,119
				$235,055,593
01 Account, Lands & Damage		PCA	LS	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				520,145,000
06 Account, Preservation - Mitigation-Tidal (40 acr $200,000/acr)				8,000,000
06 Account, Preservation - Mitigation-Non-Tidal (100 acr $5,500/acr)				550,000
				$763,775,593
30 Account, Plan, Engr.& Design			**8.0%**	61,102,047
				$824,877,640
31 Account, Constr. Management			**6.0%**	49,492,658
				$874,370,298
ESCALATION			**0.0%**	0
				$ 874,370,298
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 874,400,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 11 OF 16
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "F"*** FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Ring Levee - Moss Pt. - elev. 30 ***Pascagoula / Moss Point***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	6,300,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	80,341	sy	4.50	361,535
8" Water line removal	24,130	lf	8.00	193,040
6" Sewer line removal	24,130	lf	8.00	193,040
2" Gas line removal	24,130	lf	3.00	72,390
Electric line removal - 3 phase 1440v	24,130	lf	11.00	265,430
24" Storm Drain removal	24,130	lf	11.00	265,430
Demolished structures (avg. 1,500 sf/ea 580 ea)	870,000	sf	3.00	2,610,000
Disposal Fee - off site	32,222	cy	2.50	80,556
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee) 105,085LF	5,526,049	cy	15.00	82,890,735
New Asphalt 2" (Cross overs) 1223 cy figure 2.0 tons/cy	2,446	ton	70.00	171,220
Base material 12" (cross overs)	7,335	cy	34.50	253,058
Riprap (24")	340,971	cy	90.00	30,687,390
12 " gabion mattress cages	1,125,204	sy	16.00	18,003,264
Filter Fabric	1,125,204	sy	2.00	2,250,408
Grassing (seeding)	139	acres	2,150	298,850
Clearing and Grubbing, off-site disposal	431	acres	5,000	2,155,000
Crushed Aggregate 6" Thick(Levee wearing surface)	19,460	cy	45.00	875,704
		lf	21.00	0
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	75	pass-thrus		41,132,875
New 8" Water line	12,555	lf	41	514,755
New 6" Sewer Line	12,555	lf	48	602,640
New 2"Gas Line	12,555	lf	20	251,100
New Electrical Line - 3 phase 1440v	12,555	lf	44.00	552,420
New 24" Storm Drain	12,555	lf	68.00	853,740
Concrete Box Culverts	14,540	cy	700	10,178,000
6 rebar (box culverts)	502	tons	925	464,350
Flap Gates (10w x 4h)	50	ea	36,000	1,800,000
Flap Gates (7w x 3h)	51	ea	18,900	963,900
Flap Gates 6w x 3h)	15	ea	16,200	243,000
Flap Gates (8w x 4h)	41	ea	28,800	1,180,800
			Subtotal	**$206,674,628**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi Coastal Improvements Program "MsCIP"** SHEET NO. 12 OF 16
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "F"*** FILE NAME: mscip comprehensive study combined cost est 25jul08.xls
Ring Levee - Moss Pt. - elev. 30 ***Pascagoula / Moss Point***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
		Subtotal, brought forward		**$206,674,628**
Flap Gates (6w x 4h)	9	ea	21,600	194,400
Flap Gates (5w x 3h)	3	ea	13,500	40,500
Flap Gates (7w x 4h)	5	ea	58,800	294,000
Cutoff valves (10w x 4h)	50	ea	84,000	4,200,000
Cutoff valves (7w x 3h)	51	ea	44,100	2,249,100
Cutoff valves (6w x 3h)	15	ea	37,800	567,000
Cutoff valves (8w x4h)	41	ea	67,200	2,755,200
Cutoff valves (6w x 4h)	9	ea	50,400	453,600
Cutoff valves (5w x3h)	3	ea	31,500	94,500
Cutoff valves (7w x 4h)	5	ea	58,800	294,000
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				23,790,218
Ditch Excavation	166,696	cy	12.00	2,000,352
Boat Gate, PG-1 (reference backup file for cost derivation)				14,917,980
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	12,600,000
		Current Contract Cost, Oct 07		$271,125,478
CONTINGENCY			**25.0%**	67,781,369
				$338,906,847
01 Account, Lands & Damage		PCA	LS	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				533,059,000
06 Account, Preservation - Mitigation-Tidal (61 acr $200,000/acr)				12,200,000
06 Account, Preservation - Mitigation-Non-Tidal (158 acr $5,500/acr)				869,000
				$885,059,847
30 Account, Plan, Engr.& Design			**8.0%**	70,804,788
				$955,864,635
31 Account, Constr. Management			**6.0%**	57,351,878
				$1,013,216,513
ESCALATION			**0.0%**	0
				$ 1,013,216,513
				rounded
		TOTAL PROJECT COST, Oct 07		$ 1,013,200,000

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 13 OF 16
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "G"*** FILE NAME: mscip comprehensive study combined cost est 26jul08.xls
Ring Levee- Moss/Wash - elev. 20 ***Pascagoula / Moss Point***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	4,110,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	67,800	sy	4.50	305,100
8" Water line removal	17,415	lf	8.00	139,320
6" Sewer line removal	17,415	lf	8.00	139,320
2" Gas line removal	17,415	lf	3.00	52,245
Electric line removal - 3 phase 1440v	17,415	lf	11.00	191,565
24" Storm Drain removal	17,415	lf	11.00	191,565
Demolished structures (avg. 1,500 sf/ea 482 ea)	870,000	sf	3.00	2,610,000
Disposal Fee - off site	32,222	cy	2.50	80,556
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee) 105,085LF	1,561,061	cy	15.00	23,415,915
Compacted Fill (cross overs)	22,033	cy	15.00	330,495
New Asphalt 2" (Cross overs) 2222 cy figure 2.0 tons/cy	4,444	ton	70.00	311,080
Base material 12" (cross overs)	13,332	cy	34.50	459,954
Riprap (24")	427,490	cy	90.00	38,474,100
12 " gabion mattress cages	705,358	sy	16.00	11,285,728
Filter Fabric	705,358	sy	2.00	1,410,716
Grassing (seeding)	63	acres	2,150	135,450
Clearing and Grubbing, off-site disposal	274	acres	5,000	1,370,000
Crushed Aggregate 6" Thick(Levee wearing surface)	18,932	cy	45.00	851,940
Guardrail	18,270	lf	21.00	383,670
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	48	pass-thrus		14,130,550
New 8" Water line	10,415	lf	41	427,015
New 6" Sewer Line	10,415	lf	48	499,920
New 2"Gas Line	10,415	lf	20	208,300
New Electrical Line - 3 phase 1440v	10,415	lf	44.00	458,260
New 24" Storm Drain	10,415	lf	68.00	708,220
Concrete Box Culverts	14,326	cy	700	10,028,200
6 rebar (box culverts)	493	tons	925	456,025
Flap Gates (10w x 4h)	35	ea	36,000	1,260,000
Flap Gates (7w x 3h)	46	ea	18,900	869,400
Flap Gates 7w x 4h)	5	ea	25,200	126,000
Flap Gates 6w x 3h)	5	ea	16,200	81,000
			Subtotal	**$115,511,608**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 14 OF 16
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "G"*** FILE NAME: mscip comprehensive-study-combined cost-est 25jul08 xls
Ring Levee- Moss/Wash - elev. 20 ***Pascagoula / Moss Point***

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward		**$115,511,608**
Flap Gates (6w x 4h)			9	ea	21,600	194,400
Flap Gates (8w x 4h)			41	ea	28,800	1,180,800
Flap Gates (12w x 4h)			20	ea	100,800	2,016,000
Flap Gates (5w x 3h)			3	ea	31,500	94,500
Cutoff valves (10w x 4h)			35	ea	84,000	2,940,000
Cutoff valves (7w x 3h)			46	ea	44,100	2,028,600
Cutoff valves (7w x 4h)			5	ea	58,800	294,000
Cutoff valves (6w x 3h)			5	ea	37,800	189,000
Cutoff valves (6w x 4h)			9	ea	50,400	453,600
Cutoff valves (8w x 4h)			41	ea	67,200	2,755,200
Cutoff valves (12w x 4h)			20	ea	100,800	2,016,000
Cutoff valves (5w x 3h)			3	ea	31,500	94,500
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)						36,970,904
Ditch Excavation			156,197	cy	12.00	1,874,364
ATFP, Signage, Pavement Marking, Traffic Control, etc.			5	%	allow	8,220,000
			Current Contract Cost, Oct 07			$176,833,476
	CONTINGENCY				**25.0%**	44,208,369
						$221,041,845
	01 Account, Lands & Damage			PCA	LS	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)					574,040,000
	06 Account, Preservation - Mitigation-Tidal (46 acr	$200,000/acr)				9,200,000
	06 Account, Preservation - Mitigation-Non-Tidal (106 acr	$5,500/acr)				583,000
						$804,889,845
	30 Account, Plan, Engr.& Design				**8.0%**	64,391,188
						$869,281,033
	31 Account, Constr. Management				**6.0%**	52,156,862
						$921,437,894
	ESCALATION				**0.0%**	0
						$ 921,437,894
						rounded
			TOTAL PROJECT COST, Oct 07			$ 921,400,000

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 15	OF 16
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County ***Option "H"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls
	Ring Levee- Moss/Wash - elev. 30	***Pascagoula / Moss Point***	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	6,040,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	80,608	sy	4.50	362,736
8" Water line removal	20,930	lf	8.00	167,440
6" Sewer line removal	20,930	lf	8.00	167,440
2" Gas line removal	20,930	lf	3.00	62,790
Electric line removal - 3 phase 1440v	20,930	lf	11.00	230,230
24" Storm Drain removal	20,930	lf	11.00	230,230
Demolished structures (avg. 1,500 sf/ea 584 ea)	870,000	sf	3.00	2,610,000
Disposal Fee - off site	32,222	cy	2.50	80,556
Misc Removal	1	job	allow	10,000
NEW WORK:				
Compacted Fill (levee) 105,085LF	5,227,529	cy	15.00	78,412,935
New Asphalt 2" (Cross overs) 1312 cy figure 2.0 tons/cy	2,624	ton	70.00	183,680
Base material 12" (cross overs)	7,869	cy	34.50	271,481
Riprap (24")	332,616	cy	90.00	29,935,440
12 " gabion mattress cages	1,097,633	sy	16.00	17,562,128
Filter Fabric	1,097,633	sy	2.00	2,195,266
Grassing (seeding)	136	acres	2,150	292,400
Clearing and Grubbing, off-site disposal	416	acres	5,000	2,080,000
Crushed Aggregate 6" Thick(Levee wearing surface)	19,075	cy	45.00	858,375
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	79	pass-thrus		36,085,597
New 8" Water line	12,500	lf	41	512,500
New 6" Sewer Line	12,500	lf	48	600,000
New 2"Gas Line	12,500	lf	20	250,000
New Electrical Line - 3 phase 1440v	12,500	lf	44.00	550,000
New 24" Storm Drain	12,500	lf	68.00	850,000
Concrete Box Culverts	14,326	cy	700	10,028,200
6 rebar (box culverts)	493	tons	925	456,025
Flap Gates (10w x 4h)	35	ea	36,000	1,260,000
Flap Gates (7w x 3h)	46	ea	18,900	869,400
Flap Gates 7w x 4h)	5	ea	25,200	126,000
Flap Gates 6w x 3h)	5	ea	16,200	81,000
			Subtotal	**$193,421,848**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 16	OF 16
		PREPARED: Joseph E. Ellsworth	CHECKED. Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County *Option "H"*	FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls
	Ring Levee- Moss/Wash - elev. 30	***Pascagoula / Moss Point***	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
		Subtotal, brought forward		**$193,421,848**
Flap Gates (6w x 4h)	9	ea	21,600	194,400
Flap Gates (8w x 4h)	41	ea	28,800	1,180,800
Flap Gates (12w x 4h)	20	ea	100,800	2,016,000
Flap Gates (5w x 3h)	3	ea	31,500	94,500
Cutoff valves (10w x 4h)	35	ea	84,000	2,940,000
Cutoff valves (7w x 3h)	46	ea	44,100	2,028,600
Cutoff valves (7w x 4h)	5	ea	58,800	294,000
Cutoff valves (6w x 3h)	5	ea	37,800	189,000
Cutoff valves (6w x 4h)	9	ea	50,400	453,600
Cutoff valves (8w x 4h)	41	ea	67,200	2,755,200
Cutoff valves (12w x 4h)	20	ea	100,800	2,016,000
Cutoff valves (5w x 3h)	3	ea	31,500	94,500
Pump stations, 42" to 60" pump size (28 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				38,210,974
Ditch Excavation	156,197	cy	12.00	1,874,364
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	12,080,000
		Current Contract Cost, Oct 07		$259,843,786
CONTINGENCY			**25.0%**	64,960,946
				$324,804,732
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				584,742,000
06 Account, Preservation - Mitigation-Tidal (67 acr $200,000/acr)				13,400,000
06 Account, Preservation - Mitigation-Non-Tidal (164 acr $5,500/acr)				902,000
				$923,873,732
30 Account, Plan, Engr.& Design			**8.0%**	73,909,899
				$997,783,631
31 Account, Constr. Management			**6.0%**	59,867,018
				$1,057,650,649
ESCALATION			**0.0%**	0
				$ 1,057,650,649
				rounded
		TOTAL PROJECT COST, Oct 07		$ 1,057,700,000

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE STUDY "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***FORREST HEIGHTS LEVEE, EL 17***
Harrison County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Mike Mckown
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization			1	job	allow	$50,000
REMOVALS:						
Asphalt removal 2" Thick(cross overs)			500	sy	4.50	2,250
8" Water line removal			100	lf	8.00	800
6" Sewer line removal			100	lf	8.00	800
2" Gas line removal			100	lf	3.00	300
Electrical line removal - 3 phase 1440v			150	lf	11.00	1,650
24" Storm Drain removal			100	lf	11.00	1,100
Demolished structures (avg. 1,500 sf/ea 2 ea)			3,000	sf	3.00	9,000
Disposal Fee - off site			111	cy	2.50	278
NEW WORK:						
Compacted Fill (levee)			13,300	cy	15.00	199,500
New Asphalt 2" (Cross overs) 134 cy	figure 2.0 tons/cy		15	tons	70.00	1,050
Base material 12" (cross overs)			50	cy	34.50	1,725
Riprap (12")			170	cy	90.00	15,300
Grouted Riprap			125	cy	160.00	20,000
Filter Fabric			500	sy	2.00	1,000
Grassing (seeding)			10	acres	2,150	21,500
Clearing and Grubbing, off-site disposal			5	acres	5,000	25,000
Crushed Aggregate 6" Thick(Levee wearing surface)			1,000	cy	45.00	45,000
Selective Clearing and Snagging, soil removal and disposal			220	cy	20.00	4,400
Clearing and Snagging (from mouth of Turkey Creek upstream)			5	miles	25,000	112,500
New 8" Water line			100	lf	41	4,100
New 6" Sewer Line			100	lf	48	4,800
New 2"Gas Line			100	lf	20	2,000
New Electrical Line - 3 phase 1440v			150	lf	44.00	6,600
New 24" Storm Drain			100	lf	68.00	6,800
Pump Stations:						
Structural Concrete, complete all sites			194	cy	700	135,800
Form Work, complete all sites			4,996	sf	7	32,474
Steel Reinforcement, complete all sites			12	tons	925	11,141
Excavation			300	cy	15	4,500
Backfill			233	cy	5	1,165
Trash Screens and Miscellaneous metal items, All Sites			2	each	100,000	200,000
Pumps by Installation Site	P-1	Pumps	2	each	222,200	444,400
		Discharge Piping(42" Dia; 154 lf)	1	job	30,800	30,800
		Energy Dissipation	1	job	allow	90,000
		Electrical	2	ea	242,100	484,200
					Subtotal $	**1,971,932**

COMPREHENSIVE STUDY " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	2	OF	4
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Mike Mckown
WORK ITEM:	***FORREST HEIGHTS LEVEE, EL 17***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**1,971,932**
Ditch Excavation	965	cy	12.00		11,580
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		97,000

		Current Contract Cost, Oct 07	$	2,080,512
CONTINGENCY		**25.0%**		520,128
			$	2,600,641
01 Account, Lands & Damage	PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)		**LS**		2,571,000
06 Account, Preservation - Mitigation-Non-Tidal (19.85 acr admin+25% cont)		$5,500/acr+		118,538
			$	5,315,179
30 Account, Plan, Engr.& Design		**8.0%**		425,214
			$	5,740,393
31 Account, Constr. Management		**6.0%**		344,424
			$	6,084,816
ESCALATION		**0.0%**		0
			$	6,084,816
				rounded
		TOTAL PROJECT COST, Oct 07	**$**	**6,100,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE STUDY " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Mike Mckown
WORK ITEM: ***FORREST HEIGHTS LEVEE, EL 21*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization			1	job	allow	$120,000
REMOVALS:						
Asphalt removal 2" Thick(cross overs)			700	sy	4.50	3,150
8" Water line removal			150	lf	8.00	1,200
6" Sewer line removal			150	lf	8.00	1,200
2" Gas line removal			150	lf	3.00	450
Electric line removal - 3 phase 1440v			175	lf	11.00	1,925
24" Storm Drain removal			125	lf	11.00	1,375
Demolished structures (avg. 1,500 sf/ea	2 ea)		3,000	sf	3.00	9,000
Disposal Fee - off site			111	cy	2.50	278
NEW WORK:						
Compacted Fill (levee)			51,000	cy	15.00	765,000
Vinyl Sheetpiling			39,550	sf	25.00	988,750
New Asphalt 2" (at Tunnels) 134 cy	figure 2.0 tons/cy		20	tons	70.00	1,400
Base material 12" (cross overs)			100	cy	34.50	3,450
Riprap (12")			170	cy	90.00	15,300
Grouted Riprap			125	cy	160.00	20,000
Filter Fabric			500	sy	2.00	1,000
Grassing (seeding)			10	acres	2,150	21,500
Clearing and Grubbing, off-site disposal			10	acres	5,000	50,000
Crushed Aggregate 6" Thick(Levee wearing surface)			2,000	cy	45.00	90,000
Selective Clearing and Snagging, soil removal and disposal			220	cy	20.00	4,400
Clearing and Snagging (from mouth of Turkey Creek upstream)			5	miles	25,000	112,500
New 8" Water line			150	lf	41	6,150
New 6" Sewer Line			150	lf	48	7,200
New 2"Gas Line			150	lf	20	3,000
New Electrical Line - 3 phase 1440v			175	lf	44.00	7,700
New 24" Storm Drain			125	lf	68.00	8,500
Pump Stations:						
Structural Concrete, complete all sites			194	cy	700	135,800
Form Work, complete all sites			4,996	sf	7	32,474
Steel Reinforcement, complete all sites			12	tons	925	11,141
Excavation			300	cy	15	4,500
Backfill			233	cy	5	1,165
Trash Screens and Miscellaneous metal items, All Sites			2	each	100,000	200,000
Pumps by Installation Site	P-1	Pumps	2	each	222,200	444,400
		Discharge Piping(42" Dia; 154 lf)	1	job	30,800	30,800
		Energy Dissipation	1	job	allow	90,000
		Electrical	2	ea	242,100	484,200
					Subtotal $	**3,678,907**

COMPREHENSIVE STUDY "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Mike Mckown
WORK ITEM: ***FORREST HEIGHTS LEVEE, EL 21*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**3,678,907**
Concrete Box Culvert (5 ea) 4'x3'	155	cy	900		139,500
Flap Gates (4w x 3h)	5	ea	13,500		67,500
Cutoff valves (4w x 3h)	5	ea	31,500		157,500
Ditch Excavation	2,500	cy	12.00		30,000
EAST WALL					
Concrete Wall	1,826	cy	700		1,278,200
Structural Steel Gates	6	tons	4,800		28,800
6 rebar (box culverts)	49	tons	925		45,325
Misc. removals at Russell Blvd Entrance	1	job	allow		10,000
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		246,000
			Current Contract Cost, Oct 07	$	5,681,732
CONTINGENCY			**25.0%**		1,420,433
				$	7,102,166
01 Account, Lands & Damage		PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**		2,649,000
06 Account, Preservation - Mitigation-Non-Tidal (19.85 acr admin+25% cont)			$5,500/acr+		220,844
				$	9,997,010
30 Account, Plan, Engr.& Design			**8.0%**		799,761
				$	10,796,770
31 Account, Constr. Management			**6.0%**		647,806
				$	11,444,577
ESCALATION			**0.0%**		0
				$	11,444,577
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**11,400,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIF** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 20 ***Pearlington***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$1,540,000
REMOVALS:					
Asphalt removal 2" Thick(cross overs)		14,014	sy	4.50	63,063
8" Water line removal		4,960	lf	8.00	39,680
6" Sewer line removal		4,960	lf	8.00	39,680
2" Gas line removal		4,960	lf	3.00	14,880
Electrical line removal - 3 phase 1440v		4,960	lf	11.00	54,560
24" Storm Drain removal		4,960	lf	11.00	54,560
Demolished structures (avg. 1,500 sf/ea	28 ea)	42,000	sf	3.00	126,000
Disposal Fee - off site		1,556	cy	2.50	3,889
NEW WORK:					
Compacted Fill (levee)		786,911	cy	15.00	11,803,665
New Asphalt 2" (Cross overs) 134 cy	figure 2.0 tons/cy	268	tons	70.00	18,760
Base material 12" (cross overs)		800	cy	34.50	27,600
Riprap (24")		147,330	cy	90.00	13,259,700
24 " gabion mattress cages, galv-pvc type		265,194	sy	32.00	8,486,208
Filter Fabric		265,194	sy	2.00	530,388
Grassing (seeding)		27	acres	2,150	58,050
Clearing and Grubbing, off-site disposal		93	acres	5,000	465,000
Crushed Aggregate 6" Thick(Levee wearing surface)		5,124	cy	45.00	230,580
New 8" Water line		1,395	lf	41	57,195
New 6" Sewer Line		1,395	lf	48	66,960
New 2"Gas Line		1,395	lf	20	27,900
New Electrical Line - 3 phase 1440v		1,395	lf	44.00	61,380
New 24" Storm Drain		1,395	lf	68.00	94,860
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	9	pass-thrus		3,186,197
Concrete Box Culverts		2,224	cy	700	1,556,800
6 rebar (box culverts)		78	tons	925	72,150
				Subtotal $	**41,939,705**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIF**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 2	OF 4
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Hancock County ***Option "A"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls
	Ring Levee - elev. 20 ***Pearlington***		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**41,939,705**
Flap Gates (6w x 3h)	13	ea	16,200	210,600
Flap Gates (5w x 3h)	8	ea	13,500	108,000
Flap Gates (10w x 4h)	14	ea	36,000	504,000
Flap Gates (8w x 4h)	2	ea	28,800	57,600
Cutoff valves (6w x3h)	13	ea	37,800	491,400
Cutoff valves (5w x3h)	8	ea	31,500	252,000
Cutoff valves (10w x4h)	14	ea	84,000	1,176,000
Cutoff valves (8w x4h)	2	ea	67,200	134,400
Pump stations, 42" to 60" pump size (6 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				17,755,717
Ditch Excavation	26,000	cy	12.00	312,000
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	3,070,000
			Current Contract Cost, Oct 07	$ 66,011,422
CONTINGENCY			**25.0%**	16,502,856
				$ 82,514,278
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	8,883,133
06 Account, Preservation - Mitigation-Tidal (0 acr $200,000/acr)				0
06 Account, Preservation - Mitigation-Non-Tidal (27 acr $5,500/acr)				148,500
				$ 91,570,911
30 Account, Plan, Engr.& Design			**8.0%**	7,325,673
				$ 98,896,584
31 Account, Constr. Management			**6.0%**	5,933,795
				$ 104,830,379
ESCALATION			**0.0%**	0
				$ 104,830,379
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 104,800,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***Option "B"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08 xls
Ring Levee - elev. 30 ***Pearlington***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,770,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	18,974	sy	4.50	85,383
8" Water line removal	6,880	lf	8.00	55,040
6" Sewer line removal	6,880	lf	8.00	55,040
2" Gas line removal	6,880	lf	3.00	20,640
Electric line removal - 3 phase 1440v	6,880	lf	11.00	75,680
24" Storm Drain removal	6,880	lf	11.00	75,680
Demolished structures (avg. 1,500 sf/ea 30 ea)	45,000	sf	3.00	135,000
Disposal Fee - off site	1,667	cy	2.50	4,167
NEW WORK:				
Compacted Fill (levee)	1,266,791	cy	15.00	19,001,865
New Asphalt 2" (at Tunnels) 134 cy figure 2.0 tons/cy	268	tons	70.00	18,760
Base material 12" (cross overs)	800	cy	34.50	27,600
Riprap (12")	105,379	cy	90.00	9,484,110
24 " gabion mattress cages, galv-pvc type	347,750	sy	32.00	11,128,000
Filter Fabric	347,750	sy	2.00	695,500
Grassing (seeding)	47	acres	2,150	101,050
Clearing and Grubbing, off-site disposal	131	acres	5,000	655,000
Crushed Aggregate 6" Thick(Levee wearing surface)	5,124	cy	45.00	230,580
New 8" Water line	1,935	lf	41	79,335
New 6" Sewer Line	1,935	lf	48	92,880
New 2"Gas Line	1,935	lf	20	38,700
New Electrical Line - 3 phase 1440v	1,935	lf	44.00	85,140
New 24" Storm Drain	1,935	lf	68.00	131,580
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	9	pass-thrus		5,048,096
Concrete Box Culverts	2,224	cy	700	1,556,800
6 rebar (box culverts)	78	tons	925	72,150
			Subtotal $	**50,723,776**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 4	OF 4
		PREPARED: Joseph H Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Hancock County — ***Option "B"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls
	Ring Levee - elev. 30 — ***Pearlington***		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Subtotal, brought forward				**$**	**50,723,776**
Flap Gates (6w x 3h)	13	ea	16,200		210,600
Flap Gates (5w x 3h)	8	ea	13,500		108,000
Flap Gates (10w x 4h)	14	ea	36,000		504,000
Flap Gates (8w x 4h)	2	ea	28,800		57,600
Cutoff valves (6w x 3h)	13	ea	37,800		491,400
Cutoff valves (5w x 3h)	8	ea	31,500		252,000
Cutoff valves (10w x 4h)	14	ea	84,000		1,176,000
Cutoff valves (8w x 4h)	2	ea	67,200		134,400
Pump stations, 42" to 60" pump size (6 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					18,799,667
Ditch Excavation	26,000	cy	12.00		312,000
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		3,550,000
Current Contract Cost, Oct 07				$	76,319,443
CONTINGENCY			**25.0%**		19,079,861
				$	95,399,304
01 Account, Lands & Damage		PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**		9,340,242
06 Account, Preservation - Mitigation-Tidal (0 acr $200,000/acr)					0
06 Account, Preservation - Mitigation-Non-Tidal (40 acr $5,500/acr)					220,000
				$	104,984,546
30 Account, Plan, Engr.& Design			**8.0%**		8,398,764
				$	113,383,310
31 Account, Constr. Management			**6.0%**		6,802,999
				$	120,186,308
ESCALATION			**0.0%**		0
				$	120,186,308
					rounded
TOTAL PROJECT COST, Oct 07				**$**	**120,200,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 20 ***Ocean Springs***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$1,640,000
REMOVALS:					
Asphalt removal 2" Thick(cross overs)		11,795	sy	4.50	53,078
8" Water line removal		3,915	lf	8.00	31,320
6" Sewer line removal		3,915	lf	8.00	31,320
2" Gas line removal		3,915	lf	3.00	11,745
Electrical line removal - 3 phase 1440v		3,915	lf	11.00	43,065
24" Storm Drain removal		3,915	lf	11.00	43,065
Demolished structures (avg. 1,500 sf/ea	83 ea)	124,500	sf	3.00	373,500
Disposal Fee - off site		4,611	cy	2.50	11,528
NEW WORK:					
Compacted Fill (levee)		292,692	cy	15.00	4,390,380
Compacted Fill (cross overs)		755	cy	15.00	11,324
New Asphalt 2" (Cross overs) 296 cy	figure 2.0 tons/cy	592	tons	70.00	41,440
Base material 12" (cross overs)		1,777	cy	34.50	61,307
Riprap (24")		79,047	cy	90.00	7,114,230
24 " gabion mattress cages, galv-pvc type		130,428	sy	32.00	4,173,696
Filter Fabric		130,428	sy	2.00	260,856
Grassing (seeding)		12	acres	2,150	25,800
Clearing and Grubbing, off-site disposal		52	acres	5,000	260,000
Crushed Aggregate 6" Thick(Levee wearing surface)		3,526	cy	45.00	158,670
Guardrail		1,396	lf	21.00	29,316
New 8" Water line		2,430	lf	41	99,630
New 6" Sewer Line		2,430	lf	48	116,640
New 2"Gas Line		2,430	lf	20	48,600
New Electrical Line - 3 phase 1440v		2,430	lf	44.00	106,920
New 24" Storm Drain		2,430	lf	68.00	165,240
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	13	pass-thrus		$3,666,357
Concrete Box Culverts		6,802	cy	700	4,761,400
6 rebar (box culverts)		237	tons	925	219,225
				Subtotal	**$ 27,949,650**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 20 ***Ocean Springs***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**27,949,650**
Flap Gates (8w x 4h)	30	ea	28,800	864,000
Flap Gates (6w x 3h)	19	ea	16,200	307,800
Flap Gates (10w x 4h)	5	ea	36,000	180,000
Flap Gates (7w x 3h)	18	ea	18,900	340,200
Cutoff valves (8w x 4h)	30	ea	67,200	2,016,000
Cutoff valves (6w x 3h)	19	ea	37,800	718,200
Cutoff valves (10w x 4h)	5	ea	84,000	420,000
Cutoff valves (7w x 3h)	18	ea	44,100	793,800
Pump stations, 42" to 60" pump size (14 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				33,461,226
Ditch Excavation	31,067	cy	12.00	372,804
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	3,290,000
			Current Contract Cost, Oct 07	$ 70,713,680
CONTINGENCY			**25.0%**	17,678,420
				$ 88,392,101
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				43,608,937
06 Account, Preservation - Mitigation-Tidal (24 acr $200,000/acr)				800,000
06 Account, Preservation - Mitigation-Non-Tidal (8 acr $5,500/acr)				44,000
				$ 132,870,038
30 Account, Plan, Engr.& Design			**8.0%**	10,629,603
				$ 143,499,641
31 Account, Constr. Management			**6.0%**	8,609,978
				$ 152,109,619
ESCALATION			**0.0%**	0
				$ 152,109,619
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 152,100,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "B"*** FILE NAME: mscip-comprehensive-study-comphined-cost-est-25jul08.xls
Ring Level - elev. 30 ***Ocean Springs***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,940,000
REMOVALS:				
Asphalt removal 2" Thick(cross overs)	41,814	sy	4.50	188,163
8" Water line removal	12,800	lf	8.00	102,400
6" Sewer line removal	12,800	lf	8.00	102,400
2" Gas line removal	12,800	lf	3.00	38,400
Electric line removal - 3 phase 1440v	12,800	lf	11.00	140,800
24" Storm Drain removal	12,800	lf	11.00	140,800
Demolished structures (avg. 1,500 sf/ea 312 ea)	468,000	sf	3.00	1,404,000
Disposal Fee - off site	17,333	cy	2.50	43,333
NEW WORK:				
Compacted Fill (levee)	1,508,200	cy	15.00	22,623,000
New Asphalt 2" (Cross overs) 193 cy figure 2.0 tons/cy	578	tons	70.00	40,460
Base material 12" (cross overs)	3,467	cy	34.50	119,612
Riprap (12")	150,920	cy	90.00	13,582,800
24 " gabion mattress cages, galv-pvc type	498,037	sy	32.00	15,937,184
Filter Fabric	498,037	sy	2.00	996,074
Grassing (seeding)	54	acres	2,150	116,100
Clearing and Grubbing, off-site disposal	192	acres	5,000	960,000
Crushed Aggregate 6" Thick(Levee wearing surface)	10,671	cy	45.00	480,195
New 8" Water line	5,120	lf	41	209,920
New 6" Sewer Line	5,120	lf	48	245,760
New 2"Gas Line	5,120	lf	20	102,400
New Electrical Line - 3 phase 1440v	5,120	lf	44.00	225,280
New 24" Storm Drain	5,120	lf	68.00	348,160
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	33	pass-thrus		12,942,407
Concrete Box Culverts	6,802	cy	700	4,761,400
6 rebar (box culverts)	237	tons	925	219,225
			Subtotal $	**79,010,272**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	25-Jul-08
LOCATION: Mississippi	SHEET NO. 4	OF	4
	PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: *Line of Defense 3*	BASIS of ESTIMATE: info furnished per Project Delivery Team		
Jackson County *Option "B"*	FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
Ring Level - elev. 30 *Ocean Springs*			

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**79,010,272**
Flap Gates (8w x 4h)	30	ea	28,800		864,000
Flap Gates (6w x 3h)	19	ea	16,200		307,800
Flap Gates (10w x 4h)	5	ea	28,800		144,000
Flap Gates (7w x 3h)	18	ea	18,900		340,200
Cutoff valves (8w x 4h)	30	ea	67,200		2,016,000
Cutoff valves (6w x 3h)	19	ea	37,800		718,200
Cutoff valves (10w x 4h)	5	ea	84,000		420,000
Cutoff valves (7w x 3h)	18	ea	44,100		793,800
Pump stations, 42" to 60" pump size (14 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					35,707,123
Ditch Excavation	31,067	cy	12.00		372,804
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		5,890,000
			Current Contract Cost, Oct 07	$	126,584,199
CONTINGENCY			**25.0%**		31,646,050
				$	158,230,249
01 Account, Lands & Damage		PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**		119,542,130
06 Account, Preservation - Mitigation-Tidal (38 acr			$200,000/acr)		7,600,000
06 Account, Preservation - Mitigation-Tidal (38 acr			$5,500/acr)		209,000
				$	285,606,379
30 Account, Plan, Engr & Design			**8.0%**		22,848,510
				$	308,454,889
31 Account, Constr. Management			**6.0%**		18,507,293
				$	326,962,182
ESCALATION			**0.0%**		0
				$	326,962,182
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**327,000,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 20 ***Gautier***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$4,350,000
REMOVALS:					
Asphalt removal 2" Thick(cross overs)		21,747	sy	4.50	97,862
8" Water line removal		7,000	lf	8.00	56,000
6" Sewer line removal		7,000	lf	8.00	56,000
2" Gas line removal		7,000	lf	3.00	21,000
Electrical line removal - 3 phase 1440v		7,000	lf	11.00	77,000
24" Storm Drain removal		7,000	lf	11.00	77,000
Demolished structures (avg. 1,500 sf/ea	139 ea)	208,500	sf	3.00	625,500
Disposal Fee - off site		7,722	cy	2.50	19,306
NEW WORK:					
Compacted Fill (levee)		821,665	cy	15.00	12,324,975
Compacted Fill (cross overs)		463	cy	15.00	6,945
New Asphalt 2" (Cross overs) 427 cy	figure 2.0 tons/cy	854	tons	70.00	59,780
Base material 12" (cross overs)		2,561	cy	34.50	88,355
Riprap (24")		181,889	cy	90.00	16,370,010
24 " gabion mattress cages, galv-pvc type		300,117	sy	32.00	9,603,744
Filter Fabric		300,117	sy	2.00	600,234
Grassing (seeding)		32	acres	2,150	68,800
Clearing and Grubbing, off-site disposal		133	acres	5,000	665,000
Crushed Aggregate 6" Thick(Levee wearing surface)		8,377	cy	45.00	376,965
Guardrail		1,030	lf	21.00	21,630
New 8" Water line		2,750	lf	41	112,750
New 6" Sewer Line		2,750	lf	48	132,000
New 2"Gas Line		2,750	lf	20	55,000
New Electrical Line - 3 phase 1440v		2,750	lf	44.00	121,000
New 24" Storm Drain		2,750	lf	68.00	187,000
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	20	pass-thrus		5,051,370
Concrete Box Culverts		6,085	cy	700	4,259,500
6 rebar (box culverts)		209	tons	925	193,325
				Subtotal $	**55,678,050**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 20 ***Gautier***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward		**$ 55,678,050**
Flap Gates (8w x 4h)		27	ea	28,800	777,600
Flap Gates (12w x 4h)		23	ea	43,200	993,600
Flap Gates (7w x 3h)		32	ea	18,900	604,800
Flap Gates (6w x 3h)		8	ea	16,200	129,600
Flap Gates (5w x 3h)		3	ea	13,500	40,500
Cutoff valves (8w x 4h)		27	ea	67,200	1,814,400
Cutoff valves (12w x 4h)		23	ea	100,800	2,318,400
Cutoff valves (7w x 3h)		32	ea	44,100	1,411,200
Cutoff valves (6w x 3h)		8	ea	37,800	302,400
Cutoff valves (5w x 3h)		3	ea	31,500	94,500
Pump stations, 42" to 60" pump size (11 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				40,264,191
Ditch Excavation		95,652	cy	12.00	1,147,824
Boat Gate, G-1, G-2, G-3, G-4, G-5	(reference backup file for cost derivation)				72,907,018
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow	8,700,000
			Current Contract Cost, Oct 07		$ 187,184,083
	CONTINGENCY			**25.0%**	46,796,021
					$ 233,980,103
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)				56,976,607
	06 Account, Preservation - Mitigation-Tidal (64 acr $200,000/acr)				12,800,000
	06 Account, Preservation - Mitigation-Non-Tidal (85 acr $5,500/acr)				467,500
					$ 304,249,210
	30 Account, Plan, Engr.& Design			**8.0%**	24,339,937
					$ 328,589,147
	31 Account, Constr. Management			**6.0%**	19,715,349
					$ 348,304,496
	ESCALATION			**0.0%**	0
					$ 348,304,496 rounded
			TOTAL PROJECT COST, Oct 07		**$ 348,300,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "B"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 30 ***Gautier***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$5,750,000
REMOVALS:					
Asphalt removal 2" Thick(cross overs)		34,948	sy	4.50	157,266
8" Water line removal		10,915	lf	8.00	87,320
6" Sewer line removal		10,915	lf	8.00	87,320
2" Gas line removal		10,915	lf	3.00	32,745
Electric line removal - 3 phase 1440v		10,915	lf	11.00	120,065
24" Storm Drain removal		10,915	lf	11.00	120,065
Demolished structures (avg. 1,500 sf/ea	161 ea)	241,500	sf	3.00	724,500
Disposal Fee - off site		8,944	cy	2.50	22,361
NEW WORK:					
Compacted Fill (levee)		2,781,994	cy	15.00	41,729,910
New Asphalt 2" (Cross overs) 430 cy	figure 2.0 tons/cy	860	tons	70.00	60,200
Base material 12" (cross overs)		2,578	cy	34.50	88,941
Riprap (12")		178,264	cy	90.00	16,043,760
24 " gabion mattress cages, galv-pvc type		588,272	sy	32.00	18,824,704
Filter Fabric		588,272	sy	2.00	1,176,544
Grassing (seeding)		72	acres	2,150	154,800
Clearing and Grubbing, off-site disposal		228	acres	5,000	1,140,000
Crushed Aggregate 6" Thick(Levee wearing surface)		10,587	cy	45.00	476,415
New 8" Water line		4,595	lf	41	188,395
New 6" Sewer Line		4,595	lf	48	220,560
New 2"Gas Line		4,595	lf	20	91,900
New Electrical Line - 3 phase 1440v		4,595	lf	44.00	202,180
New 24" Storm Drain		4,595	lf	68.00	312,460
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	23	pass-thrus		10,672,007
Concrete Box Culverts		6,085	cy	700	4,259,500
6 rebar (box culverts)		209	tons	925	193,325
				Subtotal	**$ 102,937,244**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County ***Option "B"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Ring Levee - elev. 30 ***Gautier***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward		**$ 102,937,244**
Flap Gates (8w x 4h)		27	ea	28,800	777,600
Flap Gates (12w x 4h)		23	ea	43,200	993,600
Flap Gates (7w x 3h)		32	ea	18,900	604,800
Flap Gates (6w x 3h)		8	ea	16,200	129,600
Flap Gates (5w x 3h)		3	ea	13,500	40,500
Cutoff valves (8w x 4h)		27	ea	67,200	1,814,400
Cutoff valves (12w x 4h)		23	ea	100,800	2,318,400
Cutoff valves (7w x 3h)		32	ea	44,100	1,411,200
Cutoff valves (6w x 3h)		8	ea	37,800	302,400
Cutoff valves (5w x 3h)		3	ea	31,500	94,500
Pump stations, 42" to 60" pump size (11 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				43,118,404
Ditch Excavation		95,652	cy	12.00	1,147,824
Boat Gate, G-1, G-2, G-3, G-4, G-5	(reference backup file for cost derivation)				80,248,938
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow	11,800,000
			Current Contract Cost, Oct 07		$ 245,193,309
	CONTINGENCY			**25.0%**	61,298,327
					$ 306,491,636
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	66,585,077
	06 Account, Preservation - Mitigation-Tidal (95 acr $200,000/acr)				19,000,000
	06 Account, Preservation - Mitigation-Non-Tidal (188 acr $5,500/acr)				1,034,000
					$ 393,135,713
	30 Account, Plan, Engr.& Design			**8.0%**	31,450,857
					$ 424,586,570
	31 Account, Constr. Management			**6.0%**	25,475,194
					$ 450,061,764
	ESCALATION			**0.0%**	0
					$ 450,061,764
					rounded
			TOTAL PROJECT COST, Oct 07		**$ 450,100,000**

Notes:
Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Buffer Zones FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Jackson County

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Moss Point ***Option "E"*** ***elevation 20***					
Demolished Structures, including Disposal (1,144 structures)		1	LS	allow	$30,440,402
	Current Contract Cost, Oct 07				$30,440,402
	CONTINGENCY			**25.0%**	7,610,101
					$38,050,503
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	330,695,519
					$368,771,022
	30 Account, Plan, Engr.& Design			**8.0%**	29,501,682
					$398,272,703
	31 Account, Constr. Management			**6.0%**	23,896,362
					$422,169,065
	ESCALATION			**0.0%**	
					$422,169,065
					rounded
	TOTAL PROJECT COST, Oct 07				$ 422,170,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Buffer Zones FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Jackson County

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Moss Point ***Option "F"*** ***elevation 30***				
Demolished Structures, including Disposal (1,433 structures)	1	LS	allow	30,225,250
			Current Contract Cost, Oct 07	$30,225,250
CONTINGENCY			**25.0%**	7,556,313
				$37,781,563
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	328,197,869
				$366,004,432
30 Account, Plan, Engr.& Design			**8.0%**	29,280,355
				$395,284,786
31 Account, Constr. Management			**6.0%**	23,717,087
				$419,001,873
ESCALATION			**0.0%**	
				$419,001,873
				rounded
			TOTAL PROJECT COST, Oct 07	$ 419,000,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***Line of Defense 3***
Buffer Zones
Jackson County

ITEM NO.
DATE 25-Jul-08
SHEET NO. 3 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Washington Ave ***Option "C"*** ***elevation 20***				
Demolished Structures, including Disposal (58 structures)	1	LS	allow	$1,160,076
Current Contract Cost, Oct 07				$1,160,076
CONTINGENCY			**25.0%**	290,019
				$1,450,095
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	61,306,156
				$62,781,251
30 Account, Plan, Engr.& Design			**8.0%**	5,022,500
				$67,803,751
31 Account, Constr. Management			**6.0%**	4,068,225
				$71,871,976
ESCALATION			**0.0%**	
				$71,871,976
				rounded
TOTAL PROJECT COST, Oct 07				$ 71,870,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Buffer Zones FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Jackson County

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Washington Ave ***Option "D"*** ***elevation 30***				
Demolished Structures, including Disposal (47 structures)	1	LS	allow	$974,076
Current Contract Cost, Oct 07				$974,076
CONTINGENCY			**25.0%**	243,519
				$1,217,595
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	54,463,513
				$55,706,108
30 Account, Plan, Engr.& Design			**8.0%**	4,456,489
				$60,162,597
31 Account, Constr. Management			**6.0%**	3,609,756
				$63,772,352
ESCALATION			**0.0%**	
				$63,772,352
				rounded
TOTAL PROJECT COST, Oct 07				$ 63,770,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE. Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 5	OF 10
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Buffer Zones	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls
	Jackson County		

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Moss Pt. - Washington Ave	***Option "G"***	***elevation 20***			
Demolished Structures, including Disposal (1,502 structures)		1	LS	allow	$31,260,326
		Current Contract Cost, Oct 07			$31,260,326
	CONTINGENCY			**25.0%**	7,815,082
					$39,075,408
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	392,001,675
					$431,102,083
	30 Account, Plan, Engr.& Design			**8.0%**	34,488,167
					$465,590,249
	31 Account, Constr. Management			**6.0%**	27,935,415
					$493,525,664
	ESCALATION			**0.0%**	
					$493,525,664
					rounded
		TOTAL PROJECT COST, Oct 07			$ 493,530,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Buffer Zones FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Jackson County

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Moss Pt. - Washington Ave ***Option "H"***		***elevation 30***			
Demolished Structures, including Disposal (1,473 structures)		1	LS	allow	$31,061,326
		Current Contract Cost, Oct 07			$31,061,326
	CONTINGENCY			**25.0%**	7,765,332
					$38,826,658
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	382,661,381
					$421,513,039
	30 Account, Plan, Engr.& Design			**8.0%**	33,721,043
					$455,234,082
	31 Account, Constr. Management			**6.0%**	27,314,045
					$482,548,126
	ESCALATION			**0.0%**	
					$482,548,126
					rounded
		TOTAL PROJECT COST, Oct 07			$ 482,550,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 7	OF 10
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Buffer Zones	FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls	
	Jackson County		

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
BelleFontaine ***Option "C"***		***elevation 20***			
Demolished Structures, including Disposal (2 structures)		1	LS	allow	$143,076
		Current Contract Cost, Oct 07			$143,076
	CONTINGENCY			**25.0%**	35,769
					$178,845
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	2,519,063
					$2,722,908
	30 Account, Plan, Engr.& Design			**8.0%**	217,833
					$2,940,741
	31 Account, Constr. Management			**6.0%**	176,444
					$3,117,185
	ESCALATION			**0.0%**	
					$3,117,185
					rounded
		TOTAL PROJECT COST, Oct 07		$	3,120,000

Notes:

The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 8 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Buffer Zones FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Jackson County

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
BelleFontaine ***Option "D"*** ***elevation 30***				
Demolished Structures, including Disposal (0 structures)	1	LS	allow	$35,000
Current Contract Cost, Oct 07				$35,000
CONTINGENCY			**25.0%**	8,750
				$43,750
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	1,409,694
				$1,478,444
30 Account, Plan, Engr.& Design			**8.0%**	118,276
				$1,596,720
31 Account, Constr. Management			**6.0%**	95,803
				$1,692,523
ESCALATION			**0.0%**	
				$1,692,523
				rounded
TOTAL PROJECT COST, Oct 07			$	1,690,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 9	OF 10
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Buffer Zones	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls
	Jackson County		

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Gulf Park Estates ***Option "C"***		***elevation 20***			
Demolished Structures, including Disposal (11 structures)		1	LS	allow	$653,000
		Current Contract Cost, Oct 07			$653,000
	CONTINGENCY			**25.0%**	163,250
					$816,250
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	7,378,022
					$8,219,272
	30 Account, Plan, Engr.& Design			**8.0%**	657,542
					$8,876,814
	31 Account, Constr. Management			**6.0%**	532,609
					$9,409,423
	ESCALATION			**0.0%**	
					$9,409,423
					rounded
		TOTAL PROJECT COST, Oct 07		$	9,410,000

Notes:

The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups. Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***Line of Defense 3***
Buffer Zones
Jackson County

ITEM NO. DATE 25-Jul-08
SHEET NO. 10 OF 10
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Gulf Park Estates ***Option "D"*** ***elevation 30***				
Demolished Structures, including Disposal (7 structures)	1	LS	allow	$531,000
Current Contract Cost, Oct 07				$531,000
CONTINGENCY			**25.0%**	132,750
				$663,750
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	5,962,259
				$6,651,009
30 Account, Plan, Engr.& Design			**8.0%**	532,081
				$7,183,090
31 Account, Constr. Management			**6.0%**	430,985
				$7,614,075
ESCALATION			**0.0%**	
				$7,614,075
				rounded
TOTAL PROJECT COST, Oct 07			$	7,610,000

Notes:
The buffer zones for the alternate alignments will be used in combination with the cost estimates for the associated structural option. The Costs for the buffer zones will include acquisition of real estate and demolition of structures with contingencies and all administration and markups.
Real Estate (01 feature account) & Demolition Cost furnished by the Savannah District COE, Belinda Estabrook, RE-RP, Realty Specialist.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	7
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Rdwy-Seawall - elev. 11	FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls		
	Jackson County ***Ocean Springs***				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$334,000
REMOVALS:				
Asphalt removal 2" Thick(Levee/Beach road)	26,445	sy	$4.50	119,003
Asphalt removal 2" Thick(cross overs)	13,314	sy	4.50	59,913
8" Water line removal	2,000	lf	8.00	16,000
6" Sewer line removal	2,000	lf	8.00	16,000
2" Gas line removal	2,000	lf	3.00	6,000
Electric line removal - 3 phase 1440v	2,000	lf	11.00	22,000
24" Storm Drain removal	2,000	lf	11.00	22,000
Demolished structures (avg. 1500 sf/ea 55ea)	82,500	sf	3.00	247,500
Disposal Fee	3,056	cy	2.50	7,639
Misc Removal	1	job	allow	10,000
NEW WORK"				
Compacted Fill (levee)	118,571	cy	15.00	1,778,565
Compacted Fill (cross overs)	15,314	cy	15.00	229,710
New Asphalt 2" (Levee/Beach road) 1,470 cy figure 2.0 tons/cy	2,940	ton	70.00	205,800
New Asphalt 2" (Cross overs) 740 cy figure 2.0 tons/cy	1,480	ton	70.00	103,600
Base material 12" (Levee/Beach road)	8,815	cy	34.50	304,118
Base material 12" (cross overs)	4,439	cy	34.50	153,146
Beach Dune fill (5' tall)	23,000	cy	12.00	276,000
Riprap (24")	31,254	cy	90.00	2,812,860
24 " gabion mattress cages, galv-pvc type	17,190	sy	32.00	550,080
Filter Fabric	17,190	sy	2.00	34,380
Grassing	7	acres	2,150	15,050
Clearing and Grubbing	34	acres	5,000	170,000
Crushed Aggregate 6" Thick(Levee wearing surface)	766	cy	45.00	34,470
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New 24" Storm Drain	2,000	lf	68.00	136,000
Seawall (9917 LF x 25.0 sf/ft) A128	9,183	cy	600	5,509,800
ATFP, Signage, Pavement Marking, Traffic Control, etc	5	%	allow	$668,000
			Subtotal	**$14,357,317**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 7
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Rdwy-Seawall - elev. 11 FILE NAME: mscip-comprehensive-study-compbined cost-est-25jul08.xls
Jackson County ***Ocean Springs***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$14,357,317**

Current Contract Cost, Oct 07			$14,357,317
CONTINGENCY		**25.0%**	3,589,329
			$17,946,647
01 Account, Lands & Damage	PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			39,005,114
06 Account, Preservation - Mitigation-Tidal (10 acr	$200,000/acr)		2,000,000
06 Account, Preservation - Mitigation-Non-Tidal (4 acr	$5,500/acr)		22,000
			$58,998,761
30 Account, Plan, Engr.& Design		**8.0%**	4,719,901
			$63,718,662
31 Account, Constr. Management		**6.0%**	3,823,120
			$67,541,781
ESCALATION		**0.0%**	0
			$ 67,541,781
			rounded
TOTAL PROJECT COST, Oct 07			**$ 67,500,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	3	OF	7
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 3***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Rdwy-Seawall - elev. 16	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Harrison County ***Elevated US Hwy 90***				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$22,770,000
REMOVALS:				
Asphalt removal 2" Thick(Levee/Beach road)	24,906,659	sy	4.50	112,079,966
Asphalt removal 2" Thick(cross overs)	166,582	sy	4.50	749,619
8" Water line removal	27,480	lf	8.00	219,840
6" Sewer line removal	27,480	lf	8.00	219,840
2" Gas line removal	27,480	lf	3.00	82,440
Electric line removal - 3 phase 1440v	27,480	lf	11.00	302,280
24" Storm Drain removal	113,515	lf	11.00	1,248,665
Storm Drain manhole/junction box removal	360	ea	500	180,000
Storm Drain curb inlet removal	984	ea	500	492,000
Storm Drain drop inlet removal	610	ea	500	305,000
Concrete sidewalk removal, including disposal	6,837	cy	82.00	560,634
Demolished structures (avg. 1500 sf/ea 80ea)	120,000	sf	3.00	360,000
Disposal Fee	4,444	cy	2.50	11,110
NEW WORK:				
Compacted Fill (levee)	4,689,128	cy	15.00	70,336,920
Compacted Fill (cross overs)	353,840	cy	15.00	5,307,600
Beach Dune Fill (10' tall)	600,000	cy	12.00	7,200,000
New Asphalt 2" (Levee/Beach road) 1,383,980 cy figure 2.0 tons/cy	2,767,960	tons	70.00	193,757,200
New Asphalt 2" (Cross overs) 8,524 cy figure 2.0 tons/cy	17,048	tons	70.00	1,193,360
Base material 12" (Levee/Beach road)	8,303,879	cy	34.50	286,483,826
Base material 12" (cross overs)	51,144	cy	34.50	1,764,468
Riprap (24")	458,544	cy	90.00	41,268,960
24 " gabion mattress cages, galv-pvc type	756,599	sy	32.00	24,211,168
Filter Fabric	756,599	sy	2.00	1,513,198
Grassing (seeding)	7	acres	2,150	15,050
Clearing and Grubbing, off-site disposal	486	acres	5,000	2,430,000
Crushed Aggregate 6" Thick(Levee wearing surface)	2,135	cy	45.00	96,075
Guardrail	80,340	lf	21	1,687,140
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
New Electrical Line - 3 phase 1440v	27,180	lf	44	1,195,920
New 24" Storm Drain	113,515	lf	68	7,719,020
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Seawall (141,288 lf x 28.5 sf/ft) reinforced concrete	149,138	cy	600	89,482,800
Pump stations, 42" to 60" pump size (15 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				40,692,903
			Subtotal	**$921,901,221**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIF** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 7
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Rdwy-Seawall - elev. 16 FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Harrison County ***Elevated US Hwy 90***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
		Subtotal, brought forward		**$921,901,221**
Concrete Box culverts	5,278	cy	700	3,694,600
6 rebar (box culverts)	192	tons	925	177,600
Flap Gates (6w x 3h)	12	ea	16,200	194,400
Flap Gates (10w x 4h)	12	ea	36,000	432,000
Flap Gates (7w x 3h)	18	ea	18,900	340,200
Flap Gates (12w x 3h)	6	ea	32,400	194,400
Flap Gates (4w x 3h)	6	ea	10,800	64,800
Flap Gates (5w x 3h)	3	ea	13,500	40,500
Flap Gates (12w x 4h)	26	ea	43,200	1,123,200
Cutoff valves (12w x 4h)	26	ea	100,800	2,620,800
Cutoff valves (6w x 3h)	12	ea	37,800	453,600
Cutoff valves (10w x 4h)	12	ea	84,000	1,008,000
Cutoff valves (7w x 3h)	18	ea	44,100	793,800
Cutoff valves (12w x 3h)	6	ea	75,600	453,600
Cutoff valves (4w x 3h)	6	ea	25,200	151,200
Cutoff valves (5w x 3h)	3	ea	31,500	94,500
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	$45,550,000
		Current Contract Cost, Oct 07		**$979,288,421**

CONTINGENCY		**25.0%**	244,822,105
			$1,224,110,526
01 Account, Lands & Damage	PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)		**LS**	502,215,382
06 Account, Preservation - Mitigation-Tidal (56 acr $200,000/acr)			11,200,000
06 Account, Preservation - Mitigation-Non-Tidal (1 acr $5,500/acr)			5,500
			$1,737,556,408
30 Account, Plan, Engr.& Design		**8.0%**	139,004,513
			$1,876,560,920
31 Account, Constr. Management		**6.0%**	112,593,655
			$1,989,154,575
ESCALATION		**0.0%**	0
			$1,989,154,575
			rounded
TOTAL PROJECT COST, Oct 07			$1,989,200,000

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 7
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Rdwy-Seawall - elev. 11 ***& Saddle Dikes -elev. 16*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Hancock County ***Beach Blvd***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Rdwy-Seawall - elev. 11					
Mobilization. Preparatory Work, Demobilization		1	job	allow	4,580,000
REMOVALS:					
Asphalt removal 2" Thick(Levee/Beach road)		2,862,597	sy	4.50	12,881,687
Asphalt removal 2" Thick(cross overs)		26,571	sy	4.50	119,570
8" Water line removal		4,900	lf	8.00	39,200
6" Sewer line removal		4,900	lf	8.00	39,200
2" Gas line removal		4,900	lf	3.00	14,700
Electric line removal - 3 phase 1440v		4,900	lf	11.00	53,900
24" Storm Drain removal		4,900	lf	11.00	53,900
Demolished structures (avg. 1500 sf/ea 66ea)		99,000	sf	3.00	297,000
Disposal Fee		3,667	cy	2.50	9,167
NEW WORK:					
Compacted Fill (levee)		382,017	cy	15.00	5,730,255
Compacted Fill (cross overs)		27,835	cy	15.00	417,525
Beach Dune fill (5' tall)		84,000	cy	12.00	1,008,000
New Asphalt 2" (Levee/Beach road) 159,065 cy	figure 2.0 tons/cy	318,130	tons	70.00	22,269,100
New Asphalt 2" (Cross overs) 1,432 cy	figure 2.0 tons/cy	2,864	tons	70.00	200,480
Base material 12" (Levee/Beach road)		954,388	cy	34.50	32,926,386
Base material 12" (cross overs)		8,592	cy	34.50	296,424
Riprap (24")		150,072	cy	90.00	13,506,480
24 " gabion mattress cages, galv-pvc type		247,619	sy	32.00	7,923,808
Filter Fabric		247,619	sy	2.00	495,238
Grassing (seeding)		2	acres	2,150.00	4,300
Clearing and Grubbing		93	acres	5,000	465,000
Crushed Aggregate 6" Thick(Levee wearing surface)		1,556	cy	45.00	70,020
Guardrail		15,370	lf	21.00	322,770
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
New Electri Line - 3 phase 1440v		4,600	lf	44.00	202,400
New 24" Storm Drain		4,810	lf	68.00	327,080
Rdwy/RR Pass-Thrus	[illegible]	4	[illegible]		[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Concrete Box culverts (pump stations)		7,490	cy	700	5,243,000
6 rebar (box culverts)		254	tons	925	234,950
				Subtotal	**$132,840,018**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 7
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Rdwy-Seawall - elev. 11 *& Saddle Dikes -elev. 16* FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Hancock County ***Beach Blvd***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward	**$132,840,018**
Pump stations, 42" to 60" pump size (13 ea)	(reference backup file for cost derivation)		lump sum	allow	26,763,616
Ditch excavation		35,358	cy	12.00	424,296
Flap Gates (8w x 4h)		19	ea	28,800	547,200
Flap Gates (12w x 4h)		33	ea	43,200	1,425,600
Flap Gates (7w x 3h)		11	ea	18,900	207,900
Flap Gates (4w x 2h)		2	ea	7,200	14,400
Flap Gates (10w x 4h)		36	ea	36,000	1,296,000
Cutoff valves (8w x 4h)		19	ea	67,200	1,276,800
Cutoff valves (12w x 4h)		33	ea	100,800	3,326,400
Cutoff valves (7w x 3h)		11	ea	44,100	485,100
Cutoff valves (4w x 2h)		2	ea	16,800	33,600
Cutoff valves (10w x 4h)		36	ea	84,000	3,024,000
Boat Gate- HK-1	(reference backup file for cost derivation)				13,587,948
Hancock County El. 16 Saddle Dikes					
REMOVALS:					
Asphalt removal 2" Thick(cross overs)		14,157	sy	4.50	63,707
8" Water line removal		600	lf	8.00	4,800
6" Sewer line removal		600	lf	8.00	4,800
2" Gas line removal		600	lf	3.00	1,800
Electric line removal - 3 phase 1440v		600	lf	11.00	6,600
24" Storm Drain removal		600	lf	11.00	6,600
NEW WORK:					
Compacted Fill (levee)		53,903	cy	15.00	808,545
Compacted Fill (cross overs)		19,927	cy	15.00	298,905
New Asphalt 2" (Cross overs) 787 cy	figure 2.0 tons/cy	1,574	tons	70.00	110,180
Base material 12" (cross overs) 4,720 cy	figure 2.0 tons/cy	9,440	tons	70.00	660,800
Grassing (seeding)		39	acres	2,150	83,850
Clearing and Grubbing		[illegible]	acres	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
New Electric Line- 3 phase 1440v		600	lf	44.00	26,400
New 24" Storm Drain		600	lf	68.00	40,800
ATFP, Signage, Pavement Marking, Traffic Control, etc.		2	%	allow	3,670,000
				Subtotal	**$191,534,042**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 7 OF 7
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 3*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Rdwy-Seawall - elev. 11 ***& Saddle Dikes -elev. 16*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Hancock County ***Beach Blvd***

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Current Contract Cost, Oct 07				**$191,534,042**
CONTINGENCY			**25.0%**	47,883,510
				$ 239,417,552
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				44,938,806
06 Account, Preservation - Mitigation-Tidal (9 acr		$200,000/acr)		1,800,000
06 Account, Preservation - Mitigation-Tidal (62 acr		$5,500/acr)		341,000
				$ 286,522,358
30 Account, Plan, Engr.& Design			**8.0%**	22,921,789
				$ 309,444,147
31 Account, Constr. Management			**6.0%**	18,566,649
				$328,010,796
ESCALATION			**0.0%**	0
				$ 328,010,796
				rounded
TOTAL PROJECT COST, Oct 07				**$328,000,000**

Notes:

Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM.	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Inland Barrier - elev. 20 Option "A"				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$950,000
Levee System				
Length	67,780	lf		
Compacted Fill	215,340	cy	15.00	3,230,100
Grassing (seeding)	23	Ac	2,150	49,450
Crushed Aggregate 6" Thick(Levee wearing surface)	25,100	cy	45.00	1,129,500
Rock Levee	61,450	cy	90.00	5,530,500
Clearing & Grubbing	120	Ac	5,000	600,000
24" Rip Rap"	61,450	cy	90.00	5,530,500
24 " Gabion Mattress Cages	92,180	sy	32.00	2,949,760
Filter Fabric	92,180	sy	2.00	184,360
Ramps & Tunnels				
Grassing (seeding)	5	ac	2,150	10,750
New Asphalt 2" (Cross overs) 82 cy figure 2.0 tons/cy	164	tons	70.00	11,480
Base material (12")	720	cy	34.50	24,840
Removal				
Asphalt	246	sy	4.50	1,107
8" Water line removal	800	lf	8.00	6,400
6" Sewer line removal	800	lf	8.00	6,400
2" Gas line removal	800	lf	3.00	2,400
24" Storm drain pipe removal	800	lf	11.00	8,800
Electric line removal - 3 phase 1440v	800	lf	11.00	8,800
Demolish Buildings (avg. 1500 sf/ea 200 ea)	300,000	sf	3.00	900,000
Demolish Buildings (multistory avg. 1500 sf/ea 41 ea)	61,500	sf	3.50	215,250
Disposal Fee - off site	13,389	cy	2.50	33,472
Water tanks	4	ea	125,000	500,000
New Work				
New 8" Water line	800	lf	41	32,800
New 6" Sewer Line	800	lf	48	38,400
New 2"Gas Line	800	lf	20	16,000
New Electric Line - 3 phase 1440v	800	lf	44.00	35,200
New 24" Storm drain pipe	800	lf	68.00	54,400
			Subtotal $	**22,060,669**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 20 Option "A"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**22,060,669**
Concrete box culverts	1,248	cy	700	873,600
6 rebar	42	tons	925	38,850
Flap Gates (7w x 3h)	7	ea	18,900	132,300
Flap Gates (10w x 4h)	11	ea	36,000	396,000
Cutoff valves (7w x 3h)	7	ea	44,100	308,700
Cutoff valves (10w x 4h)	11	ea	84,000	924,000
Pump stations, 42" to 60" pump size (2 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				9,271,149
Ditch Excavation	418,966	cy	12.00	5,027,592
Anti-Terrorism/Force Protection, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	1,900,000
			Current Contract Cost, Oct 07	$ 40,932,861
CONTINGENCY			**25.0%**	10,233,215
				$ 51,166,076
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	58,505,782
06 Account, Preservation - Mitigation-Tidal (4 acr $200,000/acr)				800,000
06 Account, Preservation - Mitigation-Non-Tidal (68 acr $5,500/acr)				374,000
				$ 110,870,858
30 Account, Plan, Engr.& Design			**8.0%**	8,869,669
				$ 119,740,526
31 Account, Constr. Management			**6.0%**	7,184,432
				$ 126,924,958
ESCALATION			**0.0%**	0
				$ 126,924,958
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 126,900,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 30 Option "B"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$2,360,000
Levee System					
Length		68,110	lf		
Compacted Fill		1,398,140	cy	15.00	20,972,100
Grassing (seeding)		13	Ac	2,150	27,950
Crushed Aggregate 6" Thick(Levee wearing surface)		37,840	cy	45.00	1,702,800
Rock Levee		56,380	cy	90.00	5,074,200
Clearing & Grubbing		135	Ac	5,000	675,000
24" Rip Rap		218,300	cy	90.00	19,647,000
24 " Gabion Mattress Cages		654,870	sy	32.00	20,955,840
Filter Fabric		654,870	sy	2.00	1,309,740
Ramps & Tunnels	same as elev 40				
Vehicle/RR Gate-two lane (24')	(reference backup file for cost derivation) (same cost as elev 40)				362,133
Ramps-two lane (24')	(included in above levee system quantities)				
Compacted Fill (ramps and tunnels)		61,670	cy	15.00	925,050
Grassing (seeding)		14	ac	2,150	30,100
New Asphalt 2" (Cross overs) 3984 cy	figure 2.0 tons/cy	7,968	tons	70.00	557,760
Base material (12")		9,400	cy	34.50	324,300
Guardrail		16,000	lf	21.00	336,000
Removal					
Asphalt		25,000	sy	4.50	112,500
8" Water line removal		8,000	lf	8.00	64,000
6" Sewer line removal		8,000	lf	8.00	64,000
2" Gas line removal		8,000	lf	3.00	24,000
24" Storm drain pipe removal		8,000	lf	11.00	88,000
Electric line removal - 3 phase 1440v		8,000	lf	11.00	88,000
Demolish Buildings (avg. 1500 sf/ea 200 ea)		300,000	sf	3.00	900,000
Demolish Buildings (multistory avg. 1500 sf/ea 41 ea)		61,500	sf	3.50	215,250
Disposal Fee - off site		13,389	cy	2.50	33,472
Water tanks		4	ea	125,000	500,000
New Work					
New 8" Water line		8,000	lf	41	328,000
New 6" Sewer Line		8,000	lf	48	384,000
New 2"Gas Line		8,000	lf	20	160,000
New Electric Line - 3 phase 1440v		8,000	lf	44.00	352,000
New 24" Storm drain pipe		8,000	lf	68.00	544,000
				Subtotal $	**79,117,195**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton

WORK ITEM: ***Line of Defense 4***
Jackson County
Inland Barrier - elev. 30 Option "B"

BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**79,117,195**
Concrete box culverts	1,248	cy	700	873,600
6 rebar	42	tons	925	38,850
Flap Gates (7w x 3h)	7	ea	18,900	132,300
Flap Gates (10w x 4h)	11	ea	36,000	396,000
Cutoff valves (7w x 3h)	7	ea	44,100	308,700
Cutoff valves (10w x 4h)	11	ea	84,000	924,000
Pump stations, 42" to 60" pump size (2 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				9,855,749
Ditch Excavation	418,966	cy	12.00	5,027,592
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	4,720,000
			Current Contract Cost, Oct 07	$ 101,393,987
CONTINGENCY			**25.0%**	25,348,497
				$ 126,742,483
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	66,571,033
06 Account, Preservation - Mitigation-Tidal (7 acr $200,000/acr)				1,400,000
06 Account, Preservation - Mitigation-Non-Tidal (295 acr $5,500/acr)				1,622,500
				$ 196,361,016
30 Account, Plan, Engr.& Design			**8.0%**	15,708,881
				$ 212,069,898
31 Account, Constr. Management			**6.0%**	12,724,194
				$ 224,794,092
ESCALATION			**0.0%**	0
				$ 224,794,092 rounded
			TOTAL PROJECT COST, Oct 07	**$ 224,800,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 40 Option "C"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$2,900,000
Levee System					
Length		73,874	lf		
Compacted Fill		4,067,550	cy	15.00	61,013,250
Grassing (seeding)		206	Ac	2,150	442,900
Crushed Aggregate 6" Thick(Levee wearing surface)		41,050	cy	45.00	1,847,250
Rock Levee		208,240	cy	90.00	18,741,600
Clearing & Grubbing		317	Ac	5000	1,585,000
Ramps & Tunnels					
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	4	pass-thrus		362,133
Compacted Fill (ramps and tunnels)		238,960	cy	15.00	3,584,400
Grassing (seeding)		16	ac	2,150	34,400
New Asphalt 2" (Cross overs) 4620 cy	figure 2.0 tons/cy	9,240	tons	70.00	646,800
Base material (12")		13,500	cy	34.50	465,750
Guardrail		7,200	lf	21.00	151,200
Removal					
Asphalt		[illegible]	sy	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
24" Storm drain pipe removal		13,000	lf	11.00	143,000
Electric line removal - 3 phase 1440v		13,000	lf	11.00	143,000
Demolish Buildings (avg. 1500 sf/ea 200 ea)		300,000	sf	3.00	900,000
Demolish Buildings (multistory avg. 1500 sf/ea 41 ea)		61,500	sf	3.50	215,250
Disposal Fee - off site		13,389	cy	2.50	33,472
Water tanks		4	ea	125,000	500,000
New Work					
New 8" Water line		13,000	lf	8.00	104,000
New 6" Sewer Line		13,000	lf	8.00	104,000
New 2"Gas Line		13,000	lf	3.00	39,000
New Electric Line - 3 phase 1440v		13,000	lf	44.00	572,000
New 24" Storm drain pipe		13,000	lf	68.00	884,000
				Subtotal $	**94,061,705**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: Mississippi Coastal Improvements Program "MsCIP" ITEM NO. DATE 25-Jul-08
LOCATION: Mississippi SHEET NO. 6 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 40 Option "C"

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**94,061,705**
Concrete box culverts	1,248	cy	700		873,600
6 rebar	42	tons	925		38,850
Flap Gates (7w x 3h)	7	ea	18,900		132,300
Flap Gates (10w x 4h)	11	ea	36,000		396,000
Cutoff valves (7w x 3h)	7	ea	44,100		308,700
Cutoff valves (10w x 4h)	11	ea	84,000		924,000
Pump stations, 42" to 60" pump size (2 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					14,318,944
Ditch Excavation	418,966	cy	12.00		5,027,592
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		5,800,000
			Current Contract Cost, Oct 07	$	121,881,692
CONTINGENCY			**25.0%**		30,470,423
				$	152,352,115
01 Account, Lands & Damage		PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**		76,230,875
06 Account, Preservation - Mitigation-Tidal (8 acr $200000/acr)					1,600,000
06 Account, Preservation - Mitigation-Tidal (387 acr $5,500/acr)					2,128,500
				$	232,336,490
30 Account, Plan, Engr.& Design			**8.0%**		18,586,919
				$	250,923,409
31 Account, Constr. Management			**6.0%**		15,055,405
				$	265,978,813
ESCALATION			**0.0%**		0
				$	265,978,813
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**266,000,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.	DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO. 7	OF	32
		PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team	
	Harrison County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls	
	Inland Barrier - elev. 20 Option "A"			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,390,000
Levee System				
Length	142,732	lf		
Compacted Fill	582,723	cy	15.00	8,740,845
Grassing (seeding)	67	Ac	2,150	144,050
Crushed Aggregate 6" Thick(Levee wearing surface)	52,864	cy	45.00	2,378,880
Rock Levee	207,205	cy	90.00	18,648,450
Clearing & Grubbing	260	Ac	5,000	1,300,000
24" Rip Rap	184,790	cy	90.00	16,631,100
24 " Gabion Mattress Cages	277,180	sy	32.00	8,869,760
Filter Fabric	277,180	sy	2.00	554,360
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	45	pass-thrus		11,369,882
New Asphalt 2" (Cross overs) 900 cy figure 2.0 tons/cy	1,800	tons	70.00	126,000
Base material (12")	24,300	cy	34.50	838,350
Removal				
Asphalt	4,050	sy	4.50	18,225
8" Water line removal	8,000	lf	41	328,000
6" Sewer line removal	8,000	lf	48	384,000
2" Gas line removal	8,000	lf	20	160,000
24" Storm drain pipe removal	8,000	lf	11.00	88,000
Electric line removal - 3 phase 1440v	8,000	lf	11.00	88,000
Demolish Buildings (avg. 1500 sf/ea 861 ea)	1,291,500	sf	3.00	3,874,500
Disposal Fee - off site	47,833	cy	2.50	119,583
New Work				
New 8" Water line	8,000	lf	8.00	64,000
New 6" Sewer Line	8,000	lf	8.00	64,000
New 2"Gas Line	8,000	lf	3.00	24,000
New Electric Line - 3 phase 1440v	8,000	lf	44.00	352,000
New 24" Storm drain pipe	8,000	lf	68.00	544,000
			Subtotal $	**75,709,985**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 8 OF 32
PREPARED: Joseph H Ellsworth CHECKED: Gary A. Payton

WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 20 Option "A"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**75,709,985**
Concrete box culverts	3,656	cy	700	2,559,200
6 rebar	119	tons	925	110,075
Flap Gates (12w x 4h)	28	ea	43,200	1,209,600
Flap Gates (10w x 4h)	15	ea	36,000	540,000
Cutoff valves (7w x 3h)	7	ea	44,100	308,700
Cutoff valves (10w x 4h)	11	ea	84,000	924,000
Pump stations, 42" to 60" pump size (1 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				3,727,691
Ditch Excavation	872,375	cy	12.00	10,468,500
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	4,780,000
			Current Contract Cost, Oct 07 $	100,337,751
CONTINGENCY			**25.0%**	25,084,438
			$	125,422,189
01 Account, Lands & Damage		PCA	LS	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			LS	253,268,000
06 Account, Preservation - Mitigation-Tidal (8 acr $200,000/acr)				1,600,000
06 Account, Preservation - Mitigation-Non-Tidal (68 acr $5,500/acr)				374,000
			$	380,689,189
30 Account, Plan, Engr.& Design			**8.0%**	30,455,135
			$	411,144,324
31 Account, Constr. Management			**6.0%**	24,668,659
			$	435,812,983
ESCALATION			**0.0%**	0
			$	435,812,983 rounded
			TOTAL PROJECT COST, Oct 07 $	**435,800,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	9	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Inland Barrier - elev. 30 Option "B"				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$6,610,000
Levee System				
Length	142,732	lf		
Compacted Fill	2,910,170	cy	15.00	43,652,550
Grassing (seeding)	45	Ac	2,150	96,750
Crushed Aggregate 6" Thick(Levee wearing surface)	79,295	cy	45.00	3,568,275
Rock Levee	202,280	cy	90.00	18,205,200
Clearing & Grubbing	340	Ac	5,000	1,700,000
12" Rip Rap	544,102	cy	90.00	48,969,180
12 " Gabion Matress Cages	1,632,305	sy	16.00	26,116,880
Filter Fabric	1,632,305	sy	2.00	3,264,610
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	158	pass-thrus		40,232,904
New Asphalt 2" (Cross overs) 18500 cy figure 2.0 tons/cy	37,000	tons	70.00	2,590,000
Base material (12")	22,220	cy	34.50	766,590
Guardrail	50,000	lf	21.00	1,050,000
Removal				
Asphalt	225,100	sy	4.50	1,012,950
8" Water line removal	85,000	lf	41	3,485,000
6" Sewer line removal	85,000	lf	48	4,080,000
2" Gas line removal	85,000	lf	20	1,700,000
24" Storm drain pipe removal	85,000	lf	11.00	935,000
Electric line removal - 3 phase 1440v	85,000	lf	11.00	935,000
Demolish Buildings (avg. 1500 sf/ea 935 ea)	1,291,500	sf	3.00	3,874,500
Disposal Fee - off site	47,833	cy	2.50	119,583
New Work				
New 8" Water line	75,000	lf	8.00	600,000
New 6" Sewer Line	75,000	lf	8.00	600,000
New 2"Gas Line	75,000	lf	3.00	225,000
New Electric Line - 3 phase 1440v	75,000	lf	44.00	3,300,000
New 24" Storm drain pipe	75,000	lf	68.00	5,100,000
			Subtotal	**$222,789,972**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 10 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 30 Option "B"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**222,789,972**
Concrete box culverts	3,656	cy	700	2,559,200
6 rebar	119	tons	925	110,075
Flap Gates (12w x 4h)	28	ea	43,200	1,209,600
Flap Gates (10w x 4h)	15	ea	36,000	540,000
Cutoff valves (12w x 4h)	28	ea	100,800	2,822,400
Cutoff valves (10w x 4h)	15	ea	84,000	1,260,000
Pump stations, 42" to 60" pump size (7 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				23,568,446
Ditch Excavation	872,375	cy	12.00	10,468,500
Biloxi Courthous Flood Wall (reference backup file for cost derivation)	1	Job	ls	5,639,400
Gulfport Courthouse Flood wall (reference backup file for cost derivation)	1	Job	ls	6,071,580
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	13,220,000

	Current Contract Cost, Oct 07	$	290,259,173
CONTINGENCY	**25.0%**		72,564,793
		$	362,823,967
01 Account, Lands & Damage PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)	**LS**		271,796,962
06 Account, Preservation - Mitigation-Tidal (17 acr $200,000/acr)			3,400,000
06 Account, Preservation - Mitigation-Non-Tidal (180 acr $5,500/acr)			990,000
		$	639,035,929
30 Account, Plan, Engr.& Design	**8.0%**		51,122,874
		$	690,158,803
31 Account, Constr. Management	**6.0%**		41,409,528
		$	731,568,331
ESCALATION	**0.0%**		0
		$	731,568,331
			rounded
	TOTAL PROJECT COST, Oct 07	**$**	**731,600,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 11 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM. ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 40 Option "C"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$9,480,000
Levee System				
Length	142,732	lf		
Compacted Fill	8,186,158	cy	15.00	122,792,370
Grassing (seeding)	410	Ac	2,150	881,500
Crushed Aggregate 6" Thick(Levee wearing surface)	79,300	cy	45.00	3,568,500
Rock Levee	1,038,130	cy	90.00	93,431,700
Clearing & Grubbing	625	Ac	5,000	3,125,000
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	161	pass-thrus		78,715,972
Grassing (seeding)	245	Ac	2,150	526,750
New Asphalt 2" (Cross overs) 2400 cy figure 2.0 tons/cy	4,800	tons	70.00	336,000
Base material (12")	15,000	cy	34.50	517,500
Removal				
Asphalt	225,100	sy	4.50	1,012,950
8" Water line removal	85,000	lf	41	3,485,000
6" Sewer line removal	85,000	lf	48	4,080,000
2" Gas line removal	85,000	lf	20	1,700,000
24" Storm drain pipe removal	85,000	lf	11.00	935,000
Electric line removal - 3 phase 1440v	85,000	lf	11.00	935,000
Demolish Buildings (avg. 1500 sf/ea 925 ea)	1,291,500	sf	3.00	3,874,500
Demolish Buildings (multistory avg. 1500 sf/ea 41 ea)	132,000	sf	3.50	462,000
Disposal Fee - off site	52,722	cy	2.50	131,806
Water tanks	4	ea	125,000	500,000
New Work				
New 8" Water line	40,250	lf	8.00	322,000
New 6" Sewer Line	40,250	lf	8.00	322,000
New Electric Line - 3 phase 1440v	40,250	lf	44.00	1,771,000
New 24" Storm drain pipe	40,250	lf	68.00	2,737,000
			Subtotal	**$335,643,548**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	12	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM.	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Inland Barrier - elev. 40 Option "C"				

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**335,643,548**
Concrete box culverts	3,656	cy	700		2,559,200
6 rebar	119	tons	925		110,075
Flap Gates (12w x 4h)	28	ea	43,200		1,209,600
Flap Gates (10w x 4h)	15	ea	36,000		540,000
Cutoff valves (12w x 4h)	28	ea	100,800		2,822,400
Cutoff valves (10w x 4h)	15	ea	84,000		1,260,000
Pump stations, 42" to 60" pump size (7 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					25,449,584
Ditch Excavation	872,375	cy	12.00		10,468,500
Biloxi Courthous Flood Wall (reference backup file for cost derivation)	1	Job	ls		8,765,200
Gulfport Courthouse Flood wall (reference backup file for cost derivation)	1	Job	ls		9,348,980
ATFP, Signage, Pavement Marking, Traffic Control, etc	5	%	allow		18,970,000
			Current Contract Cost, Oct 07	$	417,147,087
CONTINGENCY			**25.0%**		104,286,772
				$	521,433,858
01 Account, Lands & Damage		PCA	LS		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			LS		300,446,455
06 Account, Preservation - Mitigation-Tidal (21 acr	$200,000/acr)				4,200,000
06 Account, Preservation - Mitigation-Non-Tidal (216 acr	$5,500/acr)				1,188,000
				$	827,293,313
30 Account, Plan, Engr.& Design			**8.0%**		66,183,465
				$	893,476,778
31 Account, Constr. Management			**6.0%**		53,608,607
				$	947,085,385
ESCALATION			**0.0%**		0
				$	947,085,385
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**947,100,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 13	OF	32
		PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team	
	Harrison County ***Option "D"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls	
	Levee for Roadway(75') - elev. 20			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,170,000
Levee System				
Length	142,730	lf		
Compacted Fill	1,224,812	cy	15.00	18,372,180
Grassing (seeding)	84	Ac	2,150	180,600
Crushed Aggregate 6" Thick(Levee wearing surface)	3,251	cy	45.00	146,295
24" Rip Rap	148,140	cy	90.00	13,332,600
Filter Fabric	222,210	sy	2.00	444,420
24 " Gabion Matress Cages	222,210	sy	32.00	7,110,720
Clearing & Grubbing	142	Ac	5,000	710,000
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	42	pass-thrus		19,584,340
Grassing (seeding)	4	Ac	2,150	8,600
New Asphalt 2" (Cross overs) 12 cy figure 2.0 tons/cy	4	tons	70.00	280
Base material (12")	35	cy	34.50	1,208
Removal				
Asphalt	12,575	sy	4.50	56,588
8" Water line removal	4,700	lf	41	192,700
6" Sewer line removal	4,700	lf	48	225,600
2" Gas line removal	4,700	lf	20	94,000
24" Storm drain pipe removal	4,700	lf	11.00	51,700
Electric line removal - 3 phase 1440v	4,000	lf	11.00	44,000
Demolish Buildings (avg. 1500 sf/ea 140 ea)	210,000	sf	3.00	630,000
Disposal Fee - off site	7,778	cy	2.50	19,444
Water tanks	4	ea	125,000	500,000
New Work				
New 8" Water line	4,700	lf	8.00	37,600
New 6" Sewer Line	4,700	lf	8.00	37,600
New 2" Gas Line	4,700	lf	8.00	37,600
New Electric Line - 3 phase 1440v	4,000	lf	44.00	176,000
New 24" Storm drain pipe	4,700	lf	68.00	319,600
			Subtotal	**$64,483,674**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 14 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "D"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Levee for Roadway(75') - elev. 20

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**64,483,674**
Concrete box culverts	6,215	cy	700	4,350,500
6 rebar	201	tons	925	185,925
Flap Gates (12w x 4h)	28	ea	43,200	1,209,600
Flap Gates (10w x 4h)	15	ea	36,000	540,000
Cutoff valves (12w x 4h)	28	ea	100,800	2,822,400
Cutoff valves (10w x 4h)	15	ea	84,000	1,260,000
Pump stations, 42" to 60" pump size (1 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				3,727,691
Ditch Excavation	872,375	cy	12.00	10,468,500
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	4,340,000

Current Contract Cost, Oct 07		$	93,388,290
CONTINGENCY	**25.0%**		23,347,073
		$	116,735,363
01 Account, Lands & Damage PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)	**LS**		58,265,920
06 Account, Preservation - Mitigation-Tidal (17 acr $200,000/acr)			3,400,000
06 Account, Preservation - Mitigation-Non-Tidal (180 acr $5,500/acr)			990,000
		$	179,416,283
30 Account, Plan, Engr.& Design	**8.0%**		14,353,303
		$	193,769,585
31 Account, Constr. Management	**6.0%**		11,626,175
		$	205,395,760
ESCALATION	**0.0%**		0
		$	205,395,760
			rounded
TOTAL PROJECT COST, Oct 07		**$**	**205,400,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 15 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "E"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Levee for Roadway(75') - elev. 30

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$6,830,000
Levee System				
Length	142,730	lf		
Compacted Fill	5,723,060	cy	15.00	85,845,900
Grassing (seeding)	350	Ac	2,150	752,500
Crushed Aggregate 6" Thick(Levee wearing surface)	13,027	cy	45.00	586,215
24" Rip Rap	304,200	cy	90.00	27,378,000
12 " Gabion Matress Cages	912,593	sy	16.00	14,601,488
Filter Fabric	912,593	sy	2.00	1,825,186
Clearing & Grubbing	587	Ac	5,000	2,935,000
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	140	pass-thrus		65,785,779
New Asphalt 2" (Cross overs) 2,384 cy figure 2.0 tons/cy	4,768	tons	70.00	333,760
Base material (12")	14,311	cy	34.50	493,730
Removal				
Asphalt	225,100	sy	4.50	1,012,950
8" Water line removal	85,000	lf	41	3,485,000
6" Sewer line removal	85,000	lf	48	4,080,000
2" Gas line removal	85,000	lf	20	1,700,000
24" Storm drain pipe removal	85,000	lf	11.00	935,000
Electric line removal - 3 phase 1440v	85,000	lf	11.00	935,000
Demolish Buildings (avg. 1500 sf/ea 1,138 ea)	1,707,000	sf	3.00	5,121,000
Disposal Fee - off site	63,222	cy	2.50	158,056
Water tanks	4	ea	125,000	500,000
New Work				
New 8" Water line	75,000	lf	8.00	600,000
New 6" Sewer Line	75,000	lf	8.00	600,000
New 2" Gas Line	75,000	lf	8.00	600,000
New Electric Line - 3 phase 1440v	75,000	lf	44.00	3,300,000
New 24" Storm drain pipe	75,000	lf	68.00	5,100,000
			Subtotal	**$235,494,563**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 16 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "E"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Levee for Roadway(75') - elev. 30

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**235,494,563**
Concrete box culverts	6,215	cy	700		4,350,500
6 rebar	201	tons	925		185,925
Flap Gates (12w x 4h)	28	ea	43,200		1,209,600
Flap Gates (10w x 4h)	15	ea	36,000		540,000
Cutoff valves (12w x 4h)	28	ea	100,800		2,822,400
Cutoff valves (10w x 4h)	15	ea	84,000		1,260,000
Pump stations, 42" to 60" pump size (7 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					23,568,446
Ditch Excavation	872,375	cy	12.00		10,468,500
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		13,650,000
			Current Contract Cost, Oct 07	$	293,549,934
CONTINGENCY			**25.0%**		73,387,484
				$	366,937,418
01 Account, Lands & Damage		PCA	LS		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			LS		298,748,055
06 Account, Preservation - Mitigation-Tidal (21 acr $200,000/acr)					4,200,000
06 Account, Preservation - Mitigation-Non-Tidal (217 acr $5,500/acr)					1,193,500
				$	671,103,973
30 Account, Plan, Engr.& Design			**8.0%**		53,688,318
				$	724,792,291
31 Account, Constr. Management			**6.0%**		43,487,537
				$	768,279,828
ESCALATION			**0.0%**		0
				$	768,279,828
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**768,300,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	17	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County ***Option "F"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Menge Ave(15' +) - elev. 20				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,090,000
Levee System				
Length	47,730	lf		
Compacted Fill	463,777	cy	15.00	6,956,655
Grassing (seeding)	47	Ac	2,150	101,050
Crushed Aggregate 6" Thick(Levee wearing surface)	34,700	cy	45.00	1,561,500
24" Rip Rap	132,600	cy	90.00	11,934,000
24 " Gabion Matress Cages	155,130	sy	32.00	4,964,160
Filter Fabric	155,130	sy	2.00	310,260
Clearing & Grubbing	184	Ac	5,000	920,000
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	21	pass-thrus		4,081,549
Compacted Fill (ramps and tunnels)	161,856	cy	15.00	2,427,840
Grassing (seeding)	4	Ac	2,150	8,600
New Asphalt 2" (Cross overs) 1,150 cy figure 2.0 tons/cy	2,300	tons	70.00	161,000
Base material (12")	20,348	cy	34.50	702,006
Guardrail	9,430	lf	21.00	198,030
Removal				
Asphalt	14,576	sy	4.50	65,592
8" Water line removal	8,350	lf	41	342,350
6" Sewer line removal	8,350	lf	48	400,800
2" Gas line removal	8,350	lf	20	167,000
24" Storm drain pipe removal	8,350	lf	11.00	91,850
Electric line removal - 3 phase 1440v	8,350	lf	11.00	91,850
Demolish Buildings (avg. 1500 sf/ea 469 ea)	703,500	sf	3.00	2,110,500
Disposal Fee - off site	26,056	cy	2.50	65,139
New Work				
New 8" Water line	8,350	lf	8.00	66,800
New 6" Sewer Line	8,350	lf	8.00	66,800
New 2" Gas Line	8,350	lf	8.00	66,800
New Electric Line - 3 phase 1440v	8,350	lf	44.00	367,400
New 24" Storm drain pipe	8,350	lf	68.00	567,800
			Subtotal	**$40,887,331**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 18 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "F"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Menge Ave(15' +) - elev. 20

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**40,887,331**
Concrete box culverts	3,705	cy	700	2,593,500
6 rebar	232	tons	925	214,600
Flap Gates (12w x 4h)	55	ea	43,200	2,376,000
Flap Gates (10w x 4h)	4	ea	36,000	144,000
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (6w x 3h)	4	ea	16,200	64,800
Flap Gates (8w x 4h)	4	ea	28,800	115,200
Flap Gates (10w x 4h)	19	ea	36,000	684,000
Cutoff valves (12w x 4h)	55	ea	100,800	5,544,000
Cutoff valves (10w x 4h)	19	ea	84,000	1,596,000
Cuttoff valves (7w x 4h)	5	ea	58,800	294,000
Cuttoff valves (6w x 3h)	4	ea	37,800	151,200
Cuttoff valves (8w x 4h)	4	ea	67,200	268,800
Cuttoff valves (10w x 4h)	4	ea	84,000	336,000
Pump stations, 42" to 60" pump size (3 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				19,548,152
Ditch Excavation	906,807	cy	12.00	10,881,684
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	4,190,000

		Current Contract Cost, Oct 07	$	90,015,267
CONTINGENCY		**25.0%**		22,503,817
			$	112,519,084
01 Account, Lands & Damage	PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)		**LS**		8,916,948
06 Account, Preservation - Mitigation-Tidal (4 acr $200,000/acr)				800,000
06 Account, Preservation - Mitigation-Non-Tidal (76 acr $5,500/acr)				418,000
			$	122,679,032
30 Account, Plan. Engr.& Design		**8.0%**		9,814,323
			$	132,493,354
31 Account, Constr. Management		**6.0%**		7,949,601
			$	140,442,955
ESCALATION		**0.0%**		0
			$	140,442,955
				rounded
		TOTAL PROJECT COST, Oct 07	**$**	**140,400,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	19	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County ***Option "G"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Menge Ave(15'+) - elev. 30				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$4,710,000
Levee System				
Length	187,490	lf		
Compacted Fill	2,128,830	cy	15.00	31,932,450
Grassing (seeding)	76	Ac	2,150	163,400
Crushed Aggregate 6" Thick(Levee wearing surface)	61,400	cy	45.00	2,763,000
12" Rip Rap	381	cy	90.00	34,290
12 " Gabion Matress Cages	1,042,870	sy	16.00	16,685,920
Filter Fabric	1,042,870	sy	2.00	2,085,740
Clearing & Grubbing	343	Ac	5,000	1,715,000
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	125	pass-thrus		30,124,860
Compacted Fill (ramps and tunnels)	7,200	cy	15.00	108,000
Grassing (seeding)	2	Ac	2,150	4,300
New Asphalt 2" (Cross overs) 9,645 cy figure 2.0 tons/cy	19,290	tons	70.00	1,350,300
Base material (12")	12,270	cy	34.50	423,315
Guardrail	34,800	lf	21.00	730,800
Removal				
Asphalt	154,500	sy	4.50	695,250
8" Water line removal	44,900	lf	41	1,840,900
6" Sewer line removal	44,900	lf	48	2,155,200
2" Gas line removal	44,900	lf	20	898,000
24" Storm drain pipe removal	44,900	lf	11.00	493,900
Electric line removal - 3 phase 1440v	44,900	lf	11.00	493,900
Demolish Buildings (avg. 1500 sf/ea 505 ea)	757,500	sf	3.00	2,272,500
Disposal Fee - off site	28,056	cy	2.50	70,139
New Work				
New 8" Water line	44,900	lf	8.00	359,200
New 6" Sewer Line	44,900	lf	8.00	359,200
New 2" Gas Line	44,900	lf	8.00	359,200
New Electric Line - 3 phase 1440v	44,900	lf	44.00	1,975,600
New 24" Storm drain pipe	44,900	lf	68.00	3,053,200
			Subtotal	**$107,857,563**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 20 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "G"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Menge Ave(15'+) - elev. 30

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**107,857,563**
Concrete box culverts	3,705	cy	700	2,593,500
6 rebar	233	tons	925	215,525
Flap Gates (12w x 4h)	55	ea	43,200	2,376,000
Flap Gates (10w x 4h)	5	ea	36,000	180,000
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (6w x 3h)	4	ea	16,200	64,800
Flap Gates (8w x 4h)	4	ea	28,800	115,200
Flap Gates (10w x 4h)	19	ea	36,000	684,000
Cutoff valves (12w x 4h)	55	ea	100,800	5,544,000
Cutoff valves (10w x 4h)	19	ea	84,000	1,596,000
Cuttoff valves (7w x 4h)	5	ea	58,800	294,000
Cuttoff valves (6w x 3h)	4	ea	37,800	151,200
Cuttoff valves (8w x 4h)	4	ea	67,200	268,800
Cuttoff valves (10w x 4h)	4	ea	84,000	336,000
Pump stations, 42" to 60" pump size (9 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				41,792,146
Ditch Excavation	906,807	cy	12.00	10,881,684
Biloxi Courthous Flood Wall (reference backup file for cost derivation)	1	Job	ls	8,765,200
Gulfport Courthouse Flood wall (reference backup file for cost derivation)	1	Job	ls	9,348,980
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	9,420,000

	Current Contract Cost, Oct 07		$	202,610,598
CONTINGENCY		**25.0%**		50,652,650
			$	253,263,248
01 Account, Lands & Damage	PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)		**LS**		20,801,338
06 Account, Preservation - Mitigation-Tidal (9 acr $200,000/acr)				1,800,000
06 Account, Preservation - Mitigation-Non-Tidal (201 acr $5,500/acr)				1,105,500
			$	276,995,086
30 Account, Plan, Engr.& Design		**8.0%**		22,159,607
			$	299,154,693
31 Account, Constr. Management		**6.0%**		17,949,282
			$	317,103,974
ESCALATION		**0.0%**		0
			$	317,103,974
				rounded
	TOTAL PROJECT COST, Oct 07		**$**	**317,100,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 21 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "H"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Menge Ave(15'+) - elev. 40

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$7,630,000
Levee System					
Length		187,490	lf		
Compacted Fill		7,485,500	cy	15.00	112,282,500
Grassing (seeding)		420	Ac	2,150	903,000
Crushed Aggregate 6" Thick(Levee wearing surface)		62,235	cy	45.00	2,800,575
Clearing & Grubbing		407	Ac	5,000	2,035,000
Ramps & Tunnels					
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	157	pass-thrus		67,603,699
Grassing (seeding)		7	Ac	2,150	15,050
New Asphalt 2" (Cross overs) 712 cy	figure 2.0 tons/cy	1,424	tons	70.00	99,680
Base material (12")		4,275	cy	34.50	147,488
Removal					
Asphalt		91,882	sy	4.50	413,469
8" Water line removal		75,000	lf	8.00	600,000
6" Sewer line removal		75,000	lf	8.00	600,000
2" Gas line removal		75,000	lf	3.00	225,000
24" Storm drain pipe removal		75,000	lf	11.00	825,000
Electric line removal - 3 phase 1440v		75,000	lf	11.00	825,000
Demolish Buildings (avg. 1500 sf/ea 585 ea)		877,500	sf	3.00	2,632,500
Disposal Fee - off site		32,500	cy	2.50	81,250
New Work					
New 8" Water line		75,000	lf	41	3,075,000
New 6" Sewer Line		75,000	lf	48	3,600,000
New 2" Gas Line		75,000	lf	20	1,500,000
New Electric Line - 3 phase 1440v		75,000	lf	44.00	3,300,000
New 24" Storm drain pipe		75,000	lf	68.00	5,100,000
				Subtotal	**$216,294,210**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 22 OF 32
PREPARED: Joseph H Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "H"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Menge Ave(15'+) - elev. 40

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**216,294,210**
Concrete box culverts	3,705	cy	700	2,593,500
6 rebar	232	tons	925	214,600
Flap Gates (12w x 4h)	55	ea	43,200	2,376,000
Flap Gates (10w x 4h)	4	ea	36,000	144,000
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (6w x 3h)	4	ea	16,200	64,800
Flap Gates (8w x 4h)	4	ea	28,800	115,200
Flap Gates (10w x 4h)	19	ea	36,000	684,000
Cutoff valves (12w x 4h)	55	ea	100,800	5,544,000
Cutoff valves (10w x 4h)	19	ea	84,000	1,596,000
Cuttoff valves (7w x 4h)	5	ea	58,800	294,000
Cuttoff valves (6w x 3h)	4	ea	37,800	151,200
Cuttoff valves (8w x 4h)	4	ea	67,200	268,800
Cuttoff valves (10w x 4h)	4	ea	84,000	336,000
Pump stations, 42" to 60" pump size (14 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				53,135,605
Ditch Excavation	906,807	cy	12.00	10,881,684
Biloxi Courthous Flood Wall (reference backup file for cost derivation)	1	Job	ls	8,765,200
Gulfport Courthouse Flood wall (reference backup file for cost derivation)	1	Job	ls	9,348,980
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	15,270,000
			Current Contract Cost, Oct 07	$ 328,203,779
CONTINGENCY			**25.0%**	82,050,945
				$ 410,254,724
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	28,270,865
06 Account, Preservation - Mitigation-Tidal (11 acr $200,000/acr)				2,200,000
06 Account, Preservation - Mitigation-Non-Tidal (277 acr $5,500/acr)				1,523,500
				$ 442,274,089
30 Account, Plan, Engr.& Design			**8.0%**	35,381,927
				$ 477,656,016
31 Account, Constr. Management			**6.0%**	28,659,361
				$ 506,315,377
ESCALATION			**0.0%**	0
				$ 506,315,377
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 506,300,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	23	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County ***Option "I"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	" Levee for Rdwy(75') with Menge Ave Alt - elev. 20				

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$2,410,000
Levee System					
Length		12,453	lf		
Compacted Fill		464,210	cy	15.00	6,963,150
Grassing (seeding)		13	Ac	2,150	27,950
Crushed Aggregate 6" Thick(Levee wearing surface)		2,623	cy	45.00	118,035
12" Rip Rap		226,488	cy	90.00	20,383,920
24 " Gabion Matress Cages		277,749	sy	32.00	8,887,968
Filter Fabric		277,749	sy	2.00	555,498
Clearing & Grubbing		69	Ac	5,000	345,000
Ramps & Tunnels					
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	20	pass-thrus		5,057,133
Compacted Fill (ramps and tunnels)		7,200	cy	15.00	108,000
Grassing (seeding)		2	Ac	2,150	4,300
New Asphalt 2" (Cross overs) 1,000 cy	figure 2.0 tons/cy	2,000	tons	70.00	140,000
Base material (12")		11,000	cy	34.50	379,500
Guardrail		8,900	lf	21.00	186,900
Removal					
Asphalt		70,000	sy	4.50	315,000
8" Water line removal		14,900	lf	8.00	119,200
6" Sewer line removal		14,900	lf	8.00	119,200
2" Gas line removal		14,900	lf	3.00	44,700
24" Storm drain pipe removal		14,900	lf	11.00	163,900
Electric line removal - 3 phase 1440v		14,900	lf	11.00	163,900
Demolish Buildings (avg. 1500 sf/ea 122 ea)		183,000	sf	3.00	549,000
Disposal Fee - off site		6,778	cy	2.50	16,944
New Work					
New 8" Water line		14,900	lf	41	610,900
New 6" Sewer Line		14,900	lf	48	715,200
New 2" Gas Line		14,900	lf	20	298,000
New Electric Line - 3 phase 1440v		14,900	lf	44.00	655,600
New 24" Storm drain pipe		14,900	lf	68.00	1,013,200
				Subtotal	**$50,352,098**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 24 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "I"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
" Levee for Rdwy(75') with Menge Ave Alt - elev. 20

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**50,352,098**
Concrete box culverts	9,918	cy	700		6,942,600
6 rebar	315	tons	925		291,375
Flap Gates (12w x 4h)	55	ea	43,200		2,376,000
Flap Gates (10w x 4h)	19	ea	36,000		684,000
Flap Gates (8w x 4h)	4	ea	28,800		115,200
Flap Gates (7w x 4h)	5	ea	25,200		126,000
Flap Gates (6w x 3h)	4	ea	16,200		64,800
Cutoff valves (12w x 4h)	55	ea	100,800		5,544,000
Cutoff valves (10w x 4h)	19	ea	84,000		1,596,000
Flap Gates (8w x 4h)	5	ea	28,800		144,000
Flap Gates (7w x 4h)	4	ea	25,200		100,800
Flap Gates (6w x 3h)	4	ea	16,200		64,800
Pump stations, 42" to 60" pump size (3 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					19,548,152
Ditch Excavation	906,807	cy	12.00		10,881,684
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow		4,820,000
			Current Contract Cost, Oct 07	$	103,651,509
CONTINGENCY			**25.0%**		25,912,877
				$	129,564,386
01 Account, Lands & Damage		PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**		23,937,703
06 Account, Preservation - Mitigation-Tidal (9 acr $200,000/acr)					1,800,000
06 Account, Preservation - Mitigation-Non-Tidal (132 acr $5,500/acr)					726,000
				$	156,053,089
30 Account, Plan, Engr.& Design			**8.0%**		12,484,247
				$	168,537,336
31 Account, Constr. Management			**6.0%**		10,112,240
				$	178,649,577
ESCALATION			**0.0%**		0
				$	178,649,577
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**178,600,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 25 OF 32
PREPARED: Joseph H Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "J"*** FILE NAME: mscip-comprehensive study-compbined-cost-est-25jul08.xls
" Levee for Rdwy(75') with Menge Ave Alt - elev. 30

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$7,000,000
Levee System					
Length		159,365	lf		
Compacted Fill		4,107,957	cy	15.00	61,619,355
Grassing (seeding)		268	Ac	2,150	576,200
Crushed Aggregate 6" Thick(Levee wearing surface)		44,268	cy	45.00	1,992,060
12" Rip Rap		625,059	cy	90.00	56,255,310
12 " Gabion Matress Cages		1,875,176	sy	16.00	30,002,816
Filter Fabric		1,875,176	sy	2.00	3,750,352
Clearing & Grubbing		566	Ac	5,000	2,830,000
Ramps & Tunnels					
Rdwy/RR Pass-Thrus	(reference backup file for cost derivation)	123	pass-thrus		46,593,985
Compacted Fill (ramps and tunnels)		7,200	cy	15.00	108,000
Grassing (seeding)		2	Ac	2,150	4,300
New Asphalt 2" (Cross overs) 1,000 cy	figure 2.0 tons/cy	2,000	tons	70.00	140,000
Base material (12")		11,000	cy	34.50	379,500
Guardrail		8,900	lf	21.00	186,900
Removal					
Asphalt		70,000	sy	4.50	315,000
8" Water line removal		14,900	lf	8.00	119,200
6" Sewer line removal		14,900	lf	8.00	119,200
2" Gas line removal		14,900	lf	3.00	44,700
24" Storm drain pipe removal		14,900	lf	11.00	163,900
Electric line removal - 3 phase 1440v		14,900	lf	11.00	163,900
Demolish Buildings (avg. 1500 sf/ea 92 ea)		138,000	sf	3.00	414,000
Disposal Fee - off site		5,111	cy	2.50	12,778
New Work					
New 8" Water line		14,900	lf	41	610,900
New 6" Sewer Line		14,900	lf	48	715,200
New 2" Gas Line		14,900	lf	20	298,000
New Electric Line - 3 phase 1440v		14,900	lf	44.00	655,600
New 24" Storm drain pipe		14,900	lf	68.00	1,013,200
				Subtotal	**$216,084,356**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 26 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Harrison County ***Option "J"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
" Levee for Rdwy(75') with Menge Ave Alt - elev. 30

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**216,084,356**
Concrete box culverts	9,918	cy	700	6,942,600
6 rebar	315	tons	925	291,375
Flap Gates (12w x 4h)	55	ea	43,200	2,376,000
Flap Gates (10w x 4h)	19	ea	36,000	684,000
Flap Gates (8w x 4h)	4	ea	28,800	115,200
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (6w x 3h)	4	ea	16,200	64,800
Cutoff valves (12w x 4h)	55	ea	100,800	5,544,000
Cutoff valves (10w x 4h)	19	ea	84,000	1,596,000
Flap Gates (8w x 4h)	4	ea	28,800	115,200
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (6w x 3h)	4	ea	16,200	64,800
Pump stations, 42" to 60" pump size (9 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				41,792,146
Ditch Excavation	906,807	cy	12.00	10,881,684
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	13,990,000
			Current Contract Cost, Oct 07	$ 300,794,161
CONTINGENCY			**25.0%**	75,198,540
				$ 375,992,701
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	25,350,835
06 Account, Preservation - Mitigation-Tidal (11 acr $200,000/acr)				2,200,000
06 Account, Preservation - Mitigation-Non-Tidal (144 acr $5,500/acr)				792,000
				$ 404,360,536
30 Account, Plan, Engr.& Design			**8.0%**	32,348,843
				$ 436,709,379
31 Account, Constr. Management			**6.0%**	26,202,563
				$ 462,911,941
ESCALATION			**0.0%**	0
				$ 462,911,941
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 462,900,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	27	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Inland Barrier - elev. 20 Option "A"				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$3,940,000
Levee System				
Length	153,091	lf		
Compacted Fill	1,948,860	cy	15.00	29,232,900
Grassing (seeding)	35	Ac	2,150	75,250
Crushed Aggregate 6" Thick(Levee wearing surface)	41,050	cy	45.00	1,847,250
Rock Levee	86,510	cy	90.00	7,785,900
Clearing & Grubbing	372	Ac	5,000	1,860,000
24" Rip Rap	493,710	cy	90.00	44,433,900
24 " Gabion Mattress Cages	740,570	sy	32.00	23,698,240
Filter Fabric	740,570	sy	2.00	1,481,140
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	10	pass-thrus		2,099,385
Compacted Fill (ramps and tunnels)	2,000	cy	15.00	30,000
Grassing (seeding)	2	acr	2,150	4,300
New Asphalt 2" (Cross overs) 4000 cy figure 2.0 tons/cy	8,000	tons	70.00	560,000
Base material (12")	600	cy	34.50	20,700
Guardrail	1,400	lf	21.00	29,400
Removal				
Asphalt	27,200	sy	4.50	122,400
8" Water line removal	4,400	lf	8.00	35,200
6" Sewer line removal	4,400	lf	8.00	35,200
2" Gas line removal	4,400	lf	3.00	13,200
24" Storm drain pipe removal	4,400	lf	11.00	48,400
Electric line removal - 3 phase 1440v	4,400	lf	11.00	48,400
Demolish Buildings (avg. 1500 sf/ea 150 ea)	1,291,500	sf	3.00	3,874,500
Demolish Buildings (multistory avg. 1500 sf/ea 13 ea)	132,000	sf	3.50	462,000
Disposal Fee - off site	52,722	cy	2.50	131,806
Water tanks	4	ea	125,000	500,000
Ball Field	2	acr	25,000	50,000
Trailer park (6 trailers/ac.) 2 acres	12	ea	3,000	36,000
New Work				
New 8" Water line	4,400	lf	41	180,400
New 6" Sewer Line	4,400	lf	48	211,200
New 2"Gas Line	4,400	lf	20	88,000
New Electric Line - 3 phase 1440v	4,400	lf	44.00	193,600
New 24" Storm drain pipe	4,400	lf	68.00	299,200
			Subtotal	**$123,427,871**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 28 OF 32
PREPARED: Joseph H. Elsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Inland Barrier - elev. 20 Option "A"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$123,427,871**
Concrete box culverts	7,964	cy	700	5,574,800
6 rebar	200	tons	925	185,000
24" RCP	100	lf	45	4,500
20" RCP	100	lf	40	4,000
Flap Gates (10w x 8h)	20	ea	72,000	1,440,000
Flap Gates (12w x 8h)	7	ea	86,400	604,800
Flap Gates (12w x 4h)	32	ea	43,200	1,382,400
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (7w x 3h)	4	ea	18,900	75,600
Flap Gates (4w x 2h)	2	ea	7,200	14,400
Flap Gates (24")	1	ea	7,200	7,200
Flap Gates (20")	1	ea	7,200	7,200
Cutoff valves (10w x 8h)	20	ea	168,000	3,360,000
Cutoff valves (12w x 8h)	7	ea	201,600	1,411,200
Cutoff valves (12w x 4h)	32	ea	100,800	3,225,600
Cutoff valves (7w x 4h)	5	ea	58,800	294,000
Cutoff valves (7w x 3h)	4	ea	44,100	176,400
Cutoff valves (4w x 2h)	2	ea	16,800	33,600
Cutoff valves (24")	1	ea	16,800	16,800
Cutoff valves (20")	1	ea	16,800	16,800
Pump stations, 42" to 60" pump size (3 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				8,199,791
Ditch Excavation	1,002,398	cy	12.00	12,028,776
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	7,880,000
			Current Contract Cost, Oct 07	$ 169,496,737
CONTINGENCY			**25.0%**	42,374,184
				$ 211,870,922
01 Account, Lands & Damage		PCA	LS	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			LS	66,177,149
06 Account, Preservation - Mitigation-Tidal (264 acr $200,000/acr)				52,800,000
06 Account, Preservation - Mitigation-Non-Tidal (95 acr $5,500/acr)				522,500
				$ 331,395,571
30 Account, Plan, Engr.& Design			**8.0%**	26,511,646
				$ 357,907,216
31 Account, Constr. Management			**6.0%**	21,474,433
				$ 379,381,649
ESCALATION			**0.0%**	0
				$ 379,381,649
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 379,400,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 29 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Paytor
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME: mscip-comprehensive-study-combined cost est-25jul08.xls
Inland Barrier - elev. 30 Option "B"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$10,390,000
Levee System				
Length	181,928	lf		
Compacted Fill	15,227,614	cy	15.00	228,414,210
Grassing (seeding)	72	Ac	2,150	154,800
Crushed Aggregate 6" Thick(Levee wearing surface)	101,070	cy	45.00	4,548,150
Rock Levee	184,935	cy	90.00	16,644,150
Clearing & Grubbing	409	Ac	5,000	2,045,000
12" Riprap	660,400	cy	90.00	59,436,000
12 " GABION MATRESS CAGES	1,981,200	sy	16.00	31,699,200
Filter Fabric	1,981,200	sy	2.00	3,962,400
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	20	pass-thrus		6,274,027
Compacted Fill (ramps and tunnels)	382,610	cy	15.00	5,739,150
Grassing (seeding)	45	acr	2,150	96,750
New Asphalt 2" (Cross overs) 3260 cy figure 2.0 tons/cy	6,520	tons	70.00	456,400
Base material (12")	19,200	cy	34.50	662,400
Guardrail	40,000	lf	21.00	840,000
Removal				
Asphalt	9,070	sy	4.50	40,815
8" Water line removal	40,000	lf	8.00	320,000
6" Sewer line removal	40,000	lf	8.00	320,000
2" Gas line removal	40,000	lf	3.00	120,000
24" Storm drain pipe removal	40,000	lf	11.00	440,000
Electric line removal - 3 phase 1440v	40,000	lf	11.00	440,000
Demolish Buildings (avg. 1500 sf/ea 175 ea)	262,500	sf	3.00	787,500
Demolish Buildings (multistory avg. 1500 sf/ea 13 ea)	132,000	sf	3.50	462,000
Disposal Fee - off site	14,611	cy	2.50	36,528
Water tanks	4	ea	125,000	500,000
Ball Field	2	acr	25,000	50,000
Trailer park (6 trailers/ac.) 2 acres	12	ea	3,000	36,000
New Work				
New 8" Water line	40,000	lf	41	1,640,000
New 6" Sewer Line	40,000	lf	48	1,920,000
New 2"Gas Line	40,000	lf	20	800,000
New Electric Line - 3 phase 1440v	40,000	lf	44.00	1,760,000
New 24" Storm drain pipe	40,000	lf	68.00	2,720,000
			Subtotal	**$383,755,480**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	30	OF	32
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Inland Barrier - elev. 30 Option "B"				

DESCRIPTION		Quantity	Unit	Unit Price		ESTIMATED AMOUNT
		Subtotal, brought forward			**$**	**383,755,480**
Concrete box culverts		7,964	cy	700		5,574,800
6 rebar		200	tons	925		185,000
24" RCP		100	lf	45		4,500
20" RCP		100	lf	40		4,000
Flap Gates (10w x 8h)		20	ea	72,000		1,440,000
Flap Gates (12w x 8h)		7	ea	86,400		604,800
Flap Gates (12w x 4h)		32	ea	43,200		1,382,400
Flap Gates (7w x 4h)		5	ea	25,200		126,000
Flap Gates (7w x 3h)		4	ea	18,900		75,600
Flap Gates (4w x 2h)		2	ea	7,200		14,400
Flap Gates (24")		1	ea	7,200		7,200
Flap Gates (20")		1	ea	7,200		7,200
Cutoff valves (10w x 8h)		20	ea	168,000		3,360,000
Cutoff valves (12w x 8h)		7	ea	201,600		1,411,200
Cutoff valves (12w x 4h)		32	ea	100,800		3,225,600
Cutoff valves (7w x 4h)		5	ea	58,800		294,000
Cutoff valves (7w x 3h)		4	ea	44,100		176,400
Cutoff valves (4w x 2h)		2	ea	16,800		33,600
Cutoff valves (24")		1	ea	16,800		16,800
Cutoff valves (20")		1	ea	16,800		16,800
Pump stations, 42" to 60" pump size (3 ea)	(reference "Pumping Stations" estimate, pages 1-57 for cost derivation)					12,171,846
Ditch Excavation		1,002,398	cy	12.00		12,028,776
ATFP, Signage, Pavement Marking, Traffic Control, etc.		5	%	allow		20,780,000
		Current Contract Cost, Oct 07			$	446,696,402
	CONTINGENCY			**25.0%**		111,674,100
					$	558,370,502
	01 Account, Lands & Damage		PCA	**LS**		25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**		74,262,187
	06 Account, Preservation - Mitigation-Tidal (546 acr			$200,000/acr)		109,200,000
	06 Account, Preservation - Mitigation-Non-Tidal (467 acr			$5,500/acr)		2,568,500
					$	744,426,189
	30 Account, Plan, Engr.& Design			**8.0%**		59,554,095
					$	803,980,284
	31 Account, Constr. Management			**6.0%**		48,238,817
					$	852,219,102
	ESCALATION			**0.0%**		0
				rounded	$	852,219,102
Notes: Gate/Valve Unit Cost from Waterman Industries Inc.		**TOTAL PROJECT COST, Oct 07**			**$**	**852,200,000**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 31 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: Line of Defense 4 BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Inland Barrier - elev. 40 Option "C"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$8,790,000
Levee System				
Length	199,822	lf		
Compacted Fill	15,227,614	cy	15.00	228,414,210
Grassing (seeding)	655	Ac	2,150	1,408,250
Crushed Aggregate 6" Thick(Levee wearing surface)	9,053	cy	45.00	407,385
Rock Levee	468,635	cy	90.00	42,177,150
Clearing & Grubbing	953	Ac	5,000	4,765,000
Ramps & Tunnels				
Rdwy/RR Pass-Thrus (reference backup file for cost derivation)	20	pass-thrus		11,147,923
Compacted Fill (ramps and tunnels)	497,840	cy	15.00	7,467,600
Grassing (seeding)	50	acr	2,150	107,500
New Asphalt 2" (Cross overs) 4000 cy figure 2.0 tons/cy	8,000	tons	70.00	560,000
Base material (12")	25,000	cy	34.50	862,500
Guardrail	50,000	lf	21.00	1,050,000
Removal				
Asphalt	54,400	sy	4.50	244,800
8" Water line removal	30,000	lf	8.00	240,000
6" Sewer line removal	30,000	lf	8.00	240,000
2" Gas line removal	30,000	lf	3.00	90,000
24" Storm drain pipe removal	30,000	lf	11.00	330,000
Electric line removal - 3 phase 1440v	30,000	lf	11.00	330,000
Demolish Buildings (avg. 1500 sf/ea 200 ea)	300,000	sf	3.00	900,000
Demolish Buildings (multistory avg. 1500 sf/ea 13 ea)	132,000	sf	3.50	462,000
Disposal Fee - off site	16,000	cy	2.50	40,000
Water tanks	4	ea	125,000	500,000
Ball Field	2	acr	25,000	50,000
Trailer park (6 trailers/ac.) 2 acres	12	ea	3,000	36,000
New Work				
New 8" Water line	30,000	lf	41	1,230,000
New 6" Sewer Line	30,000	lf	48	1,440,000
New 2"Gas Line	30,000	lf	20	600,000
New Electric Line - 3 phase 1440v	30,000	lf	44.00	1,320,000
New 24" Storm drain pipe	30,000	lf	68.00	2,040,000
Concrete box culverts	7,964	cy	700	5,574,800
6 rebar	200	tons	925	185,000
			Subtotal	**$323,010,118**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 32 OF 32
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Inland Barrier - elev. 40 Option "C"

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward $	**323,010,118**
24" RCP	100	lf	45	4,500
20" RCP	100	lf	40	4,000
Flap Gates (10w x 8h)	20	ea	72,000	1,440,000
Flap Gates (12w x 8h)	7	ea	86,400	604,800
Flap Gates (12w x 4h)	32	ea	43,200	1,382,400
Flap Gates (7w x 4h)	5	ea	25,200	126,000
Flap Gates (7w x 3h)	4	ea	18,900	75,600
Flap Gates (4w x 2h)	2	ea	7,200	14,400
Flap Gates (24")	1	ea	7,200	7,200
Flap Gates (20")	1	ea	7,200	7,200
Cutoff valves (10w x 8h)	20	ea	168,000	3,360,000
Cutoff valves (12w x 8h)	7	ea	201,600	1,411,200
Cutoff valves (12w x 4h)	32	ea	100,800	3,225,600
Cutoff valves (7w x 4h)	5	ea	58,800	294,000
Cutoff valves (7w x 3h)	4	ea	44,100	176,400
Cutoff valves (4w x 2h)	2	ea	16,800	33,600
Cutoff valves (24")	1	ea	16,800	16,800
Cutoff valves (20")	1	ea	16,800	16,800
Pump stations, 42" to 60" pump size (3 ea) (reference "Pumping Stations" estimate, pages 1-57 for cost derivation)				13,293,184
Ditch Excavation	1,002,398	cy	12.00	12,028,776
ATFP, Signage, Pavement Marking, Traffic Control, etc.	5	%	allow	17,590,000
			Current Contract Cost, Oct 07	$ 378,122,578
CONTINGENCY			**25.0%**	94,530,644
				$ 472,653,222
01 Account, Lands & Damage		PCA	LS	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			LS	81,106,793
06 Account, Preservation - Mitigation-Tidal (662 acr $200,000/acr)				132,400,000
06 Account, Preservation - Mitigation-Non-Tidal (834 acr $5,500/acr)				4,587,000
				$ 690,772,015
30 Account, Plan, Engr.& Design			**8.0%**	55,261,761
				$ 746,033,776
31 Account, Constr. Management			**6.0%**	44,762,027
				$ 790,795,803
ESCALATION			**0.0%**	0
				$ 790,795,803
				rounded
			TOTAL PROJECT COST, Oct 07	**$ 790,800,000**

Notes: Gate/Valve Unit Cost from Waterman Industries Inc.

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
St. Louis Bay ***Option "A"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Surge Barrier - elev. 20

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$26,790,000
Surge Barrier				
Civil:				
Cofferdam and Dewatering:				
Cell Piling	38,008	Tons	2,200	83,617,600
Cell Excavation	484,505	C.Y.	20.00	9,690,100
Cell Fill (from required excavation)	892,806	C.Y.	10.00	8,928,060
Foundation Dewatering (84 months $45,000/mo.)	1	Job		3,780,000
Earthwork:				
Structural Excavation	590,100	C.Y.	20.00	11,802,000
Foundation Piling (20,856 Piles)	4,171,200	L.F.	35.00	145,992,000
Structural Fill (from required excavation)	226,500	C.Y.	10.00	2,265,000
Stone Protection	210,000	C.Y.	90	18,900,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	738,860	C.Y.	450	332,487,131
Forming	536,835	sf	6.50	3,489,428
Reinforcement	1,833	Tons	925	1,695,525
Abutment Walls				
Concrete	14,044	C.Y.	450	6,319,800
Forming	31,920	sf	6.50	207,480
Stilling Slab				
Concrete	11,900	C.Y.	450	5,355,000
Reinforcement	684	Tons	925	632,700
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	6,954	Tons	9,800	68,149,200
Stainless Steel	22,382	Tons	11,700	261,869,400
Low Level Culverts:				
Structural Concrete	14,072	C.Y.	450	6,332,524
Forming	625,738	sf	6.50	4,067,297
Reinforcement	900	Tons	925	832,117
Sluice Gates (6'x4'x $2100xn)	204	Each	50,400	10,281,600
Miscellaneous Metal	290	Tons	8,000	2,320,000
			Subtotal	**$1,015,803,962**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIF**	ITEM NO.		DATE	25-Jul-08	
LOCATION:	**Mississippi**	SHEET NO.	2	OF	6	
		PREPARED:	Joseph H Ellsworth	CHECKED:	Gary A Payton	
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team			
	St. Louis Bay — ***Option "A"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls			
	Surge Barrier - elev. 20					

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward	**$1,015,803,962**
Control Building		3,000	sf	450	1,350,000
Maintenance Building		10,000	sf	200	2,000,000
Mechanical:					
Operator Arms and Linkages		7,510	Tons	10,000	75,100,000
Ancillary Operating Equipment		1	Job		600,000
Spare Parts		1	ls	allow	5,000,000
Electrical:		1	Job		1,708,100
Anti-Terrorism/Force Protection, etc.		3	%	allow	32,140,000
		Current Contract Cost, Oct 07			$1,133,702,062
	CONTINGENCY			**25.0%**	283,425,515
					$1,417,127,577
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)				1,109,966
	06 Account, Preservation - Mitigation-Tidal (19 acr	$200,000/acr)			3,800,000
	06 Account, Preservation - Mitigation-Tidal (0 acr	$5,500/acr)			0
					$1,422,062,543
	30 Account, Plan, Engr.& Design			**8.0%**	113,765,003
					$1,535,827,546
	31 Account, Constr. Management			**6.0%**	92,149,653
					$1,627,977,199
	ESCALATION			**0.0%**	0
					$1,627,977,199
					rounded
		TOTAL PROJECT COST, Oct 07			$1,628,000,000

Notes: (reference backup files for mechanical & electrical cost derivation)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIF	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 3	OF 6
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	St. Louis Bay ***Option "B"***	FILE NAME:	mscip-comprehensive-study-cmmpbined-cost-est-25jul08.xls
	Surge Barrier - elev. 30		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$36,190,000
Surge Barrier				
Civil:				
Cofferdam and Dewatering:				
Cell Piling	47,511	Tons	2,200	104,524,200
Cell Excavation	484,505	C.Y.	20.00	9,690,100
Cell Fill (from required excavation)	1,174,394	C.Y.	10.00	11,743,940
Foundation Dewatering (84 months $45,000 /mo.)		Job		3,780,000
Earthwork:				
Structural Excavation	1,174,900	C.Y.	20.00	23,498,000
Foundation Piling (22,032 Piles)	4,406,400	L.F.	35.00	154,224,000
Structural Fill (from required excavation)	547,700	C.Y.	10.00	5,477,000
Stone Protection	210,000	C.Y.	90.00	18,900,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	792,302	C.Y.	450	239,878,026
Forming	688,272	sf	6.50	3,463,304
Reinforcement	1,638	Tons	925	981,425
Abutment Walls				
Concrete	20,400	C.Y.	450	10,645,200
Forming	39,600	sf	6.50	279,825
Stilling Slab				
Concrete	11,900	C.Y.	450	5,355,000
Reinforcement	684	tons	925	632,700
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	16,953	Tons	9,800	193,942,250
Stainless Steel	19,456	Tons	11,700	396,255,600
Low Level Culverts:				
Structural Concrete	20,883	C.Y.	450	36,605,437
Forming	928,541	sf	6.50	4,472,687
Reinforcement	1,335	Tons	925	673,140
Sluice Gates (6'x4'x $2100xn)	204	Each	50,400	10,281,600
Miscellaneous Metal	360	Tons	8,000	3,200,000
			Subtotal	**$1,112,545,193**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	4	OF	6
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	St. Louis Bay — ***Option "B"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Surge Barrier - elev. 30				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
			Subtotal, brought forward	**$1,112,545,193**
Control Building	3,000	sf	450	1,350,000
Maintenance Building	10,000	sf	200	2,000,000
Mechanical:				
Operator Arms and Linkages	9,350	Tons	10,000	201,600,000
Ancillary Operating Equipment	1	Job		600,000
Spare Parts	1	ls	allow	5,000,000
Electrical:	1	Job		1,708,100
Anti-Terrorism/Force Protection, etc.	3	%	allow	43,420,000
		Current Contract Cost, Oct 07		$1,368,223,293
CONTINGENCY			**25.0%**	342,055,823
				$1,710,279,117
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				1,109,966
06 Account, Preservation - Mitigation-Tidal (19 acr		$200,000/acr)		3,800,000
06 Account, Preservation - Mitigation-Non-Tidal (0 acr		$5,500/acr)		0
				$1,715,214,083
30 Account, Plan, Engr.& Design			**8.0%**	137,217,127
				$1,852,431,209
31 Account, Constr. Management			**6.0%**	111,145,873
				$1,963,577,082
ESCALATION			**0.0%**	0
				$1,963,577,082
				rounded
		TOTAL PROJECT COST, Oct 07		$1,963,600,000

Notes: (reference backup files for mechanical & electrical cost derivation)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
St. Louis Bay ***Option "C"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Surge Barrier - elev. 40

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$38,940,000
Surge Barrier				
Civil:				
Cofferdam and Dewatering:				
Cell Piling	47,511	Tons	2,200	104,524,200
Cell Excavation	484,505	C.Y.	20.00	9,690,100
Cell Fill	1,455,982	C.Y.	10.00	14,559,820
Foundation Dewatering (84 Months $45,000 /mo.)		Job		3,780,000
Earthwork:				
Structural Excavation	1,144,000	C.Y.	20.00	22,880,000
Foundation Piling (21,060)	4,212,000	L.F.	35.00	147,420,000
Structural Fill	544,800	C.Y.	10.00	5,448,000
Stone Protection	210,000	C.Y.	90	18,900,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	782,501	C.Y.	450	352,125,617
Forming	784,095	sf	6.50	5,096,618
Reinforcement	1,560	Tons	925	1,443,000
Abutment Walls				
Concrete	23,656	C.Y.	450	10,645,200
Forming	43,050	sf	6.50	279,825
Stilling Slab				
Concrete	11,900	C.Y.	450	5,355,000
Reinforcement	684	tons	925	632,700
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	22,382	Tons	9,800	219,343,600
Stainless Steel	37,430	Tons	11,700	437,931,000
Low Level Culverts				
Structural Concrete	27,724	C.Y.	450	12,475,633
Forming	1,232,668	sf	6.50	8,012,345
Reinforcement	1,772	Tons	925	1,639,340
Sluice Gates (4x6x$2100xn)	204	Each	50,400	10,281,600
Miscellaneous Metal	600	Tons	8,000	4,800,000
			Subtotal	$1,436,203,596

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIF**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	6	OF	6
		PREPARED:	Joseph H Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	St. Louis Bay ***Option "C"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Surge Barrier - elev. 40				

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward	$ 1,436,203,596
Control Building		3,000	sf	450	1,350,000
Maintenance Building		10,000	sf	200	2,000,000
Mechanical:					
Operator Arms and Linkages		15,320	Tons	10,000	153,200,000
Ancillary Operating Equipment		1	Job		600,000
Spare Parts		1	ls	allow	5,000,000
Electrical:		1	Job		1,708,100
Anti-Terrorism/Force Protection, etc.		3	%	allow	46,730,000
		Current Contract Cost, Oct 07			$ 1,646,791,696
	CONTINGENCY			**25.0%**	411,697,924
					$ 2,058,489,620
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)				1,109,966
	06 Account, Preservation - Mitigation-Tidal (19 acr			$200,000/acr)	3,800,000
	06 Account, Preservation - Mitigation-Non-Tidal (0 acr			$5,500/acr)	0
					$ 2,063,424,586
	30 Account, Plan, Engr.& Design			**8.0%**	165,073,967
					$ 2,228,498,553
	31 Account, Constr. Management			**6.0%**	133,709,913
					$ 2,362,208,467
	ESCALATION			**0.0%**	0
					$ 2,362,208,467 rounded
		TOTAL PROJECT COST, Oct 07			$ 2,362,200,000

Notes: (reference backup files for mechanical & electrical cost derivation)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Back Bay of Biloxi ***Option "A"*** FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Surge Barrier - elev. 20

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$16,110,000
Surge Gates				
Civil:				
Cofferdam and Dewatering:				
Cell Piling	23,294	Tons	2200	51,246,800
Cell Excavation	279,846	C.Y.	20	5,596,920
Cell Fill	754,770	C.Y.	10	7,547,700
Foundation Dewatering (60 month duration, 45,000/month)	1	Job		2,700,000
Earthwork:				
Structural Excavation	23,294	C.Y.	20	465,880
Foundation Piling (13,836 Piles)	279,846	L.F.	35	9,794,610
Structural Fill	754,770	C.Y.	10	7,547,700
Stone Protection	210,000	C.Y.	90	18,900,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	480,239	C.Y.	450	216,107,726
Forming	356,663	sf	6.50	2,318,310
Reinforcement	1,210	Tons	925	1,119,250
Abutment Walls				
Concrete	12,188	C.Y.	450	5,484,600
Forming	30,900	sf	6.50	200,850
Stilling Structure				
Concrete	11,900	C.Y.	450	5,355,000
Reinforcement	684	Tons	925	632,700
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	4,686	Tons	9,800	45,922,800
Stainless Steel	15,061	Tons	11,700	176,213,700
Low Level Culverts:				
Structural Concrete	5,596	C.Y.	450	2,518,086
Forming	241,637	sf	6.50	1,570,641
Reinforcement	357	Tons	925	330,565
Sluice Gates (4x6x $2100xn)	85	Each	50,400	4,284,000
Miscellaneous Metal	200	Tons	8,000	1,600,000
			Subtotal $	**583,567,837**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIF**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	2	OF	6
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 4***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Back Bay of Biloxi ***Option "A"***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		
	Surge Barrier - elev. 20				

DESCRIPTION		Quantity	Unit	Unit Price		ESTIMATED AMOUNT
				Subtotal, brought forward	**$**	**583,567,837**
Control Building		3,000	sf	450		1,350,000
Maintenance Building		10,000	sf	200		2,000,000
Mechanical:						
Operator Arms and Linkages		7,510	Tons	10,000		75,100,000
Ancillary Operating Equipment		1	Job			600,000
Electrical:		1	Job			1,393,200
Spare Parts		1	ls	allow		5,000,000
Anti-Terrorism/Force Protection, etc.		3	%	allow		19,490,000
			Current Contract Cost, Oct 07		$	688,501,037
	CONTINGENCY			**25.0%**		172,125,259
					$	860,626,296
	01 Account, Lands & Damage		PCA	**LS**		25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)					1,767,353
	06 Account, Preservation - Mitigation-Tidal (11 acr			$200,000/acr)		2,200,000
	06 Account, Preservation - Mitigation-Tidal (0 acr			$5,500/acr)		0
					$	864,618,649
	30 Account, Plan, Engr.& Design			**8.0%**		69,169,492
					$	933,788,141
	31 Account, Constr. Management			**6.0%**		56,027,288
					$	989,815,430
	ESCALATION			**0.0%**		0
					$	989,815,430
						rounded
			TOTAL PROJECT COST, Oct 07		**$**	**989,800,000**

Notes: (reference backup files for mechanical & electrical cost derivation)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIF** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Back Bay of Biloxi ***Option "B"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Surge Barrier - elev. 30

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$20,810,000
Surge Barrier				
Civil:				
Cell Piling	31,837	Tons	2200	70,041,400
Cell Excavation	279,846	C.Y.	20	5,596,920
Cell Fill (from required excavation)	754,770	C.Y.	10	7,547,700
Foundation Dewatering (60Mo. $45,000 / Mo.)	1	Job		2,700,000
Earthwork:				
Structural Excavation	881,900	C.Y.	20	17,638,000
Foundation Piling (14,538 Piles)	1,134,024	L.F.	35	39,690,840
Structural Fill (from required excavation)	414,500	C.Y.	10	4,145,000
Stone Protection	210000	C.Y.	90	18,900,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	540,621	C.Y.	450	243,279,522
Forming	351,575	sf	6.50	2,285,238
Reinforcement	1,083	Tons	925	1,001,775
Abutment Walls				
Concrete	12,188	C.Y.	450	5,484,600
Forming	30,900	sf	6.50	200,850
Stilling Slab				
Concrete	11900	C.Y.	450	5,355,000
Reinforcement	684	Tons	925	632,700
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	11238	Tons	9,800	110,132,400
Stainless Steel	13024	Tons	11,700	152,380,800
Low Level Culverts:				
Structural Concrete	41,300	C.Y.	450	18,584,795
Forming	468,061	sf	6.50	3,042,394
Reinforcement	542	Tons	925	501,427
Sluice Gates (6'x4'x $2100xn)	85	Each	50,400	4,284,000
Miscellaneous Metal	240	Tons	8,000	1,920,000
			Subtotal $	**736,155,360**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 4 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Back Bay of Biloxi ***Option "B"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Surge Barrier - elev. 30

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward $	**736,155,360**
Control Building		3,000	sf	450	1,350,000
Maintenance Building		10,000	sf	200	2,000,000
Mechanical:					
Gate Arms		11,020	Tons	10,000	110,200,000
Operating Equipment		1	Job	600,000	600,000
Spare Parts		1	ls	allow	5,000,000
Electrical:		1	Job	1,393,200	1,393,200
Anti-Terrorism/Force Protection, etc.		3	%	allow	25,600,000
		Current Contract Cost, Oct 07			$ 882,298,560
	CONTINGENCY			**25.0%**	220,574,640
					$ 1,102,873,200
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)				1,767,353
	06 Account, Preservation - Mitigation-Tidal (11 acr			$200,000/acr)	2,200,000
	06 Account, Preservation - Mitigation-Tidal (0 acr			$5,500/acr)	0
					$ 1,106,865,553
	30 Account, Plan, Engr.& Design			**8.0%**	88,549,244
					$ 1,195,414,797
	31 Account, Constr. Management			**6.0%**	71,724,888
					$ 1,267,139,685
	ESCALATION			**0.0%**	0
					$ 1,267,139,685
					rounded
		TOTAL PROJECT COST, Oct 07			$ 1,267,100,000

Notes: (reference backup files for mechanical & electrical cost derivation)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Back Bay of Biloxi ***Option "C"*** FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls
Surge Barrier - elev. 40

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$29,810,000
Surge Barrier				
Civil:				
Cofferdam and Dewatering:				
Cell Piling	31,837	Tons	2,200	70,041,400
Cell Excavation	279,846	C.Y.	20	5,596,920
Cell Fill	1,075,547	C.Y.	10	10,755,470
Foundation Dewatering (60 month duration, 45,000/month)	1	Job		2,700,000
Earthwork:				
Structural Excavation	903,200	C.Y.	20	18,064,000
Foundation Piling (14,250 Piles)	2,850,000	L.F.	35	99,750,000
Structural Fill (from required excavation)	434,800	C.Y.	10	4,348,000
Stone Protection	210000	C.Y.	90	18,900,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	533,062	C.Y.	450	239,878,026
Forming	532,816	sf	6.50	3,463,304
Reinforcement	1,061	Tons	925	981,425
Abutment Walls				
Concrete	23,656	C.Y.	450	10,645,200
Forming	43,050	sf	6.50	279,825
Stilling Slab				
Concrete	11900	C.Y.	450	5,355,000
Reinforcement	684	Tons	925	632,700
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	14890	Tons	9,800	145,922,000
Stainless Steel	25401	Tons	11,700	297,191,700
Low Level Culverts:				
Structural Concrete	81,345	C.Y.	450	36,605,437
Forming	688,106	sf	6.50	4,472,687
Reinforcement	728	Tons	925	673,140
Sluice Gates (4x6x $2100xn)	85	Each	50,400	4,284,000
Miscellaneous Metal	400	Tons	8,000	3,200,000
			Subtotal	$ 1,013,550,233

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIF** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 6
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Back Bay of Biloxi ***Option "C"*** FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls
Surge Barrier - elev. 40

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
				Subtotal, brought forward	**$ 1,013,550,233**
Control Building		3,000	sf	450	1,350,000
Maintenance Building		10,000	sf	200	2,000,000
Mechanical:					
Gate Arms		20,160	Tons	10,000	201,600,000
Operating Equipment		1	Job		600,000
Electrical:		1	Job		1,393,200
Spare Parts		1	ls	allow	5,000,000
Anti-Terrorism/Force Protection, etc.		3.00	%	allow	36,660,000
		Current Contract Cost, Oct 07			$ 1,262,153,433
	CONTINGENCY			**25.0%**	315,538,358
					$ 1,577,691,792
	01 Account, Lands & Damage		PCA	**LS**	25,000
	01 Account, Lands & Damage (land + admin + 25% contingency)				1,767,353
	06 Account, Preservation - Mitigation-Tidal (11 acr		$200,000/acr)		2,200,000
	06 Account, Preservation - Mitigation-Tidal (0 acr		$5,500/acr)		0
					$ 1,581,684,145
	30 Account, Plan, Engr.& Design			**8.0%**	126,534,732
					$ 1,708,218,876
	31 Account, Constr. Management			**6.0%**	102,493,133
					$ 1,810,712,009
	ESCALATION			**0.0%**	0
					$ 1,810,712,009 rounded
		TOTAL PROJECT COST, Oct 07			$ 1,810,700,000

Notes: (reference backup files for mechanical & electrical cost derivation)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Llyod Oliver
WORK ITEM: ***Harrison County - Line of Defense 4***
Biloxi Courthouse- Elevation 30 BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Tee Wall				
Earthwork:				
Structural Excavation	11,750	C.Y.	20	$235,000
Foundation Piling	1540	Tons	1,500	2,310,000
Cutoff Wall Piling	635	Tons	2,200	1,395,900
Structural Fill	11,050	C.Y.	10	110,500
Structural:				
Concrete:				
Structural Concrete (Add Reinf. At 130 /C.Y.)	1960	C.Y.	700	1,372,000
Structural Steel:				
Roadway Closure Gates (Including Miscellaneous Metal)	4	Each	54,000	216,000
		Current Contract Cost, Oct 07		**$5,639,400**

Notes: (Gate unit cost based on similar projects provided by New Orleans COE District)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 2 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Llyod Oliver
WORK ITEM: ***Harrison County - Line of Defense 4*** BASIS of ESTIMATE: by L.O. project delv'd. team
Biloxi Courthouse- Elevation 40 FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Tee Wall				
Earthwork:				
Structural Excavation	18,100	C.Y.	20	$362,000
Foundation Piling	1540	Tons	1,500	2,310,000
Cutoff Wall Piling	635	Tons	2,200	1,395,900
Structural Fill	15,730	C.Y.	10	157,300
Structural:				
Concrete:				
Structural Concrete (Add Reinf. At 130 /C.Y.)	5,800	C.Y.	700	4,060,000
Structural Steel:				
Roadway Closure Gates (Including Miscellaneous Metal)	4	Each	120,000	480,000
		Current Contract Cost, Oct 07		**$8,765,200**

Notes: (Gate unit cost based on similar projects provided by New Orleans COE District)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 4
PREPARED: Joseph H. Ellsworth CHECKED: Llyod Oliver
WORK ITEM: ***Harrison County - Line of Defense 4 Gulfport Courthouse- Elevation 30*** BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Tee Wall				
Earthwork:				
Structural Excavation	12,930	C.Y.	20	$258,600
Foundation Piling	1690	Tons	1,500	2,535,000
Cutoff Wall Piling	698	Tons	2,200	1,536,480
Structural Fill	12,150	C.Y.	10	121,500
Structural:				
Concrete:				
Structural Concrete (Add Reinf. At 130 /C.Y.)	2160	C.Y.	700	1,512,000
Structural Steel:				
Roadway Closure Gates (Including Miscellaneous Metal)	2	Each	54,000	108,000
		Current Contract Cost, Oct 07		**$6,071,580**

Notes: (Gate unit cost based on similar projects provided by New Orleans COE District)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP'**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 4	OF	4
	PREPARED: Joseph H. Ellsworth	CHECKED:	Llyod Oliver
WORK ITEM: ***Harrison County - Line of Defense 4***	BASIS of ESTIMATE:	by L.O. project delv'd. team	
Gulfport Courthouse- Elevation 40	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Tee Wall				
Earthwork:				
Structural Excavation	19,920	C.Y.	20	$398,400
Foundation Piling	1690	Tons	1,500	2,535,000
Cutoff Wall Piling	698	Tons	2,200	1,536,480
Structural Fill	17,310	C.Y.	10	173,100
Structural:				
Concrete:				
Structural Concrete (Add Reinf. At 130 /C.Y.)	6,380	C.Y.	700	4,466,000
Structural Steel:				
Roadway Closure Gates (Including Miscellaneous Metal)	2	Each	120,000	240,000
		Current Contract Cost, Oct 07		**$9,348,980**

Notes: (Gate unit cost based on similar projects provided by New Orleans COE District)

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

NO GATE STRUCTURES

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 1 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier*** BASIS of ESTIMATE: by project delv'd. team
Jackson County - Elevation 20 FILE NAME: Jackson Lod4 Inland Barrier Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County				
Structural Concrete, complete	0	cy		0
Form Work	0	sf		0
Steel Reinforcement	0	tons		0
11.5' wide x 16' high Swing Gates (railroad)	0	each		0
16.75' wide x 14' high Swing Gates	0	each		0
3' high x 31.5' wide Roller Gates	0	each		0
4' high x 31.5' wide Roller Gates	0	each		0
5' high x 31.5' wide Roller Gates	0	each		0
6' high x 31.5' wide Roller Gates	0	each		0
7' high x 31.5' wide Roller Gates	0	each		0
8' high x 31.5' wide Roller Gates	0	each		0
9' high x 31.5' wide Roller Gates	0	each		0

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $0

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

NO GATE STRUCTURES

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION **Mississippi**	SHEET NO.	2	OF	24
	PREPARED: Joseph H. Ellsworth		CHECKED:	Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier***	BASIS of ESTIMATE:	by project delv'd. team		
Jackson County - Elevation 30	FILE NAME: Jackson Lod4 Inland Barrier Vehicle Gates.xls			
Vehicle-RR-Gates				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County				
Structural Concrete, complete	0	cy		0
Form Work	0	sf		0
Steel Reinforcement	0	tons		0
11.5' wide x 6' high Swing Gates (railroad)	0	each		0
16.75' wide x 14' high Swing Gates	0	each		0
3' high x 31.5' wide Roller Gates	0	each		0
4' high x 31.5' wide Roller Gates	0	each		0
5' high x 31.5' wide Roller Gates	0	each		0
6' high x 31.5' wide Roller Gates	0	each		0
7' high x 31.5' wide Roller Gates	0	each		0
8' high x 31.5' wide Roller Gates	0	each		0
9' high x 31.5' wide Roller Gates	0	each		0

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$0

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION **Mississippi**	SHEET NO.	3	OF	24
	PREPARED: Joseph H. Ellsworth		CHECKED:	Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier***	BASIS of ESTIMATE:	by project delv'd. team		
Jackson County - Elevation 40	FILE NAME: Jackson Lod4 Inland Barrier Vehicle Gates.xls			
Vehicle-RR-Gates				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County				
Structural Concrete, complete	425	cy	450	191,471
Form Work	9,485	sf	6.50	61,653
Steel Reinforcement	18	tons	925	17,009
3.7' high x 31.5' wide Roller Gates	1	each	24,800	24,800
4' high x 31.5' wide Roller Gates	1	each	25,600	25,600
8.5' high x 31.5' wide Roller Gates	1	each	41,600	41,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$362,133

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 4 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier***
Harrison County - Elevation 20
Vehicle-RR-Gates
BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: Harrison Lod4 Inland Barrier Vehicle Gates.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections				
Structural Concrete, complete	12,891	cy	450	5,800,931
Form Work	305,078	sf	6.50	1,983,008
Steel Reinforcement	625	tons	925	577,943
16.75' wide x 14' high Swing Gates	50	each	47,200	2,360,000
3' high x 31.5' wide Roller Gates	1	each	22,400	22,400
4' high x 31.5' wide Roller Gates	2	each	25,600	51,200
5' high x 31.5' wide Roller Gates	1	each	29,600	29,600
6' high x 31.5' wide Roller Gates	2	each	32,800	65,600
7' high x 31.5' wide Roller Gates	1	each	36,000	36,000
8' high x 31.5' wide Roller Gates	8	each	39,200	313,600
9' high x 31.5' wide Roller Gates	3	each	43,200	129,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$11,369,882

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 5 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 -Inland Barrier*** BASIS of ESTIMATE: by L.O. project delv'd. team
Harrison County - Elevation 30 FILE NAME: Harrison Lod4 Inland Barrier Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections				
Structural Concrete, complete	49,443	cy	450	22,249,146
Form Work	1,027,645	sf	6.50	6,679,691
Steel Reinforcement	2,207	tons	925	2,041,666
11.5' wide x 36' high Swing Gates (railroad)	2	each	96,000	192,000
16.75' wide x 14' high Swing Gates	138	each	47,200	6,513,600
3' high x 31.5' wide Roller Gates	7	each	22,400	156,800
4' high x 31.5' wide Roller Gates	3	each	25,600	76,800
5' high x 31.5' wide Roller Gates	3	each	29,600	88,800
6' high x 31.5' wide Roller Gates	49	each	32,800	1,607,200
7' high x 31.5' wide Roller Gates	5	each	36,000	180,000
8' high x 31.5' wide Roller Gates	7	each	39,200	274,400
9' high x 31.5' wide Roller Gates	4	each	43,200	172,800

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$40,232,904

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 6 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier Harrison County - Elevation 40 Vehicle-RR-Gates*** BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: Harrison Lod4 Inland Barrier Vehicle Gates.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections				
Structural Concrete, complete	104,486	cy	450	47,018,762
Form Work	1,923,781	sf	6.50	12,504,579
Steel Reinforcement	4,491	tons	925	4,154,231
11.5' wide x 36' high Swing Gates (railroad)	2	each	96,000	192,000
16.75' wide x 14' high Swing Gates	314	each	47,200	14,820,800
4' high x 31.5' wide Roller Gates	1	each	25,600	25,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$78,715,972

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 7 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier*** BASIS of ESTIMATE: by L.O. project delv'd. team
Hancock County - Elevation 20 FILE NAME: Hancock Lod4 Inland Barrier Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections				
Structural Concrete, complete	2,447	cy	450	1,100,927
Form Work	49,422	sf	6.50	321,241
Steel Reinforcement	114	tons	925	105,217
16.75' wide x 14' high Swing Gates	6	each	47,200	283,200
11.5' wide x 16' high Swing Gates (railroad)	4	each	43,200	172,800
4' high x 31.5' wide Roller Gates	3	each	25,600	76,800
8' high x 31.5' wide Roller Gates	1	each	39,200	39,200

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$2,099,385

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 8 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier***
Hancock County - Elevation 30
Vehicle-RR-Gates
BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: Hancock Lod4 Inland Barrier Vehicle Gates.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections				
Structural Concrete, complete	7,829	cy	450	3,522,973
Form Work	153,514	sf	6.50	997,842
Steel Reinforcement	346	tons	925	320,412
16.75' wide x 14' high Swing Gates	18	each	47,200	849,600
11.5' wide x 26' high Swing Gates (railroad)	4	each	72,000	288,000
6' high x 31.5' wide Roller Gates	9	each	32,800	295,200

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $6,274,027

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 9 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Inland Barrier***
Hancock County - Elevation 40
Vehicle-RR-Gates
BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: Hancock Lod4 Inland Barrier Vehicle Gates.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections				
Structural Concrete, complete	14,972	cy	450	6,737,298
Form Work	267,385	sf	6.50	1,738,001
Steel Reinforcement	637	tons	925	589,424
16.75' wide x 14' high Swing Gates	36	each	47,200	1,699,200
11.5' wide x 36' high Swing Gates (railroad)	4	each	96,000	384,000

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $11,147,923

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 10 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3- Ring Levees*** BASIS of ESTIMATE: by project delv'd. team
Hancock County - Elevation 20 FILE NAME: Hancock Lod3 RingLevee Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pearlington				
Structural Concrete, complete	3,609	cy	450.00	1,623,949
Form Work	84,427	sf	6.50	548,778
Steel Reinforcement	177	tons	925.00	163,870
16.75' wide x 14' high Swing Gates	18	each	47,200	849,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $3,186,197

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 11 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver

WORK ITEM ***Line of Defense 3- Ring Levees***
Hancock County - Elevation 30
Vehicle-RR-Gates

BASIS of ESTIMATE: by project delv'd. team
FILE NAME: Hancock Lod3 RingLevee Vehicle Gates.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pearlington				
Structural Concrete, complete	6,980	cy	450.00	3,140,999
Form Work	121,607	sf	6.50	790,445
Steel Reinforcement	289	tons	925.00	267,052
16.75' wide x 14' high Swing Gates	18	each	47,200	849,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $5,048,096

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 12 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3- Ring Levees*** BASIS of ESTIMATE: by project delv'd. team
Jackson County - Elevation 20 FILE NAME: Jackson Lod3 RingLevee Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Ocean Springs				
Structural Concrete, complete	4,066	cy	450.00	1,829,877
Form Work	93,878	sf	6.50	610,206
Steel Reinforcement	195	tons	925.00	180,673
16.75' wide x 14' high Swing Gates	18	each	47,200	849,600
4' high x 31.5' wide Roller Gates	1	each	25,600	25,600
5' high x 31.5' wide Roller Gates	2	each	29,600	59,200
6' high x 31.5' wide Roller Gates	1	each	32,800	32,800
8' high x 31.5' wide Roller Gates	2	each	39,200	78,400

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $3,666,357

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Gulf Park Estates				
Structural Concrete, complete	3,867	cy	450.00	1,740,147
Form Work	91,821	sf	6.50	596,834
Steel Reinforcement	190	tons	925.00	175,948
16.75' wide x 14' high Swing Gates	18	each	47,200	849,600
6' high x 31.5' wide Roller Gates	1	each	32,800	32,800
9' high x 31.5' wide Roller Gates	1	each	43,200	43,200

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $3,438,529

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION **Mississippi**	SHEET NO.	13	OF	24
	PREPARED: Joseph H. Ellsworth		CHECKED:	Lloyd Oliver
WORK ITEM ***Line of Defense 3- Ring Levees***	BASIS of ESTIMATE:	by project delv'd. team		
Jackson County - Elevation 20	FILE NAME: Jackson Lod3 RingLevee Vehicle Gates.xls			
Vehicle-RR-Gates				

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Bellefontaine				
Structural Concrete, complete	2,672	cy	450.00	1,202,400
Form Work	62,535	sf	6.50	406,478
Steel Reinforcement	128	tons	925.00	118,400
16.75' wide x 14' high Swing Gates	12	each	47,200	566,400
4' high x 31.5' wide Roller Gates	3	each	25,600	76,800
8' high x 31.5' wide Roller Gates	2	each	39,200	78,400

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $2,448,878

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Gautier				
Structural Concrete, complete	5,691	cy	450.00	2,560,772
Form Work	132,238	sf	6.50	859,550
Steel Reinforcement	272	tons	925.00	251,849
16.75' wide x 14' high Swing Gates	22	each	47,200	1,038,400
4' high x 31.5' wide Roller Gates	5	each	25,600	128,000
6' high x 31.5' wide Roller Gates	2	each	32,800	65,600
7' high x 31.5' wide Roller Gates	3	each	36,000	108,000
8' high x 31.5' wide Roller Gates	1	each	39,200	39,200

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $5,051,370

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 14 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3- Ring Levees*** BASIS of ESTIMATE: by project delv'd. team
Jackson County - Elevation 20 FILE NAME: Jackson Lod3 RingLevee Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pascagoula				
Structural Concrete, complete	20,625	cy	450.00	9,281,315
Form Work	460,958	sf	6.50	2,996,225
Steel Reinforcement	981	tons	925.00	907,571
11.5' wide x 8' high Swing Gates (railroad)	2	each	22,400	44,800
11.5' wide x 14' high Swing Gates (railroad)	4	each	41,600	166,400
11.5' wide x 15' high Swing Gates (railroad)	2	each	42,400	84,800
16.75' wide x 14' high Swing Gates	88	each	47,200	4,153,600
3' high x 31.5' wide Roller Gates	1	each	22,400	22,400
4' high x 31.5' wide Roller Gates	6	each	25,600	153,600
5' high x 31.5' wide Roller Gates	1	each	29,600	29,600
6' high x 31.5' wide Roller Gates	6	each	32,800	196,800
7' high x 31.5' wide Roller Gates	5	each	36,000	180,000
8' high x 31.5' wide Roller Gates	6	each	39,200	235,200
9' high x 31.5' wide Roller Gates	4	each	43,200	172,800

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	$18,625,110

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 15 OF 24
PREPARED: Joseph H Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3- Ring Levees*** BASIS of ESTIMATE: by project delv'd. team
Jackson County - Elevation 30 FILE NAME: Jackson Lod3 RingLevee Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Ocean Springs				
Structural Concrete, complete	14,958	cy	450.00	6,731,094
Form Work	317,595	sf	6.50	2,064,370
Steel Reinforcement	688	tons	925.00	636,543
16.75' wide x 14' high Swing Gates	70	each	47,200	3,304,000
6' high x 31.5' wide Roller Gates	4	each	32,800	131,200
7' high x 31.5' wide Roller Gates	1	each	36,000	36,000
8' high x 31.5' wide Roller Gates	1	each	39,200	39,200
Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.				
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS				
		Current Contract Cost, Oct 07		$12,942,407
Gulf Park Estates				
Structural Concrete, complete	9,419	cy	450.00	4,238,425
Form Work	168,317	sf	6.50	1,094,063
Steel Reinforcement	395	tons	925	365,471
16.75' wide x 14' high Swing Gates	26	each	47,200	1,227,200
Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.				
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS				
		Current Contract Cost, Oct 07		$6,925,159
Bellefontaine				
Structural Concrete, complete	6,153	cy	450.00	2,768,638
Form Work	117,463	sf	6.50	763,507
Steel Reinforcement	268	tons	925	247,619
16.75' wide x 14' high Swing Gates	20	each	47,200	944,000
Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.				
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS				
		Current Contract Cost, Oct 07		$4,723,764

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 16 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3- Ring Levees*** BASIS of ESTIMATE: by project delv'd. team
Jackson County - Elevation 30 FILE NAME: Jackson Lod3 RingLevee Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Gautier				
Structural Concrete, complete	13,282	cy	450.00	5,976,809
Form Work	260,864	sf	6.50	1,695,619
Steel Reinforcement	589	tons	925.00	545,180
16.75' wide x 14' high Swing Gates	52	each	47,200	2,454,400
Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.				
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS				
		Current Contract Cost, Oct 07		$10,672,007
Pascagoula				
Structural Concrete, complete	49,705	cy	450.00	22,367,224
Form Work	920,758	sf	6.50	5,984,928
Steel Reinforcement	2,134	tons	925.00	1,974,156
11.5' wide x 12' high Swing Gates (railroad)	2	each	32400	64,800
11.5' wide x 18' high Swing Gates (railroad)	2	each	48600	97,200
11.5' wide x 24' high Swing Gates (railroad)	4	each	66480	265,920
11.5' wide x 25' high Swing Gates (railroad)	2	each	69200	138,400
16.75' wide x 14' high Swing Gates	166	each	47,200	7,835,200
8' high x 31.5' wide Roller Gates	1	each	39,200	39,200
Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.				
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS				
		Current Contract Cost, Oct 07		$38,767,028

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION **Mississippi**	SHEET NO. 17	OF	24
	PREPARED: Joseph H. Ellsworth	CHECKED:	Lloyd Oliver
WORK ITEM ***Line of Defense 3- Railway/Vehicle Gates***	BASIS of ESTIMATE:	by project delv'd. team	
Hancock County - Elevation 11	FILE NAME: Hancock Lod3 Railway Vehicle Gates.xls		
Vehicle-RR-Gates			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
East of Bay Saint Louis				
Structural Concrete, complete	438	cy	450.00	197,217
Form Work	8,294	sf	6.50	53,912
Steel Reinforcement	18	tons	925.00	17,091
11.5' wide x3' high Swing Gates (railroad)	2	each	18,880	37,760
31.5' wide x 3' high Roller Gates	2	each	22,400	44,800
31.5' wide x 7' high Roller Gates	1	each	36,000	36,000

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 $ 386,780

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 18 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'D' FILE NAME: Harrison(OptD&E) Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Roadway on Levee				
Structural Concrete, complete	27,194	cy	450.00	12,237,417
Form Work	516,538	sf	6.50	3,357,498
Steel Reinforcement	1,061	tons	925.00	981,425
16.75' wide x 14' high Swing Gates	50	each	47,200	2,360,000
3' high x 31.5' wide Roller Gates	1	each	22,400	22,400
4' high x 31.5' wide Roller Gates	2	each	25,600	51,200
5' high x 31.5' wide Roller Gates	1	each	29,600	29,600
6' high x 31.5' wide Roller Gates	2	each	32,800	65,600
7' high x 31.5' wide Roller Gates	1	each	36,000	36,000
8' high x 31.5' wide Roller Gates	8	each	39,200	313,600
9' high x 31.5' wide Roller Gates	3	each	43,200	129,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District;
25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 **$19,584,340**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 19 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'E' FILE NAME: Harrison(OptD&E) Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Roadway on Levee				
Structural Concrete, complete	94,060	cy	450.00	42,326,783
Form Work	1,675,265	sf	6.50	10,889,221
Steel Reinforcement	3,579	tons	925.00	3,310,575
11.5' wide x 6' high Swing Gates (railroad)	2	each	28,800	57,600
16.75' wide x 14' high Swing Gates	138	each	47,200	6,513,600
3' high x 31.5' wide Roller Gates	7	each	22,400	156,800
4' high x 31.5' wide Roller Gates	3	each	25,600	76,800
5' high x 31.5' wide Roller Gates	4	each	29,600	118,400
6' high x 31.5' wide Roller Gates	51	each	32,800	1,672,800
7' high x 31.5' wide Roller Gates	6	each	36,000	216,000
8' high x 31.5' wide Roller Gates	7	each	39,200	274,400
9' high x 31.5' wide Roller Gates	4	each	43,200	172,800

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 **$65,785,779**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 20 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'F' FILE NAME: Harrison(Opt'F-G-H') Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Menge Avenue Alternative				
Structural Concrete, complete	4,704	cy	450.00	2,116,928
Form Work	109,607	sf	6.50	712,446
Steel Reinforcement	219	tons	925.00	202,575
16.75' wide x 14' high Swing Gates	10	each	47,200	472,000
3' high x 31.5' wide Roller Gates	1	each	22,400	22,400
4' high x 31.5' wide Roller Gates	3	each	25,600	76,800
5' high x 31.5' wide Roller Gates	2	each	29,600	59,200
6' high x 31.5' wide Roller Gates	2	each	32,800	65,600
7' high x 31.5' wide Roller Gates	1	each	36,000	36,000
8' high x 31.5' wide Roller Gates	7	each	39,200	274,400
9' high x 31.5' wide Roller Gates	1	each	43,200	43,200

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	**$4,081,549**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 21 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'G' FILE NAME: Harrison(Opt'F-G-H') Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Menge Avenue Alternative				
Structural Concrete, complete	35,366	cy	450.00	15,914,508
Form Work	785,319	sf	6.50	5,104,576
Steel Reinforcement	1,627	tons	925.00	1,504,975
11.5' wide x 6' high Swing Gates (railroad)	2	each	36,000	72,000
16.75' wide x 14' high Swing Gates	100	each	47,200	4,720,000
3' high x 31.5' wide Roller Gates	8	each	22,400	179,200
4' high x 31.5' wide Roller Gates	3	each	25,600	76,800
5' high x 31.5' wide Roller Gates	4	each	29,600	118,400
6' high x 31.5' wide Roller Gates	54	each	32,800	1,771,200
7' high x 31.5' wide Roller Gates	6	each	36,000	216,000
8' high x 31.5' wide Roller Gates	7	each	39,200	274,400
9' high x 31.5' wide Roller Gates	4	each	43,200	172,800

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07 **$30,124,860**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 22 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'H' FILE NAME: Harrison(Opt'F-G-H') Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Menge Avenue Alternative				
Structural Concrete, complete	84,216	cy	450	37,897,026
Form Work	1,694,457	sf	6.50	11,013,973
Steel Reinforcement	3,788	tons	925	3,503,900
11.5' wide x 16' high Swing Gates (railroad)	2	each	43,200	86,400
16.75' wide x 14' high Swing Gates	318	each	47,200	15,009,600
4' high x 31.5' wide Roller Gates	2	each	25,600	51,200
6.5' high x 31.5' wide Roller Gates	1	each	41,600	41,600

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	**$67,603,699**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 23 OF 24
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'I' FILE NAME: Harrison(Opt'l-J') Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Menge Avenue Alternative				
Structural Concrete, complete	6,459	cy	450	2,906,378
Form Work	134,893	sf	6.50	876,805
Steel Reinforcement	278	tons	925	257,150
16.75' wide x 14' high Swing Gates	10	each	47,200	472,000
4' high x 31.5' wide Roller Gates	1	each	22,400	22,400
6.5' high x 31.5' wide Roller Gates	3	each	25,600	76,800
5' high x 31.5' wide Roller Gates	2	each	29,600	59,200
6' high x 31.5' wide Roller Gates	1	each	32,800	32,800
7' high x 31.5' wide Roller Gates	1	each	36,000	36,000
8' high x 31.5' wide Roller Gates	7	each	39,200	274,400
9' high x 31.5' wide Roller Gates	1	each	43,200	43,200

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.
ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	**$5,057,133**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 24 OF 24
PREPARED: oseph H. Ellswort CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Railway/Vehicle Gates*** BASIS of ESTIMATE: by project delv'd. team
Harrison County - Option 'J' FILE NAME: Harrison(Opt'l-J') Lod4 Inland Barrier(8-07) Vehicle Gates.xls
Vehicle-RR-Gates

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Levee and Roadway/Railway Intersections - Menge Avenue Alternative				
Structural Concrete, complete	64,538	cy	450	29,042,067
Form Work	1,199,949	sf	6.50	7,799,668
Steel Reinforcement	2,530	tons	925	2,340,250
11.5' wide x 6' high Swing Gates (railroad)	2	each	36,000	72,000
16.75' wide x 14' high Swing Gates	96	each	47,200	4,531,200
4' high x 31.5' wide Roller Gates	8	each	22,400	179,200
6.5' high x 31.5' wide Roller Gates	3	each	25,600	76,800
5' high x 31.5' wide Roller Gates	4	each	29,600	118,400
6' high x 31.5' wide Roller Gates	54	each	32,800	1,771,200
7' high x 31.5' wide Roller Gates	6	each	36,000	216,000
8' high x 31.5' wide Roller Gates	7	each	39,200	274,400
9' high x 31.5' wide Roller Gates	4	each	43,200	172,800

Note: All Gate Unit Costs noted above are installed costs with contingencies included, as provided by New Orleans District; 25% Contingency removed from the figures provided before insertion into this work; Price Level is for 3/23/07.

ABOVE GATE COUNTS ARE FOR INDIVIDUAL GATE LEAVES AT BOTH SWING GATE AND ROLLER GATE INSTALLATIONS

Current Contract Cost, Oct 07	**$46,593,985**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Hancock County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Beach Boulevard- Elevation 11 FILE NAME Beach Boulevard Lod3 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations W-1 thru W -10					
Structural Concrete, complete all sites		3,931	cy	$450	$1,768,938
Form Work, complete all sites		95,349	sf	$6.50	619,770
Steel Reinforcement, complete all sites		241	tons	$925	222,691
Excavation		6,407	cy	$15	96,104
Backfill		4,483	cy	$5	22,413
Trash Screens and Miscellaneous metal items, All Sites		34	each	$100,000	3,400,000
Pumps by Installation Site					
W-1	Pumps	4	each	$192,500	770,000
	Discharge Piping (42" Dia; 150 L.F.)				123,200
	Energy Dissipation				150,000
W-2	Pumps	4	each	$330,000	1,320,000
	Discharge Piping (54" Dia; 150 L.F.)				197,100
	Energy Dissipation				150,000
W-3	Pumps	4	each	$192,500	770,000
	Discharge Piping (42" Dia; 150 L.F.)				123,200
	Energy Dissipation				150,000
W-4	Pumps	3	each	$440,000	1,320,000
	Discharge Piping (60" Dia; 150 L.F.)				188,500
	Energy Dissipation				120,000
W-5	Pumps	3	each	$330,000	990,000
	Discharge Piping (54" Dia; 150 L.F.)				147,800
	Energy Dissipation				120,000
W-6	Pumps	4	each	$330,000	1,320,000
	Discharge Piping (54" Dia; 150 L.F.)				197,100
	Energy Dissipation				150,000
W-7	Pumps	2	each	$192,500	385,000
	Discharge Piping (42" Dia; 150 L.F.)				61,600
	Energy Dissipation				90,000
W-8	Pumps	4	each	$192,500	770,000
	Discharge Piping (42" Dia; 150 L.F.)				123,200
	Energy Dissipation				150,000
W-9	Pumps	3	each	$330,000	990,000
	Discharge Piping (54" Dia; 150 L.F.)				147,800
	Energy Dissipation				120,000
W-10	Pumps	3	each	$330,000	990,000
	Discharge Piping (54" Dia; 150 L.F.)				147,800
	Energy Dissipation				120,000
Electrical		34	each	$242,100	8,231,400
		Current Contract Cost, Oct 07			**$26,763,616**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO.	2	OF	57
	PREPARED Joseph H. Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 3- Pumping Stations***	BASIS of ESTIMATE:	by L.O. project delv'd. team		
Bellfountaine- Elevation 20	FILE NAME bellfountaine Lod3 Ring Levee Pumping Stations.xls			

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BF-1 thru BF-7					
Structural Concrete, complete all sites		3,151	cy	$450.00	$1,417,950
Form Work, complete all sites		77,358	sf	6.50	502,827
Steel Reinforcement, complete all sites		193	tons	925.00	178,525
Excavation		4,653	cy	15.00	69,795
Backfill		3,244	cy	5.00	16,220
Trash Screens and Miscellaneous metal items, All Sites		23	each	100,000	2,300,000
Pumps by Installation					
BF-1	Pumps	3	each	203,500	610,500
	Discharge Piping (150 L.F. ; D=60")		Job		225,000
	Energy Dissipation		Job		120,000
BF-2	Pumps	3	each	240,350	721,050
	Discharge Piping (150 L.F. ; D=42")		Job		225,000
	Energy Dissipation		Job		120,000
BF-3	Pumps	2	each	240,350	480,700
	Discharge Piping (150 L.F. ; D=42")		Job		150,000
	Energy Dissipation		Job		90,000
BF-4	Pumps	4	each	120,175	480,700
	Discharge Piping (150 L.F. ; D=60")		Job		300,000
	Energy Dissipation		Job		150,000
BF-5	Pumps	3	each	160,233	721050
	Discharge Piping (150 L.F. ; D=42")		Job		225,000
	Energy Dissipation		Job		120,000
BF-6	Pumps	4	each	398,200	1592800
	Discharge Piping (150 L.F. ; D=54")		Job		300,000
	Energy Dissipation		Job		150,000
BF-7	Pumps	4	each	398,200	1,592,800
	Discharge Piping (150 L.F. ; D=54")		Job		300,000
	Energy Dissipation		Job		150,000
Electrical		23	Job	242,100	5,568,300
		Current Contract Cost, Oct 07			**$16,878,217**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 3 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM **_Line of Defense 3- Pumping Stations_** BASIS of ESTIMATE: by L.O. project delv'd. team
Bellfontaine- Elevation 30 FILE NAME Bellfontaine Lod3 Ring Levee Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BF-1 thru BF-7					
Structural Concrete, complete all sites		2,558	cy	$450.00	$1,151,100
Form Work, complete all sites		63,943	sf	6.50	415,630
Steel Reinforcement, complete all sites		157	tons	925.00	145,225
Excavation		3,376	cy	15.00	50,640
Backfill		2,425	cy	5.00	12,125
Trash Screens and Miscellaneous metal items, All Sites		21	each	100,000	2,100,000
Pumps by Installation Site					
BF-1	Pumps	3	each	203,500	610,500
	Discharge Piping (250 L.F. ; D=42")		Job		375,000
	Energy Dissipation		Job		120,000
BF-2	Pumps	3	each	240,350	721,050
	Discharge Piping (250 L.F. ; D=42")		Job		375,000
	Energy Dissipation		Job		120,000
BF-3	Pumps	2	each	240,350	480,700
	Discharge Piping (250 L.F. ; D=42")		Job		250,000
	Energy Dissipation		Job		90,000
BF-4	Pumps	2	each	240,350	480,700
	Discharge Piping (250 L.F. ; D=42")		Job		250,000
	Energy Dissipation		Job		90,000
BF-5	Pumps	3	each	240,350	721,050
	Discharge Piping (250 L.F. ; D=42")		Job		375,000
	Energy Dissipation		Job		120,000
BF-6	Pumps	4	each	398,200	1,592,800
	Discharge Piping (250 L.F. ; D=54")		Job		500,000
	Energy Dissipation		Job		150,000
BF-7	Pumps	4	each	398,200	1,592,800
	Discharge Piping (250 L.F. ; D=54")		Job		500,000
	Energy Dissipation		Job		150,000
Electrical		21	Job	242,100	5,084,100
		Current Contract Cost, Oct 07			**$18,623,420**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 4	OF	57
	PREPARED Joseph H. Ellsworth	CHECKED:	Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations Gautier- Elevation 20***	BASIS of ESTIMATE: by L.O. project delv'd. team		
	FILE NAME Gautier Lod3 Ring Levee Pumping Stations.xls		

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations G-1 thru G-8 (11 Sites Total)					
Structural Concrete, complete all sites		6,860	cy	$450	$3,086,794
Form Work, complete all sites		165,560	sf	$6.50	1,076,141
Steel Reinforcement, complete all sites		418	tons	$925	386,633
Excavation		10,173	cy	$15	152,599
Backfill		6,805	cy	$5	34,025
Discharge Piping and Energy Dissipation (150L.F. + Stilling Str.)		47	each		
Trash Screens and Miscellaneous metal items, All Sites		47	each	100,000	4,700,000
Pumps by Installation					
G-1	Pumps	6	each	440,000	2,640,000
	Discharge Piping (150 L.F. ; D=60")		Job		377,000
	Energy Dissipation		Job		210,000
G-2	Pumps	6	each	440,000	2,640,000
	Discharge Piping (150 L.F. ; D=60")		Job		377,000
	Energy Dissipation		Job		60,000
G-3a	Pumps	3	each	222,200	666,600
	Discharge Piping (150 L.F. ; D=42")		Job		92,400
	Energy Dissipation		Job		30,000
G-3f	Pumps	4	each	440,000	1,760,000
	Discharge Piping (150 L.F. ; D=60")		Job		251,300
	Energy Dissipation		Job		40,000
G-4a	Pumps	6	each	440,000	2640000
	Discharge Piping (150 L.F. ; D=60")		Job		377,000
	Energy Dissipation		Job		60,000
G-5	Pumps	4	each	440,000	140800
	Discharge Piping (150 L.F. ; D=54")		Job		165,100
	Energy Dissipation		Job		40,000
G-6	Pumps	4	each	35,200	1,760,000
	Discharge Piping (150 L.F. ; D=60")		Job		251,300
	Energy Dissipation		Job		40,000
G-7	Pumps	4	each	440,000	1,408,000
	Discharge Piping (150 L.F. ; D=54")		Job		197,100
	Energy Dissipation		Job		40,000
G-8a	Pumps	4	each	352,000	888,800
	Discharge Piping (150 L.F. ; D=42")		Job		123,200
	Energy Dissipation		Job		40,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 5 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations***
Gautier- Elevation 20
BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME Gautier Lod3 Ring Levee Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
G-8c	Pumps	2	each	222,200	407000
	Discharge Piping (150 L.F. ; D=42")		Job		61,600
	Energy Dissipation		Job		20000
G-9	Pumps	4	each	203,500	1,408,000
	Discharge Piping (150 L.F. ; D=54")		Job		197,100
	Energy Dissipation		Job		40,000
Electrical		47	Job	242,100	11,378,700
		Current Contract Cost, Oct 07			**$40,264,191**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 6 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations***
Gautier- Elevation 30
BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME Gautier Lod3 Ring Levee Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations G-1 thru G-8 (11 Sites Total)					
Structural Concrete, complete all sites		6,268	cy	$450	$2,820,735
Form Work, complete all sites		154,233	sf	$6.50	1,002,512
Steel Reinforcement, complete all sites		383	tons	$925	354,134
Excavation		9,820	cy	$15	147,295
Backfill		7,055	cy	$5	35,277
Discharge Piping and Energy Dissipation		41	each		
Trash Screens and Miscellaneous metal items, All Sites		41	each	$100,000	4,100,000
Pumps by Installation Site					
G-1	Pumps	6	each	$467,500	2,805,000
	Discharge Piping (250 L.F. ; D=60")		Job		531,200
	Energy Dissipation		Job		210,000
G-2	Pumps	6	each	$467,500	2,805,000
	Discharge Piping (250 L.F. ; D=60")		Job		531,200
	Energy Dissipation		Job		210,000
G-3a	Pumps	3	each	$240,350	721,050
	Discharge Piping (250 L.F. ; D=42")		Job		130,200
	Energy Dissipation		Job		120,000
G-3f	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (250 L.F. ; D=60")		Job		354,100
	Energy Dissipation		Job		150,000
G-4a	Pumps	6	each	$311,667	2,805,000
	Discharge Piping (250 L.F. ; D=60")		Job		531,200
	Energy Dissipation		Job		210,000
G-5	Pumps	4	each	$701,250	1,592,800
	Discharge Piping (250 L.F. ; D=54")		Job		277,800
	Energy Dissipation		Job		150,000
G-6	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (250 L.F. ; D=60")		Job		354,100
	Energy Dissipation		Job		150,000
G-7	Pumps	4	each	$398,200	1,592,800
	Discharge Piping (250 L.F. ; D=54")		Job		277,800
	Energy Dissipation		Job		150,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 7 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Gautier- Elevation 30 FILE NAME Gautier Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
G-8a	Pumps	4	each	$467,500	961,400
	Discharge Piping (250 L.F. ; D=42")		Job		173,600
	Energy Dissipation		Job		150,000
G-8c	Pumps	2	each	$796,400	774,400
	Discharge Piping (250 L.F. ; D=42")		Job		86,800
	Energy Dissipation		Job		90,000
G-9	Pumps	4	each	$240,350	1,592,800
	Discharge Piping (250 L.F. ; D=60")		Job		354,100
	Energy Dissipation		Job		150,000
Electrical		41	Job	$242,100	9,926,100
		Current Contract Cost, Oct 07			**$43,118,404**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 8 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Cary A. Payton
WORK ITEM: ***Line of Defense 3 - Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Gulf Park Estates - Elevation 20 FILE NAME Hancock Lod3 Inland Barrier Vehicle Gates.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations GP-1 thru GP-8					
Structural Concrete, complete all sites		3,441	cy	$450	$1,548,413
Form Work, complete all sites		84,868	sf	$6.50	551,640
Steel Reinforcement, complete all sites		210	tons	$925	194,636
Excavation		5,005	cy	$15	75,082
Backfill		3,401	cy	$5	17,007
Trash Screens and Miscellaneous metal items, All Sites		24	each	$100,000	2,400,000
Pumps by Installation Site					
GP-1	Pumps	3	each	$222,200	666,600
	Discharge Piping (42" Dia; 150 L.F.)		job		87,000
	Energy Dissipation		job		120,000
GP-2	Pumps	4	each	$352,000	1,408,000
	Discharge Piping (54" Dia; 150 L.F.)		job		197,100
	Energy Dissipation		job		150,000
GP-3	Pumps	4	each	$440,000	1,760,000
	Discharge Piping (42" Dia; 150 L.F.)		job		240,000
	Energy Dissipation		job		150,000
GP-4	Pumps	3	each	$222,200	666,600
	Discharge Piping (42" Dia; 130 L.F.)		job		77,400
	Energy Dissipation		job		120,000
GP-5	Pumps	4	each	$352,000	1,408,000
	Discharge Piping (54" Dia; 140 L.F.)		job		180,500
	Energy Dissipation		job		150,000
GP-6	Pumps	4	each	$440,000	1,760,000
	Discharge Piping (60" Dia; 150 L.F.)		job		240,000
	Energy Dissipation		job		150,000
GP-7	Pumps	1	each	$385,000	385,000
	Discharge Piping (42" Dia; 125 L.F.)		job		24,000
	Energy Dissipation		job		60,000
GP-8	Pumps	1	each	$385,000	385,000
	Discharge Piping (42" Dia; 150 L.F.)		job		29,000
	Energy Dissipation		job		60,000
Electrical		24	Job	$242,100	5,810,400
		Current Contract Cost, Oct 07			**$21,071,378**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 9 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3 - Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Gulf Park Estates - Elevation 30 FILE NAME GulfPkEst Lod3 Ring Levee Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations GP-1 thru GP-8					
Structural Concrete, complete all sites		3,441	cy	$450	$1,548,413
Form Work, complete all sites		84,868	sf	$6.50	551,640
Steel Reinforcement, complete all sites		210	tons	$925	194,636
Excavation		5,005	cy	$15	75,082
Backfill		3,401	cy	$5	17,007
Trash Screens and Miscellaneous metal items, All Sites		65	each	$100,000	6,500,000
Pumps by Installation Site					
GP-1	Pumps	3	each	$240,350	721,050
	Discharge Piping (42" Dia; 150 L.F.)		job		87,000
	Energy Dissipation		job		120,000
GP-2	Pumps	4	each	$398,200	1,592,800
	Discharge Piping (54" Dia; 150 L.F.)		job		197,100
	Energy Dissipation		job		150,000
GP-3	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (42" Dia; 150 L.F.)		job		240,000
	Energy Dissipation		job		150,000
GP-4	Pumps	3	each	$240,350	721,050
	Discharge Piping (42" Dia; 130 L.F.)		job		77,400
	Energy Dissipation		job		120,000
GP-5	Pumps	4	each	$398,200	1,592,800
	Discharge Piping (54" Dia; 140 L.F.)		job		180,500
	Energy Dissipation		job		150,000
GP-6	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (60" Dia; 150 L.F.)		job		240,000
	Energy Dissipation		job		150,000
GP-7	Pumps	1	each	$203,500	203,500
	Discharge Piping (42" Dia; 125 L.F.)		job		24,000
	Energy Dissipation		job		60,000
GP-8	Pumps	1	each	$203,500	203,500
	Discharge Piping (42" Dia; 150 L.F.)		job		29,000
	Energy Dissipation		job		60,000
Electrical		65	Job	$242,100	15,736,500
		Current Contract Cost, Oct 07			**$35,432,978**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 10 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4 - Hancock County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 20 FILE NAME Hancock County Lod4 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pump Stations HC-1 thru HC-3					
Structural Concrete, complete all sites		618	cy	450	278,142
Form Work, complete all sites		14,777	sf	6.50	96,047
Steel Reinforcement, complete all sites		38	tons	925	34,869
Excavation		1,075	cy	15	16,130
Backfill		721	cy	5	3,603
Trash Screens and Miscellaneous metal items, All Sites		10	each	100,000	1,000,000
Pumps by Installation Site					
HC-1	Pump	4	each	440,000	$1,760,000
	Discharge Piping (130 L.F.; D=60")		job		210,500
	Energy Dissipation		job		150,000
HC-2	Pump	4	each	352,000	$1,408,000
	Discharge Piping (120 L.F.; D=54")		job		148,500
	Energy Dissipation		job		150,000
HC-3	Pump	2	each	203,500	$407,000
	Discharge Piping (65 L.F.; D=42")		job		26,000
	Energy Dissipation		job		90,000
Electrical		10	Job	242,100	2,421,000
			Current Contract Cost, Oct 07		**$8,199,791**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 11 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4 - Hancock County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 30 FILE NAME HancockCounty Lod4 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations HC-1 thru HC-3					
Structural Concrete, complete all sites		4,042	cy	450	1,818,963
Form Work, complete all sites		90,309	sf	6.50	587,007
Steel Reinforcement, complete all sites		245	tons	925	226,794
Excavation		11,697	cy	15	175,461
Backfill		7,404	cy	5	37,022
Trash Screens and Miscellaneous metal items, All Sites		10	each	100,000	1,000,000
Pumps by Installation Site					
HC-1	Pump	4	each	467,500	1,870,000
	Discharge Piping (190L.F.; D=60")		job		313,300
	Energy Dissipation		job		150,000
HC-2	Pump	4	each	398,200	1,592,800
	Discharge Piping (180 L.F.; D=54")		job		229,100
	Energy Dissipation		job		150,000
HC-3	Pump	2	each	387,200	774,400
	Discharge Piping (130 L.F.; D=42")		job		51,600
	Energy Dissipation		job		774,400
Electrical		10	Job	242,100	2,421,000
		Current Contract Cost, Oct 07			**$12,171,846**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 12 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4 - Hancock County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 40 FILE NAME Hancock County Lod4 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations HC-1 thru HC-3					
Structural Concrete, complete all sites		3,717	cy	450	1,672,671
Form Work, complete all sites		89,251	sf	6.50	580,133
Steel Reinforcement, complete all sites		227	tons	925	209,771
Excavation		6,237	cy	15	93,554
Backfill		4,251	cy	5	21,255
Trash Screens and Miscellaneous metal items, All Sites		12	each	100,000	1,200,000
Pumps by Installation Site					
HC-1	Pump	6	each	451,000	2706000
	Discharge Piping (255 L.F.; D=54")		job		489,600
	Energy Dissipation		job		210,000
HC-2	Pump	4	each	451,000	1804000
	Discharge Piping (240L.F.; D=54")		job		309,800
	Energy Dissipation		job		150,000
HC-3	Pump	2	each	387,200	774400
	Discharge Piping (190 L.F.; D=42")		job		76,800
	Energy Dissipation		job		90,000
Electrical		12	Job	242,100	2,905,200
		Current Contract Cost, Oct 07			**$13,293,184**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 13 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - HarrisonCounty*** BASIS of ESTIMATE: by L.O. project delv'd. team
Elevated Roadway - Elevation 16 FILE NAME Harrison County Lod3 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations H3-1 thru H3-15					
Structural Concrete, complete all sites		5,054	cy	$450	2,274,204
Form Work, complete all sites		119,999	sf	$6.50	779,995
Steel Reinforcement, complete all sites		310	tons	$925	286,503
Excavation		10,041	cy	$15	150,619
Backfill		13,516	cy	$5	67,581
Trash Screens and Miscellaneous metal items, All Sites		47	each	$100,000	4,700,000
Pumps by Installation Site					
H3-1	Pumps	2	each	$192,500	385,000
	Discharge Piping (130 L.F. ; D=42")		Job		51,600
	Energy Dissipation		Job		90,000
H3-2	Pumps	3	each	$376,200	1,128,600
	Discharge Piping (130 L.F. ; D=54")				123,800
	Energy Dissipation				120,000
H3-3	Pumps	3	each	$376,200	1,128,600
	Discharge Piping (130 L.F. ; D=54")				123,800
	Energy Dissipation				120,000
H3-4	Pumps	2	each	$240,350	480,700
	Discharge Piping (140 L.F. ; D=42")				56,400
	Energy Dissipation				90,000
H3-5	Pumps	3	each	$398,200	1,194,600
	Discharge Piping (150 L.F. ; D=54")				147,800
	Energy Dissipation				120,000
H3-6	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (150 L.F. ; D=60")				251,300
	Energy Dissipation				150,000
H3-7	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (150 L.F. ; D=60")				230,100
	Energy Dissipation				150,000
H3-8	Pumps	4	each	$467,500	1,870,000
	Discharge Piping (150 L.F. ; D=60")				251,300
	Energy Dissipation				150,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 14 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - HarrisonCounty*** BASIS of ESTIMATE: by L.O. project delv'd. team
Elevated Roadway - Elevation 16 FILE NAME Harrison County Lod3 Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
H3-9	Pumps	6	each	$467,500	2,805,000
	Discharge Piping (140 L.F. ; D=60")				345,200
	Energy Dissipation				210,000
H3-10	Pumps	3	each	$376,200	1,128,600
	Discharge Piping (130 L.F. ; D=54")				123,800
	Energy Dissipation				120,000
H3-11	Pumps	3	each	$376,200	1,128,600
	Discharge Piping (130 L.F. ; D=54")				123,800
	Energy Dissipation				120,000
H3-12	Pumps	4	each	$203,500	814,000
	Discharge Piping (130 L.F. ; D=42")				103,200
	Energy Dissipation				150,000
H3-13	Pumps	3	each	$203,500	610,500
	Discharge Piping (130 L.F. ; D=42")				77,400
	Energy Dissipation				120,000
H3-14	Pumps	1	each	$203,500	203,500
	Discharge Piping (130 L.F. ; D=42")				25,800
	Energy Dissipation				60,000
H3-15	Pumps	2	each	$240,350	480,700
	Discharge Piping (150 L.F. ; D=42")				61,600
	Energy Dissipation				90,000
Electrical		47	each	$242,100	11,378,700
		Current Contract Cost, Oct 07			**$40,692,903**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 15 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Harrison County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 40 FILE NAME Harrison County Lod4 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations H4-1 thru H4-7					
Structural Concrete, complete all sites		3,717	cy	$450	1,672,671
Form Work, complete all sites		89,251	sf	6.50	580,133
Steel Reinforcement, complete all sites		227	tons	925	209,771
Excavation		6,237	cy	15	93,554
Backfill		4,251	cy	5	21,255
Trash Screens and Miscellaneous metal items, All Sites		26	each	100,000	2,600,000
Pumps by Installation Site					
H4-1	Pump	4	each	456,500	1,826,000
	Discharge Piping (170L.F.; D=60")		job		270,900
	Energy Dissipation		job		120,000
H4-2	Pump	4	each	376,200	1,504,800
	Discharge Piping (170 L.F.; D=54")		job		212,500
	Energy Dissipation		job		120,000
H4-3	Pump	3	each	352,000	1,056,000
	Discharge Piping (150 L.F.; D=54")		job		147,800
	Energy Dissipation		job		90,000
H4-4	Pump	4	each	660,000	2,640,000
	Discharge Piping (255L.F.; D=60")		job		416,200
	Energy Dissipation		job		120,000
H4-5	Pump	4	each	456,500	1,826,000
	Discharge Piping (180 L.F.; D=60")		job		292,100
	Energy Dissipation		job		120,000
H4-6	Pump	4	each	376,200	1,504,800
	Discharge Piping (170 L.F.; D=54")		job		212,500
	Energy Dissipation		job		120,000
H4-7	Pump	3	each	376,200	1,128,600
	Discharge Piping (170 L.F.; D=54")		job		159,400
	Energy Dissipation		job		90,000
Electrical		26	each	242,100	6,294,600
			Current Contract Cost, Oct 07		**$25,449,584**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 16 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Harrison County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 20 FILE NAME Harrison County Lod4 Pumping Stations.xls
Option "A"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations H4-4 (only)					
Structural Concrete, complete all sites		618	cy	$450.00	278,142
Form Work, complete all sites		14,777	sf	6.50	96,047
Steel Reinforcement, complete all sites		38	tons	925	34,869
Excavation		1,075	cy	15	16,130
Backfill		721	cy	5	3,603
Trash Screens and Miscellaneous metal items, All Sites		4	each	100,000	400,000
Pumps by Installation Site					
H4-4	Pump	4	each	400,000	$1,600,000
	Discharge Piping (130 L.F.; D=60")		job		210,500
	Energy Dissipation		job		120,000
Electrical		4	each	242,100	968,400
			Current Contract Cost, Oct 07		**$3,727,691**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-06
LOCATION: **Mississippi** SHEET NO. 17 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM **Line of Defense 4 - Harrison County** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 30 FILE NAME Harrison County Lod4 Pumping Stations.xls
Option "B"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations H4-1 thru H4-7					
Structural Concrete, complete all sites		4,042	cy	$450.00	1,818,963
Form Work, complete all sites		90,309	sf	6.50	587,007
Steel Reinforcement, complete all sites		245	tons	925	226,794
Excavation		11,697	cy	15	175,461
Backfill		7,404	cy	5	37,022
Trash Screens and Miscellaneous metal items, All Sites		26	each	100,000	2,600,000
Pumps by Installation Site					
H4-1	Pump	4	each	440,000	1,760,000
	Discharge Piping (100L.F.; D=60")		job		168,100
	Energy Dissipation		job		120,000
H4-2	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-3	Pump	3	each	313,500	940,500
	Discharge Piping (90 L.F.; D=54")		job		86,400
	Energy Dissipation		job		90,000
H4-4	Pump	4	each	456,500	1,826,000
	Discharge Piping (190 L.F.; D=60")		job		313,300
	Energy Dissipation		job		120,000
H4-5	Pump	4	each	440,000	1,760,000
	Discharge Piping (120 L.F.; D=60")		job		189,300
	Energy Dissipation		job		120,000
H4-6	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-7	Pump	3	each	330,000	990,000
	Discharge Piping (120 L.F.; D=54")		job		111,400
	Energy Dissipation		job		90,000
Electrical		26	each	242,100	6,294,600
			Current Contract Cost, Oct 07		**$23,566,446**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 18 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 20 FILE NAME Jackson County Lod4 Inland Barrier Pumping Stations.xls
Option "A"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations J-1 and J-2					
Structural Concrete, complete all sites		1,457	cy	$450	$655,544
Form Work, complete all sites		34,623	sf	$6.50	225,050
Steel Reinforcement, complete all sites		89	tons	$925	81,991
Excavation		2,300	cy	$15	34,507
Backfill		1,512	cy	$5	7,558
Trash Screens and Miscellaneous metal items, All Sites		10	each	$100,000	1,000,000
Pumps by Installation Site					
J-1	Pumps	6	each	$440,000	2,640,000
	Discharge Piping (150 L.F.; D=60")		job		377,000
	Energy Dissipation		job		210,000
J-2	Pumps	4	each	$330,000	1,320,000
	Discharge Piping (65 L.F.; D=54")		job		148,500
	Energy Dissipation		job		150,000
Electrical		10	each	$242,100	2,421,000
		Current Contract Cost, Oct 07			**$9,271,149**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 19 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 30 FILE NAME Jackson County Lod4 Inland Barrier Pumping Stations.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations J-1 and J-2				
Structural Concrete, complete all sites	1,457	cy	$450	$655,544
Form Work, complete all sites	34,623	sf	$6.50	225,050
Steel Reinforcement, complete all sites	89	tons	$925	81,991
Excavation	2,300	cy	$15	34,507
Backfill	1,512	cy	$5	7,558
Trash Screens and Miscellaneous metal items, All Sites	10	each	100,000	1,000,000
Pumps by Installation Site				
J-1 Pumps	6	each	467,500	2,805,000
Discharge Piping (217L.F.; D=60")		job		531,200
Energy Dissipation		job		210,000
J-2 Pumps	4	each	376,200	1,504,800
Discharge Piping (180 L.F.; D=54")		job		229,100
Energy Dissipation		job		150,000
Electrical	10	each	242,100	2,421,000
Current Contract Cost, Oct 07				**$9,855,749**

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 20 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 40 FILE NAME Jackson County Lod4 Inland Barrier Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations J-1 and J-2					
Structural Concrete, complete all sites		1,903	cy	$450	$856,506
Form Work, complete all sites		46,408	sf	$6.50	301,651
Steel Reinforcement, complete all sites		116	tons	$925	107,190
Excavation		2,088	cy	$15	31,314
Backfill		1,357	cy	$5	6,783
Trash Screens and Miscellaneous metal items, All Sites		15	each	100,000	1,500,000
Pumps by Installation Site					
J-1	Pumps	8	each	451,000	3,608,000
	Discharge Piping (280 L.F.; D=54")		job		716,800
	Energy Dissipation		job		270,000
J-2	Pumps	7	each	387,200	2,710,400
	Discharge Piping (240L.F.; D=42")		job		338,800
	Energy Dissipation		job		240,000
Electrical		15	each	242,100	3,631,500
		Current Contract Cost, Oct 07			**$14,318,944**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 21 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Elevated Roadway - Elevation 11 FILE NAME Jackson Co Seawall Lod3 Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations J3-1 thru J3-9 (7 stations total)					
Structural Concrete, complete all sites		1,756	cy	$450.00	$790,377
Form Work, complete all sites		42,353	sf	6.50	275,295
Steel Reinforcement, complete all sites		108	tons	925.00	100,212
Excavation		3,455	cy	15.00	51,824
Backfill (From Required Excavation)		2,505	cy	5.00	12,526
Trash Screens and Miscellaneous metal items, All Sites		22	each	100,000	2,200,000
Pumps by Installation Site					
J3-1	Pumps	3	each	192,500	577,500
	Discharge Piping (42" Dia; 75 L.F.)				43,200
	Energy Dissipation				120,000
J3-3	Pumps	3	each	330,000	990,000
	Discharge Piping (54" Dia; 100 L.F.)				93,100
	Energy Dissipation				120,000
J3-4	Pumps	2	each	192,500	385,000
	Discharge Piping (42" Dia; 100 L.F.)				38,800
	Energy Dissipation				90,000
J3-5	Pumps	6	each	192,500	1,155,000
	Discharge Piping (42" Dia; 100 L.F.)				116,400
	Energy Dissipation				210,000
J3-6	Pumps	4	each	192,500	770,000
	Discharge Piping (42" Dia; 90 L.F.)				72,400
	Energy Dissipation				150,000
J3-7	Pumps	2	each	330,000	660,000
	Discharge Piping (54" Dia; 100 L.F.)				62,100
	Energy Dissipation				90,000
J3-9	Pumps	2	each	313,500	627,000
	Discharge Piping (54" Dia; 60 L.F.)				37,800
	Energy Dissipation				90,000
Electrical		22	each	242,100	5,326,200
				Current Contract Cost, Oct 07	**$15,254,735**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 22 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ocean Springs- Elevation 20 FILE NAME OceanSprings Lod3 RingLevee Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations OS-1 thru OS -14					
Structural Concrete, complete all sites		5,615	cy	$450.00	$2,526,969
Form Work, complete all sites		139,413	sf	6.50	906,182
Steel Reinforcement, complete all sites		344	tons	925.00	318,037
Excavation		8,153	cy	15.00	122,290
Backfill		5,810	cy	5.00	29,049
Trash Screens and Miscellaneous metal items, All Sites		40	each	100,000	4,000,000
Pumps by Installation Site					
OS-1	Pumps	2	each	222,200	444,400
	Discharge Piping (130 L.F. ; D=42")				51,600
	Energy Dissipation				90,000
OS-2	Pumps	3	each	352,000	1,056,000
	Discharge Piping (150 L.F. ; D=54")				147,800
	Energy Dissipation				120,000
OS-3	Pumps	4	each	352,000	1,408,000
	Discharge Piping (150 L.F. ; D=54")				197,100
	Energy Dissipation				150,000
OS-4	Pumps	2	each	222,200	444,400
	Discharge Piping (150 L.F. ; D=42")				61,600
	Energy Dissipation				90,000
OS-5	Pumps	4	each	352,000	1,408,000
	Discharge Piping (150 L.F. ; D=54")				197,100
	Energy Dissipation				150,000
OS-6	Pumps	3	each	352,000	1,056,000
	Discharge Piping (150 L.F. ; D=54")				141,000
	Energy Dissipation				120,000
OS-7	Pumps	2	each	352,000	704,000
	Discharge Piping (150 L.F. ; D=54")				98,600
	Energy Dissipation				90,000
OS-8	Pumps	3	each	352,000	1,056,000
	Discharge Piping (150 L.F. ; D=54")				147,800
	Energy Dissipation				120,000
OS-9	Pumps	2	each	352,000	704,000
	Discharge Piping (120 L.F. ; D=54")				74,200
	Energy Dissipation				90,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 23 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ocean Springs- Elevation 20 FILE NAME OceanSprings Lod3 RingLevee Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations OS-1 thru OS -14					
OS-10	Pumps	2	each	192,500	385,000
	Discharge Piping (65 L.F. ; D=42")				26,000
	Energy Dissipation				90,000
OS-11	Pumps	4	each	192,500	770,000
	Discharge Piping (125 L.F. ; D=42")				52,000
	Energy Dissipation				150,000
OS-12	Pumps	4	each	440,000	1,760,000
	Discharge Piping (150 L.F. ; D=60")				251,300
	Energy Dissipation				150,000
OS-13	Pumps	3	each	352,000	1,056,000
	Discharge Piping (140 L.F. ; D=54")				135,400
	Energy Dissipation				120,000
OS-14	Pumps	2	each	192,500	385,000
	Discharge Piping (90 L.F. ; D=42")				36,400
	Energy Dissipation				90,000
Electrical		40	each	242,100	9,684,000
		Current Contract Cost, Oct 07			**$33,461,226**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 24 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ocean Springs- Elevation 30 FILE NAME Jackson County Lod4 Inland Barrier Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations OS-1 thru OS-14					
Structural Concrete, complete all sites		5,555	cy	$450.00	$2,499,806
Form Work, complete all sites		137,982	sf	6.50	896,882
Steel Reinforcement, complete all sites		360	tons	925.00	332,576
Excavation		8,236	cy	15.00	123,536
Backfill		5,884	cy	5.00	29,421
Trash Screens and Miscellaneous metal items, All Sites		40	each	100,000	4,000,000
Pumps by Installation Site					
Pumps by Installation Site					
OS-1	Pumps	2	each	240,350	480,700
	Discharge Piping (190 L.F. ; D=42")				76,800
	Energy Dissipation				90,000
OS-2	Pumps	3	each	398,200	1,194,600
	Discharge Piping (220 L.F. ; D=54")				208,300
	Energy Dissipation				120,000
OS-3	Pumps	4	each	398,200	1,592,800
	Discharge Piping (220 L.F. ; D=54")				277,800
	Energy Dissipation				150,000
OS-4	Pumps	2	each	240,350	480,700
	Discharge Piping (220 L.F. ; D=42")				86,800
	Energy Dissipation				90,000
OS-5	Pumps	4	each	398,200	1,592,800
	Discharge Piping (220 L.F. ; D=54")				277,800
	Energy Dissipation				150,000
OS-6	Pumps	3	each	398,200	1,194,600
	Discharge Piping (210 L.F. ; D=54")				201,900
	Energy Dissipation				120,000
OS-7	Pumps	2	each	398,200	796,400
	Discharge Piping (220 L.F. ; D=54")				138,900
	Energy Dissipation				90,000
OS-8	Pumps	3	each	398,200	1,194,600
	Discharge Piping (220 L.F. ; D=54")				208,300
	Energy Dissipation				120,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 25 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - Jackson County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ocean Springs- Elevation 30 FILE NAME Jackson County Lod4 Inland Barrier Pumping Stations.xls

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations OS-1 thru OS-14					
OS-9	Pumps	2	each	398,200	796,400
	Discharge Piping (180 L.F. ; D=54")				114,600
	Energy Dissipation				90,000
OS-10	Pumps	2	each	222,200	444,400
	Discharge Piping (130 L.F. ; D=42")				51,600
	Energy Dissipation				90,000
OS-11	Pumps	4	each	188,100	752,400
	Discharge Piping (185 L.F. ; D=54")				237,200
	Energy Dissipation				150,000
OS-12	Pumps	4	each	467,500	1,870,000
	Discharge Piping (220 L.F. ; D=60")				354,100
	Energy Dissipation				150,000
OS-13	Pumps	3	each	398,200	1,194,600
	Discharge Piping (200 L.F. ; D=54")				195,800
	Energy Dissipation				120,000
OS-14	Pumps	2	each	222,200	444,400
	Discharge Piping (150 L.F. ; D=42")				61,600
	Energy Dissipation				90,000
Electrical		40	each	242,100	9,684,000
		Current Contract Cost, Oct 07			**$35,707,123**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 26 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM **_Line of Defense 3- Pumping Stations_** BASIS of ESTIMATE: by L.O. project delv'd. team
Pascagoula-MossPoint - Elevation 30 FILE NAME Pascagoula-LossPoint Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations PM-1 thru PM-28				
Structural Concrete, complete all sites	12,908	cy	$450.00	$5,808,808
Form Work, complete all sites	316,185	sf	6.50	2,055,199
Steel Reinforcement, complete all sites	744	tons	925.00	687,899
Excavation	18,513	cy	15.00	277,701
Backfill	12,815	cy	5.00	64,075
Trash Screens and Miscellaneous metal items, All Sites	21	each	100,000.00	2,100,000
Pumps by Site Name				
PM-1 Pumps	9	each	467,500.00	$4,207,500
Discharge Piping (150 L.F. ; D=54")		each	69,440.00	624,960
Energy Dissipation		Job		300,000
PM-2 Pumps	2	each	302,500.00	$605,000
Discharge Piping (150L.F. ; D=54")		Job	69,440.00	138,880
Energy Dissipation		Job		90,000
PM-3 Pumps	1	each	387,200.00	$387,200
Discharge Piping (140 L.F. ; D=42")		Job	40,800.00	40,800
Energy Dissipation		Job		60,000
PM-4 Pumps	2	each	302,500.00	$605,000
Discharge Piping (150 L.F. ; D=42)		Job	43,400.00	86,800
Energy Dissipation		Job		90,000
PM-5 Pumps	1	each	387,200.00	$387,200
Discharge Piping (150 L.F. ; D=54")		Job	69,440.00	69,440
Energy Dissipation		Job		60,000
PM-6 Pumps	1	each	387,200.00	$387,200
Discharge Piping (150 L.F. ; D=42")		Job	43,400.00	43,400
Energy Dissipation		Job		60,000
PM-7 Pumps	2	each	193,600.00	$387,200
Discharge Piping (130 L.F. ; D=42")		Job	38,400.00	76,800
Energy Dissipation		Job		90,000
PM-8 Pumps	4	each	240,350.00	$961,400
Discharge Piping (150 L.F. ; D=42")		Job	43,400.00	173,600
Energy Dissipation		Job		150,000
PM-9 Pumps	7	each	240,350.00	$1,682,450
Discharge Piping (150L.F. ; D=42")		Job	43,400.00	303,800
Energy Dissipation		Job		240,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 27 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Pascagoula-MossPoint - Elevation 30 FILE NAME Pascagoula-LossPoint Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations PM-1 thru PM-28				
PM-10 Pumps	5	each	192,280.00	$961,400
Discharge Piping (150 L.F. ; D=54")		Job	69,440.00	347,200
Energy Dissipation		Job		180,000
PM-11 Pumps	2	each	376,200.00	$752,400
Discharge Piping (150 L.F. ; D=54)		Job	69,440.00	138,880
Energy Dissipation		Job		90,000
PM-12 Pumps	2	each	398,200.00	$796,400
Discharge Piping (150 L.F. ; D=54")		Job	69,440.00	138,880
Energy Dissipation		Job		90,000
PM-13 Pumps	2	each	398,200.00	$796,400
Discharge Piping (150 L.F. ; D=54")		Job	69,440.00	138,880
Energy Dissipation		Job		90,000
PM-14 Pumps	1	each	203,500.00	$203,500
Discharge Piping (125 L.F. ; D=42")		Job	34,500.00	34,500
Energy Dissipation		Job		60,000
PM-15 Pumps	5	each	238,920.00	$1,194,600
Discharge Piping (140 L.F. ; D=54")		Job	65,280.00	326,400
Energy Dissipation		Job		180,000
PM-16 Pumps	2	each	302,500.00	$605,000
Discharge Piping (150L.F. ; D=42")		Job	43,400.00	86,800
Energy Dissipation		Job		90,000
PM-17 Pumps	1	each	961,400.00	$961,400
Discharge Piping (135L.F. ; D=42")		Job	39,600.00	39,600
Energy Dissipation		Job		60,000
PM-18 Pumps	5	each	374,000.00	$1,870,000
Discharge Piping (145 L.F. ; D=42)		Job	42,100.00	210,500
Energy Dissipation		Job		180,000
PM-19 Pumps	5	each	192,280.00	$961,400
Discharge Piping (150 L.F. ; D=42")		Job	43,400.00	217,000
Energy Dissipation		Job		180,000
PM-20 Pumps	4	each	240,350.00	$961,400
Discharge Piping (150 L.F. ; D=42")		Job	43,400.00	173,600
Energy Dissipation		Job		150,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 28 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Pascagoula-MossPoint - Elevation 30 FILE NAME Pascagoula-LossPoint Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations PM-1 thru PM-28					
PM-21	Pumps	3	each	398,200.00	$1,194,600
	Discharge Piping (150 L.F. ; D=54")		Job	69440	208,320
	Energy Dissipation		Job		120,000
PM-22	Pumps	10	each	119,460.00	1,194,600
	Discharge Piping (150 L.F. ; D=54")		Job	69,440.00	694,400
	Energy Dissipation		Job		330,000
PM-23	Pumps	4	each	467,500.00	1,870,000
	Discharge Piping (150L.F. ; D=42")		Job	43,400.00	173,600
	Energy Dissipation		Job		150,000
PM-24	Pumps	5	each	238,920.00	1,194,600
	Discharge Piping (105 L.F. ; D=54")		Job	53,120.00	265,600
	Energy Dissipation		Job		180,000
PM-25	Pumps	5	each	238,920.00	1,194,600
	Discharge Piping (150 L.F. ; D=54)		Job	69,440.00	347,200
	Energy Dissipation		Job		180,000
PM-26	Pumps	3	each	623,333.33	1,870,000
	Discharge Piping (150 L.F. ; D=54")		Job	69,440.00	208,320
	Energy Dissipation		Job		120,000
PM-27	Pumps	2	each	480,700.00	961,400
	Discharge Piping (150 L.F. ; D=42")		Job	43,400.00	86,800
	Energy Dissipation		Job		90,000
PM-28	Pumps	2	each	597,300.00	1,194,600
	Discharge Piping (150 L.F. ; D=54")		Job	69440	138,880
	Energy Dissipation		Job		90,000
Electrical		21	each	242,100	5,084,100
		Current Contract Cost, Oct 07			**$55,710,072**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 29 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Pascagoula-MossPoint - Elevation 20 FILE NAME Pascagoula-MossPoint Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations PM-1 thru PM-28				
Structural Concrete, complete all sites	13,456	cy	$450.00	$6,055,421
Form Work, complete all sites	330,110	sf	6.50	2,145,717
Steel Reinforcement, complete all sites	752	tons	925.00	695,945
Excavation	18,134	cy	15.00	272,014
Backfill	12,560	cy	5.00	62,800
Trash Screens and Miscellaneous metal items, All Sites	23	each	100,000.00	2,300,000
Pumps by Site Name				
PM-1 Pumps	9	each	352,000	3,168,000
Discharge Piping (150 L.F. ; D=54")		each	49,280	443,520
Energy Dissipation		Job		300,000
PM-2 Pumps	2	each	352,000	704,000
Discharge Piping (150L.F. ; D=54")		Job	49,280	98,560
Energy Dissipation		Job		30,000
PM-3 Pumps	1	each	203,500	203,500
Discharge Piping (140 L.F. ; D=42")		Job	28,200	28,200
Energy Dissipation		Job		20,000
PM-4 Pumps	2	each	222,200	444,400
Discharge Piping (150 L.F. ; D=42)		Job	30,800	61,600
Energy Dissipation		Job		40,000
PM-5 Pumps	4	each	352,000	1,408,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	197,120
Energy Dissipation		Job		30,000
PM-6 Pumps	1	each	203,500	203,500
Discharge Piping (150 L.F. ; D=42")		Job	30,800	30,800
Energy Dissipation		Job		40,000
PM-7 Pumps	2	each	192,500	385,000
Discharge Piping (130 L.F. ; D=42")		Job	25,800	51,600
Energy Dissipation		Job		40,000
PM-8 Pumps	4	each	222,200	888,800
Discharge Piping (150 L.F. ; D=42")		Job	30,800	123,200
Energy Dissipation		Job		30,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 30	OF	57
	PREPARED Joseph H. Ellsworth	CHECKED:	Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations***	BASIS of ESTIMATE:	by L.O. project delv'd. team	
Pascagoula-MossPoint - Elevation 20	FILE NAME Pascagoula-MossPoint Lod3 Ring Levee Pumping Stations.xls		

Pumping Stations PM-1 thru PM-28

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
PM-9 Pumps	7	each	222,200	$1,555,400
Discharge Piping (150L.F. ; D=42")		Job	30,800	215,600
Energy Dissipation		Job		30,000
PM-10 Pumps	3	each	352,000	1,056,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	147,840
Energy Dissipation		Job		20,000
PM-11 Pumps	2	each	352,000	704,000
Discharge Piping (150 L.F. ; D=54)		Job	49,280	98,560
Energy Dissipation		Job		40,000
PM-12 Pumps	2	each	352,000	704,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	98,560
Energy Dissipation		Job		30,000
PM-13 Pumps	2	each	352,000	704,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	98,560
Energy Dissipation		Job		40,000
PM-14 Pumps	1	each	203,500	203,500
Discharge Piping (125 L.F. ; D=42")		Job	24,500	24,500
Energy Dissipation		Job		40,000
PM-15 Pumps	5	each	352,000	1,760,000
Discharge Piping (140 L.F. ; D=54")		Job	45,120	225,600
Energy Dissipation		Job		30,000
PM-16 Pumps	4	each	222,200	888,800
Discharge Piping (150L.F. ; D=42")		Job	30,800	123,200
Energy Dissipation		Job		30,000
PM-17 Pumps	1	each	192,500	192,500
Discharge Piping (135L.F. ; D=42")		Job	27,000	27,000
Energy Dissipation		Job		20,000
PM-18 Pumps	10	each	222,200	2,222,000
Discharge Piping (145 L.F. ; D=42)		Job	29,500	295,000
Energy Dissipation		Job		40,000
PM-19 Pumps	5	each	222,200	1,111,000
Discharge Piping (150 L.F. ; D=42")		Job	30,800	154,000
Energy Dissipation		Job		30,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 31 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Pascagoula-MossPoint - Elevation 20 FILE NAME Pascagoula-MossPoint Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations PM-1 thru PM-28				
PM-20 Pumps	8	each	203,500	$1,628,000
Discharge Piping (150 L.F. ; D=42")		Job	30,800	246,400
Energy Dissipation		Job		40,000
PM-21 Pumps	3	each	352,000	1,056,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	147,840
Energy Dissipation		Job		40,000
PM-22 Pumps	10	each	352,000	3,520,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	492,800
Energy Dissipation		Job		30,000
PM-23 Pumps	8	each	222,200	1,777,600
Discharge Piping (150L.F. ; D=42")		Job	30,800	246,400
Energy Dissipation		Job		30,000
PM-24 Pumps	5	each	330,000	1,650,000
Discharge Piping (105 L.F. ; D=54")		Job	32,960	164,800
Energy Dissipation		Job		20,000
PM-25 Pumps	5	each	352,000	1,760,000
Discharge Piping (150 L.F. ; D=54)		Job	49,280	246,400
Energy Dissipation		Job		40,000
PM-26 Pumps	4	each	352,000	1,408,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	197,120
Energy Dissipation		Job		30,000
PM-27 Pumps	2	each	222,200	444,400
Discharge Piping (150 L.F. ; D=42")		Job	30,800	61,600
Energy Dissipation		Job		40,000
PM-28 Pumps	2	each	352,000	704,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280	98,560
Energy Dissipation		Job		40,000
Electrical	23	each	242,100	5,568,300
	Current Contract Cost, Oct 07			**$55,189,536**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 32 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - Hancock County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Pearlington- Elevation 20 FILE NAME Pearlington Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations P-1 thru P-6					
Structural Concrete, complete all sites		2,945	cy	$450.00	$1,325,119
Form Work, complete all sites		72,044	sf	6.50	468,284
Steel Reinforcement, complete all sites		180	tons	925.00	166,284
Excavation		4,205	cy	15.00	63,070
Backfill		2,872	cy	5.00	14,361
Trash Screens and Miscellaneous metal items, All Sites		20	each	100,000	2,000,000
Pumps by Installation Site					
P-1	Pumps	4	each	352,000	1,408,000
	Discharge Piping (54" Dia; 150 L.F.)				197,100
	Energy Dissipation				150,000
P-2	Pumps	3	each	352,000	1,056,000
	Discharge Piping (54" Dia; 150 L.F.)				147,800
	Energy Dissipation				120,000
P-3	Pumps	8	each	440,000	3,520,000
	Discharge Piping (60" Dia; 150 L.F.)				502,700
	Energy Dissipation				270,000
P-4	Pumps	2	each	222,200	444,400
	Discharge Piping (42" Dia; 150 L.F.)				61,600
	Energy Dissipation				90,000
P-5	Pumps	2	each	222,200	444,400
	Discharge Piping (42" Dia; 150 L.F.)				61,600
	Energy Dissipation				90,000
P-6	Pumps	1	each	222,200	222,200
	Discharge Piping (42" Dia; 150 L.F.)				30,800
	Energy Dissipation				60,000
Electrical		20	each	242,100	4,842,000
		Current Contract Cost, Oct 07			**$17,755,717**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 33 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3 - Hancock County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Pearlington- Elevation 30 FILE NAME Pearlington Lod3 Ring Levee Pumping Stations.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations P-1 thru P-6					
Structural Concrete, complete all sites		2,945	cy	$450.00	$1,325,119
Form Work, complete all sites		72,044	sf	6.50	468,284
Steel Reinforcement, complete all sites		180	tons	925.00	166,284
Excavation		4,205	cy	15.00	63,070
Backfill		2,872	cy	5.00	14,361
Trash Screens and Miscellaneous metal items, All Sites		20	each	100,000	2,000,000
Pumps by Installation Site					
P-1	Pumps	4	each	398,200	1,592,800
	Discharge Piping (54 Dia; 150 L.F.)				277,800
	Energy Dissipation				150,000
P-2	Pumps	3	each	398,200	1,194,600
	Discharge Piping (54" Dia; 150 L.F.)				208,300
	Energy Dissipation				120,000
P-3	Pumps	8	each	467,500	3,740,000
	Discharge Piping (60" Dia; 150 L.F.)				708,300
	Energy Dissipation				270,000
P-4	Pumps	2	each	240,350	480,700
	Discharge Piping (42" Dia; 130 L.F.)				86,800
	Energy Dissipation				90,000
P-5	Pumps	2	each	240,350	480,700
	Discharge Piping (42" Dia; 140 L.F.)				86,800
	Energy Dissipation				90,000
P-6	Pumps	1	each	240,350	240,350
	Discharge Piping (42" Dia; 150 L.F.)				43,400
	Energy Dissipation				60,000
Electrical		20	each	242,100	4,842,000
		Current Contract Cost, Oct 07			**$18,799,667**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 34 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4 - Harrison County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 20 FILE NAME Harrison County Lod4 Pumping Stations.xls
Option "D"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations H4-4 (only)					
Structural Concrete, complete all sites		618	cy	$450.00	278,142
Form Work, complete all sites		14,777	sf	6.50	96,047
Steel Reinforcement, complete all sites		38	tons	925	34,869
Excavation		1,075	cy	15	16,130
Backfill		721	cy	5	3,603
Trash Screens and Miscellaneous metal items, All Sites		4	each	100,000	400,000
Pumps by Installation Site					
H4-4	Pump	4	each	400,000	$1,600,000
	Discharge Piping (130 L.F.; D=60")		job		210,500
	Energy Dissipation		job		120,000
Electrical		4	each	242,100	968,400
			Current Contract Cost, Oct 07		**$3,727,691**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 35 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4 - Harrison County*** BASIS of ESTIMATE: by L.O. project delv'd. team
Inland Barrier - Elevation 30 FILE NAME Harrison County Lod4 Pumping Stations.xls
Option "E"

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations H4-1 thru H4-7					
Structural Concrete, complete all sites		4,042	cy	$450.00	1,818,963
Form Work, complete all sites		90,309	sf	6.50	587,007
Steel Reinforcement, complete all sites		245	tons	925	226,794
Excavation		11,697	cy	15	175,461
Backfill		7,404	cy	5	37,022
Trash Screens and Miscellaneous metal items, All Sites		26	each	100,000	2,600,000
Pumps by Installation Site					
H4-1	Pump	4	each	440,000	1,760,000
	Discharge Piping (100L.F.; D=60")		job		168,100
	Energy Dissipation		job		120,000
H4-2	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-3	Pump	3	each	313,500	940,500
	Discharge Piping (90 L.F.; D=54")		job		86,400
	Energy Dissipation		job		90,000
H4-4	Pump	4	each	456,500	1,826,000
	Discharge Piping (190 L.F.; D=60")		job		313,300
	Energy Dissipation		job		120,000
H4-5	Pump	4	each	440,000	1,760,000
	Discharge Piping (120 L.F.; D=60")		job		189,300
	Energy Dissipation		job		120,000
H4-6	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-7	Pump	3	each	330,000	990,000
	Discharge Piping (120 L.F.; D=54")		job		111,400
	Energy Dissipation		job		90,000
Electrical		26	each	242,100	6,294,600
		Current Contract Cost, Oct 07			$23,568,446

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 36 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Menge Ave.- Elevation 20 FILE NAME MengeAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement F (8-07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Pumping Stations M-1 and M-2				
Structural Concrete, complete all sites	2,497	cy	$450.00	$202,500
Form Work, complete all sites	58,529	ft2	6.50	380,437
Steel Reinforcement, complete all sites	152	lbs	925.00	140,841
Excavation	3,616	cy	15.00	54,235
Backfill	2,338	cy	5.00	11,689
Trash Screens and Miscellaneous metal items, All Sites	28	each	100,000.00	2,800,000
Pumps by Site Name				
M-1 Pumps	11	each	222200	$2,444,200
Discharge Piping (150 L.F. ; D=42")		each	28200	310,200
Energy Dissipation		Job		360,000.00
M-2 Pumps	13	each	280500	$3,646,500
Discharge Piping (150L.F. : D=48")		Job	35250	458,250
Energy Dissipation		Job		30,000
H4-4 Pump	4	each	400,000	$1,600,000
Discharge Piping (130 L.F.; D=60")		job		210,500
Energy Dissipation		job		120,000
Electrical	28	each	242100	6,778,800
	Current Contract Cost, Oct 07			$19,548,152

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 37 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
MengeAve.- Elevation 30 FILE NAME MengeAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement G (8-07)

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Pumping Stations M-1 nd M-2					
Structural Concrete, complete all sites		6,307	cy	$450.00	$2,838,183
Form Work, complete all sites		144,481	ft2	6.50	939,127
Steel Reinforcement, complete all sites		383	lbs	925.00	354,411
Excavation		14,238	cy	15.00	213,567
Backfill		9,022	cy	5.00	45,108
Trash Screens and Miscellaneous metal items, All Sites		50	each	100,000.00	5,000,000
Pumps by Site Name					
	M-1 Pumps	11	each	240,350.00	$2,643,850
	Discharge Piping (150 L.F. ; D=42")		each	40,800.00	$448,800
	Energy Dissipation		Job		$360,000
	M-2 Pumps	13	each	302,500.00	$3,932,500
	Discharge Piping (150L.F. ; D=48")		Job	51,000.00	$663,000
	Energy Dissipation		Job		$420,000
H4-1	Pump	4	each	440,000	1,760,000
	Discharge Piping (100L.F.; D=60")		job		168,100
	Energy Dissipation		job		120,000
H4-2	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-3	Pump	3	each	313,500	940,500
	Discharge Piping (90 L.F.; D=54")		job		86,400
	Energy Dissipation		job		90,000
H4-4	Pump	4	each	456,500	1,826,000
	Discharge Piping (190 L.F.; D=60")		job		313,300
	Energy Dissipation		job		120,000
H4-5	Pump	4	each	440,000	1,760,000
	Discharge Piping (120 L.F.; D=60")		job		189,300
	Energy Dissipation		job		120,000
H4-6	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-7	Pump	3	each	330,000	990,000
	Discharge Piping (120 L.F.; D=54")		job		111,400
	Energy Dissipation		job		90,000
Electrical		50	each	242,100	$12,105,000
		Current Contract Cost, Oct 07			$41,792,146

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 38 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 4- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
MengeAve.- Elevation 40 FILE NAME MengeAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement H(8-07)

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Pumping Stations M-1 thru M-7					
Structural Concrete, complete all sites		6,169	cy	$450.00	$2,776,119
Form Work, complete all sites		146,574	ft2	6.50	952,730
Steel Reinforcement, complete all sites		377	lbs	925.00	348,896
Excavation		10,542	cy	15.00	158,136
Backfill		7,177	cy	5.00	35,884
Trash Screens and Miscellaneous metal items, All Sites		59	each	100,000.00	5,900,000
Pumps by Site Name					
M-1 Pumps		10	each	409,200.00	$4,092,000
	Discharge Piping (150 L.F. ; D=48")		each	67,000.00	$670,000
	Energy Dissipation		Job		$330,000
M-2 Pumps		13	each	409,200.00	$5,319,600
	Discharge Piping (150L.F. ; D=48")		Job	67,000.00	$871,000
	Energy Dissipation		Job		$420,000
M-3 Pumps		2	each	187,000.00	$374,000
	Discharge Piping (140 L.F. ; D=36")		Job	28,800.00	$57,600
	Energy Dissipation		Job		$90,000
M-4 Pumps		2	each	97,900.00	$195,800
	Discharge Piping (150 L.F. ; D=26")		Job	14,100.00	$28,200
	Energy Dissipation		Job		$90,000
M-5 Pumps		2	each	280,500.00	$561,000
	Discharge Piping (150 L.F. ; D=48")		Job	35,250.00	$70,500
	Energy Dissipation		Job		$90,000
M-6 Pumps		2	each	154,000.00	$308,000
	Discharge Piping (150 L.F. ; D=36")		Job	56,000.00	$112,000
	Energy Dissipation		Job		$90,000
M-7 Pumps		2	each	376,200.00	$752,400
	Discharge Piping (150 L.F. ; D=54")		Job	45,120.00	$90,240
	Energy Dissipation		Job		$90,000
H4-1	Pump	4	each	456,500	1,826,000
	Discharge Piping (170L.F.; D=60")		job		270,900
	Energy Dissipation		job		120,000
H4-2	Pump	4	each	376,200	1,504,800
	Discharge Piping (170 L.F.; D=54")		job		212,500
	Energy Dissipation		job		120,000
H4-3	Pump	3	each	352,000	1,056,000
	Discharge Piping (150 L.F.; D=54")		job		147,800
	Energy Dissipation		job		90,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 39 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 4- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
MengeAve.- Elevation 40 FILE NAME MengeAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement H(8-07)

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Pumping Stations M-1 thru M-7					
H4-4	Pump	4	each	660,000	2,640,000
	Discharge Piping (255L.F.; D=60")		job		416,200
	Energy Dissipation		job		120,000
H4-5	Pump	4	each	456,500	1,826,000
	Discharge Piping (180 L.F.; D=60")		job		292,100
	Energy Dissipation		job		120,000
H4-6	Pump	4	each	376,200	1,504,800
	Discharge Piping (170 L.F.; D=54")		job		212,500
	Energy Dissipation		job		120,000
H4-7	Pump	3	each	376,200	1,128,600
	Discharge Piping (170 L.F.; D=54")		job		159,400
	Energy Dissipation		job		90,000
Electrical		59	each	242,100	$14,283,900
		Current Contract Cost, Oct 07			$53,135,605

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 40 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Menge Ave.- Elevation 20 FILE NAME MengeAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement I (8-07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Pumping Stations M-1 and M-2				
Structural Concrete, complete all sites	2,497	cy	$450.00	$202,500
Form Work, complete all sites	58,529	ft2	6.50	380,437
Steel Reinforcement, complete all sites	152	lbs	925.00	140,841
Excavation	3,616	cy	15.00	54,235
Backfill	2,338	cy	5.00	11,689
Trash Screens and Miscellaneous metal items, All Sites	28	each	100,000.00	2,800,000
Pumps by Site Name				
M-1 Pumps	11	each	222200	$2,444,200
Discharge Piping (150 L.F. ; D=42")		each	28200	310,200
Energy Dissipation		Job		360,000.00
M-2 Pumps	13	each	280500	$3,646,500
Discharge Piping (150L.F. ; D=48")		Job	35250	458,250
Energy Dissipation		Job		30,000
H4-4 Pump	4	each	400,000	$1,600,000
Discharge Piping (130 L.F.; D=60")		job		210,500
Energy Dissipation		job		120,000
Electrical	28	each	242100	6,778,800
	Current Contract Cost, Oct 07			$19,548,152

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 41 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 4- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
MengeAve.- Elevation 30 FILE NAME MengeAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement J (8-07)

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Harrison County Pumping Stations M-1 nd M-2					
Structural Concrete, complete all sites		6,307	cy	$450.00	$2,838,183
Form Work, complete all sites		144,481	ft2	6.50	939,127
Steel Reinforcement, complete all sites		383	lbs	925.00	354,411
Excavation		14,238	cy	15.00	213,567
Backfill		9,022	cy	5.00	45,108
Trash Screens and Miscellaneous metal items, All Sites		50	each	100,000.00	5,000,000
Pumps by Site Name					
M-1	Pumps	11	each	240,350.00	$2,643,850
	Discharge Piping (150 L.F. ; D=42")		each	40,800.00	$448,800
	Energy Dissipation		Job		$360,000
M-2	Pumps	13	each	302,500.00	$3,932,500
	Discharge Piping (150L.F. ; D=48")		Job	51,000.00	$663,000
	Energy Dissipation		Job		$420,000
H4-1	Pump	4	each	440,000	1,760,000
	Discharge Piping (100L.F.; D=60")		job		168,100
	Energy Dissipation		job		120,000
H4-2	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-3	Pump	3	each	313,500	940,500
	Discharge Piping (90 L.F.; D=54")		job		86,400
	Energy Dissipation		job		90,000
H4-4	Pump	4	each	456,500	1,826,000
	Discharge Piping (190 L.F.; D=60")		job		313,300
	Energy Dissipation		job		120,000
H4-5	Pump	4	each	440,000	1,760,000
	Discharge Piping (120 L.F.; D=60")		job		189,300
	Energy Dissipation		job		120,000
H4-6	Pump	4	each	330,000	1,320,000
	Discharge Piping (100 L.F.; D=54")		job		131,800
	Energy Dissipation		job		120,000
H4-7	Pump	3	each	330,000	990,000
	Discharge Piping (120 L.F.; D=54")		job		111,400
	Energy Dissipation		job		90,000
Electrical		50	each	242,100	$12,105,000
		Current Contract Cost, Oct 07			$41,792,146

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 42 OF 57
PREPARED: Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Washington Ave.- Elevation 20 FILE NAME WashingtonAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement 'C'(8-07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Pumping Stations W-1 thru W-6 (with Washington Ave.)				
Structural Concrete, complete all sites	2,951	cy	$450.00	$1,328,133
Form Work, complete all sites	69,582	sf	6.50	452,283
Steel Reinforcement, complete all sites	180	tons	925.00	166,683
Excavation	5,224	cy	15.00	78,356
Backfill	3,524	cy	5.00	17,619
Trash Screens and Miscellaneous metal items, All Sites	26	each	100,000.00	2,600,000
Pumps by Site Name				
W-1 Pumps	3	each	302500	$907,500
Discharge Piping (150 L.F. ; D=48")		each	38500	115,500
Energy Dissipation		Job		120,000.00
W-2 Pumps	5	each	456500	$2,282,500
Discharge Piping (150L.F. ; D=60")		Job	60180	300,900
Energy Dissipation		Job		30,000
W-3 Pumps	3	each	280500	$841,500
Discharge Piping (140 L.F. ; D=48")		Job	38500	115,500
Energy Dissipation		Job		20,000
W-4 Pumps	4	each	376200	$1,504,800
Discharge Piping (150 L.F. ; D=54")		Job	49280	197,120
Energy Dissipation		Job		40,000
W-5 Pumps	4	each	376200	$1,504,800
Discharge Piping (150 L.F. ; D=54")		Job	49280	197,120
Energy Dissipation		Job		30,000
W-6 Pumps	7	each	330000	$2,310,000
Discharge Piping (150 L.F. ; D=54")		Job	32960	230,720
Energy Dissipation		Job		40,000
Electrical	26	each	242100	6,294,600
		Current Contract Cost, Oct 07		$21,725,635

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 43 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Washington Ave.- Elevation 30 FILE NAME WashingtonAveOpt(8-07) Lod4 Pumping Stations.xls
Optional Arrangement 'D'(8-07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Jackson County Pumping Stations W-1 thru W-6 (with Washington Ave.)				
Structural Concrete, complete all sites	3,452	cy	$450.00	$1,553,571
Form Work, complete all sites	83,467	sf	6.50	542,537
Steel Reinforcement, complete all sites	211	tons	925.00	194,746
Excavation	5,227	cy	15.00	78,399
Backfill	3,537	cy	5.00	17,683
Trash Screens and Miscellaneous metal items, All Sites	24	each	100,000.00	2,400,000
Pumps by Site Name				
W-1 Pumps	3	each	302,500.00	$907,500
Discharge Piping (150 L.F. ; D=48")		each	38,500.00	$115,500
Energy Dissipation		Job		$120,000
W-2 Pumps	5	each	561,000.00	$2,805,000
Discharge Piping (150L.F. ; D=60")		Job	60,180.00	$300,900
Energy Dissipation		Job		$180,000
W-3 Pumps	3	each	302,500.00	$907,500
Discharge Piping (140 L.F. ; D=48")		Job	38,500.00	$115,500
Energy Dissipation		Job		$120,000
W-4 Pumps	4	each	398,200.00	$1,592,800
Discharge Piping (150 L.F. ; D=54")		Job	49,280.00	$197,120
Energy Dissipation		Job		$150,000
W-5 Pumps	4	each	451,000.00	$1,804,000
Discharge Piping (150 L.F. ; D=54")		Job	49,280.00	$197,120
Energy Dissipation		Job		$150,000
W-6 Pumps	5	each	456,500.00	$2,282,500
Discharge Piping (150 L.F. ; D=60")		Job	42,024.00	$210,120
Energy Dissipation		Job		$180,000
Electrical	24	each	242,100	$5,810,400
		Current Contract Cost, Oct 07		$22,932,896

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 44 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
MossPoint - Elevation 20 FILE NAME MossPoint(8-07) Lod3 Ring Levee Pumping Stations.xls
Optional Arrangement 'E'(8-07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations MP-1 thru MP-10				
Structural Concrete, complete all sites	2,907	cy	$450.00	$1,308,148
Form Work, complete all sites	70,100	sf	6.50	455,652
Steel Reinforcement, complete all sites	179	tons	925.00	165,312
Excavation	5,267	cy	15.00	79,012
Backfill	3,742	cy	5.00	18,708
Trash Screens and Miscellaneous metal items, All Sites	32	each	100,000.00	3,200,000
Pumps by Site Name				
MP-1 Pumps	3	each	192,500	$577,500
Discharge Piping (150 L.F. ; D=42")		each	18,200	$54,600
Energy Dissipation		Job		$120,000
MP-2 Pumps	2	each	376,200	$752,400
Discharge Piping (150L.F. ; D=54")		Job	49,280	$98,560
Energy Dissipation		Job		$30,000
MP-3 Pumps	4	each	376,200	$1,504,800
Discharge Piping (140 L.F. ; D=54")		Job	49,280	$197,120
Energy Dissipation		Job		$20,000
MP-4 Pumps	7	each	330,000	$2,310,000
Discharge Piping (150 L.F. ; D=54)		Job	32,960	$230,720
Energy Dissipation		Job		$40,000
MP-5 Pumps	2	each	222,200	$444,400
Discharge Piping (150 L.F. ; D=42")		Job	20,600	$41,200
Energy Dissipation		Job		$30,000
MP-6 Pumps	4	each	192,500	$770,000
Discharge Piping (150 L.F. ; D=42")		Job	20,600	$82,400
Energy Dissipation		Job		$40,000
MP-7 Pumps	3	each	280,500	$841,500
Discharge Piping (130 L.F. ; D=48")		Job	29,000	$87,000
Energy Dissipation		Job		$40,000
MP-8 Pumps	2	each	154,000	$308,000
Discharge Piping (150 L.F. ; D=36")		Job	15,450	$30,900
Energy Dissipation		Job		$30,000
PM-9 Pumps	2	each	330,000	$660,000
Discharge Piping (150L.F. ; D=54")		Job	29,120	$58,240
Energy Dissipation		Job		$30,000
MP-10 Pumps	3	each	154,000	$462,000
Discharge Piping (150 L.F. ; D=36")		Job	15,450	$46,350
Energy Dissipation		Job		$20,000
Electrical	32	each	242,100	7,747,200
	Current Contract Cost, Oct 07			$22,931,722

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 45 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
MossPoint - Elevation 30 FILE NAME MossPoint(8-07) Lod3 Ring Levee Pumping Stations.xls
Optional Arrangement 'F' (8-07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations PM-1 thru PM-10				
Structural Concrete, complete all sites	3,400	cy	$450.00	$1,530,208
Form Work, complete all sites	84,293	sf	6.50	547,901
Steel Reinforcement, complete all sites	209	tons	925.00	192,952
Excavation	5,059	cy	15.00	75,879
Backfill	3,617	cy	5.00	18,087
Trash Screens and Miscellaneous metal items, All Sites	29	each	100,000.00	2,900,000
Pumps by Site Name				
MP-1 Pumps	3	each	203,500.00	$610,500
Discharge Piping (150 L.F. ; D=42")		each	30,800.00	$92,400
Energy Dissipation		Job		$120,000
MP-2 Pumps	2	each	451,000.00	$902,000
Discharge Piping (150L.F. ; D=54")		Job	69,440.00	$138,880
Energy Dissipation		Job		$90,000
MP-3 Pumps	4	each	451,000.00	$1,804,000
Discharge Piping (140 L.F. ; D=54")		Job	69,440.00	$277,760
Energy Dissipation		Job		$150,000
MP-4 Pumps	5	each	456,500.00	$2,282,500
Discharge Piping (150 L.F. ; D=60")		Job	67,700.00	$338,500
Energy Dissipation		Job		$180,000
MP-5 Pumps	2	each	240,350.00	$480,700
Discharge Piping (150 L.F. ; D=42")		Job	33,200.00	$66,400
Energy Dissipation		Job		$90,000
MP-6 Pumps	4	each	203,500.00	$814,000
Discharge Piping (150 L.F. ; D=42")		Job	33,200.00	$132,800
Energy Dissipation		Job		$150,000
MP-7 Pumps	2	each	240,350.00	$480,700
Discharge Piping (130 L.F. ; D=42")		Job	35,800.00	$71,600
Energy Dissipation		Job		$90,000
MP-8 Pumps	2	each	176,000.00	$352,000
Discharge Piping (150 L.F. ; D=36")		Job	24,900.00	$49,800
Energy Dissipation		Job		$90,000
PM-9 Pumps	2	each	376,200.00	$752,400
Discharge Piping (150L.F. ; D=54")		Job	49,300.00	$98,600
Energy Dissipation		Job		$90,000
MP-10 Pumps	3	each	176,000.00	$528,000
Discharge Piping (150 L.F. ; D=36")		Job	20,250.00	$60,750
Energy Dissipation		Job		$120,000
Electrical	29	each	242,100	7,020,900
		Current Contract Cost, Oct 07		$23,790,218

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 46 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Washington Ave.-MossPoint - Elevation 20 FILE NAME Washington-MossPtComb Lod3 Ring Levee Pumping Stations.xls
Optional Configuration 'G' (8/07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations WM-1 thru WM-14				
Structural Concrete, complete all sites	4,694	cy	$450.00	$2,112,267
Form Work, complete all sites	112,710	sf	6.50	732,615
Steel Reinforcement, complete all sites	288	tons	925.00	266,328
Excavation	8,393	cy	15.00	125,891
Backfill	5,880	cy	5.00	29,398
Trash Screens and Miscellaneous metal items, All Sites	47	each	100,000.00	4,700,000
Pumps by Site Name				
WM-1 Pumps	3	each	192,500	$577,500
Discharge Piping (150 L.F. ; D=42")		each	18,200	54,600
Energy Dissipation		Job		120,000
WM-2 Pumps	2	each	376,200	$752,400
Discharge Piping (150L.F. ; D=54")		Job	49,280	98,560
Energy Dissipation		Job		90,000
WM-3 Pumps	3	each	302,500	$907,500
Discharge Piping (140 L.F. ; D=48)		Job	38,500	115,500
Energy Dissipation		Job		120,000
WM-4 Pumps	5	each	456,500	$2,282,500
Discharge Piping (150 L.F. ; D=60)		Job	62,832	314,160
Energy Dissipation		Job		180,000
WM-5 Pumps	3	each	280,500	$841,500
Discharge Piping (150 L.F. ; D=48")		Job	35,250	105,750
Energy Dissipation		Job		120,000
WM-6 Pumps	4	each	376,200	$1,504,800
Discharge Piping (150 L.F. ; D=54")		Job	45,120	180,480
Energy Dissipation		Job		150,000
WM-7 Pumps	4	each	376,200	$1,504,800
Discharge Piping (130 L.F. ; D=54")		Job	49,280	197,120
Energy Dissipation		Job		150,000
WM-8 Pumps	7	each	330,000	$2,310,000
Discharge Piping (150 L.F. ; D=54")		Job	32,960	230,720
Energy Dissipation		Job		240,000
WM-9 Pumps	2	each	222,200	$444,400
Discharge Piping (150L.F. ; D=42")		Job	20,600	41,200
Energy Dissipation		Job		90,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 47	OF	57
	PREPARED Joseph H. Ellsworth	CHECKED:	Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations***	BASIS of ESTIMATE: by L.O. project delv'd. team		
Washington Ave.-MossPoint - Elevation 20	FILE NAME Washington-MossPtComb Lod3 Ring Levee Pumping Stations.xls		
Optional Configuration 'G' (8/07)			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations WM-1 thru WM-14				
WM-10 Pumps	4	each	192,500	**$770,000**
Discharge Piping (150 L.F. ; D=42")		Job	20,600	82,400
Energy Dissipation		Job		150,000
WM-11 Pumps	3	each	280,500	**$841,500**
Discharge Piping (150 L.F. ; D=48)		Job	29,000	87,000
Energy Dissipation		Job		120,000
WM-12 Pumps	2	each	154,000	**$308,000**
Discharge Piping (150 L.F. ; D=36)		Job	15,450	30,900
Energy Dissipation		Job		90,000
WM-13 Pumps	2	each	330,000	**$660,000**
Discharge Piping (150 L.F. ; D=54")		Job	29,120	58,240
Energy Dissipation		Job		90,000
WM-14 Pumps	3	each	154,000	**$462,000**
Discharge Piping (125 L.F. ; D=36")		Job	10,725	32,175
Energy Dissipation		Job		120,000
Electrical	47	each	242,100	11,378,700
	Current Contract Cost, Oct 07			$36,970,904

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 48 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Washington Ave.-MossPoint - Elevation 30 FILE NAME Washington-MossPtComb Lod3 Ring Levee Pumping Stations.xls
Optional Configuration 'H'(8/07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations WM-1 thru WM-14				
Structural Concrete, complete all sites	5,550	cy	$450.00	$2,497,494
Form Work, complete all sites	136,692	sf	6.50	888,499
Steel Reinforcement, complete all sites	340	tons	925.00	314,305
Excavation	8,184	cy	15.00	122,758
Backfill	5,756	cy	5.00	28,778
Trash Screens and Miscellaneous metal items, All Sites	44	each	100,000.00	4,400,000
Pumps by Site Name				
WM-1 Pumps	3	each	203,500.00	610,500
Discharge Piping (150 L.F. ; D=42")		each	30,800.00	92,400
Energy Dissipation		Job		120,000
WM-2 Pumps	2	each	451,000.00	902,000
Discharge Piping (150L.F. ; D=54")		Job	69,440.00	138,880
Energy Dissipation		Job		90,000
WM-3 Pumps	3	each	302,500.00	907,500
Discharge Piping (140 L.F. ; D=48")		Job	54,250.00	162,750
Energy Dissipation		Job		120,000
WM-4 Pumps	5	each	561,000.00	2,805,000
Discharge Piping (150 L.F. ; D=60)		Job	88,536.00	442,680
Energy Dissipation		Job		180,000
WM-5 Pumps	3	each	302,500.00	907,500
Discharge Piping (150 L.F. ; D=48")		Job	51,000.00	153,000
Energy Dissipation		Job		120,000
WM-6 Pumps	4	each	398,200.00	1,592,800
Discharge Piping (150 L.F. ; D=54)		Job	65,280.00	261,120
Energy Dissipation		Job		150,000
WM-7 Pumps	4	each	451,000.00	1,804,000
Discharge Piping (130 L.F. ; D=54")		Job	69,440.00	277,760
Energy Dissipation		Job		150,000
WM-8 Pumps	5	each	456,500.00	2,282,500
Discharge Piping (150 L.F. ; D=60")		Job	67,728.00	338,640
Energy Dissipation		Job		180,000
WM-9 Pumps	2	each	240,350.00	480,700
Discharge Piping (150L.F. ; D=42")		Job	33,200.00	66,400
Energy Dissipation		Job		90,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 49 OF 57
PREPARED Joseph H. Ellsworth CHECKED:
WORK ITEM ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Washington Ave.-MossPoint - Elevation 30 FILE NAME Washington-MossPtComb Lod3 Ring Levee Pumping Stations.xls
Optional Configuration 'H'(8/07)

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations WM-10 thru WM-14				
WM-10 Pumps	4	each	203,500.00	814,000
Discharge Piping (150 L.F. ; D=42)		Job	33,200.00	132,800
Energy Dissipation		Job		150,000
WM-11 Pumps	2	each	240,350.00	480,700
Discharge Piping (150 L.F. ; D=42)		Job	35,800.00	71,600
Energy Dissipation		Job		90,000
WM-12 Pumps	2	each	176,000.00	352,000
Discharge Piping (150 L.F. ; D=36")		Job	24,900.00	49,800
Energy Dissipation		Job		90,000
WM-13 Pumps	2	each	376,200.00	752,400
Discharge Piping (150 L.F. ; D=54")		Job	49,280.00	98,560
Energy Dissipation		Job		90,000
WM-14 Pumps	3	each	176,000.00	528,000
Discharge Piping (125 L.F. ; D=36)		Job	20,250.00	60,750
Energy Dissipation		Job		120,000
Electrical	44	each	242,100	10,652,400
Current Contract Cost, Oct 07				$38,210,974

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO.	50	OF	57
	PREPARED Joseph H. Ellsworth		CHECKED:	Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations***	BASIS of ESTIMATE: by L.O. project delv'd. team			
Bellfountaine- Elevation 20	FILE NAME bellfountaine(8/07) Lod3 Ring Levee Pumping Stations.xls			
Optional Arrangement 'C'(8/07)				

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BF-1 thru BF-7					
Structural Concrete, complete all sites		2,130	cy	$450.00	$958,371
Form Work, complete all sites		51,955	sf	6.50	337,709
Steel Reinforcement, complete all sites		131	tons	925.00	121,109
Excavation		3,571	cy	15.00	53,560
Backfill		2,556	cy	5.00	12,782
Trash Screens and Miscellaneous metal items, All Sites		23	each	100,000	2,300,000
Pumps by Installation					
BF-1	Pumps	5	each	222,200	1,111,000
	Discharge Piping (150 L.F. ; D=42")		Job	23,000	115,000
	Energy Dissipation		Job		180,000
BF-2	Pumps	3	each	203,500	610,500
	Discharge Piping (150 L.F. ; D=42")		Job	28,200	84,600
	Energy Dissipation		Job		120,000
BF-3	Pumps	2	each	222,200	444,400
	Discharge Piping (150 L.F. ; D=42")		Job	28,200	56,400
	Energy Dissipation		Job		90,000
BF-4	Pumps	3	each	456,500	1,369,500
	Discharge Piping (150 L.F. ; D=60")		Job	62,832	188,496
	Energy Dissipation		Job		120,000
BF-5	Pumps	3	each	192,500	577,500
	Discharge Piping (150 L.F. ; D=42")		Job	18,200	54,600
	Energy Dissipation		Job		120,000
BF-6	Pumps	4	each	192,500	770,000
	Discharge Piping (150 L.F. ; D=42")		Job	15,600	62,400
	Energy Dissipation		Job		150,000
BF-7	Pumps	3	each	376,200	1,128,600
	Discharge Piping (150 L.F. ; D=54")		Job	49,280	147,840
	Energy Dissipation		Job		120,000
Electrical		23	Job	242,100	5,568,300
			Current Contract Cost, Oct 07		$16,972,667

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 51 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Bellfontaine- Elevation 30 FILE NAME bellfountaine(8/07) Lod3 Ring Levee Pumping Stations.xls
Optional Arrangement 'D'(8/07)

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BF-1 thru BF-7					
Structural Concrete, complete all sites		2,637	cy	$450.00	$1,186,704
Form Work, complete all sites		65,655	sf	6.50	426,759
Steel Reinforcement, complete all sites		162	tons	925.00	149,570
Excavation		3,571	cy	15.00	53,560
Backfill		2,556	cy	5.00	12,782
Trash Screens and Miscellaneous metal items, All Sites		23	each	100,000	2,300,000
Pumps by Installation Site					
BF-1	Pumps	5	each	240,350	1,201,750
	Discharge Piping (250 L.F. ; D=42")		Job	35,000	175,000
	Energy Dissipation		Job		180,000
BF-2	Pumps	3	each	387,200	1,161,600
	Discharge Piping (250 L.F. ; D=42")		Job	40,800	122,400
	Energy Dissipation		Job		120,000
BF-3	Pumps	2	each	240,350	480,700
	Discharge Piping (250 L.F. ; D=42")		Job	40,800	81,600
	Energy Dissipation		Job		90,000
BF-4	Pumps	3	each	561,000	1,683,000
	Discharge Piping (250 L.F. ; D=60")		Job	88,536	265,608
	Energy Dissipation		Job		120,000
BF-5	Pumps	3	each	203,500	610,500
	Discharge Piping (250 L.F. ; D=42")		Job	30,800	92,400
	Energy Dissipation		Job		120,000
BF-6	Pumps	4	each	203,500	814,000
	Discharge Piping (250 L.F. ; D=42")		Job	28,200	112,800
	Energy Dissipation		Job		150,000
BF-7	Pumps	3	each	451,000	1,353,000
	Discharge Piping (250 L.F. ; D=54")		Job	69,440	208,320
	Energy Dissipation		Job		120,000
Electrical		23	Job	242,100	5,568,300
		Current Contract Cost, Oct 07			$18,960,353

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 52 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM **_Line of Defense 3 - Pumping Stations_** BASIS of ESTIMATE: by L.O. project delv'd. team
Gulf Park Estates - Elevation 20 FILE NAME GulfPkEst(8-07) Lod3 Ring Levee Pumping Stations.xls
Optional Arrangement 'C'(8/07)

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations GP-1 thru GP-9					
Structural Concrete, complete all sites		2,425	cy	$450	$1,091,145
Form Work, complete all sites		59,717	sf	$6.50	388,157
Steel Reinforcement, complete all sites		149	tons	$925	138,232
Excavation		3,376	cy	$15	50,642
Backfill		2,424	cy	$5	12,119
Trash Screens and Miscellaneous metal items, All Sites		34	each	$100,000	3,400,000
Pumps by Installation Site					
GP-1	Pumps	3	each	$203,500	610,500
	Discharge Piping (42" Dia; 150 L.F.)		job	$29,500	88,500
	Energy Dissipation		job		120,000
GP-2	Pumps	6	each	$203,500	1,221,000
	Discharge Piping (42" Dia; 150 L.F.)		job	$30,800	184,800
	Energy Dissipation		job		210,000
GP-3	Pumps	8	each	$203,500	1,628,000
	Discharge Piping (42" Dia; 150 L.F.)		job	$29,500	236,000
	Energy Dissipation		job		270,000
GP-4	Pumps	3	each	$222,200	666,600
	Discharge Piping (42" Dia; 130 L.F.)		job	$25,800	77,400
	Energy Dissipation		job		120,000
GP-5	Pumps	5	each	$192,500	962,500
	Discharge Piping (42" Dia; 140 L.F.)		job	$21,900	109,500
	Energy Dissipation		job		180,000
GP-6	Pumps	3	each	$154,000	462,000
	Discharge Piping (36" Dia; 150 L.F.)		job	$9,750	29,250
	Energy Dissipation		job		120,000
GP-7	Pumps	2	each	$97,900	195,800
	Discharge Piping (26" Dia; 125 L.F.)		job	$12,250	24,500
	Energy Dissipation		job		90,000
GP-8	Pumps	2	each	$97,900	195,800
	Discharge Piping (26" Dia; 150 L.F.)		job	$14,750	29,500
	Energy Dissipation		job		90,000
GP-9	Pumps	2	each	$192,500	385,000
	Discharge Piping (42" Dia; 150 L.F.)		job	$16,900	33,800
	Energy Dissipation		job		90,000
Electrical		34	Job	$242,100	8,231,400
			Current Contract Cost, Oct 07		$21,742,146

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 53 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3 - Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Gulf Park Estates - Elevation 30 FILE NAME GulfPkEst(8-07) Lod3 Ring Levee Pumping Stations.xls
Optional Arrangement 'D'(8/07)

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations GP-1 thru GP-8					
Structural Concrete, complete all sites		3,441	cy	$450	$1,548,413
Form Work, complete all sites		84,868	sf	$6.50	551,640
Steel Reinforcement, complete all sites		210	tons	$925	194,636
Excavation		5,005	cy	$15	75,082
Backfill		3,401	cy	$5	17,007
Trash Screens and Miscellaneous metal items, All Sites		33	each	$100,000	3,300,000
Pumps by Installation Site					
GP-1	Pumps	3	each	$387,200	1,161,600
	Discharge Piping (42" Dia; 150 L.F.)		job	$38,400	115,200
	Energy Dissipation		job		120,000
GP-2	Pumps	6	each	$387,200	2,323,200
	Discharge Piping (42" Dia; 150 L.F.)		job	$39,600	237,600
	Energy Dissipation		job		210,000
GP-3	Pumps	8	each	$387,200	3,097,600
	Discharge Piping (42" Dia; 150 L.F.)		job	$38,400	307,200
	Energy Dissipation		job		270,000
GP-4	Pumps	3	each	$240,350	721,050
	Discharge Piping (42" Dia; 130 L.F.)		job	$34,500	103,500
	Energy Dissipation		job		120,000
GP-5	Pumps	5	each	$203,500	1,017,500
	Discharge Piping (42" Dia; 140 L.F.)		job	$28,200	141,000
	Energy Dissipation		job		180,000
GP-6	Pumps	2	each	$222,200	444,400
	Discharge Piping (42" Dia; 150 L.F.)		job	$27,000	54,000
	Energy Dissipation		job		90,000
GP-7	Pumps	2	each	$103,400	206,800
	Discharge Piping (26" Dia; 125 L.F.)		job	$16,600	33,200
	Energy Dissipation		job		90,000
GP-8	Pumps	2	each	$387,200	774,400
	Discharge Piping (42" Dia; 150 L.F.)		job	$38,400	76,800
	Energy Dissipation		job		90,000
GP-9	Pumps	2	each	$203,500	407,000
	Discharge Piping (42" Dia; 150 L.F.)		job	$28,200	56,400
	Energy Dissipation		job		90,000
Electrical		33	Job	$242,100	7,989,300
		Current Contract Cost, Oct 07			$26,214,528

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 54	OF	57
	PREPARED Joseph H. Ellsworth	CHECKED:	Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations***	BASIS of ESTIMATE: by L.O. project delv'd. team		
Bay Saint Louis- Elevation 20	FILE NAME BayStLou Lod3 Ring Levee Pumping Stations.xls		
Optional Arrangement 'A'	***Hancock County***		

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BSL1 thru BSL12					
Structural Concrete, complete all sites		5,061	cy	$450.00	$2,277,233
Form Work, complete all sites		124,378	sf	6.50	808,457
Steel Reinforcement, complete all sites		310	tons	925.00	286,829
Excavation		6,535	cy	15.00	98,019
Backfill		4,569	cy	5.00	22,846
Trash Screens and Miscellaneous metal items, All Sites		52	each	100,000	5,200,000
Pumps by Installation					
BSL-1	Pumps	8	each	222,200	1,777,600
	Discharge Piping (150 L.F. ; D=42")		each	25,800	206,400
	Energy Dissipation		Job		270,000
BSL-2	Pumps	4	each	280,500	1,122,000
	Discharge Piping (150 L.F. ; D=48")		each	29,000	116,000
	Energy Dissipation		Job		150,000
BSL-3	Pumps	2	each	154,000	308,000
	Discharge Piping (150 L.F. ; D=36")		each	13,000	26,000
	Energy Dissipation		Job		90,000
BSL-4	Pumps	3	each	192,500	577,500
	Discharge Piping (150 L.F. ; D=42")		each	18,200	54,600
	Energy Dissipation		Job		120,000
BSL-5	Pumps	4	each	330,000	1,320,000
	Discharge Piping (150 L.F. ; D=54")		each	20,600	82,400
	Energy Dissipation		Job		150,000
BSL-6	Pumps	4	each	280,500	1,122,000
	Discharge Piping (150 L.F. ; D=48")		each	29,000	116,000
	Energy Dissipation		Job		150,000
BSL-7	Pumps	3	each	222,200	666,600
	Discharge Piping (150 L.F. ; D=42")		each	23,200	69,600
	Energy Dissipation		Job		120,000
BSL-8	Pumps	7	each	192,500	1,347,500
	Discharge Piping (150 L.F. ; D=42")		each	20,600	144,200
	Energy Dissipation		Job		240,000
BSL-9	Pumps	3	each	192,500	577,500
	Discharge Piping (150 L.F. ; D=42")		each	15,600	46,800
	Energy Dissipation		Job		120,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 55 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Bay Saint Louis- Elevation 20 FILE NAME BayStLou Lod3 Ring Levee Pumping Stations.xls
Optional Arrangement 'A' ***Hancock County***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BSL1 thru BSL12					
BSL-10	Pumps	6	each	280,500	1,683,000
	Discharge Piping (150 L.F. ; D=48")		each	32,250	193,500
	Energy Dissipation		Job		210,000
BSL-11	Pumps	5	each	222,200	1,111,000
	Discharge Piping (150 L.F. ; D=42")		each	28,200	141,000
	Energy Dissipation		Job		180,000
BSL-12	Pumps	3	each	192,500	577,500
	Discharge Piping (150 L.F. ; D=42")		each	20,600	61,800
	Energy Dissipation		Job		120,000
Electrical		52	Job	242,100	12,589,200
		Current Contract Cost, Oct 07			$36,651,084

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 56 OF 57
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM: ***Line of Defense 3- Pumping Stations*** BASIS of ESTIMATE: by L.O. project delv'd. team
Bay Saint Louis- Elevation 30 FILE NAME Beach Boulevard Lod3 Pumping Stations.xls
Optional Arrangement 'B' ***Hancock County***

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Pumping Stations BSL1 thru BSL12					
Structural Concrete, complete all sites		4828	cy	$450.00	$2,172,600
Form Work, complete all sites		118906	sf	6.50	772,889
Steel Reinforcement, complete all sites		296	tons	925.00	273,800
Excavation		6335	cy	15.00	95,025
Backfill		4452	cy	5.00	22,260
Trash Screens and Miscellaneous metal items, All Sites		49	each	100,000	4,900,000
Pumps by Installation					
BSL-1	Pumps	8	each	240,350	1,922,800
	Discharge Piping (150 L.F. ; D=42")		each	38,400	307,200
	Energy Dissipation		Job		270,000
BSL-2	Pumps	4	each	302,500	1,210,000
	Discharge Piping (150 L.F. ; D=48")		each	44,750	179,000
	Energy Dissipation		Job		150,000
BSL-3	Pumps	2	each	176,000	352,000
	Discharge Piping (150 L.F. ; D=36")		each	25,800	51,600
	Energy Dissipation		Job		90,000
BSL-4	Pumps	3	each	203,500	610,500
	Discharge Piping (150 L.F. ; D=42")		each	30,800	92,400
	Energy Dissipation		Job		120,000
BSL-5	Pumps	4	each	376,200	1,504,800
	Discharge Piping (150 L.F. ; D=54")		each	53,120	212,480
	Energy Dissipation		Job		150,000
BSL-6	Pumps	3	each	398,200	1,194,600
	Discharge Piping (150 L.F. ; D=54")		each	57,280	171,840
	Energy Dissipation		Job		120,000
BSL-7	Pumps	3	each	240,350	721,050
	Discharge Piping (150 L.F. ; D=42")		each	35,800	107,400
	Energy Dissipation		Job		120,000
BSL-8	Pumps	7	each	192,500	1,347,500
	Discharge Piping (150 L.F. ; D=54")		each	53,120	371,840
	Energy Dissipation		Job		240,000
BSL-9	Pumps	3	each	203,500	610,500
	Discharge Piping (150 L.F. ; D=42")		each	28,200	84,600
	Energy Dissipation		Job		120,000

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 57	OF	57
	PREPARED Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Line of Defense 3- Pumping Stations***	BASIS of ESTIMATE: by L.O. project delv'd. team		
Bay Saint Louis- Elevation 30	FILE NAME bellfountaine Lod3 Ring Levee Pumping Stations.xls		
Optional Arrangement 'B'	***Hancock County***		

Pumping Stations BSL1 thru BSL12

	DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
BSL-10	Pumps	6	each	302,500	1,815,000
	Discharge Piping (150 L.F. ; D=48")		each	48,000	288,000
	Energy Dissipation		Job		210,000
BSL-11	Pumps	3	each	176,000	528,000
	Discharge Piping (150 L.F. ; D=42")		each	40,800	122,400
	Energy Dissipation		Job		120,000
BSL-12	Pumps	3	each	561,000	1,683,000
	Discharge Piping (150 L.F. ; D=36")		each	33,200	99,600
	Energy Dissipation		Job		120,000
	Electrical	49	Job	242,100	11,862,900
			Current Contract Cost, Oct 07		**$37,517,584**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 1 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3 - Elevated Roadway*** BASIS of ESTIMATE: by L.O. project delv'd. team
FILE NAME: Hanc Co-Lod 3-Elevated Roadway-Elev 11-BoatGate.xls

Boat Access Gate Structures

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Boat Access Gate Structures				
Hanc Co-Lod 3-Elevated Roadway-Elev 11-BoatGate.xls				**$13,587,948**
Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls				
Pascagoula - El20 Estimate(PG-1)				**$12,920,900**
Estimate(G-1)				10,756,700
Estimate(G-2)				12,836,100
Estimate(G-3)				9,321,720
Estimate(G-4)				21,534,300
Estimate(G-5)				18,458,200
Gautier.-El.20				**$72,907,018**
Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls				
Pascagoula - El30 Estimate(PG-1)				**$14,917,980**
Estimate(G-1)				11,460,580
Estimate(G-2)				14,148,380
Estimate(G-3)				9,372,720
Estimate(G-4)				25,448,480
Estimate(G-5)				19,818,780
Gautier-El.30				**$80,248,938**

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 2 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Line of Defense 3 - Elevated Roadway*** BASIS of ESTIMATE: by L.O. project delv'd. team
Hancock County - Elevation 11 FILE NAME: Hanc Co-Lod 3-Elevated Roadway-Elev 11-BoatGate.xls
Boat Access Gate HK-1

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	73,800	C.Y.	20	1,476,000
Foundation Piling (500 Piles)18x18 precast c	100000	L.F.	35	3,500,000
Structural Fill	45,800	C.Y.	10	458,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	13,344	C.Y.	450	6,004,728
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	28	Tons	925	25,900
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	82	Tons	9,800	802,620
Stainless Steel	82	Tons	11,700	959,400
Miscellaneous Metal	2	Tons	8,000	16,000
Mechanical:	6	Tons	10,000	60,000
Electrical:	1	Job		45,000
		Current Contract Cost, Oct 07		$13,577,948

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 3 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Pascagoula - Elevation 20 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls
Boat Access Gate PG-1

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	65,300	C.Y.	20	1,306,000
Foundation Piling (380 Piles)18x18 precast c	76000	L.F.	35	2,660,000
Structural Fill	42,300	C.Y.	10	423,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	13,300	C.Y.	450	5,985,000
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	60	Tons	925	55,500
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	68	Tons	9,800.00	666,400
Stainless Steel	121	Tons	11,700.00	1,415,700
Miscellaneous Metal	3	Tons	8,000.00	24,000
Mechanical:	10	Tons	10,000.00	100,000
Electrical:	1	Job		45,000
		Current Contract Cost, Oct 07		$12,910,900

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 4 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 20 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls
Boat Access Gate G-1

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	58,900	C.Y.	20	1,178,000
Foundation Piling (300 Piles)	60000	L.F.	35	2,100,000
Structural Fill	39,700	C.Y.	10	397,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	12,600	C.Y.	450	5,670,000
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	60	Tons	925	55,500
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	36	Tons	9,800.00	352,800
Stainless Steel	53	Tons	11,700.00	620,100
Miscellaneous Metal	1	Tons	8,000.00	8,000
Mechanical:	10	Tons	10,000.00	100,000
Electrical:	1	Job		45,000
Current Contract Cost, Oct 07				$10,756,700

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 5 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 20 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls
Boat Access Gate G-2

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	64,000	C.Y.	20	1,280,000
Foundation Piling (360 Piles)18x18 precast c	72000	L.F.	35	2,520,000
Structural Fill	41,800	C.Y.	10	418,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	14100	C.Y.	450	6,345,000
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	60	Tons	925	55,500
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	61	Tons	9,800.00	597,800
Stainless Steel	105	Tons	11,700.00	1,228,500
Miscellaneous Metal	2	Tons	8,000.00	16,000
Mechanical:	10	Tons	10,000.00	100,000
Electrical:	1	Job		45,000
			Current Contract Cost, Oct 07	$12,836,100

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 6 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 20 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls
Boat Access Gate G-3

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	54,300	C.Y.	20	1,086,000
Foundation Piling (240 Piles)18x18 precast c	48000	L.F.	35	1,680,000
Structural Fill	37,900	C.Y.	10	379,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	11800	C.Y.	450	5,310,000
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	60	Tons	925	55,500
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	17.4	Tons	9,800.00	170,520
Stainless Steel	22	Tons	11,700.00	257,400
Miscellaneous Metal	1	Tons	8,000.00	8,000
Mechanical:	10	Tons	10,000.00	100,000
Electrical:	1	Job		45,000
Current Contract Cost, Oct 07				$9,321,720

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 7 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 20 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls
Boat Access Gate G-4

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	79,900	C.Y.	20	1,598,000
Foundation Piling (580 Piles) 18x18 precast c	116000	L.F.	35	4,060,000
Structural Fill	48,200	C.Y.	10	482,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	19500	C.Y.	450	8,775,000
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	60	Tons	925	55,500
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	178	Tons	9,800.00	1,744,400
Stainless Steel	373	Tons	11,700.00	4,364,100
Miscellaneous Metal	10	Tons	8,000.00	80,000
Mechanical:	10	Tons	10,000.00	100,000
Electrical:	1	Job		45,000

Current Contract Cost, Oct 07 $21,534,300

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 8 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 20 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 20-BoatGates.xls
Boat Access Gate G-5

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	72,700	C.Y.	20	1,454,000
Foundation Piling (480 Piles)18x18 precast c	96000	L.F.	35	3,360,000
Structural Fill	45,300	C.Y.	10	453,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	17100	C.Y.	450	7,695,000
Forming	13,123	S.Y.	6.50	85,300
Reinforcement	60	Tons	925	55,500
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	118	Tons	9,800.00	1,156,400
Stainless Steel	330	Tons	11,700.00	3,861,000
Miscellaneous Metal	6	Tons	8,000.00	48,000
Mechanical:	10	Tons	10,000.00	100,000
Electrical:	1	Job		45,000
Current Contract Cost, Oct 07				$18,458,200

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 9 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Pascagoula - Elevation 30 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls
Boat Access Gate PG-1

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	65,300	C.Y.	20	1,306,000
Foundation Piling (380 Piles)18x18 precast c	76000	L.F.	35	2,660,000
Structural Fill	42,300	C.Y.	10	423,000
Stone Protection	500	C.Y.	90	55,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	15,030	C.Y.	450	6,763,500
Forming	16,493	S.Y.	6.50	107,205
Reinforcement	71	Tons	925	65,675
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	149	Tons	9,800.00	1,460,200
Stainless Steel	152	Tons	11,700.00	1,778,400
Miscellaneous Metal	3	Tons	8,000.00	24,000
Mechanical:	13	Tons	10,000.00	130,000
Electrical:	1	Job		45,000

Current Contract Cost, Oct 07 $14,917,980

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 10 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 30 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls
Boat Access Gate G-1

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	58,900	C.Y.	20	1,178,000
Foundation Piling (300 Piles18x18 precast cc	60000	L.F.	35	2,100,000
Structural Fill	39,700	C.Y.	10	397,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	12,830	C.Y.	450	5,773,500
Forming	16,493	S.Y.	6.50	107,205
Reinforcement	71	Tons	925	65,675
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	72	Tons	9,800.00	705,600
Stainless Steel	68	Tons	11,700.00	795,600
Miscellaneous Metal	1	Tons	8,000.00	8,000
Mechanical:	13	Tons	10,000.00	130,000
Electrical:	1	Job		45,000
			Current Contract Cost, Oct 07	$11,450,580

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 11 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 30 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls
Boat Access Gate G-2

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	64,000	C.Y.	20	1,280,000
Foundation Piling (360 Piles)18x18 precast c	72000	L.F.	35	2,520,000
Structural Fill	41,800	C.Y.	10	418,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	14590	C.Y.	450	6,565,500
Forming	16,493	S.Y.	6.50	107,205
Reinforcement	71	Tons	925	65,675
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	132	Tons	9,800.00	1,293,600
Stainless Steel	132	Tons	11,700.00	1,544,400
Miscellaneous Metal	3	Tons	8,000.00	24,000
Mechanical:	13	Tons	10,000.00	130,000
Electrical:	1	Job		45,000

Current Contract Cost, Oct 07 $14,138,380

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 12 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 30 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls
Boat Access Gate G-3

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	54,300	C.Y.	20	1,086,000
Foundation Piling (240 Piles)	48000	L.F.	35	1,680,000
Structural Fill	37,900	C.Y.	10	379,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	11240	C.Y.	450	5,058,000
Forming	16,493	S.Y.	6.50	107,205
Reinforcement	71	Tons	925	65,675
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	33.8	Tons	9,800.00	331,240
Stainless Steel	28	Tons	11,700.00	327,600
Miscellaneous Metal	1	Tons	8,000.00	8,000
Mechanical:	13	Tons	10,000.00	130,000
Electrical:	1	Job		45,000
			Current Contract Cost, Oct 07	$9,362,720

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 13 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 30 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls
Boat Access Gate G-4

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	79,900	C.Y.	20	1,598,000
Foundation Piling (580 Piles)	116000	L.F.	35	4,060,000
Structural Fill	48,200	C.Y.	10	482,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	20050	C.Y.	450	9,022,500
Forming	16,493	S.Y.	6.50	107,205
Reinforcement	71	Tons	925	65,675
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	431	Tons	9,800.00	4,223,800
Stainless Steel	469	Tons	11,700.00	5,487,300
Miscellaneous Metal	9	Tons	8,000.00	72,000
Mechanical:	13	Tons	10,000.00	130,000
Electrical:	1	Job		45,000
		Current Contract Cost, Oct 07		$25,438,480

COMPREHENSIVE PLAN " STRUCTURAL " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 14 OF 14
PREPARED Joseph H. Ellsworth CHECKED: Lloyd Oliver
WORK ITEM ***Jackson County - Line of Defense 3*** BASIS of ESTIMATE: by L.O. project delv'd. team
Ring Levee - Gautier - Elevation 30 FILE NAME: Jack Co-Lod 3-Ring Levee-Pas-Elev 30-BoatGates.xls
Boat Access Gate G-5

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Civil:				
Cofferdam and Dewatering	$100,000	Job		$100,000
Earthwork:				
Structural Excavation	72,700	C.Y.	20	1,454,000
Foundation Piling (480 Piles)	96000	L.F.	35	3,360,000
Structural Fill	45,300	C.Y.	10	453,000
Stone Protection	500	C.Y.	90	45,000
Structural:				
Concrete:				
Gate Structure				
Structural Concrete	17580	C.Y.	450	7,911,000
Forming	16,493	S.Y.	6.50	107,205
Reinforcement	71	Tons	925	65,675
Structural Steel:				
Rising Sector Gates (Incl. end disks and Trunnion Hubs & Bearings)				
Mild Steel	274	Tons	9,800.00	2,685,200
Stainless Steel	291	Tons	11,700.00	3,404,700
Miscellaneous Metal	6	Tons	8,000.00	48,000
Mechanical:	13	Tons	10,000.00	130,000
Electrical:	1	Job		45,000
		Current Contract Cost, Oct 07		$19,808,780

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Line of Defense 1***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Beach / Dune Construction	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Ship Island Fort Mass & French Warehouse Emergency Beach Nourishment				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$290,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipmen	1	job	allow	3,000
Construct Sand (dune), Dredged from near Shore Borrow Site	125,000	cy	5.50	687,500
Misc Site Items	1	ls	allow	1,700
Current Contract Cost, Oct 07				$982,200
CONTINGENCY			**25.0%**	245,550
				$1,227,750
01 Account, Lands & Damage		PCA	**LS**	25,000
				$1,252,750
30 Account, Plan, Engr.& Design			**8.0%**	100,220
				$1,352,970
31 Account, Constr. Management			**6.0%**	81,178
				$1,434,148
ESCALATION			**0.0%**	
				$1,434,148
				rounded
TOTAL PROJECT COST, Oct 07			$	1,430,000

Notes:

Unit Dredge Cost based on Current Dredge Project, Dauphin Island Berm, Al

COMPREHENSIVE STUDY " Programmatic Environmental Restoration Summary"

PROJECT: **Mississippi Coastal Improvement Project** ITEM NO. DATE 25-Jul-08
LOCATION **Mississippi** SHEET NO. 1 OF 1
PREPARED: oseph H. Ellswon CHECKED: Michael McKown
WORK ITEM ***Summary*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION			ESTIMATED AMOUNT	ANNUAL O&M
	ENVIRONMENTAL RESTORATION 32 SITES			
Area No.	**Area Name**	**Acreage**		THOUS
1	**Pearlington**	76	**$ 30,200,000**	**40**
2	***Pearlington South***	11	**$ 23,400,000**	**11**
3	***Port/West***	49	**$ 19,800,000**	**20**
4	***Ansley***	2,023	**$ 482,100,000**	**500**
5	***Heron Bay***	594	**$ 192,100,000**	**100**
6	***Lower Bay Road***	226	**$ 53,000,000**	**60**
7	***Lakeshore***	275	**$ 69,200,000**	**75**
8	***Bayou Caddy/Lakeshore***	362	**$ 113,400,000**	**78**
9	***Clermont Harbor***	209	**$ 208,300,000**	**60**
10	***Bayou La Croix***	259	**$ 207,100,000**	**72**
11	***Shoreline Park***	889	**$ 1,259,200,000**	**110**
12	***Chapman Road***	146	**$ 174,100,000**	**35**
13	***Jourdan River-Interstate 10 Development***	638	**$ 155,900,000**	**100**
14	***Diamondhead***	433	**$ 267,700,000**	**90**
15	***Delisle***	120	**$ 41,900,000**	**59**
16	***Ellis Property***	443	**$ 60,300,000**	**70**
17	***Pine Point East***	103	**$ 47,500,000**	**35**
18	***Pine Point West***	83	**$ 36,700,000**	**20**
19	***Pass Christian Beach Front low forested drainage way***	21	**$ 10,700,000**	**15**
20	***Pass Christian Site-Bayou Portage***	43	**$ 27,800,000**	**17**
21	***Brickyard Bayou***	14	**$ 7,000,000**	**10**
22	***Biloxi River-Shorecrest Drive***	15	**$ 12,500,000**	**10**
23	***Biloxi River-Eagle Point***	17	**$ 17,400,000**	**10**
24	***Biloxi Front Beach-South of Highway 90***	40	**$ 60,500,000**	**13**
25	***Keegan Bayou***	54	**$ 31,500,000**	**14**
26	***St. Martin***	467	**$ 147,500,000**	**95**
27	***Fort Point***	83	**$ 29,400,000**	**38**
28	***Pine Island***	2,531	**$ 518,600,000**	**550**
29	***Belle Fontaine***	1,516	**$ 373,700,000**	**450**
30	***Griffin Point***	182	**$ 70,900,000**	**66**
31	***Bayou Chico***	258	**$ 82,900,000**	**69**
32	***Grand Bay Marsh***	2,666	**$ 621,400,000**	**500**
		Grand Total	**$ 5,453,700,000**	**3,392**
			*** see backup for Cost Derivation**	

Notes:

Price Level, FY-07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Structural Removal Cost includes minor Site Restoration (filling septic tanks, removal outside structures, pavements & utilities)
Utility Removal Cost includes, sewer, storm drain, water, gas, power, cable, phone, traffic signaling
Estimate Excl Operational & Maintenance Cost
Project Escalation
Relocations, Environment, HTRW & Real Estate Cost (except PCA)
Historical Preservation
Asbestos Removal during Structure Removal

Environmental Restoration, 32 Sites Costs - program enviro restor summary

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKeown
WORK ITEM:	**Pearlington**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$260,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	490,973	cy	12.00	5,891,676
b. Removal of structures (1,500 sf avg size 7 ea =)	10,500	sf	3.50	36,750
b. Disposal Fee	389	cy	2.50	972
c. Removal of roads (24' wide assumed)	2,415	lf	14.00	33,810
d. Removal of utilities	2,415	lf	41.00	99,015
2. Herbicide, hand application (untouched areas from excavation)	10	acre	3,100	31,000
3. Filling of existing ditches and channels (from req'd. excavation)	2,500	cy	5.00	12,500
4. Plantings	76	acre	57,600	4,377,600
Misc Site Items	1	ls	allow	50,000
	Current Contract Cost, FY 07		$	10,793,323

CONTINGENCY		**25.0%**		2,698,331
			$	13,491,654
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, acqs.		**LS**		16,098,678
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$29,615,332
30 Account, Plan, Engr.& Design		**8.0%**		2,369,227
			$	31,984,559
31 Account, Constr. Management		**6.0%**		1,919,074
			$	33,903,632
ESCALATION		**0.0%**		
			$	33,903,632
				rounded
TOTAL PROJECT COST, FY- 07			**$**	**33,900,000**

Environmental Restoration, 32 Sites Costs - Pearlington

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Pearlington South**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$40,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	70,140	cy	12.00	841,680
b. Removal of structures (1,500 sf avg size 1ea =)	1,440	sf	3.50	5,040
b. Disposal Fee	56	cy	2.50	139
c. Removal of roads (24' wide assumed)	345	lf	14.00	4,830
d. Removal of utilities	345	lf	41.00	14,145
2. Herbicide, hand application (untouched areas from excavation)	11	acre	3,100	34,100
3. Filling of existing ditches and channels (from req'd. excavation)	205	cy	5.00	1,025
4. Plantings	11	acre	57,600	633,600
Misc Site Items	1	ls	allow	10,000

Current Contract Cost, FY 07			$	1,584,559
CONTINGENCY		**25.0%**		396,140
			$	1,980,699
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, acqs.		**LS**		23,012,156
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$25,017,855
30 Account, Plan, Engr.& Design		**8.0%**		2,001,428
			$	27,019,283
31 Account, Constr. Management		**6.0%**		1,621,157
			$	28,640,440
ESCALATION		**0.0%**		
			$	28,640,440
				rounded
TOTAL PROJECT COST, FY- 07			**$**	**28,600,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT: **Mississippi Coastal Improvements Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: **Port West**
Hancock County

ITEM NO.
SHEET NO. 1 OF 1
DATE 25-Jul-08
PREPARED: Joseph H. Ellsworth CHECKED: Michael McKown
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$170,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	327,316	cy	12.00	3,927,792
b. Removal of structures (1,500 sf avg size 5 ea =)	7,500	sf	3.50	26,250
b. Disposal Fee	278	cy	2.50	694
c. Removal of roads (24' wide assumed)	1,610	lf	14.00	22,540
d. Removal of utilities	1,610	lf	41.00	66,010
2. Herbicide, hand application (untouched areas from excavation)	8	acre	3,100	24,800
3. Filling of existing ditches and channels (from req'd. excavation)	954	cy	5.00	4,770
4. Plantings	49	acre	57,600	2,822,400
Misc Site Items	1	ls	allow	30,000
	Current Contract Cost, FY 07			$ 7,095,256
CONTINGENCY			**25.0%**	1,773,814
				$ 8,869,071
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aqas.			**LS**	10,486,413
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$19,380,484
30 Account, Plan, Engr.& Design			**8.0%**	1,550,439
				$ 20,930,922
31 Account, Constr. Management			**6.0%**	1,255,855
				$ 22,186,778
ESCALATION			**0.0%**	
				$ 22,186,778
				rounded
	TOTAL PROJECT COST, FY- 07			**$ 22,200,000**

Environmental Restoration, 32 Sites Costs - PortWest

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT: **Mississippi Coastal Improvements Project "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Michael McKown
WORK ITEM: **Ansley** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME:
mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$6,860,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	12,695,161	cy	12.00		152,341,932
b. Removal of structures (1,500 sf avg size 174 ea =)	261,000	sf	3.50		913,500
b. Disposal Fee	9,667	cy	2.50		24,167
c. Removal of roads (24' wide assumed)	62,429	lf	14.00		874,006
d. Removal of utilities	62,429	lf	41.00		2,559,589
2. Herbicide, hand application (untouched areas from excavation)	310	acre	3,100		961,000
3. Filling of existing ditches and channels (from req'd. excavation)	5,000	cy	5.00		25,000
3. Plantings	2,023	acre	57,600		116,524,800
Misc Site Items	1	ls	allow		1,370,000
	Current Contract Cost, FY 07			$	282,453,994
CONTINGENCY			**25.0%**		70,613,498
				$	353,067,492
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		85,003,422
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$438,095,914
30 Account, Plan, Engr.& Design			**8.0%**		35,047,673
				$	473,143,587
31 Account, Constr. Management			**6.0%**		28,388,615
				$	501,532,202
ESCALATION			**0.0%**		
				$	501,532,202
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**501,500,000**

Environmental Restoration, 32 Sites Costs - Ansley

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT: **Mississippi Coastal Improvements Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: **Heron Bay**
Hancock County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Michael McKown
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip comprehensive study combined cost est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$2,020,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	3,740,748	cy	12.00		44,888,976
b. Removal of structures (1,500 sf avg size 52 ea =)	78,000	sf	3.50		273,000
b. Disposal Fee	2,889	cy	2.50		7,222
c. Removal of roads (24' wide assumed)	18,396	lf	14.00		257,544
d. Removal of utilities	18,396	lf	41.00		754,236
2. Herbicide, hand application (untouched areas from excavation)	92	acre	3,100		285,200
3. Filling of existing ditches and channels (from req'd. excavation)	2,500	cy	5.00		12,500
3. Plantings	594	acre	57,600		34,214,400
Misc Site Items	1	ls	allow		400,000
	Current Contract Cost, FY 07			$	83,113,078
CONTINGENCY			**25.0%**		20,778,270
				$	103,891,348
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		79,883,456
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$183,799,804
30 Account, Plan, Engr.& Design			**8.0%**		14,703,984
				$	198,503,788
31 Account, Constr. Management			**6.0%**		11,910,227
				$	210,414,015
ESCALATION			**0.0%**		
				$	210,414,015
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**210,400,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Lower Bay Road**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$770,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	1,421,485	cy	12.00	17,057,820
b. Removal of structures (1,500 sf avg size 20 ea =)	30,000	sf	3.50	105,000
b. Disposal Fee	1,111	cy	2.50	2,778
c. Removal of roads (24' wide assumed)	6,991	lf	14.00	97,874
d. Removal of utilities	6,991	lf	41.00	286,631
2. Herbicide, hand application (untouched areas from excavation)	35	acre	3,100	108,500
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00	7,155
3. Plantings	226	acre	57,600	13,017,600
Misc Site Items	1	ls	allow	200,000
		Current Contract Cost, FY 07		$ 31,653,358
CONTINGENCY			**25.0%**	7,913,339
				$ 39,566,697
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aquas			**LS**	8,400,156
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$47,991,853
30 Account, Plan, Engr.& Design			**8.0%**	3,839,348
				$ 51,831,201
31 Account, Constr. Management			**6.0%**	3,109,872
				$ 54,941,074
ESCALATION			**0.0%**	
				$ 54,941,074
				rounded
		TOTAL PROJECT COST, FY- 07		**$ 54,900,000**

Environmental Restoration, 32 Sites Costs - Lower Bay Road

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Lakeshore**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			
			mscip-comprehensive-study-comphined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$930,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	1,734,212	cy	12.00		20,810,544
b. Removal of structures (1,500 sf avg size 25 ea =)	37,500	sf	3.50		131,250
b. Disposal Fee	1,389	cy	2.50		3,472
c. Removal of roads (24' wide assumed)	8,530	lf	14.00		119,420
d. Removal of utilities	8,530	lf	41.00		349,730
2. Herbicide, hand application (untouched areas from excavation)	43	acre	3,100		133,300
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00		7,155
3. Plantings	275	acre	57,600		15,840,000
Misc Site Items	1	ls	allow		200,000
	Current Contract Cost, FY 07			$	38,524,871
CONTINGENCY			**25.0%**		9,631,218
				$	48,156,089
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		15,323,959
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$63,505,048
30 Account, Plan, Engr.& Design			**8.0%**		5,080,404
				$	68,585,452
31 Account, Constr. Management			**6.0%**		4,115,127
				$	72,700,579
ESCALATION			**0.0%**		
				$	72,700,579
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**72,700,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT: **Mississippi Coastal Improvements Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: **Bayou Caddy Lakeshore**
Hancock County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Michael McKown
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$1,230,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	2,291,208	cy	12.00		27,494,496
b. Removal of structures (1,500 sf avg size 33 ea =)	49,500	sf	3.50		173,250
b. Disposal Fee	1,833	cy	2.50		4,583
c. Removal of roads (24' wide assumed)	11,260	lf	14.00		157,640
d. Removal of utilities	11,260	lf	41.00		461,660
2. Herbicide, hand application (untouched areas from excavation)	57	acre	3,100		176,700
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00		7,155
3. Plantings	362	acre	57,600		20,851,200
Misc Site Items	1	ls	allow		200,000
	Current Contract Cost, FY 07			$	50,756,684
CONTINGENCY			**25.0%**		12,689,171
				$	63,445,855
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		44,506,544
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$107,977,399
30 Account, Plan, Engr.& Design			**8.0%**		8,638,192
				$	116,615,591
31 Account, Constr. Management			**6.0%**		6,996,935
				$	123,612,527
ESCALATION			**0.0%**		
				$	123,612,527
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**123,600,000**

Environmental Restoration, 32 Sites Costs - Bayou Caddy Lakeshore

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Clermont Harbor**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			
			mscip-comprehensive study-combined cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$720,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	1,332,642	cy	12.00	15,991,704
b. Removal of structures (1,500 sf avg size 20 ea =)	30,000	sf	3.50	105,000
b. Disposal Fee	1,111	cy	2.50	2,778
c. Removal of roads (24' wide assumed)	6,531	lf	14.00	91,434
d. Removal of utilities	6,531	lf	41.00	267,771
2. Herbicide, hand application (untouched areas from excavation)	34	acre	3,100	105,400
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00	7,155
3. Plantings	209	acre	57,600	12,038,400
Misc Site Items	1	ls	allow	100,000

	Current Contract Cost, FY 07		$	29,429,642
CONTINGENCY		**25.0%**		7,357,410
			$	36,787,052
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		181,417,747
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$218,229,799
30 Account, Plan, Engr.& Design		**8.0%**		17,458,384
			$	235,688,183
31 Account, Constr. Management		**6.0%**		14,141,291
			$	249,829,474
ESCALATION		**0.0%**		
			$	249,829,474
				rounded
	TOTAL PROJECT COST, FY-07		**$**	**249,800,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Bayou La Croix**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			

mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$880,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	1,636,577	cy	12.00	19,638,924
b. Removal of structures (1,500 sf avg size 25 ea =)	37,500	sf	3.50	131,250
b. Disposal Fee	1,389	cy	2.50	3,472
c. Removal of roads (24' wide assumed)	8,099	lf	14.00	113,386
d. Removal of utilities	8,099	lf	41.00	332,059
2. Herbicide, hand application (untouched areas from excavation)	43	acre	3,100	133,300
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00	7,155
3. Plantings	259	acre	57,600	14,918,400
Misc Site Items	1	ls	allow	200,000

Current Contract Cost, FY 07			$	36,357,946
CONTINGENCY		25.0%		9,089,487
			$	45,447,433
01 Account, Lands & Damage	PCA	LS		25,000
02 Account, Relocations, aquas		LS		169,307,134
Account, Environmental		LS		
09 Account, Aids to Navigation		LS		
				$214,779,567
30 Account, Plan, Engr.& Design		8.0%		17,182,365
			$	231,961,932
31 Account, Constr. Management		6.0%		13,917,716
			$	245,879,648
ESCALATION		0.0%		
			$	245,879,648
				rounded
TOTAL PROJECT COST, FY-07			**$**	**245,900,000**

Environmental Restoration, 32 Sites Costs - Bayou La Croix

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Shoreline Park**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			

mscip-comprehensive study componed cost-est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$3,020,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	5,587,742	cy	12.00	67,052,904
b. Removal of structures (1,500 sf avg size 88 ea =)	132,000	sf	3.50	462,000
b. Disposal Fee	4,889	cy	2.50	12,222
c. Removal of roads (24' wide assumed)	27,933	lf	14.00	391,062
d. Removal of utilities	27,933	lf	41.00	1,145,253
2. Herbicide, hand application (untouched areas from excavation)	149	acre	3,100	461,900
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00	7,155
3. Plantings	889	acre	57,600	51,206,400
Misc Site Items	1	ls	allow	600,000
	Current Contract Cost, FY 07			$ 124,358,896
CONTINGENCY			**25.0%**	31,089,724
				$ 155,448,620
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aquas			**LS**	19,250,916
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$174,724,536
30 Account, Plan, Engr.& Design			**8.0%**	13,977,963
				$ 188,702,499
31 Account, Constr. Management			**6.0%**	11,322,150
				$ 200,024,649
ESCALATION			**0.0%**	
				$ 200,024,649 rounded
	TOTAL PROJECT COST, FY-07			**$ 200,000,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Chapman Road**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			

mscip-comprehensive-study-combined cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$500,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	935,187	cy	12.00	11,222,244
b. Removal of structures (1,500 sf avg size 13ea =)	19,500	sf	3.50	68,250
b. Disposal Fee	722	cy	2.50	1,806
c. Removal of roads (24' wide assumed)	4,599	lf	14.00	64,386
d. Removal of utilities	4,599	lf	41.00	188,559
2. Herbicide, hand application (untouched areas from excavation)	23	acre	3,100	71,300
3. Filling of existing ditches and channels (from req'd. excavation)	1,431	cy	5.00	7,155
3. Plantings	146	acre	57,600	8,409,600
Misc Site Items	1	ls	allow	100,000

	Current Contract Cost, FY 07		$	20,633,300
CONTINGENCY		**25.0%**		5,158,325
			$	25,791,624
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		1,180,610,509
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$1,206,427,133
30 Account, Plan, Engr.& Design		**8.0%**		96,514,171
			$	1,302,941,304
31 Account, Constr. Management		**6.0%**		78,176,478
			$	1,381,117,782
ESCALATION		**0.0%**		
			$	1,381,117,782
				rounded
	TOTAL PROJECT COST, FY-07		$	1,381,100,000

Environmental Restoration, 32 Sites Costs - Chapman Road

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Jourdan River I-10 Dev**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			

mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,170,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	4,021,304	cy	12.00	48,255,648
b. Removal of structures (1,500 sf avg size 56ea =)	84,000	sf	3.50	294,000
b. Disposal Fee	3,111	cy	2.50	7,778
c. Removal of roads (24' wide assumed)	19,775	lf	14.00	276,850
d. Removal of utilities	19,775	lf	41.00	810,775
2. Herbicide, hand application (untouched areas from excavation)	99	acre	3,100	306,900
3. Filling of existing ditches and channels (from req'd. excavation)	4,000	cy	5.00	20,000
3. Plantings	638	acre	57,600	36,748,800
Misc Site Items	1	ls	allow	400,000

Current Contract Cost, FY 07			$	89,290,751
CONTINGENCY		**25.0%**		22,322,688
			$	111,613,438
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		157,856,094
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$269,494,532
30 Account, Plan, Engr.& Design		**8.0%**		21,559,563
			$	291,054,095
31 Account, Constr. Management		**6.0%**		17,463,246
			$	308,517,341
ESCALATION		**0.0%**		
			$	308,517,341
				rounded
TOTAL PROJECT COST, FY- 07			**$**	**308,500,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	Mississippi Coastal Improvements Project "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Diamondhead**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est 25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,470,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	2,735,422	cy	12.00	32,825,064
b. Removal of structures (1,500 sf avg size 38ea =)	57,000	sf	3.50	199,500
b. Disposal Fee	2,111	cy	2.50	5,278
c. Removal of roads (24' wide assumed)	13,452	lf	14.00	188,328
d. Removal of utilities	13,452	lf	41.00	551,532
2. Herbicide, hand application (untouched areas from excavation)	67	acre	3,100	207,700
3. Filling of existing ditches and channels (from req'd. excavation)	3,000	cy	5.00	15,000
3. Plantings	433	acre	57,600	24,940,800
Misc Site Items	1	ls	allow	300,000

	Current Contract Cost, FY 07		$	60,703,202
CONTINGENCY		**25.0%**		15,175,800
			$	75,879,002
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		30,631,509
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$106,535,511
30 Account, Plan, Engr.& Design		**8.0%**		8,522,841
			$	115,058,352
31 Account, Constr. Management		**6.0%**		6,903,501
			$	121,961,853
ESCALATION		**0.0%**		
			$	121,961,853
				rounded
	TOTAL PROJECT COST, FY- 07		**$**	**122,000,000**

Environmental Restoration, 32 Sites Costs - Diamondhead

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Michael McKown
WORK ITEM:	**Delisle**	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Harrison County	FILE NAME:	mscip comprehensive study-combined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$410,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	771,529	cy	12.00	9,258,348
b. Removal of structures (1,500 sf avg size 11ea =)	16,500	sf	3.50	57,750
b. Disposal Fee	611	cy	2.50	1,528
c. Removal of roads (24' wide assumed)	3,795	lf	14.00	53,130
d. Removal of utilities	3,795	lf	41.00	155,595
2. Herbicide, hand application (untouched areas from excavation)	19	acre	3,100	58,900
3. Filling of existing ditches and channels (from req'd. excavation)	2,000	cy	5.00	10,000
3. Plantings	120	acre	57,600	6,912,000
Misc Site Items	1	ls	allow	100,000
Current Contract Cost, FY 07				$ 17,017,251
CONTINGENCY			**25.0%**	4,254,313
				$ 21,271,563
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aquas			**LS**	197,388,356
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$218,684,919
30 Account, Plan, Engr.& Design			**8.0%**	17,494,794
				$ 236,179,713
31 Account, Constr. Management			**6.0%**	14,170,783
				$ 250,350,496
ESCALATION			**0.0%**	
				$ 250,350,496
				rounded
TOTAL PROJECT COST, FY- 07				**$ 250,400,000**

Environmental Restoration, 32 Sites Costs - Delisle

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Ellis Property**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			
			mscip-comprehensive-study-complained-cost-est 25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$800,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	500,000	cy	12.00		6,000,000
b. Removal of structures (1,500 sf avg size 11ea =)	16,500	sf	3.50		57,750
b. Disposal Fee	611	cy	2.50		1,528
c. Removal of roads (24' wide assumed)	3,795	lf	14.00		53,130
d. Removal of utilities	3,795	lf	41.00		155,595
2. Herbicide, hand application (untouched areas from excavation)	68	acre	3,100		210,800
3. Filling of existing ditches and channels (from req'd. excavation)	2,000	cy	5.00		10,000
3. Plantings	443	acre	57,600		25,516,800
Misc Site Items	1	ls	allow		200,000
	Current Contract Cost, FY 07			$	33,005,603
CONTINGENCY			**25.0%**		8,251,401
				$	41,257,003
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		19,166,243
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$60,448,246
30 Account, Plan, Engr.& Design			**8.0%**		4,835,860
				$	65,284,106
31 Account, Constr. Management			**6.0%**		3,917,046
				$	69,201,153
ESCALATION			**0.0%**		
				$	69,201,153
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**69,200,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	Mississippi Coastal Improvements Project "MsCIP"	ITEM NO.	DATE 25-Jul-08
LOCATION:	Mississippi	SHEET NO. 1	OF 1
		PREPARED: Joseph H Ellsworth	CHECKED: Michael McKown
WORK ITEM:	**Pine Point East**	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Harrison County	FILE NAME:	mscip comprehensive study combined cost est 25jul08 xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$350,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	654,631	cy	12.00		7,855,572
b. Removal of structures (1,500 sf avg size 9ea =)	13,500	sf	3.50		47,250
b. Disposal Fee	500	cy	2.50		1,250
c. Removal of roads (24' wide assumed)	3,219	lf	14.00		45,066
d. Removal of utilities	3,219	lf	41.00		131,979
2. Herbicide, hand application (untouched areas from excavation)	16	acre	3,100		49,600
3. Filling of existing ditches and channels (from req'd. excavation)	2,000	cy	5.00		10,000
3. Plantings	103	acre	57,600		5,932,800
Misc Site Items	1	ls	allow		100,000
	Current Contract Cost, FY 07			$	14,523,517
CONTINGENCY			**25.0%**		3,630,879
				$	18,154,396
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aqu			**LS**		14,199,388
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$32,378,784
30 Account, Plan, Engr.& Design			**8.0%**		2,590,303
				$	34,969,087
31 Account, Constr. Management			**6.0%**		2,098,145
				$	37,067,232
ESCALATION			**0.0%**		
				$	37,067,232
					rounded
	TOTAL PROJECT COST, FY- 07			**$**	**37,100,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Pine Point West**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			

mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$290,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	537,733	cy	12.00	6,452,796
b. Removal of structures (1,500 sf avg size 8ea =)	12,000	sf	3.50	42,000
b. Disposal Fee	444	cy	2.50	1,111
c. Removal of roads (24' wide assumed)	2,645	lf	14.00	37,030
d. Removal of utilities	2,645	lf	41.00	108,445
2. Herbicide, hand application (untouched areas from excavation)	14	acre	3,100	43,400
3. Filling of existing ditches and channels (from req'd. excavation)	2,000	cy	5.00	10,000
3. Plantings	83	acre	57,600	4,780,800
Misc Site Items	1	ls	allow	100,000

	Current Contract Cost, FY 07		$	11,865,582
CONTINGENCY		**25.0%**		2,966,396
			$	14,831,978
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aqua		**LS**		29,155,568
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$44,012,546
30 Account, Plan, Engr.& Design		**8.0%**		3,521,004
			$	47,533,549
31 Account, Constr. Management		**6.0%**		2,852,013
			$	50,385,562
ESCALATION		**0.0%**		
			$	50,385,562
				rounded
	TOTAL PROJECT COST, FY-07		**$**	**50,400,000**

Environmental Restoration, 32 Sites Costs - Pine Point West

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Pass Christian Beach Front**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			

mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$70,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	140,278	cy	12.00	1,683,336
b. Removal of structures (1,500 sf avg size 2ea =)	3,000	sf	3.50	10,500
b. Disposal Fee	111	cy	2.50	278
c. Removal of roads (24' wide assumed)	690	lf	14.00	9,660
d. Removal of utilities	690	lf	41.00	28,290
2. Herbicide, hand application (untouched areas from excavation)	4	acre	3,100	12,400
3. Filling of existing ditches and channels (from req'd. excavation)	1,500	cy	5.00	7,500
3. Plantings	21	acre	57,600	1,209,600
Misc Site Items	1	ls	allow	10,000

Current Contract Cost, FY 07			$	3,041,564
CONTINGENCY		25.0%		760,391
			$	3,801,955
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		21,510,900
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$25,337,855
30 Account, Plan, Engr.& Design		**8.0%**		2,027,028
			$	27,364,883
31 Account, Constr. Management		**6.0%**		1,641,893
			$	29,006,776
ESCALATION		**0.0%**		
			$	29,006,776
				rounded
TOTAL PROJECT COST, FY- 07			**$**	**29,000,000**

Environmental Restoration, 32 Sites Costs - Pass Christian Beach Front

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Michael McKown
WORK ITEM:	**Pass Christian Bayou Portage**	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Harrison County	FILE NAME:	

mscip-comprehensive study-combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$150,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	280,556	cy	12.00	3,366,672
b. Removal of structures (1,500 sf avg size 4ea =)	6,000	sf	3.50	21,000
b. Disposal Fee	222	cy	2.50	556
c. Removal of roads (24' wide assumed)	1,380	lf	14.00	19,320
d. Removal of utilities	1,380	lf	41.00	56,580
2. Herbicide, hand application (untouched areas from excavation)	7	acre	3,100	21,700
3. Filling of existing ditches and channels (from req'd. excavation)	1,500	cy	5.00	7,500
3. Plantings	43	acre	57,600	2,476,800
Misc Site Items	1	ls	allow	30,000

	Current Contract Cost, FY 07		$	6,150,128
CONTINGENCY		**25.0%**		1,537,532
			$	7,687,659
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		6,904,320
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$14,616,979
30 Account, Plan, Engr.& Design		**8.0%**		1,169,358
			$	15,786,338
31 Account, Constr. Management		**6.0%**		947,180
			$	16,733,518
ESCALATION		**0.0%**		
			$	16,733,518
				rounded
	TOTAL PROJECT COST, FY- 07		**$**	**16,700,000**

Environmental Restoration, 32 Sites Costs - Pass Christian Bayou Portage

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph B. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Bayou Brickyard**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			

mscip comprehensive-study-compbined cost-est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$50,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	93,519	cy	12.00	1,122,228
b. Removal of structures (1,500 sf avg size 2ea =)	3,000	sf	3.50	10,500
b. Disposal Fee	111	cy	2.50	278
c. Removal of roads (24' wide assumed)	460	lf	14.00	6,440
d. Removal of utilities	460	lf	41.00	18,860
2. Herbicide, hand application (untouched areas from excavation)	3	acre	3,100	9,300
3. Filling of existing ditches and channels (from req'd. excavation)	1,000	cy	5.00	5,000
3. Plantings	14	acre	57,600	806,400
Misc Site Items	1	ls	allow	10,000

Current Contract Cost, FY 07			$	2,039,006
CONTINGENCY		**25.0%**		509,751
			$	2,548,757
01 Account, Lands & Damage	PCA	**LS**		25,000
02 Account, Relocations, aquas		**LS**		20,763,975
Account, Environmental		**LS**		
09 Account, Aids to Navigation		**LS**		
				$23,337,732
30 Account, Plan, Engr.& Design		**8.0%**		1,867,019
			$	25,204,751
31 Account, Constr. Management		**6.0%**		1,512,285
			$	26,717,036
ESCALATION		**0.0%**		
			$	26,717,036
				rounded
TOTAL PROJECT COST, FY-07			**$**	**26,700,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph E. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Biloxi River Shorecrest**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			

mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow		$50,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0		93,519	cy	12.00		1,122,228
b. Removal of structures (1,500 sf avg size 2ea =)		3,000	sf	3.50		10,500
b. Disposal Fee		111	cy	2.50		278
c. Removal of roads (24' wide assumed)		460	lf	14.00		6,440
d. Removal of utilities		460	lf	41.00		18,860
2. Herbicide, hand application (untouched areas from excavation)		3	acre	3,100		9,300
3. Filling of existing ditches and channels (from req'd. excavation)		1,000	cy	5.00		5,000
3. Plantings		15	acre	57,600		864,000
Misc Site Items		1	ls	allow		10,000
		Current Contract Cost, FY 07			$	2,096,606
	CONTINGENCY			**25.0%**		524,151
					$	2,620,757
	01 Account, Lands & Damage		PCA	**LS**		25,000
	02 Account, Relocations, aquas			**LS**		736,178
	Account, Environmental			**LS**		
	09 Account, Aids to Navigation			**LS**		
						$3,381,935
	30 Account, Plan, Engr.& Design			**8.0%**		270,555
					$	3,652,490
	31 Account, Constr. Management			**6.0%**		219,149
					$	3,871,639
	ESCALATION			**0.0%**		
					$	3,871,639
						rounded
		TOTAL PROJECT COST, FY- 07			**$**	**3,900,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Biloxi River Eagle Poin**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			

mscip comprehensive study combined cost est 25Jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$50,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	93,519	cy	12.00		1,122,228
b. Removal of structures (1,500 sf avg size 2ea =)	3,000	sf	3.50		10,500
b. Disposal Fee	111	cy	2.50		278
c. Removal of roads (24' wide assumed)	460	lf	14.00		6,440
d. Removal of utilities	460	lf	41.00		18,860
2. Herbicide, hand application (untouched areas from excavation)	3	acre	3,100		9,300
3. Filling of existing ditches and channels (from req'd. excavation)	1,000	cy	5.00		5,000
3. Plantings	17	acre	57,600		979,200
Misc Site Items	1	ls	allow		10,000
	Current Contract Cost, FY 07			$	2,211,806
CONTINGENCY			**25.0%**		552,951
				$	2,764,757
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		4,432,825
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$7,222,582
30 Account, Plan, Engr.& Design			**8.0%**		577,807
				$	7,800,389
31 Account, Constr. Management			**6.0%**		468,023
				$	8,268,412
ESCALATION			**0.0%**		
				$	8,268,412 rounded
	TOTAL PROJECT COST, FY-07			**$**	**8,300,000**

Environmental Restoration, 32 Sites Costs - Biloxi River Eagle Point

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Biloxi Front Beach S of 90t**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:	mscip-comprehensive-study-comphined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$120,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	200,000	cy	12.00		2,400,000
b. Removal of structures (1,500 sf avg size 5ea =)	7,500	sf	3.50		26,250
b. Disposal Fee	278	cy	2.50		694
c. Removal of roads (24' wide assumed)	950	lf	14.00		13,300
d. Removal of utilities	950	lf	41.00		38,950
2. Herbicide, hand application (untouched areas from excavation)	7	acre	3,100		21,700
3. Filling of existing ditches and channels (from req'd. excavation)	1,500	cy	5.00		7,500
3. Plantings	40	acre	57,600		2,304,000
Misc Site Items	1	ls	allow		20,000
	Current Contract Cost, FY 07			$	4,952,394
CONTINGENCY			**25.0%**		1,238,099
				$	6,190,493
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aqua			**LS**		10,326,300
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$16,541,793
30 Account, Plan, Engr.& Design			**8.0%**		1,323,343
				$	17,865,137
31 Account, Constr. Management			**6.0%**		1,071,908
				$	18,937,045
ESCALATION			**0.0%**		
				$	18,937,045
					rounded
	TOTAL PROJECT COST, FY- 07			**$**	**18,900,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	Mississippi Coastal Improvements Project "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Keegan Bayou**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Harrison County	FILE NAME:			

mscip comprehensive study-combined-cost-est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$190,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	350,696	cy	12.00		4,208,352
b. Removal of structures (1,500 sf avg size 5ea =)	7,500	sf	3.50		26,250
b. Disposal Fee	278	cy	2.50		694
c. Removal of roads (24' wide assumed)	1,725	lf	14.00		24,150
d. Removal of utilities	1,725	lf	41.00		70,725
2. Herbicide, hand application (untouched areas from excavation)	9	acre	3,100		27,900
3. Filling of existing ditches and channels (from req'd. excavation)	1,700	cy	5.00		8,500
3. Plantings	54	acre	57,600		3,110,400
Misc Site Items	1	ls	allow		40,000
	Current Contract Cost, FY 07			$	7,706,971
CONTINGENCY			**25.0%**		1,926,743
				$	9,633,714
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		15,537,250
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$25,195,964
30 Account, Plan, Engr.& Design			**8.0%**		2,015,677
				$	27,211,641
31 Account, Constr. Management			**6.0%**		1,632,698
				$	28,844,340
ESCALATION			**0.0%**		
				$	28,844,340
					rounded
	TOTAL PROJECT COST, FY- 07			**$**	**28,800,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT: **Mississippi Coastal Improvements Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: **St Martin**
Jackson County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Michael McKown
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,590,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	2,945,839	cy	12.00	35,350,068
b. Removal of structures (1,500 sf avg size 41ea =)	61,500	sf	3.50	215,250
b. Disposal Fee	2,278	cy	2.50	5,694
c. Removal of roads (24' wide assumed)	14,487	lf	14.00	202,818
d. Removal of utilities	14,487	lf	41.00	593,967
2. Herbicide, hand application (untouched areas from excavation)	72	acre	3,100	223,200
3. Filling of existing ditches and channels (from req'd. excavation)	4,000	cy	5.00	20,000
3. Plantings	467	acre	57,600	26,899,200
Misc Site Items	1	ls	allow	320,000
Current Contract Cost, FY 07			$	65,420,197
CONTINGENCY			**25.0%**	16,355,049
			$	81,775,247
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aquas			**LS**	58,274,698
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$140,074,945
30 Account, Plan, Engr.& Design			**8.0%**	11,205,996
			$	151,280,940
31 Account, Constr. Management			**6.0%**	9,076,856
			$	160,357,797
ESCALATION			**0.0%**	
			$	160,357,797
				rounded
TOTAL PROJECT COST, FY-07			**$**	**160,400,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Fort Point**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			

mscip comprehensive study compbinest cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$290,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	537,733	cy	12.00		6,452,796
b. Removal of structures (1,500 sf avg size 8ea =)	12,000	sf	3.50		42,000
b. Disposal Fee	444	cy	2.50		1,111
c. Removal of roads (24' wide assumed)	2,645	lf	14.00		37,030
d. Removal of utilities	2,645	lf	41.00		108,445
2. Herbicide, hand application (untouched areas from excavation)	14	acre	3,100		43,400
3. Filling of existing ditches and channels (from req'd. excavation)	1,800	cy	5.00		9,000
3. Plantings	83	acre	57,600		4,780,800
Misc Site Items	1	ls	allow		60,000
	Current Contract Cost, FY 07			$	11,824,582
CONTINGENCY			**25.0%**		2,956,146
				$	14,780,728
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		22,349,145
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$37,154,873
30 Account, Plan, Engr.& Design			**8.0%**		2,972,390
				$	40,127,262
31 Account, Constr. Management			**6.0%**		2,407,636
				$	42,534,898
ESCALATION			**0.0%**		
				$	42,534,898
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**42,500,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Pine Island**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			
			mscip-comprehensive study-combined cost est 25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$8,550,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	15,804,657	cy	12.00		189,655,884
b. Removal of structures (1,500 sf avg size 218ea =)	327,000	sf	3.50		1,144,500
b. Disposal Fee	12,111	cy	2.50		30,278
c. Removal of roads (24' wide assumed)	78,065	lf	14.00		1,092,910
d. Removal of utilities	78,065	lf	41.00		3,200,665
2. Herbicide, hand application (untouched areas from excavation)	388	acre	3,100		1,202,800
3. Filling of existing ditches and channels (from req'd. excavation)	5,000	cy	5.00		25,000
3. Plantings	2,531	acre	57,600		145,785,600
Misc Site Items	1	ls	allow		1,710,000
	Current Contract Cost, FY 07			$	352,397,637
CONTINGENCY			**25.0%**		88,099,409
				$	440,497,046
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		58,771,659
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$499,293,705
30 Account, Plan, Engr.& Design			**8.0%**		39,943,496
				$	539,237,201
31 Account, Constr. Management			**6.0%**		32,354,232
				$	571,591,433
ESCALATION			**0.0%**		
				$	571,591,433
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**571,600,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph D. Ellsworth	CHECKED: Michael McKown
WORK ITEM:	**Belle Fountaine**	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County	FILE NAME:	mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$5,120,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	9,445,387	cy	12.00	113,344,644
b. Removal of structures (1,500 sf avg size 130ea =)	195,000	sf	3.50	682,500
b. Disposal Fee	7,222	cy	2.50	18,056
c. Removal of roads (24' wide assumed)	46,793	lf	14.00	655,102
d. Removal of utilities	46,793	lf	41.00	1,918,513
2. Herbicide, hand application (untouched areas from excavation)	232	acre	3,100	719,200
3. Filling of existing ditches and channels (from req'd. excavation)	4,000	cy	5.00	20,000
3. Plantings	1,516	acre	57,600	87,321,600
Misc Site Items	1	ls	allow	1,020,000
Current Contract Cost, FY 07			$	210,819,615
CONTINGENCY			**25.0%**	52,704,904
			$	263,524,518
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aquas			**LS**	13,639,822
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$277,189,340
30 Account, Plan, Engr.& Design			**8.0%**	22,175,147
			$	299,364,487
31 Account, Constr. Management			**6.0%**	17,961,869
			$	317,326,357
ESCALATION			**0.0%**	
			$	317,326,357
				rounded
TOTAL PROJECT COST, FY-07			**$**	**317,300,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	Mississippi Coastal Improvements Project "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKown
WORK ITEM:	**Griffin Point**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			

mscip comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$620,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	1,145,604	cy	12.00	13,747,248
b. Removal of structures (1,500 sf avg size 16ea =)	24,000	sf	3.50	84,000
b. Disposal Fee	889	cy	2.50	2,222
c. Removal of roads (24' wide assumed)	5,634	lf	14.00	78,876
d. Removal of utilities	5,634	lf	41.00	230,994
2. Herbicide, hand application (untouched areas from excavation)	28	acre	3,100	86,800
3. Filling of existing ditches and channels (from req'd. excavation)	1,800	cy	5.00	9,000
3. Plantings	182	acre	57,600	10,483,200
Misc Site Items	1	ls	allow	120,000

	Current Contract Cost, FY 07		$	25,462,340
CONTINGENCY		25.0%		6,365,585
			$	31,827,925
01 Account, Lands & Damage	PCA	LS		25,000
02 Account, Relocations, aquas		LS		15,564,422
Account, Environmental		LS		
09 Account, Aids to Navigation		LS		
				$47,417,347
30 Account, Plan, Engr.& Design		8.0%		3,793,388
			$	51,210,735
31 Account, Constr. Management		6.0%		3,072,644
			$	54,283,379
ESCALATION		0.0%		
			$	54,283,379 rounded
	TOTAL PROJECT COST, FY-07		**$**	**54,300,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvements Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Michael McKowe
WORK ITEM:	**Bayou Chico**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			
			mscip comprehensive study combined cost est 25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow		$880,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	1,636,577	cy	12.00		19,638,924
b. Removal of structures (1,500 sf avg size 23ea =)	34,500	sf	3.50		120,750
b. Disposal Fee	1,278	cy	2.50		3,194
c. Removal of roads (24' wide assumed)	8,048	lf	14.00		112,672
d. Removal of utilities	8,048	lf	41.00		329,968
2. Herbicide, hand application (untouched areas from excavation)	40	acre	3,100		124,000
3. Filling of existing ditches and channels (from req'd. excavation)	2,200	cy	5.00		11,000
3. Plantings	258	acre	57,600		14,860,800
Misc Site Items	1	ls	allow		180,000
	Current Contract Cost, FY 07			$	36,261,308
CONTINGENCY			**25.0%**		9,065,327
				$	45,326,636
01 Account, Lands & Damage		PCA	**LS**		25,000
02 Account, Relocations, aquas			**LS**		78,568,456
Account, Environmental			**LS**		
09 Account, Aids to Navigation			**LS**		
					$123,920,092
30 Account, Plan, Engr.& Design			**8.0%**		9,913,607
				$	133,833,699
31 Account, Constr. Management			**6.0%**		8,030,022
				$	141,863,721
ESCALATION			**0.0%**		
				$	141,863,721
					rounded
	TOTAL PROJECT COST, FY-07			**$**	**141,900,000**

Environmental Restoration, 32 Sites Costs - Bayou Chico

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT: **Mississippi Coastal Improvements Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: **Grand Bay Marsh Bayou Cumbest**
Jackson County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Michael McKown
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive study combined cost est 25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$9,030,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	16,716,465	cy	12.00	200,597,580
b. Removal of structures (1,500 sf avg size 229ea =)	343,500	sf	3.50	1,202,250
b. Disposal Fee	12,722	cy	2.50	31,806
c. Removal of roads (24' wide assumed)	82,204	lf	14.00	1,150,856
d. Removal of utilities	82,204	lf	41.00	3,370,364
2. Herbicide, hand application (untouched areas from excavation)	408	acre	3,100	1,264,800
3. Filling of existing ditches and channels (from req'd. excavation)	4,500	cy	5.00	22,500
3. Plantings	2,666	acre	57,600	153,561,600
Misc Site Items	1	ls	allow	1,810,000
Current Contract Cost, FY 07				$ 372,041,756
CONTINGENCY			**25.0%**	93,010,439
				$ 465,052,194
01 Account, Lands & Damage		PCA	**LS**	25,000
02 Account, Relocations, aquas			**LS**	37,575,406
Account, Environmental			**LS**	
09 Account, Aids to Navigation			**LS**	
				$502,652,600
30 Account, Plan, Engr.& Design			**8.0%**	40,212,208
				$ 542,864,808
31 Account, Constr. Management			**6.0%**	32,571,889
				$ 575,436,697
ESCALATION			**0.0%**	
				$ 575,436,697
				rounded
TOTAL PROJECT COST, FY-07				**$ 575,400,000**

Environmental Restoration, 32 Sites Costs - Grand Bay Marsh

COMPREHENSIVE STUDY " Admiral Island Environmental Restoration " Summary

					(revised)
PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Summary***	BASIS of ESTIMATE	Info furnished per Project Delivery Team		
		FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	ESTIMATED AMOUNT
ENVIRONMENTAL RESTORATION	
Hancock County **Admiral Island**	
0.5 METER PLANTINGS WITH FILL	**$ 26,300,000**
1.0 METER PLANTINGS WITH FILL	**$ 23,800,000**
2.0 METER PLANTINGS WITH FILL	**$ 22,500,000**
0.5 METER PLANTINGS WITHOUT FILL	**$ 26,300,000**
1.0 METER PLANTINGS WITHOUT FILL	**$ 23,700,000**
2.0 METER PLANTINGS WITHOUT FILL	**$ 22,400,000**

Notes:

Price Level, Oct 07

Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment

Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"

Quantities listed within the Estimate represent Major Elements of the Project

Structural Removal Cost included in nonstructural estimates

Utility Removal Cost includes, sewer, storm drain, water, gas, power, cable, phone, traffic signaling

Estimate Exclud Operational & Maintenance Cost

Project Escalation

Relocations, Environment, HTRW & Real Estate Cost (except PCA)

Historical Preservation

Environmental Restoration, 5 Sites Costs - admiral island summary

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Admiral Island** ***0.5 Meter Planting W/ Fill***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,400,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	916,483	cy	12.00	10,997,796
b. Removal of structures (1,500 sf avg size ea =)	cost included in the nonstructural estimate			
b. Disposal Fee	cost included in the nonstructural estimate			
c. Removal of roads (24' wide assumed)	3,500	lf	14.00	49,000
d. Removal of utilities	3,500	lf	41.00	143,500
2. Herbaside, application from truck (untouched areas from excavation)	62	acre	3,100	192,200
3. Filling of existing ditches and channels (from req'd. excavation)	7,000	cy	5.00	35,000
4. Plantings a. 0.5 meter spacing	62	acre	57,600	3,571,200
Misc Site Items	1	ls	allow	1,000,000
	Current Contract Cost, Oct 07			$18,388,696
CONTINGENCY			**25.0%**	4,597,174
				$22,985,870
01 Account, Lands & Damage		PCA	**LS**	25,000
				$23,010,870
30 Account, Plan, Engr.& Design			**8.0%**	1,840,870
				$24,851,740
31 Account, Constr. Management			**6.0%**	1,491,104
				$26,342,844
ESCALATION			**0.0%**	
				$26,342,844
				rounded
	TOTAL PROJECT COST, Oct 07			**$ 26,300,000**

Environmental Restoration, 5 Sites Costs - 0.5 meter spacing w fill

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Admiral Island** ***1 Meter Planting W/ Fill***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,400,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	916,483	cy	12.00	10,997,796
b. Removal of structures (1,500 sf avg size 225 ea =)	cost included in the nonstructural estimate			
b. Disposal Fee	cost included in the nonstructural estimate			
c. Removal of roads (24' wide assumed)	3,500	lf	14.00	49,000
d. Removal of utilities	3,500	lf	41.00	143,500
2. Herbaside, application from truck (untouched areas from excavation)	62	acre	3,100	192,200
3. Filling of existing ditches and channels (from req'd. excavation)	7,000	cy	5.00	35,000
4. Plantings b. 1.0 meter spacing	62	acre	28,800	1,785,600
Misc Site Items	1	ls	allow	1,000,000
	Current Contract Cost, Oct 07			$16,603,096
CONTINGENCY			**25.0%**	4,150,774
				$20,753,870
01 Account, Lands & Damage		PCA	**LS**	25,000
				$20,778,870
30 Account, Plan, Engr.& Design			**8.0%**	1,662,310
				$22,441,180
31 Account, Constr. Management			**6.0%**	1,346,471
				$23,787,650
ESCALATION			**0.0%**	
				$23,787,650
				rounded
	TOTAL PROJECT COST, Oct 07			**$23,800,000**

Environmental Restoration, 5 Sites Costs - 1 meter spacing w fill

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	Mississippi Coastal Improvements Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Admiral Island** *2 Meter Planting W/ Fill*	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Hancock County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,400,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	915,483	cy	12.00	10,985,796
b. Removal of structures (1,500 sf avg size 225 ea =)	cost included in the nonstructural estimate			
b. Disposal Fee	cost included in the nonstructural estimate			
c. Removal of roads (24' wide assumed)	3,500	lf	14.00	49,000
d. Removal of utilities	3,500	lf	41.00	143,500
2. Herbaside, application from truck (untouched areas from excavation)	62	acre	3,100	192,200
3. Filling of existing ditches and channels (from req'd. excavation)	7,000	cy	5.00	35,000
4. Plantings c. 2.0 meter spacing	62	acre	14,400	892,800
Misc Site Items	1	ls	allow	1,000,000
	Current Contract Cost, OCT 07			$15,698,296
CONTINGENCY			**25.0%**	3,924,574
				$19,622,870
01 Account, Lands & Damage		PCA	**LS**	25,000
				$19,647,870
30 Account, Plan, Engr.& Design			**8.0%**	1,571,830
				$21,219,700
31 Account, Constr. Management			**6.0%**	1,273,182
				$22,492,882
ESCALATION			**0.0%**	
				$22,492,882
				rounded
	TOTAL PROJECT COST, Oct 07			**$22,500,000**

Environmental Restoration, 5 Sites Costs - 2 meter spacing w fill

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	**Admiral Island** ***0.5 Meter Planting WOUT/ Fill***	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Hancock County	FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$2,400,000
1. Removals:	a. Excavation existing Area from -0.5 to +2.0	915,483	cy	12.00	10,985,796
	b. Removal of structures (1,500 sf avg size 225 ea =)	cost included in the nonstructural estimate			
	b. Disposal Fee	cost included in the nonstructural estimate			
	c. Removal of roads (24' wide assumed)	3,500	lf	14.00	49,000
	d. Removal of utilities	3,500	lf	41.00	143,500
2. Herbaside, application from truck (untouched areas from excavation)		62	acre	3,100	192,200
3. Plantings	a. 0.5 meter spacing	62	acre	57,600	3,571,200
Misc Site Items		1	ls	allow	1,000,000
		Current Contract Cost, Oct 07			$18,341,696
	CONTINGENCY			**25.0%**	4,585,424
					$22,927,120
	01 Account, Lands & Damage		PCA	**LS**	25,000
					$22,952,120
	30 Account, Plan, Engr.& Design			**8.0%**	1,836,170
					$24,788,290
	31 Account, Constr. Management			**6.0%**	1,487,297
					$26,275,587
	ESCALATION			**0.0%**	
					$26,275,587
					rounded
		TOTAL PROJECT COST, Oct 07			**$ 26,300,000**

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: **Admiral Island** ***1 Meter Planting WOUT/ Fill*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME:
mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,400,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	915,483	cy	12.00	10,985,796
b. Removal of structures (1,500 sf avg size 0 ea =)	cost included in the nonstructural estimate			
b. Disposal Fee	cost included in the nonstructural estimate			
c. Removal of roads (24' wide assumed)	3,500	lf	14.00	49,000
d. Removal of utilities	3,500	lf	41.00	143,500
2. Herbaside, application from truck (untouched areas from excavation)	62	acre	3,100	192,200
3. Plantings b. 1.0 meter spacing	62	acre	28,800	1,785,600
Misc Site Items	1	ls	allow	1,000,000
	Current Contract Cost, Oct 07			$16,556,096
CONTINGENCY			**25.0%**	4,139,024
				$20,695,120
01 Account, Lands & Damage		PCA	**LS**	25,000
				$20,720,120
30 Account, Plan, Engr.& Design			**8.0%**	1,657,610
				$22,377,730
31 Account, Constr. Management			**6.0%**	1,342,664
				$23,720,393
ESCALATION			**0.0%**	
				$23,720,393
				rounded
	TOTAL PROJECT COST, Oct 07			**$23,700,000**

Environmental Restoration, 5 Sites Costs - 1 meter spacing wout fill

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: **Admiral Island** ***2 Meter Planting WOUT/ Fill*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$2,400,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	915,483	cy	12.00	10,985,796
b. Removal of structures (1,500 sf avg size 0 ea =)	cost included in the nonstructural estimate			
b. Disposal Fee	cost included in the nonstructural estimate			
c. Removal of roads (24' wide assumed)	3,500	lf	14.00	49,000
d. Removal of utilities	3,500	lf	41.00	143,500
2. Herbaside, application from truck (untouched areas from excavation)	62	acre	3,100	192,200
3. Plantings c. 2.0 meter spacing	62	acre	14,400	892,800
Misc Site Items	1	ls	allow	1,000,000
	Current Contract Cost, Oct 07			$15,663,296
CONTINGENCY			**25.0%**	3,915,824
				$19,579,120
01 Account, Lands & Damage		PCA	**LS**	25,000
				$19,604,120
30 Account, Plan, Engr.& Design			**8.0%**	1,568,330
				$21,172,450
31 Account, Constr. Management			**6.0%**	1,270,347
				$22,442,797
ESCALATION			**0.0%**	
				$22,442,797
				rounded
	TOTAL PROJECT COST, Oct 07			**$22,400,000**

Environmental Restoration, 5 Sites Costs - 2 meter spacing wout fill

COMPREHENSIVE STUDY " Environmental Restoration - O & M " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 1	OF	1
	PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: **Admiral Island**	BASIS of ESTIMATE: info furnished per Project Delivery Team		
	FILE NAME: mscip-admiral-enviro-restor-compreh-study-O&M-cost-13sep07.xls		

DESCRIPTION		ESTIMATED AMOUNT

ENVIRONMENTAL RESTORATION O&M

Hancock County
Replanting Effort

Admiral Island

0.5 METER PLANTINGS WITH FILL	(monitoring only 5 yrs $7,000)	$ 35,000
1.0 METER PLANTINGS WITH FILL		$ 1,233,000
2.0 METER PLANTINGS WITH FILL		$ 1,233,000
0.5 METER PLANTINGS WITHOUT FILL	(monitoring only 5 yrs $7,000)	$ 35,000
1.0 METER PLANTINGS WITHOUT FILL		$ 1,233,000
2.0 METER PLANTINGS WITHOUT FILL		$ 1,233,000

****THESE REPLANTING COSTS WILL OCCUR IN YEARS 3 AND 5 OF THE PERIOD OF ANALYSIS.***

Notes:
Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Estimate Excludes Project Escalation

COMPREHENSIVE STUDY " Environmental Restoration - O & M " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: **Admiral Island** ***Replanting 25% of area*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***Years 3 and 5*** FILE NAME:
mscip-admiral-enviro-restor-compreh-study-O&M-cost-13sep07.xls

DESCRIPTION			Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)			1	job	allow		$20,000
Re-Plantings	b. 1.0 meter spacing	at year 3	14	acre	28,800		403,200
Re-Plantings	b. 1.0 meter spacing	at year 5	14	acre	28,800		403,200
Monitoring	b. 1.0 meter spacing		5	yrs	7,000		35,000
Misc Site Items			1	ls	allow		0
			Current Contract Cost, OCT 07				$861,400
		CONTINGENCY			**25.0%**		215,350
						$	1,076,750
		30 Account, Plan, Engr.& Design			**8.0%**		86,140
						$	1,162,890
		31 Account, Constr. Management			**6.0%**		69,773
						$	1,232,663
		ESCALATION			**0.0%**		
						$	1,232,663
							rounded
			TOTAL PROJECT COST, OCT 07			**$**	**1,233,000**

COMPREHENSIVE STUDY "Environmental Restoration - O & M" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**
LOCATION: **Mississippi**
WORK ITEM: **Admiral Island** ***Replanting 50% of area***
Hancock County ***in Years 3 and 5***

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)			1	job	allow	$20,000
Re-Plantings	b. 2.0 meter spacing	at year 3	28	acre	14,400	403,200
Re-Plantings	b. 2.0 meter spacing	at year 5	28	acre	14,400	403,200
Monitoring	b. 2.0 meter spacing		5	yrs	7,000	35,000
Misc Site Items			1	ls	allow	0
		Current Contract Cost, OCT 07				$861,400
		CONTINGENCY			**25.0%**	215,350
					$	1,076,750
		30 Account, Plan, Engr.& Design			**8.0%**	86,140
					$	1,162,890
		31 Account, Constr. Management			**6.0%**	69,773
					$	1,232,663
		ESCALATION			**0.0%**	
					$	1,232,663
						rounded
		TOTAL PROJECT COST, OCT 07			**$**	**1,233,000**

COMPREHENSIVE STUDY " Environmental Restoration - O & M " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: **Admiral Island** ***Replanting 25% of area*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County ***in Years 3 and 5*** FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)		1	job	allow	$20,000
Re-Plantings b. 1.0 meter spacing	at year 3	14	acre	28,800	403,200
Re-Plantings b. 1.0 meter spacing	at year 5	14	acre	28,800	403,200
Monitoring b. 1.0 meter spacing		5	yrs	7,000	35,000
Misc Site Items		1	ls	allow	0
		Current Contract Cost, OCT 07			$ 861,400
	CONTINGENCY			**25.0%**	215,350
					$ 1,076,750
	30 Account, Plan, Engr.& Design			**8.0%**	86,140
					$ 1,162,890
	31 Account, Constr. Management			**6.0%**	69,773
					$ 1,232,663
	ESCALATION			**0.0%**	
					$ 1,232,663
					rounded
		TOTAL PROJECT COST, OCT 07			**$1,233,000**

Environmental Restoration, 5 Sites O/M Costs - 1 meter spacing wout fill (2)

COMPREHENSIVE STUDY " Environmental Restoration - O & M " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: **Admiral Island** ***Replanting 50% of area*** BASIS of ESTIMATE Info furnished per Project Delivery Team
Hancock County ***in Years 3 and 5*** FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)		1	job	allow	$20,000
Re-Plantings b. 2.0 meter spacing	at year 3	28	acre	14,400	403,200
Re-Plantings b. 2.0 meter spacing	at year 5	28	acre	14,400	403,200
Monitoring b. 2.0 meter spacing		5	yrs	7,000	35,000
Misc Site Items		1	ls	allow	0
		Current Contract Cost, OCT 07			$861,400
	CONTINGENCY			**25.0%**	215,350
					$ 1,076,750
	30 Account, Plan, Engr.& Design			**8.0%**	86,140
					$ 1,162,890
	31 Account, Constr. Management			**6.0%**	69,773
					$ 1,232,663
	ESCALATION			**0.0%**	
					$ 1,232,663 rounded

TOTAL PROJECT COST, OCT 0 $ 1,233,000

Environmental Restoration, 5 Sites O/M Costs - 2 meter spacing wout fill (2)

COMPREHENSIVE STUDY " Turkey Creek Environmental Restoration " SUMMARY

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 1 OF 1
	PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Summary***	BASIS of ESTIMATE: info furnished per Project Delivery Team
	FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION			ESTIMATED AMOUNT
	ENVIRONMENTAL RESTORATION		
Harrison County	**Turkey Creek**	**North and South of Railroad**	**$ 7,600,000**
Harrison County	**Turkey Creek**	**North of Railroad**	**$1,900,000**
Harrison County	**Turkey Creek**	**South of Railroad**	**$5,900,000**

Notes:

Price Level. Oct 07

Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment

Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"

Quantities listed within the Estimate represent Major Elements of the Project

Structural Removal Cost includes minor Site Restoration (filling septic tanks, removal outside structures, pavements & utilities)

Utility Removal Cost includes, sewer, storm drain, water, gas, power, cable, phone, traffic signaling

Estimate Excluc Operational & Maintenance Cost

- Project Escalation
- Relocations, Environment, HTRW & Real Estate Cost (except PCA)
- Historical Preservation
- Asbestos Removal during Structure Removal

01 Account, Lands & Damage (land + admin + 25% contingency) in all options at $736,178.

Environmental Restoration, 5 Sites Costs - turkey creek rest summary

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Turkey Creek*** **North and South of Railroad** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$20,000
1. Fill in Ditches (from off-site borrow)	130,202	cy	12.00	1,562,424
2a. Burn Vegetation (surface only burn)	879	acre	150	131,850
b. Mow vegitation (annually)	879	acre	85	74,715
3. Removals b. Removal of structures (1,500 sf avg size 15 ea =)	22,500	sf	3.50	78,750
b. Disposal Fee	833	cy	2.50	2,083
c. Removal of roads (24' wide assumed)	45,822	lf	14.00	641,508
d. Removal of utilities	45,822	lf	41.00	1,878,702
Misc Site Items	1	ls	allow	45,000

Current Contract Cost, Oct 07			$4,435,032
CONTINGENCY		**25.0%**	1,108,758
			$5,543,790
01 Account, Lands & Damage	PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)		**LS**	1,101,000
			$6,669,790
30 Account, Plan, Engr.& Design		**8.0%**	533,583
			$7,203,374
31 Account, Constr. Management		**6.0%**	432,202
			$7,635,576
ESCALATION		**0.0%**	
			$7,635,576 rounded
TOTAL PROJECT COST, Oct 07			**$ 7,600,000**

Environmental Restoration, 5 Sites Costs - Turkey Creel North and South

COMPREHENSIVE STUDY "Environmental Restoration" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Turkey Creek*** **North of Railroad** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$20,000
1. Fill in Ditches (from off-site borrow)	28,124	cy	12.00	337,484
2a. Burn Vegetation (surface only burn)	190	acre	150	28,480
b. Mow vegitation (annually)	190	acre	85	16,138
3. Removals b. Removal of structures (1,500 sf avg size 3 ea =)	4,500	sf	3.50	15,750
b. Disposal Fee	167	cy	2.50	417
c. Removal of roads (24' wide assumed)	9,898	lf	14.00	138,566
d. Removal of utilities	9,898	lf	41.00	405,800
Misc Site Items	1	ls	allow	45,000
Current Contract Cost, Oct 07				$1,007,634
CONTINGENCY			**25.0%**	251,908
				$1,259,542
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	350,000
				$1,634,542
30 Account, Plan, Engr.& Design			**8.0%**	130,763
				$1,765,305
31 Account, Constr. Management			**6.0%**	105,918
				$1,871,224
ESCALATION			**0.0%**	
				$1,871,224 rounded

TOTAL PROJECT COST, Oct 07 **$1,900,000**

Environmental Restoration, 5 Sites Costs - Turkey Creek North

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Program "MsCIP'** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Turkey Creek*** **South of Railroad** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$20,000
1. Fill in Ditches (from off-site borrow)	102,078	cy	12.00	1,224,940
2a. Burn Vegetation (surface only burn)	689	acre	150	103,370
b. Mow vegitation (annually)	689	acre	85	58,577
3. Removal: b. Removal of structures (1,500 sf avg size 12 ea =	18,000	sf	3.50	63,000
b. Disposal Fee	667	cy	2.50	1,667
c. Removal of roads (24' wide assumed)	35,924	lf	14.00	502,942
d. Removal of utilities	35,924	lf	41.00	1,472,902
Misc Site Items	1	ls	allow	45,000
Current Contract Cost, Oct 07				$3,492,399
CONTINGENCY			**25.0%**	873,100
				$4,365,498
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)			**LS**	752,000
				$5,142,498
30 Account, Plan, Engr.& Design			**8.0%**	411,400
				$5,553,898
31 Account, Constr. Management			**6.0%**	333,234
				$5,887,132
ESCALATION			**0.0%**	
				$5,887,132
				rounded
TOTAL PROJECT COST, Oct 07				**$5,900,000**

Environmental Restoration, 5 Sites Costs - Turkey Creek South

COMPREHENSIVE STUDY " Turkey Creek O & M Environmental Restoration " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED	Joseph H. Lilsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Summary*** North & South O&M	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
		FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION			ESTIMATED AMOUNT
		ENVIRONMENTAL RESTORATION	
Harrison County	**Turkey Creek**	**Burn North and South of Railroad**	$190,000
Harrison County	**Turkey Creek**	**Mow North and South of Railroad**	$110,000
Harrison County	**Turkey Creek**	**Burn North of Railroad**	$41,000
Harrison County	**Turkey Creek**	**Mow North of Railroad**	$20,000
Harrison County	**Turkey Creek**	**Burn South of Railroad**	$149,000
Harrison County	**Turkey Creek**	**Mow South of Railroad**	$80,000

Notes: *** see backup for Cost Derivation**

Price Level, FY-07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Operations and Maintenance
Estimate Excludes: Project Escalation

Environmental Restoration, 5 Sites O/M Costs - turkey creek rest o&m

COMPREHENSIVE STUDY "Environmental Restoration" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPAREC Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Turkey Creek*** **Burn North and South of Railroad** BASIS of ESTIMATE: info furnished per Project Delivery Team
Hancock County FILE NAME:
mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$1,000
Burn Vegetation (surface only burn)	879	acre	150	131,850
	Current Contract Cost, FY 07			$132,850
CONTINGENCY			**25.0%**	33,213
				$166,063
30 Account, Plan, Engr.& Design			**8.0%**	13,285
				$179,348
31 Account, Constr. Management			**6.0%**	10,761
				$190,108
ESCALATION			**0.0%**	
				$190,108
				rounded
	TOTAL PROJECT COST, FY-07			$190,000

Environmental Restoration, 5 Sites O/M Costs - O&M North & South Burn

COMPREHENSIVE STUDY "Environmental Restoration" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***Turkey Creek*** **Hancock County** — **Mow North and South of Railroad**

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$400
b. Mow vegitation (annually)	879	acre	85	74,715
	Current Contract Cost, FY 07			$75,115
CONTINGENCY			**25.0%**	18,779
				$93,894
30 Account, Plan, Engr.& Design			**8.0%**	7,512
				$101,405
31 Account, Constr. Management			**6.0%**	6,084
				$107,490
ESCALATION			**0.0%**	
				$107,490
				rounded
	TOTAL PROJECT COST, FY- 07			$110,000

Environmental Restoration, 5 Sites O/M Costs - O&M North and South Mow

COMPREHENSIVE STUDY "Environmental Restoration" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***Turkey Creek*** **Burn North of Railroad**
Hancock County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$100
Burn Vegetation (surface only burn)	190	acre	150	28,500
	Current Contract Cost, FY 07			$28,600
CONTINGENCY			**25.0%**	7,150
				$35,750
30 Account, Plan, Engr.& Design			**8.0%**	2,860
				$38,610
31 Account, Constr. Management			**6.0%**	2,317
				$40,927
ESCALATION			**0.0%**	
				$40,927
				rounded
	TOTAL PROJECT COST, FY-07			$41,000

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***Turkey Creek*** **Mow North of Railroad**
Hancock County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE Info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$100
b. Mow vegitation (annually)	190	acre	85	16,150
	Current Contract Cost, FY 07			$16,250
CONTINGENCY			**25.0%**	4,063
				$20,313
30 Account, Plan, Engr.& Design			**8.0%**	1,625
				$21,938
31 Account, Constr. Management			**6.0%**	1,316
				$23,254
ESCALATION			**0.0%**	
				$23,254
				rounded
	TOTAL PROJECT COST, FY- 07			$20,000

Environmental Restoration, 5 Sites O/M Costs - O&M North Mow

COMPREHENSIVE STUDY "Environmental Restoration" COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Project "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPAREC Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Turkey Creek*** **Burn South of Railroad**	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Hancock County	FILE NAME:	
		mscip-comprehensive-study-combined-cost-est-25jul08.xls	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$500
Burn Vegetation (surface only burn)	689	acre	150	103,350
	Current Contract Cost, FY 07			$103,850
CONTINGENCY			**25.0%**	25,963
				$129,813
30 Account, Plan, Engr.& Design			**8.0%**	10,385
				$140,198
31 Account, Constr. Management			**6.0%**	8,412
				$148,609
ESCALATION			**0.0%**	
				$148,609
				rounded
	TOTAL PROJECT COST, FY- 07			$149,000

Environmental Restoration, 5 Sites O/M Costs - O&M South Burn

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvement Project "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: ***Turkey Creek*** **Mow South of Railroad**
Hancock County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE Info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$300
b. Mow vegitation (annually)	689	acre	85	58,565
		Current Contract Cost, FY 07		$58,865
CONTINGENCY			**25.0%**	14,716
				$73,581
30 Account, Plan, Engr.& Design			**8.0%**	5,887
				$79,468
31 Account, Constr. Management			**6.0%**	4,768
				$84,236
ESCALATION			**0.0%**	
				$84,236
				rounded
		TOTAL PROJECT COST, FY- 07		$80,000

Environmental Restoration, 5 Sites O/M Costs - O&M South Mow

COMPREHENSIVE STUDY " Dantzler Environmental Restoration " SUMMARY

PROJECT: Mississippi Coastal Improvements Program "MsCIP"
LOCATION: Mississippi

WORK ITEM: **Summary**

ITEM NO.
DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph B. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip comprehensive study combined cost-est-25jul08.xls

DESCRIPTION			ESTIMATED AMOUNT

ENVIRONMENTAL RESTORATION

Jackson County	Dantzler	Area A and B	$ 1,900,000
Jackson County	Dantzler	Area A	$ 870,000
Jackson County	Dantzler	Area B	$ 1,040,000

Notes:
Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Structural Removal Cost included in nonstructural estimates
Utility Removal Cost includes, sewer, storm drain, water, gas, power, cable, phone, traffic signaling
Estimate Exclude Operational & Maintenance Cost
Project Escalation
Relocations, Environment, HTRW & Real Estate Cost (except PCA)
Historical Preservation

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Dantzler*** **Area A and B**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$40,000
1. Fill in Ditches (from off-site borrow)	66,560	cy	12.00	798,720
2a. Burn Vegetation (surface only burn)	385	acre	150	57,750
b. Mow vegitation (annually)	385	acre	85	32,725
3. Removals b. Removal of structures (1,500 sf avg size 5 ea =)	cost included in the nonstructural estmate			
b. Disposal Fee	cost included in the nonstructural estmate			
c. Removal of roads (24' wide assumed)	5,000	lf	14.00	70,000
d. Removal of utilities	5,000	lf	41.00	205,000
Misc Site Items	1	ls	allow	90,000
		Current Contract Cost, Oct 07		$1,294,195
CONTINGENCY			**25.0%**	323,549
				$1,617,744
01 Account, Lands & Damage		PCA	**LS**	25,000
				$1,642,744
30 Account, Plan, Engr.& Design			**8.0%**	131,420
				$1,774,163
31 Account, Constr. Management			**6.0%**	106,450
				$1,880,613
ESCALATION			**0.0%**	
				$1,880,613
				rounded
	TOTAL PROJECT COST, Oct 07			**$1,900,000**

Environmental Restoration, 5 Sites Costs - Area A and B

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**
LOCATION: **Mississippi**
WORK ITEM: ***Dantzler*** **Area North**
Jackson County

ITEM NO. DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$20,000
1. Fill in Ditches (from off-site borrow)	30,560	cy	12.00	366,720
2a. Burn Vegetation (surface only burn)	151	acre	150	22,650
b. Mow vegitation (annually)	151	acre	85	12,835
3. Removals b. Removal of structures (1,500 sf avg size 3 ea =)	cost included in the nonstructural estmate			
b. Disposal Fee	cost included in the nonstructural estmate			
c. Removal of roads (24' wide assumed)	2,200	lf	14.00	30,800
d. Removal of utilities	2,200	lf	41.00	90,200
Misc Site Items	1	ls	allow	45,000
		Current Contract Cost, Oct 07		$588,205
CONTINGENCY			**25.0%**	147,051
				$735,256
01 Account, Lands & Damage		PCA	**LS**	25,000
				$760,256
30 Account, Plan, Engr.& Design			**8.0%**	60,821
				$821,077
31 Account, Constr. Management			**6.0%**	49,265
				$870,341
ESCALATION			**0.0%**	
				$870,341 rounded
	TOTAL PROJECT COST, Oct 07			**$ 870,000**

Environmental Restoration, 5 Sites Costs - Area A

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Dantzler*** **Area South**	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$20,000
1. Fill in Ditches (from off-site borrow)	36,000	cy	12.00	432,000
2a. Burn Vegetation (surface only burn)	234	acre	150	35,100
b. Mow vegitation (annually)	234	acre	85	19,890
3. Removals b. Removal of structures (1,500 sf avg size 2 ea =)	cost included in the nonstructural estmate			
b. Disposal Fee	cost included in the nonstructural estmate			
c. Removal of roads (24' wide assumed)	2,800	lf	14.00	39,200
d. Removal of utilities	2,800	lf	41.00	114,800
Misc Site Items	1	ls	allow	45,000
	Current Contract Cost, Oct 07			$705,990
CONTINGENCY			**25.0%**	176,498
				$882,488
01 Account, Lands & Damage		PCA	**LS**	25,000
				$907,488
30 Account, Plan, Engr.& Design			**8.0%**	72,599
				$980,087
31 Account, Constr. Management			**6.0%**	58,805
				$1,038,892
ESCALATION			**0.0%**	
				$1,038,892 rounded
	TOTAL PROJECT COST, Oct 07			**$1,040,000**

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: **Dantzler** Area North and South O&M BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-combined-cost-est-25jul08.xls

DESCRIPTION			ESTIMATED AMOUNT

ENVIRONMENTAL RESTORATION O&M

Jackson County	Dantzler	Burn Area North and South	$ 83,000
Jackson County	Dantzler	Mow Area North and South	$ 47,000
Jackson County	Dantzler	Burn Area North	$ 33,000
Jackson County	Dantzler	Mow Area North	$ 19,000
Jackson County	Dantzler	Burn Area South	$ 51,000
Jackson County	Dantzler	Mow Area South	$ 29,000

Notes:
Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Operations and Maintenance
Estimate Exclud Project Escalation

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Project "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Dantzler*** **Burn Area North and**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County **South**	FILE NAME:			
			mscip-comprehensive-study-combined-cost-est-25jul08.xls		

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$0
Burn Vegetation (surface only burn)		385	acre	150	57,750
		Current Contract Cost, OCT 07			$57,750
	CONTINGENCY			**25.0%**	14,438
					$72,188
	30 Account, Plan, Engr.& Design			**8.0%**	5,775
					$77,963
	31 Account, Constr. Management			**6.0%**	4,678
					$82,640
	ESCALATION			**0.0%**	
					$82,640
					rounded
		TOTAL PROJECT COST, OCT 07			$83,000

Environmental Restoration, 5 Sites O/M Costs - O&M Area North and South Burn

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Dantzler*** **Mow Area North and south** **Jackson County**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
		FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$200
b. Mow vegitation (annually)	385	acre	85	32,725
	Current Contract Cost, OCT 07			$32,925
CONTINGENCY			**25.0%**	8,231
				$41,156
30 Account, Plan, Engr.& Design			**8.0%**	3,293
				$44,449
31 Account, Constr. Management			**6.0%**	2,667
				$47,116
ESCALATION			**0.0%**	
				$47,116
				rounded
	TOTAL PROJECT COST, OCT 07			$47,000

Environmental Restoration, 5 Sites O/M Costs - O&M Area North and South Mow

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Dantzler*** **Burn North** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$100
Burn Vegetation (surface only burn)		151	acre	150	22,650
		Current Contract Cost,OCT 07			$22,750
	CONTINGENCY			**25.0%**	5,688
					$28,438
	30 Account, Plan, Engr.& Design			**8.0%**	2,275
					$30,713
	31 Account, Constr. Management			**6.0%**	1,843
					$32,555
	ESCALATION			**0.0%**	
					$32,555
					rounded
		TOTAL PROJECT COST, OCT 07			$33,000

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF	1
		PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Dantzler*** **Mow Area North**	BASIS of ESTIMATE: info furnished per Project Delivery Team		
	Jackson County	FILE NAME:		
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$100
b. Mow vegitation (annually)	151	acre	85	12,835
		Current Contract Cost, OCT07		$12,935
CONTINGENCY			**25.0%**	3,234
				$16,169
30 Account, Plan, Engr.& Design			**8.0%**	1,294
				$17,462
31 Account, Constr. Management			**6.0%**	1,048
				$18,510
ESCALATION			**0.0%**	
				$18,510
				rounded
		TOTAL PROJECT COST, OCT 07		$19,000

Environmental Restoration, 5 Sites O/M Costs - O&M Area North Mow

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Dantzler*** **Burn Area South** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$200
Burn Vegetation (surface only burn)	234	acre	150	35,100
	Current Contract Cost, OCT 07			$35,300
CONTINGENCY			**25.0%**	8,825
				$44,125
30 Account, Plan, Engr.& Design			**8.0%**	3,530
				$47,655
31 Account, Constr. Management			**6.0%**	2,859
				$50,514
ESCALATION			**0.0%**	
				$50,514
				rounded
	TOTAL PROJECT COST, OCT 07			$51,000

Environmental Restoration, 5 Sites O/M Costs - O&M Area South Burn

COMPREHENSIVE STUDY " Dantzler Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Dantzler*** **Mow Area South**	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Jackson County	FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$100
b. Mow vegitation (annually)	234	acre	85	19,890
	Current Contract Cost, OCT 07			$19,990
CONTINGENCY			**25.0%**	4,998
				$24,988
30 Account, Plan, Engr.& Design			**8.0%**	1,999
				$26,987
31 Account, Constr. Management			**6.0%**	1,619
				$28,606
ESCALATION			**0.0%**	
				$28,606
				rounded
	TOTAL PROJECT COST, OCT 07			$29,000

COMPREHENSIVE STUDY "Franklin Creek Environmental Restoration " SUMMARY

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.	DATE	25-Jul-08
LOCATION: **Mississippi**	SHEET NO. 1	OF	1
	PREPARED: Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM: ***Summary***	BASIS of ESTIMATE: info furnished per Project Delivery Team		
	FILE NAME: mscip-comprehensive-study-comphined-cost-est-25jul08.xls		

DESCRIPTION	ESTIMATED AMOUNT

ENVIRONMENTAL RESTORATION

Jackson County	**Franklin Creek**	**Area A and B**	**$ 1,630,000**
Jackson County	**Franklin Creek**	**Area A**	**$ 1,110,000**
Jackson County	**Franklin Creek**	**Area B**	**$ 550,000**

Notes:
Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Structural Removal Cost included in nonstructural estimates
Utility Removal Cost includes, sewer, storm drain, water, gas, power, cable, phone, traffic signaling
Estimate Excludes:
- Operational & Maintenance Cost
- Project Escalation
- Relocations, Environment, HTRW & Real Estate Cost (except PCA)
- Historical Preservation

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Franklin Creek*** **Area A and B** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$40,000
24 inch RCP culverts, (15 100 ft long ea.)	1500	lf	100.00	150,000
1. Fill in Ditches (from off-site borrow)	26,000	cy	12.00	312,000
2a. Burn Vegetation (surface only burn)	149	acre	150	22,350
b. Mow vegitation (annually)	149	acre	85	12,665
3. Removals b. Removal of structures (1,500 sf avg size 15 ea =)	cost included in the nonstructural estmate			
b. Disposal Fee	cost included in the nonstructural estmate			
c. Removal of roads (24' wide assumed)	9,000	lf	14.00	126,000
d. Removal of utilities	9,000	lf	41.00	369,000
Misc Site Items	1	ls	allow	90,000
			Current Contract Cost, Oct 07	$1,122,015
CONTINGENCY			**25.0%**	280,504
				$1,402,519
01 Account, Lands & Damage		PCA	**LS**	25,000
				$1,427,519
30 Account, Plan, Engr.& Design			**8.0%**	114,202
				$1,541,720
31 Account, Constr. Management			**6.0%**	92,503
				$1,634,223
ESCALATION			**0.0%**	
				$1,634,223
				rounded
	TOTAL PROJECT COST, Oct 07			**$ 1,630,000**

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Franklin Creek* Area A** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$20,000
24 inch RCP culverts, (15 100 ft long ea.)	1500	lf	100.00	150,000
1. Fill in Ditches (from off-site borrow)	16,000	cy	12.00	192,000
2a. Burn Vegetation (surface only burn)	93	acre	150	13,950
b. Mow vegitation (annually)	93	acre	85	7,905
3. Removals b. Removal of structures (1,500 sf avg size 15 ea =)	cost included in the nonstructural estmate			
b. Disposal Fee	cost included in the nonstructural estmate			
c. Removal of roads (24' wide assumed)	6,000	lf	14.00	84,000
d. Removal of utilities	6,000	lf	41.00	246,000
Misc Site Items	1	ls	allow	45,000
	Current Contract Cost, Oct 07			$758,855
CONTINGENCY			**25.0%**	189,714
				$948,569
01 Account, Lands & Damage		PCA	**LS**	25,000
				$973,569
30 Account, Plan. Engr.& Design			**8.0%**	77,886
				$1,051,454
31 Account, Constr. Management			**6.0%**	63,087
				$1,114,542
ESCALATION			**0.0%**	
				$1,114,542
				rounded
	TOTAL PROJECT COST, Oct 07			**$ 1,110,000**

Environmental Restoration, 5 Sites Costs - Area A (2)

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Franklin Creek*** **Area B** BASIS of ESTIMATE: info furnished per Project Delivery Team
Jackson County FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$20,000
1. Fill in Ditches (from off-site borrow)	10,000	cy	12.00	120,000
2a. Burn Vegetation (surface only burn)	56	acre	150	8,400
b. Mow vegitation (annually)	56	acre	85	4,760
3. Removals b. Removal of structures (1,500 sf avg size 15 ea =)	cost included in the nonstructural estmate			
b. Disposal Fee	cost included in the nonstructural estmate			
c. Removal of roads (24' wide assumed)	3,000	lf	14.00	42,000
d. Removal of utilities	3,000	lf	41.00	123,000
Misc Site Items	1	ls	allow	45,000
		Current Contract Cost, Oct 07		$363,160
CONTINGENCY			**25.0%**	90,790
				$453,950
01 Account, Lands & Damage		PCA	**LS**	25,000
				$478,950
30 Account, Plan, Engr.& Design			**8.0%**	38,316
				$517,266
31 Account, Constr. Management			**6.0%**	31,036
				$548,302
ESCALATION			**0.0%**	
				$548,302 rounded
		TOTAL PROJECT COST, Oct 07		**$ 550,000**

Environmental Restoration, 5 Sites Costs - Area B (2)

COMPREHENSIVE STUDY "Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT: **Mississippi Coastal Improvement Program "MsCIP"**
LOCATION: **Mississippi**

WORK ITEM: **Franklin Creek** **Area A and B O&M**

ITEM NO.
DATE 25-Jul-08
SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME:
mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION			ESTIMATED AMOUNT
ENVIRONMENTAL RESTORATION			
Jackson County	**Franklin Creek**	**Burn Area A and B**	$ 34,000
Jackson County	**Franklin Creek**	**Mow Area A and B**	$ 19,000
Jackson County	**Franklin Creek**	**Burn Area A**	$ 21,000
Jackson County	**Franklin Creek**	**Mow Area A**	$ 12,000
Jackson County	**Franklin Creek**	**Burn Area B**	$ 13,000
Jackson County	**Franklin Creek**	**Mow Area B**	$ 7,000

Notes:
Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Operations and Maintenance
Estimate Excludes Project Escalation

Environmental Restoration, 5 Sites O/M Costs - franklin creek rest o&m summary

COMPREHENSIVE STUDY " Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Franklin Creek*** **Burn Area A and B** **Jackson County**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
		FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$1,100
Burn Vegetation (surface only burn)	149	acre	150	22,350
	Current Contract Cost, OCT 07			$23,450
CONTINGENCY			**25.0%**	5,863
				$29,313
30 Account, Plan, Engr.& Design			**8.0%**	2,345
				$31,658
31 Account, Constr. Management			**6.0%**	1,899
				$33,557
ESCALATION			**0.0%**	
				$33,557
				rounded
	TOTAL PROJECT COST, OCT07			**$34,000**

COMPREHENSIVE STUDY " Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Franklin Creek*** **Mow Area A and B**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$600
b. Mow vegitation (annually)	149	acre	85	12,665
	Current Contract Cost, OCT 07			$13,265
CONTINGENCY			**25.0%**	3,316
				$16,581
30 Account, Plan, Engr.& Design			**8.0%**	1,327
				$17,908
31 Account, Constr. Management			**6.0%**	1,074
				$18,982
ESCALATION			**0.0%**	
				$18,982
				rounded
	TOTAL PROJECT COST, OCT 07			**$19,000**

COMPREHENSIVE STUDY " Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Franklin Creek*** **Burn Area A** **Jackson County**	BASIS of ESTIMATE: info furnished per Project Delivery Team	
		FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$700
Burn Vegetation (surface only burn)	93	acre	150	13,950
	Current Contract Cost, OCT07			$14,650
CONTINGENCY			**25.0%**	3,663
				$18,313
30 Account, Plan, Engr.& Design			**8.0%**	1,465
				$19,778
31 Account, Constr. Management			**6.0%**	1,187
				$20,964
ESCALATION			**0.0%**	
				$20,964
				rounded
	TOTAL PROJECT COST, OCT 07			**$21,000**

Environmental Restoration, 5 Sites O/M Costs - O&M Area A Burn

COMPREHENSIVE STUDY " Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Franklin Creek* Mow Area A**	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Jackson County	FILE NAME:	
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION		Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization		1	job	allow	$400
b. Mow vegitation (annually)		93	acre	85	7,905
		Current Contract Cost, OCT 07			$8,305
	CONTINGENCY			**25.0%**	2,076
					$10,381
	30 Account, Plan, Engr.& Design			**8.0%**	831
					$11,212
	31 Account, Constr. Management			**6.0%**	673
					$11,884
	ESCALATION			**0.0%**	
					$11,884
					roonded
		TOTAL PROJECT COST, OCT07			**$12,000**

COMPREHENSIVE STUDY " Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Franklin Creek*** **Burn Area B**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$420
Burn Vegetation (surface only burn)	56	acre	150	8,400
	Current Contract Cost, OCT 07			$8,820
CONTINGENCY			**25.0%**	2,205
				$11,025
30 Account, Plan, Engr.& Design			**8.0%**	882
				$11,907
31 Account, Constr. Management			**6.0%**	714
				$12,621
ESCALATION			**0.0%**	
				$12,621
				rounded
	TOTAL PROJECT COST, OCT 07			**$13,000**

COMPREHENSIVE STUDY " Franklin Creek Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	***Franklin Creek* Mow Area B**	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Jackson County	FILE NAME: mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$240
b. Mow vegitation (annually)	56	acre	85	4,760
		Current Contract Cost, OCT 07		$5,000
CONTINGENCY			**25.0%**	1,250
				$6,250
30 Account, Plan, Engr.& Design			**8.0%**	500
				$6,750
31 Account, Constr. Management			**6.0%**	405
				$7,155
ESCALATION			**0.0%**	
				$7,155
				rounded
		TOTAL PROJECT COST, OCT 07		**$7,000**

COMPREHENSIVE STUDY " Bayou Cumbest Environmental Restoration " SUMMARY

PROJECT: Mississippi Coastal Improvement Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION: Mississippi	SHEET NO.	1	OF	1
	PREPARED Joseph H. Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM: ***Summary***	BASIS of ESTIMATE Info furnished per Project Delivery Team			
	FILE NAME:			
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	ESTIMATED AMOUNT
ENVIRONMENTAL RESTORATION	
Jackson County **Bayou Cumbest** **Area 34**	
0.5 METER PLANTINGS WITH FILL	**$ 28,000,000**
1.0 METER PLANTINGS WITH FILL	**$ 23,400,000**
2.0 METER PLANTINGS WITH FILL	**$ 21,000,000**
0.5 METER PLANTINGS WITHOUT FILL	**$ 28,000,000**
1.0 METER PLANTINGS WITHOUT FILL	**$ 23,300,000**
2.0 METER PLANTINGS WITHOUT FILL	**$ 21,000,000**

Notes:

Price Level, Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Structural Removal Cost includes minor Site Restoration (filling septic tanks, removal outside structures, pavements & utilities)
Utility Removal Cost includes, sewer, storm drain, water, gas, power, cable, phone, traffic signaling

Estimate Excludes:

- Operational & Maintenance Cost
- Project Escalation
- Relocations, Environment, HTRW & Real Estate Cost (except PCA)
- Historical Preservation
- Asbestos Removal during Structure Removal

Environmental Restoration, 5 Sites Costs - bayou cumbest enviro rest sum

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED: Joseph H. Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Area 31***	BASIS of ESTIMATE: info furnished per Project Delivery Team			
	Jackson County	FILE NAME:			
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$380,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	693,909	cy	12.00	8,326,908
b. Removal of structures (1,500 sf avg size 18 ea =)	27,000	sf	3.50	94,500
b. Disposal Fee	1,000	cy	2.50	2,500
c. Removal of roads (24' wide assumed)	6,439	lf	14.00	90,146
d. Removal of utilities	6,439	lf	41.00	263,999
2. Herbicide, hand application (untouched areas from excavation)	32	acre	3,100	99,200
3. Filling of existing ditches and channels (from req'd. excavation)	2,023	cy	5.00	10,115
4. Plantings a. 0.5 meter spacing	110	acre	57,600	6,336,000
Misc Site Items	1	ls	allow	100,000

	Current Contract Cost, FY 07			$ 15,703,368
CONTINGENCY			**25.0%**	3,925,842
				$ 19,629,210
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				4,806,603
				$24,460,813
30 Account, Plan, Engr.& Design			**8.0%**	1,956,865
				$ 26,417,678
31 Account, Constr. Management			**6.0%**	1,585,061
				$ 28,002,739
ESCALATION			**0.0%**	
				$ 28,002,739
				rounded
	TOTAL PROJECT COST, Oct- 07			**$ 28,000,000**

Environmental Restoration, 5 Sites Costs - cumbest .5 meter spacing w fill

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	Mississippi Coastal Improvement Program "MsCIP"	ITEM NO.		DATE	25-Jul-08
LOCATION:	Mississippi	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Area 34***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:			
	1.0 METER PLANTINGS WITH FILL		mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$300,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	693,909	cy	12.00	8,326,908
b. Removal of structures (1,500 sf avg size 18 ea =)	27,000	sf	3.50	94,500
b. Disposal Fee	1,000	cy	2.50	2,500
c. Removal of roads (24' wide assumed)	6,439	lf	14.00	90,146
d. Removal of utilities	6,439	lf	41.00	263,999
2. Herbicide, hand application (untouched areas from excavation)	32	acre	3,100	99,200
3. Filling of existing ditches and channels (from req'd. excavation)	2,023	cy	5.00	10,115
4. Plantings b. 1.0 meter spacing	110	acre	28,800	3,168,000
Misc Site Items	1	ls	allow	100,000
		Current Contract Cost, FY 07		$ 12,455,368
CONTINGENCY			**25.0%**	3,113,842
				$ 15,569,210
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				4,806,603
				$20,400,813
30 Account, Plan. Engr.& Design			**8.0%**	1,632,065
				$ 22,032,878
31 Account, Constr. Management			**6.0%**	1,321,973
				$ 23,354,851
ESCALATION			**0.0%**	
				$ 23,354,851
				rounded
		TOTAL PROJECT COST, Oct- 07		**$ 23,400,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Area 31***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$260,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	693,909	cy	12.00	8,326,908
b. Removal of structures (1,500 sf avg size 18 ea =)	27,000	sf	3.50	94,500
b. Disposal Fee	1,000	cy	2.50	2,500
c. Removal of roads (24' wide assumed)	6,439	lf	14.00	90,146
d. Removal of utilities	6,439	lf	41.00	263,999
2. Herbicide, hand application (untouched areas from excavation)	32	acre	3,100	99,200
3. Filling of existing ditches and channels (from req'd. excavation)	2,023	cy	5.00	10,115
4. Plantings c. 2.0 meter spacing	110	acre	14,400	1,584,000
Misc Site Items	1	ls	allow	100,000
Current Contract Cost, FY 07				$ 10,831,368
CONTINGENCY			**25.0%**	2,707,842
				$ 13,539,210
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				4,806,603
				$18,370,813
30 Account, Plan, Engr.& Design			**8.0%**	1,469,665
				$ 19,840,478
31 Account, Constr. Management			**6.0%**	1,190,429
				$ 21,030,907
ESCALATION			**0.0%**	
				$ 21,030,907 rounded
TOTAL PROJECT COST, Oct-07				**$ 21,000,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Area 31***	BASIS of ESTIMATE:	info furnished per Project Delivery Team
	Jackson County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$380,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	693,909	cy	12.00	8,326,908
b. Removal of structures (1,500 sf avg size 18 ea =)	27,000	sf	3.50	94,500
b. Disposal Fee	1,000	cy	2.50	2,500
c. Removal of roads (24' wide assumed)	6,439	lf	14.00	90,146
d. Removal of utilities	6,439	lf	41.00	263,999
2. Herbicide, hand application (untouched areas from excavation)	32	acre	3,100	99,200
3. Plantings a. 0.5 meter spacing	110	acre	57,600	6,336,000
Misc Site Items	1	ls	allow	100,000
	Current Contract Cost, FY 07			$ 15,693,253
CONTINGENCY			**25.0%**	3,923,313
				$ 19,616,566
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				4,806,603
				$24,448,169
30 Account, Plan, Engr.& Design			**8.0%**	1,955,854
				$ 26,404,023
31 Account, Constr. Management			**6.0%**	1,584,241
				$ 27,988,264
ESCALATION			**0.0%**	
				$ 27,988,264
				rounded
TOTAL PROJECT COST, Oct- 07				**$ 28,000,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** *Area 31*	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$300,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	693,909	cy	12.00	8,326,908
b. Removal of structures (1,500 sf avg size 18 ea =)	27,000	sf	3.50	94,500
b. Disposal Fee	1,000	cy	2.50	2,500
c. Removal of roads (24' wide assumed)	6,439	lf	14.00	90,146
d. Removal of utilities	6,439	lf	41.00	263,999
2. Herbicide, hand application (untouched areas from excavation)	32	acre	3,100	99,200
3. Plantings b. 1.0 meter spacing	110	acre	28,800	3,168,000
Misc Site Items	1	ls	allow	100,000
Current Contract Cost, FY 07				$ 12,445,253
CONTINGENCY			**25.0%**	3,111,313
				$ 15,556,566
01 Account, Lands & Damage		PCA	**LS**	25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				4,806,603
				$20,388,169
30 Account, Plan, Engr.& Design			**8.0%**	1,631,054
				$ 22,019,223
31 Account, Constr. Management			**6.0%**	1,321,153
				$ 23,340,376
ESCALATION			**0.0%**	
				$ 23,340,376
				rounded
TOTAL PROJECT COST, Oct-07				**$ 23,300,000**

COMPREHENSIVE STUDY "Environmental Restoration" Cost Estimate

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Area 31***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	Jackson County	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization	1	job	allow	$260,000
1. Removals: a. Excavation existing Area from -0.5 to +2.0	693,909	cy	12.00	8,326,908
b. Removal of structures (1,500 sf avg size 18 ea =)	27,000	sf	3.50	94,500
b. Disposal Fee	1,000	cy	2.50	2,500
c. Removal of roads (24' wide assumed)	6,439	lf	14.00	90,146
d. Removal of utilities	6,439	lf	41.00	263,999
2. Herbicide, hand application (untouched areas from excavation)	32	acre	3,100	99,200
3. Plantings c. 2.0 meter spacing	110	acre	14,400	1,584,000
Misc Site Items	1	ls	allow	100,000

	Current Contract Cost, FY 07		$	10,821,253
CONTINGENCY		**25.0%**		2,705,313
			$	13,526,566
01 Account, Lands & Damage	PCA	**LS**		25,000
01 Account, Lands & Damage (land + admin + 25% contingency)				4,806,603
				$18,358,169
30 Account, Plan, Engr.& Design		**8.0%**		1,468,654
			$	19,826,823
31 Account, Constr. Management		**6.0%**		1,189,609
			$	21,016,432
ESCALATION		**0.0%**		
			$	21,016,432
				rounded
	TOTAL PROJECT COST, Oct- 07		**$**	**21,000,000**

Environmental Restoration, 5 Sites Costs - cumbest 2 meter spacing wo fill

COMPREHENSIVE STUDY " Bayou Cumbest Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest**	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
		FILE NAME:	mscip-comprehensive-study-combined-cost-est-25jul08.xls		

DESCRIPTION		ESTIMATED AMOUNT
ENVIRONMENTAL RESTORATION		
Jackson County Replanting Effort	**Bayou Cumbest Area 30**	
0.5 METER PLANTINGS WITH FILL	(monitoring only 5 yrs $7,000)	$35,000
1.0 METER PLANTINGS WITH FILL		$ 2,400,000
2.0 METER PLANTINGS WITH FILL		$ 2,400,000
0.5 METER PLANTINGS WITHOUT FILL	(monitoring only 5 yrs $7,000)	$35,000
1.0 METER PLANTINGS WITHOUT FILL		$ 2,400,000
2.0 METER PLANTINGS WITHOUT FILL		$ 2,400,000

****THESE REPLANTING COSTS WILL OCCUR IN YEARS 3 AND 5 OF THE PERIOD OF ANALYSIS.***

Notes:

Price Level. Oct 07
Unit Cost based on Historical Data, Recent Pricing, & Estimator's Judgment
Cost Estimate Type is PROGRAMMING & PLANNING "Parametric Type"
Quantities listed within the Estimate represent Major Elements of the Project
Estimate Excludes Project Escalation

COMPREHENSIVE STUDY " Bayou Cumbest Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Replanting 25% of area***	BASIS of ESTIMATE:	Info furnished per Project Delivery Team		
	Jackson County ***Years 3 and 5***	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION			Quantity	Unit	Unit Price		ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)			1	job	allow		$40,000
Re-Plantings	b. 1.0 meter spacing	at year 3	28	acre	28,800		806,400
Re-Plantings	b. 1.0 meter spacing	at year 5	28	acre	28,800		806,400
Monitoring	b. 1.0 meter spacing		5	yrs	7,000		35,000
Misc Site Items			1	ls	allow		10,000
			Current Contract Cost, OCT 07				$1,697,800
		CONTINGENCY			**25.0%**		424,450
						$	2,122,250
		30 Account, Plan, Engr.& Design			**8.0%**		169,780
						$	2,292,030
		31 Account, Constr. Management			**6.0%**		137,522
						$	2,429,552
		ESCALATION			**0.0%**		
						$	2,429,552
							rounded
			TOTAL PROJECT COST, OCT 07			**$**	**2,400,000**

Environmental Restoration, 5 Sites O/M Costs - cumbest1 meter space w fill o&m

COMPREHENSIVE STUDY " Bayou Cumbest Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	1	OF	1
		PREPARED: Joseph H. Ellsworth		CHECKED:	Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Replanting 50% of area***	BASIS of ESTIMATE: info furnished per Project Delivery Team			
	Jackson County ***in Years 3 and 5***	FILE NAME:			
			mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)			1	job	allow	$40,000
Re-Plantings	b. 2.0 meter spacing	at year 3	55	acre	14,400	792,000
Re-Plantings	b. 2.0 meter spacing	at year 5	55	acre	14,400	792,000
Monitoring	b. 2.0 meter spacing		5	yrs	7,000	35,000
Misc Site Items			1	ls	allow	10,000
			Current Contract Cost, OCT 07			$1,669,000
		CONTINGENCY			**25.0%**	417,250
						$ 2,086,250
		30 Account, Plan, Engr.& Design			**8.0%**	166,900
						$ 2,253,150
		31 Account, Constr. Management			**6.0%**	135,189
						$ 2,388,339
		ESCALATION			**0.0%**	
						$ 2,388,339
						rounded
			TOTAL PROJECT COST, OCT 07			**$ 2,400,000**

Environmental Restoration, 5 Sites O/M Costs - cumbest2 meter space w fill o&m

COMPREHENSIVE STUDY " Bayou Cumbest Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Replanting 25% of area***	BASIS of ESTIMATE	Info furnished per Project Delivery Team
	Jackson County ***In Years 3 and 5***	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)			1	job	allow	$40,000
Re-Plantings	b. 1.0 meter spacing	at year 3	28	acre	28,800	806,400
Re-Plantings	b. 1.0 meter spacing	at year 5	28	acre	28,800	806,400
Monitoring	b. 1.0 meter spacing		5	yrs	7,000	35,000
Misc Site Items			1	ls	allow	10,000
			Current Contract Cost, OCT 07			$1,697,800
		CONTINGENCY			**25.0%**	424,450
						$ 2,122,250
		30 Account, Plan, Engr.& Design			**8.0%**	169,780
						$ 2,292,030
		31 Account, Constr. Management			**6.0%**	137,522
						$ 2,429,552
		ESCALATION			**0.0%**	
						$ 2,429,552
						rounded
			TOTAL PROJECT COST, OCT 07			**$ 2,400,000**

Environmental Restoration, 5 Sites O/M Costs - cumbest 1 meter space wo fill

COMPREHENSIVE STUDY " Bayou Cumbest Environmental Restoration - O & M " SUMMARY

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	DATE 25-Jul-08
LOCATION:	**Mississippi**	SHEET NO. 1	OF 1
		PREPARED: Joseph H. Ellsworth	CHECKED: Gary A. Payton
WORK ITEM:	**Bayou Cumbest** ***Replanting 50% of area***	BASIS of ESTIMATE: info furnished per Project Delivery Team	
	Jackson County ***in Years 3 and 5***	FILE NAME:	
		mscip-comprehensive-study-compbined-cost-est-25jul08.xls	

DESCRIPTION			Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (2 ea)			1	job	allow	$40,000
Re-Plantings	b. 2.0 meter spacing	at year 3	55	acre	14,400	792,000
Re-Plantings	b. 2.0 meter spacing	at year 5	55	acre	14,400	792,000
Monitoring	b. 2.0 meter spacing		5	yrs	7,000	35,000
Misc Site Items			1	ls	allow	10,000
			Current Contract Cost, OCT 07			$1,669,000
		CONTINGENCY			**25.0%**	417,250
						$ 2,086,250
		30 Account, Plan, Engr.& Design			**8.0%**	166,900
						$ 2,253,150
		31 Account, Constr. Management			**6.0%**	135,189
						$ 2,388,339
		ESCALATION			**0.0%**	
						$ 2,388,339
						rounded
			TOTAL PROJECT COST, OCT 07			**$ 2,400,000**

Environmental Restoration, 5 Sites O/M Costs - cumbes2 meter space wo fill o&m

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 25-Jul-08
LOCATION: **Mississippi** SHEET NO. 1 OF 2
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Deer Island -Aquatic Ecosystem Restoration*** BASIS of ESTIMATE: info furnished per Project Delivery Team
FILE NAME: mscip-comprehensive-study-comphined-cost-est-25jul08 xls

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Mobilization, Preparatory Work, Demobilization (Dredge Plant,16")	1	job	allow	$250,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipment)	1	job	allow	150,000
Seaward Shoreline				
Beach Fill, in-place, 16" dia dredge	400,000	cy	3.50	1,400,000
Grade / Shape Berm, small Doser-Trackhoe Work	120	days	4,000	480,000
Environmental Planting	100	ac	45,000	4,500,000
Misc. Site Items	1	ls	allow	16,000
Repair/replace Containment Dike				
Fill, in-place, 16" dia dredge	4,200	cy	3.50	14,700
Grade / Shape Berm, small Doser-Trackhoe Work	120	days	4,000	480,000
Misc. Site Items	1	ls	allow	1,200
Add Material to Containment Area				
Fill, in-place, 16" dia dredge	100,000	cy	3.50	350,000
Grade / Shape Berm, small Doser-Trackhoe Work	15	days	4,000	60,000
Environmental Planting	10	ac	45,000	450,000
Misc. Site Items	1	ls	allow	2,200
Lengthen Stone Containment Dikes				
Analyze Stone Containment Dikes	1	ls	1.00	50,000
Fill, in-place, 16" dia dredge	91,000	cy	3.50	318,500
Grade / Shape Berm, small Doser-Trackhoe Work	30	days	4,000	120,000
Filter Fabric	1,500	sy	3.00	4,500
Riprap	3,000	cy	110.00	330,000
Misc. Site Items	1	ls	allow	2,100
Create Additional Marsh Area				
Beach Fill, in-place, 16" dia dredge	300,000	cy	3.50	1,050,000
Grade / Shape Berm, small Doser-Trackhoe Work	60	days	4,000	240,000
Environmental Planting	20	ac	45,000	900,000
Misc. Site Items	1	ls	allow	5,500
			Subtotal $	**11,174,700**

COMPREHENSIVE STUDY " Environmental Restoration " COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvements Program "MsCIP"**	ITEM NO.		DATE	25-Jul-08
LOCATION:	**Mississippi**	SHEET NO.	2	OF	2
		PREPARED:	Joseph H. Ellsworth	CHECKED:	Gary A. Payton
WORK ITEM:	***Deer Island -Aquatic Ecosystem Restoration***	BASIS of ESTIMATE:	info furnished per Project Delivery Team		
	-	FILE NAME:	mscip-comprehensive-study-compbined-cost-est-25jul08.xls		

DESCRIPTION	Quantity	Unit	Unit Price		ESTIMATED AMOUNT
			Subtotal, brought forward	**$**	**11,174,700**
			Current Contract Cost, Oct 07	$	11,174,700
CONTINGENCY			**25.0%**		2,793,675
				$	13,968,375
01 Account, Lands & Damage		PCA	**LS**		25,000
				$	13,993,375
30 Account, Plan, Engr.& Design			**8.0%**		1,119,470
				$	15,112,845
31 Account, Constr. Management			**6.0%**		906,771
				$	16,019,616
ESCALATION			**0.0%**		0
				$	16,019,616
					rounded
			TOTAL PROJECT COST, Oct 07	**$**	**16,000,000**

Notes:

Unit Dredge Cost based on Current Dredge Project, Harrison County Beaches, Ms.

Nonstructural Summary Cost (ABFE-2 Level of Protection)									
ECONOMIC REACH	TOTAL PARCELS	ACQUISITION PARCELS	ACQUISITION COST	DEMOLITION COST	RELOCATION PARCELS	RELOCATION COST	FLOOD PROOFING PARCEI	FLOOD PROOFING COST	NONSTRUCTURAL TOTAL
1	1391	997	$187,669,171.88	$6,449,046.00	0	$0.00	394	$101,229,150.00	$295,347,367.88
2	13206	9911	$2,895,031,206.25	$95,757,925.00	1	$392,586.21	3294	$1,566,973,598.33	$4,558,155,315.80
3	2578	2202	$653,107,621.88	$15,583,815.00	0	$0.00	376	$269,175,578.00	$937,867,014.88
4	938	922	$113,922,240.63	$6,385,676.00	0	$0.00	16	$24,642,670.00	$144,950,586.63
5	2833	2714	$232,321,346.88	$6,041,447.00	0	$0.00	119	$64,055,584.00	$302,418,377.88
6	1158	567	$103,859,775.00	$3,433,000.00	1	$8,492,694.34	590	$272,099,608.68	$387,885,078.02
7	682	450	$31,275,743.75	$1,934,430.00	0	$0.00	232	$149,936,910.00	$183,147,083.75
8	5356	3623	$464,556,882.50	$11,531,450.00	3	$25,478,083.02	1730	$573,389,674.75	$1,074,956,090.27
9	60	44	$16,010,782.50	$122,000.00	0	$0.00	16	$13,361,448.00	$29,494,230.50
10	2007	1945	$423,333,807.50	$9,247,426.00	0	$0.00	62	$20,028,706.00	$452,609,939.50
11	8	0	$0.00	$0.00	0	$0.00	8	$1,727,008.00	$1,727,008.00
12	2183	1047	$175,416,295.00	$4,198,530.00	0	$0.00	1136	$361,865,652.75	$541,480,477.75
13	650	650	$578,114,005.00	$5,007,538.00	0	$0.00	0	$0.00	$583,121,543.00
15	94	85	$43,548,305.00	$806,538.00	0	$0.00	9	$22,725,000.00	$67,079,843.00
16	199	78	$16,255,190.00	$144,538.00	0	$0.00	121	$31,715,348.00	$48,115,076.00
18	1507	1502	$398,263,330.00	$11,148,202.00	0	$0.00	5	$1,138,504.00	$410,550,036.00
19	46	46	$292,633,610.00	$94,453.00	0	$0.00	0	$0.00	$292,728,063.00
20	3448	1397	$227,316,640.00	$11,116,442.00	1	$8,492,694.34	2050	$712,073,298.74	$958,999,075.08
21	2527	2108	$294,785,977.81	$7,012,294.00	0	$0.00	419	$157,364,440.99	$459,162,712.81
22	153	61	$25,918,662.50	$412,000.00	0	$0.00	92	$36,587,106.00	$62,917,768.50
23	44	0	$0.00	$0.00	0	$0.00	44	$19,986,176.00	$19,986,176.00
24	398	220	$64,527,300.63	$702,520.00	0	$0.00	178	$47,664,846.00	$112,894,666.63
26	989	37	$9,035,335.94	$175,000.00	0	$0.00	952	$272,934,675.34	$282,145,011.28
27	1082	53	$12,684,943.75	$196,000.00	0	$0.00	1029	$226,725,426.34	$239,606,370.09
28	1083	961	$88,942,778.75	$1,351,918.00	0	$0.00	122	$47,989,150.00	$138,283,846.75
29	315	147	$22,302,837.50	$1,091,991.00	0	$0.00	168	$51,396,802.00	$74,791,630.50
30	557	90	$28,802,550.00	$656,453.00	0	$0.00	467	$160,944,119.00	$190,403,122.00
31	498	51	$14,626,215.31	$320,614.00	0	$0.00	447	$168,990,104.00	$183,936,933.31
32	209	1	$216,228.13	$0.00	0	$0.00	208	$51,710,800.00	$51,927,028.13

Non-Structural Costs - NS ABFE-2 bReach Consise 200710

Nonstructural Summary Cost (ABFE-2 Level of Protection)									
ECONOMIC REACH	TOTAL PARCELS	ACQUISITION PARCELS	ACQUISITION COST	DEMOLITION COST	RELOCATION PARCELS	RELOCATION COST	FLOOD PROOFING PARCEI	FLOOD PROOFING COST	NONSTRUCTURAL TOTAL
35	1418	12	$636,228.13	$46,000.00	0	$0.00	1406	$350,816,536.00	$351,498,764.13
36	34	32	$3,761,409.38	$73,076.00	0	$0.00	2	$5,050,000.00	$8,884,485.38
38	128	50	$20,859,328.13	$565,538.00	0	$0.00	78	$15,883,024.00	$37,307,890.13
39	6	0	$0.00	$0.00	0	$0.00	6	$991,302.00	$991,302.00
43	1	0	$0.00	$0.00	0	$0.00	1	$170,304.00	$170,304.00
48	2	0	$0.00	$0.00	0	$0.00	2	$366,298.00	$366,298.00
50	1343	495	$87,303,122.50	$1,944,538.00	0	$0.00	848	$215,363,629.00	$304,611,289.50
51	786	0	$0.00	$0.00	0	$0.00	786	$267,859,601.33	$267,859,601.33
52	7124	285	$100,808,144.06	$2,143,067.00	1	$8,492,694.34	6838	$1,966,832,623.52	$2,078,276,528.93
53	759	399	$111,009,291.56	$2,006,043.00	0	$0.00	360	$204,582,670.00	$317,598,004.56
54	817	9	$1,048,409.06	$66,453.00	0	$0.00	808	$327,127,401.50	$328,242,263.56
Total	**58617**	**33191**	**$7,739,904,716.91**	**$207,765,961.00**	**7**	**$51,348,752.25**	**25419**	**$8,783,474,774.27**	**$16,782,494,204.46**

PART 2

RECOMMENDED ALTERNATIVES

Part 2 of the Cost Appendix contains updated cost estimates for the recommended alternatives in the Comprehensive Plan and Integrated Programmatic Environmental Impact Statement. Selected structural and environmental options included in the Engineering Appendix and Part 1 of the Cost Appendix were used as the basis for the selected alternatives. All recommended alternatives other than the Homeowners Assistance Relocation Program (HARP) have Total Projects Cost Summaries included herein. Part 2 also includes an Escalation Derivations Chart used for the updated costs, Gnatt charts with brief project descriptions, and results of a Cost Risk Analysis completed for the Barrier Island Restoration Plan. The HARP is a program based on purchase of 1800 to 2000 properties in coastal Mississippi out of 17,000 that were identified as being in high hazard areas. These 17,000 properties were identified in the "Preliminary Estimate of Project Cost for the Floodproofing of Residential Structures" and is based on a price level equivalent to 1 October, 2007. This document is also included. The costs for the structural and environmental alternatives were completed by Mobile District and the costs for the nonstructural alternatives were completed by Huntington District.

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Barier Islands — DISTRICT: MOBILE
LOCATION: Mississippi Coastal Barrier Islands — P.O.C.: Joseph H. Ellsworth

ACCOUNT NUM	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 / EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORI ./BUDGET YEAR: FY-09 / EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ COST ($K)	CNTG ($K)	FULL ($K)
17---	BEACH REPLENISHMENT (Barrier Islands) ***(Barrier Islands)***	326,279,000	107,543,280	33%	433,822,280	326,279,000	107,543,280	433,822,280	353,465,241	116,490,463	469,955,704
30---	PLANNING, ENGINEERING & DESIGN	13,051,160	4,301,731	33%	17,352,891	13,051,160	4,301,731	17,352,891	13,490,461	4,448,199	17,938,660
31---	CONSTRUCTION MANAGEMENT	19,576,740	6,452,597	33%	26,029,337	19,576,740	6,452,597	26,029,337	21,207,914	6,989,428	28,197,342
	TOTAL PROJECT COST ========>	**358,906,900**	**118,297,608**		**477,204,508**	**358,906,900**	**118,297,608**	**477,204,508**	**388,163,616**	**127,928,090**	**516,091,706**

rounded

100% TOTAL FEDERAL COSTS ============> $516,000,000

0% TOTAL NON - FEDERAL COSTS ======>

DISTRICT APPROVED:

CHIEF, COST ENGINEERING

CHIEF, REAL ESTATE

CHIEF, PLANNING

CHIEF, ENGINEERING

CHIEF, OPERATIONS

CHIEF, CONSTRUCTION

CHIEF, PROGRAMS MANAGEMENT

PROJECT MANAGER

DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Barier Islands DISTRICT: MOBILE
LOCATION: Mississippi Coastal Barrier Islands P.O.C.: Joseph H. Ellsworth

		CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORI ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No.	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
	Contract 1													
17---	DREDGING (Hopper)	183,829,000	58,825,280	32%	242,654,280	0.0%	183,829,000	58,825,280	242,654,280	Apr 12	7.9%	198,351,491	63,472,477	261,823,968
30---	PLANNING, ENGINEERING & DESIGN, 4%	7,353,160	2,353,011	32%	9,706,171	0.0%	7,353,160	2,353,011	9,706,171	Apr 09	1.6%	7,470,811	2,390,659	9,861,470
31---	CONSTRUCTION MANAGEMENT, 6% +-	11,029,740	3,529,517	32%	14,559,257	0.0%	11,029,740	3,529,517	14,559,257	Apr 12	7.9%	11,901,089	3,808,349	15,709,438
	Contract # 1 Subtotal	202,211,900	64,707,808		266,919,708		202,211,900	64,707,808	266,919,708			217,723,391	69,671,485	287,394,876
	Contract 2													
17---	DREDGING (Hopper)	78,350,000	28,206,000	36%	106,556,000	0.0%	78,350,000	28,206,000	106,556,000	Apr 12	7.9%	84,539,650	30,434,274	114,973,924
30---	PLANNING, ENGINEERING & DESIGN, 4%	3,134,000	1,128,240	36%	4,262,240	0.0%	3,134,000	1,128,240	4,262,240	Oct 10	4.7%	3,281,298	1,181,267	4,462,565
31---	CONSTRUCTION MANAGEMENT, 6% +-	4,701,000	1,692,360	36%	6,393,360	0.0%	4,701,000	1,692,360	6,393,360	Apr 12	7.9%	5,072,379	1,826,056	6,898,435
	Contract # 2 Subtotal	86,185,000	31,026,600		117,211,600		86,185,000	31,026,600	117,211,600			92,893,327	33,441,597	126,334,924
	Contract 3													
17---	DREDGING (Hopper)	64,100,000	20,512,000	32%	84,612,000	0.0%	64,100,000	20,512,000	84,612,000	Apr13	10.1%	70,574,100	22,583,712	93,157,812
30---	PLANNING, ENGINEERING & DESIGN, 4%	2,564,000	820,480	32%	3,384,480	0.0%	2,564,000	820,480	3,384,480	Apr 11	6.8%	2,738,352	876,273	3,614,625
31---	CONSTRUCTION MANAGEMENT, 6% +-	3,846,000	1,230,720	32%	5,076,720	0.0%	3,846,000	1,230,720	5,076,720	Apr 13	10.1%	4,234,446	1,355,023	5,589,469
	Contract # 3 Subtotal	70,510,000	22,563,200		93,073,200		70,510,000	22,563,200	93,073,200			77,546,898	24,815,008	102,361,906

Some quantity of high quality sand may be available in the old channel alignment at the west end of West Ship Island. If there is deemed a sufficient quantity of sand to use from this area, this sand could be pumped to areas on the northern shore of West Ship Island that has been included in the areas to be filled near Fort Massachusetts.

West and East Ship Island also have two major historic sites that are in danger from the continuing erosion of the barrier islands. The presence of these historic sites led to the inclusion of the barrier islands off the coast of Mississippi as a National Seashore. Current studies by the Corps indicate that restoring the two islands to a single island, pre-Camille condition may prevent the rapid erosion of the beaches that is now occurring at these sites and aid in the reduction of erosion that is endangering Historic Fort Massachusetts on West Ship Island. The placement of sand on the northern side of West Ship Island under the filling of Camille Cut will be considered a priority to provide protection to the Fort as early as possible in the course of this work. The addition of sheet pile for minimizing erosional loss of the sand during placement will be allowed as long as the sheet pile is removed. It can be assumed that a 2000 foot running length will be used as the fill progresses across the open pass. The transfer of heavy equipment from barges to both of the islands can be done in selected locations where deeper water is close to the existing shorelines.

The pre-Camille footprint of Ship Island was obtained from historical records and this data showed that the island was breached during Hurricane Camille in 1969 forming two separate islands as mentioned above. This breach had been partially filled with a sand spit extending westward from East Ship Island when Hurricane Katrina again opened the breach in 2005. As happened during Hurricane Camille, the new breach was formed leaving two islands with approximately three miles of open water between the remaining portions. West Ship Island has been experiencing severe erosion in some areas because of the loss of sand in the system from the ebb tidal flows through the breach. East Ship Island is also losing land mass as the sand in its system migrates into the breach area. Currents studies (USGS, 2007 and Rosati, 2007) indicate that West and East Ship will probably not recover from their current severely eroded state.

The first step in the barrier restoration process would be to fill the three mile breach in Ship Island, Camille Cut, to a 1000-foot width and a height that would require approximately 13-million cubic yards of sand including loss during placement and the re-nourishment of some erosion along the northern shore. The other two measures would be to add sand into the
littoral system with about 5-million cubic yards going into the area east of East Ship Island and the rest (4-million cubic yards) going to the area east of Petit Bois Island. Placing more sand at Ship Island is assumed because of the accelerated erosion that has taken place there. The quantities of material assumed for the littoral placements would be subject to change after additional sediment transport modeling if this modeling indicates this adjustment.

West Ship has migrated westward along the littoral drift zone with the western end of the island now terminating against the deep-water, Gulfport navigation channel that prevents further drift. Studies (Rosati, 2007) have confirmed that West Ship Island is the last active island system in the littoral zone that originates in northwest Florida. The same type of land loss exists for Petit Bois Island where the east end is migrating westward and the western end is now terminated against the Pascagoula navigation channel. Records indicate that over 22 million cubic yards of sediment have been removed for maintenance from the Pascagoula Channel since it was created. This quantity of sand was used as the basis of adding sand back into the littoral system since, theoretically, this sand would have continued its transport

Estimated by CESAM-EN-E, Cost Engineering Branch

Designed by CESAM-EN-E, Mobile District, Corps of Engineers

Prepared by Joseph Ellsworth

Preparation Date 8/14/2008

Effective Date of Pricing 8/14/2008

Estimated Construction Time Days

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project file: Mscip-barrier islands-feasibility-14aug08.mlp

report file: barrier islands-feasibilty-report.mrp

output file: mscip-barrier islands-feasibility-14aug08.doc along the littoral system. Three measures were adopted to return this sand into the system.

Price Level July 08
FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/14/2008
Effective Date of Pricing 8/14/2008
Estimated Construction Time Days

project file: Mscip-barrier islands-feasibility-14aug08.mlp

report file: barrier islands-feasibilty-report.mrp

output file: mscip-barrier islands-feasibility-14aug08.doc

Date Author **Note**

Joseph H. Ellsworth

The addition of sand into the littoral system on the eastern ends of East Ship and Petit Bois Islands will provide a sediment source for the islands and help mitigate any affects from the maintenance of the navigation channels. The additional sediment transport modeling will include modeling to predict the optimal location for the placement of sand into the littoral zone near the islands to provide a source of sand for the natural healing on the breach.

The quantity of sand required for these options are considerably less than the total restoration of the islands, but still substantial. To fill the breach, the sand would have strict requirements on color, grain size, and roundness. In discussions with the USGS, a potential source of sand was identified at St. Bernard Shoals which is a submerged chain of barrier islands approximately 45 miles south of the Mississippi barrier islands. Both quality and quantity are assumed to be available, but further investigations are required to verify the source. Activity from oil and gas production in the local area must also be considered. As described above approximately 13,000,000 cubic yards of the high quality sand are needed to fill the breach. An additional 5,000,000 cubic yards of sand is being proposed for placement into the littoral zone east of East Ship Island. This sand would still have physical compatibility characteristics to the sand in the littoral system that must be considered. The last measure of the plan would be to add approximately 4,000,000 cubic yards of compatible sand into the littoral zone east of Petit Bois Island. The source of this sand is also proposed to be from the St. Bernard Shoals.

The placement of sand to fill Camille Cut and the two large littoral zone placements are planned as one-time events to restore some of the islands land surface that may have been lost to erosion from mans past activities or from mass erosion during storm events. This decision was based on an agreement with the NPS that allows them to mitigate ay damage from mans activities or to perform necessary means to preserve historic sites. This agreement has a positive aspect to MsCIP with the replacement of sand that has been lost from the littoral system. This sand addition will extend the life of the islands and the closure of Camille Cut will help maintain the boundaries of the estuary. It is understandably difficult to quantify either of these sand loss causes because the barrier islands themselves are dynamic systems that are undergoing constant change.

The detailed cost estimate will be based as follows:
Barrier Island Comprehensive Plan Cost Items

Contract 1:
Fill Camille Cut by Direct Placement – 13,000,000 cy (10,200,000 cy measured in place in place with estimated 30% loss during handling) placed to create a 1,000 foot wide fill for the existing breach with 60-foot wide swath of plantings along both shores (477,500 total plants). Source of sand borrow from St. Bernard Shoals. Assume using 2,000 running feet of sheet pile to add placement. See LOD-1, Option G in the Engineering Appendix.
Award Jan 2010
Period of Performance – 4 years

Contract 2
Little Dog Keys Pass Littoral Placement – 5,000,000 cy (measured in the dredge hopper) placed in an area approximately 1.5 square miles in up to 5 foot lift. Source of sand borrow from St. Bernard Shoals. See LOD-1, Option C1 in the Engineering Appendix.
Award Jan 2011
Period of Performance – 2 years

Contract 3
Petit Bois Island Littoral Placement – 4,000,000 cy (measured on the barges) placed in one area of approximately 2 square miles in up to a 3 foot lift. Source of sand borrow from St. Bernard Shoals. See LOD-1, Option C2 in the Engineering Appendix for quantities, but the source area has changed as indicated above.
Award Jan 2012
Period of Performance – 2 years

7/28/2008 Joseph H. Ellsworth

BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a general prime dredging contractor. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08).

Date	Author	Note
		Project Life is assumed as 50 years in Cost Estimate.
		17 Feature Account, Beach Replenishment (Barrier Islands) - was developed using CEDEP. Reference CEDEP for Cost Derivation.
		30 Feature Account, Planning, Engineering & Design was developed and assigned at 4% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.
		31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.
		Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 33% (80% confidence level) weighted average reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used is different for each contract. A risk analysis was performed by Walla Walla District for each contract within project. A risk analysis report is included in maint report.
		Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.
		Mobilization & Demobilization are derived within the CEDEP estimates.
		Unit Prices, for such items as closure piling and planting is based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

Description	Quantity	UOM	ContractCost
Contract Cost Summary Report			**326,279,000**
			14.14
01 Contract 1 - Fill Camille Cut by Direct Placement	**13,000,000.00**	**CY**	**183,829,000**
(Note: SCOPE OF WORK Contract 1: Fill Camille Cut by Direct Placement -- 13,000,000 cy (10,200,000 cy measured in place in place with estimated 30% loss during handling) placed to create a 1,000 foot wide fill for the existing breach with 60-foot wide swath of plantings along both shores (477,500 total plants). Source of sand borrow from St. Bernard Shoals. Assume using 2,000 running feet of sheet pile to add placement. See LOD-1, Option G in the Engineering Appendix. Award Jan 2010 Period of Performance -- 4 years CONTRACT NO. 1 FILL CAMILLE CUT CONNECTING WEST AND EAST SHIP ISLANDS Work will commence January 2010. The work will be scheduled for 4 years. The material will be obtained by hopper dredge from the St. Bernard shoals some 45 miles to the south. The material will be transported to the -30 contour and pumped into the work area. Small dozer equipment will be required to shape the material above water. A template 1000 feet wide for the full length of the closure will be established and the Contractor shall be paid in increments completed placement. Approximately 3,250,000 c.y. of material will be placed each year. Sheet pile will be required to secure the end of a placement at the end of each year. Assume that you purchase and install 60,000 square feet of sheet pile at the end of year 1. At the start of year 2 you must recover the 60,000 square feet and store the material. Assume 10 percent or 6,000 square feet must be replaced. At the end of year 2, Install 60,000 square feet of sheet pile. At the beginning of year 3, recover 60,000 SF of sheet pile. Assume 10 percent or 6,000 SF of sheet pile must be replaced. At the end of year 3 install 60,000 SF of sheet pile. At the beginning of year 4 recover 60,000 SF of sheet pile and salvage or discard. Summary---- Purchase 72,000 SF of sheet pile. Install 180,000 SF of sheet pile. Recover 180,000 SF of sheet pile. Fill quantity is 13,000,000 c.y. Plant 477,500 sea oats on the created surface Assume 1major mob and demob and 3 intermediate mob and demob.)			
17 Federal Costs	**1.00**	**LS**	**183,829,000**
			14.14
017 Beach Replenishment Dredging	**13,000,000.00**	**CY**	**183,829,000**
Mobilization, Demobilization, Preparatory Work	**1.00**	**LS**	**13,800,000**
(Note: Reference CEDEP for Cost Derivation. Mob / Demob to and from job (1 initial mob/demob plus three intermediate mob/demob equal 4 events).)			
			950,000.00
USR Mob & Demob - Marine Equipment	4.00	EA	3,800,000
(Note: Cost from CEDEP.)			
USR Mob & Demob - Land Base Equipment	4.00	LS	10,000,000
(Note: Cost from CEDEP. Land based equipment includes dosers, marshbuggies, backhoe, crane for piling, light plant, etc.)			
			12.64
Hopper Dredging	**13,000,000.00**	**CY**	**164,350,000**
(Note: Referenc CEDEP for Cost Derivation.)			
			12.25
USR Sand Borrow (by Hopper Dredge)	13,000,000.00	CY	159,250,000
(Note: Referenc CEDEP for Cost Derivation.)			
			10,000.00
USR Grading & Shaping	390.00	ACR	3,900,000
(Note: Land base Equipment, Marshbuggies, dosers, ect. Unit Cost base on Historical data.)			
			200,000.00
USR GIS Support During Construction	4.00	YR	800,000
			100,000.00
USR Control & Placement Surveys	4.00	YR	400,000
(Note: Survey Cost base on historical cost from Operation Field Office.)			
Beach & Dune Planting	**1.00**	**LS**	**1,719,000**
			3.00
USR Sea Oats	573,000.00	EA	1,719,000
(Note: Plants are planted in a 60 foot swath at 30 in centers along shores at the newly created 1,000 foot wide fill. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 477,500 plants plus 20% replacement			

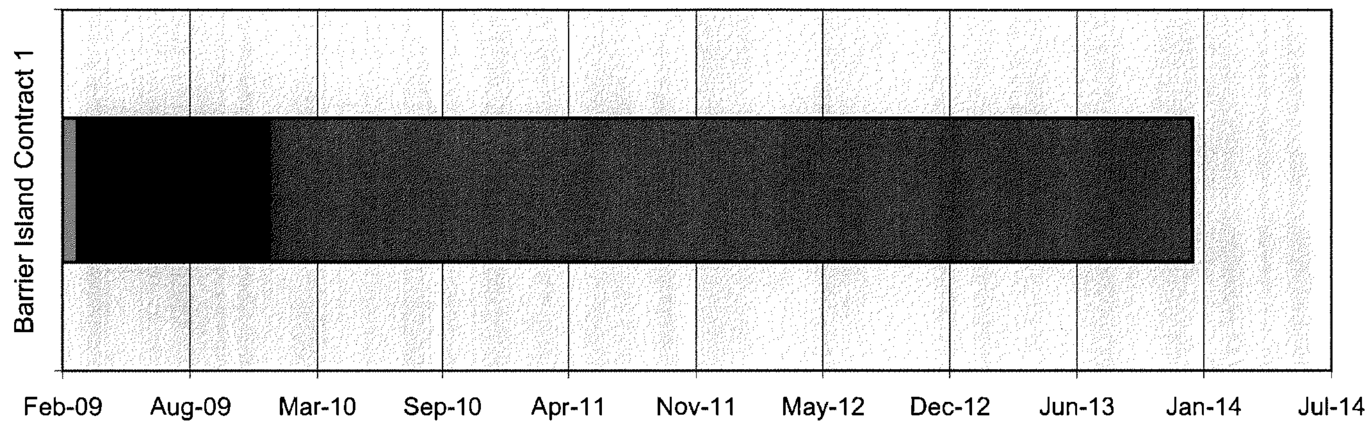
Labor ID: LB06NatFD EQ ID: EP06R08 — Currency in US dollars — TRACES MII Version 3.0

Description	Quantity	UOM	ContractCost
= 573,000 plants. Material price fob job site @ $1.12/ea, Fertilizer @0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.99/plant. Use $3.00 / plant.)			
Temporary Breach Closure	**1.00**	**LS**	**3,960,000**
			22.00
USR Temporary Sheet Pile Closure	180,000.00	SF	3,960,000
(Note: Assume that you purchase and install 60,000 square feet of sheet pile at the end of year 1. At the start of year 2 you must recover the 60,000 square feet and store the material. Assume 10 percent or 6,000 square feet must be replaced. At the end of year 2, Install 60,000 square feet of sheet pile. At the beginning of year 3, recover 60,000 SF of sheet pile. Assume 10 percent or 6,000 SF of sheet pile must be replaced. At the end of year 3 install 60,000 SF of sheet pile. At the beginning of year 4 recover 60,000 SF of sheet pile and salvage or discard. Summary----Purchase 72,000 SF of sheet pile. Install 180,000 SF of sheet pile. Recover 180,000 SF of sheet pile.)			
			15.67
02 Contract 2 - Little Dog Key Pass Littoral Placement by Direct Placement	**5,000,000.00**	**CY**	**78,350,000**
(Note: SCOPE OF WORK Contract 2 Little Dog Keys Pass Littoral Placement – 5,000,000 cy (measured in the dredge hopper) placed in an area approximately 1.5 square miles in up to 5 foot lift. Source of sand borrow from St. Bernard Shoals. See LOD-1, Option C1 in the Engineering Appendix. Award Jan 2011 Period of Performance – 2 years CONTRACT NO. 2 FILL 1.5 SQUARE MILE AREA OFFSHORE OF EAST SHIP ISLAND LITTLE DOG KEYS PASS Work will commence January 2011. The work will be scheduled for 2 years. The material will be obtained by hopper dredge from the St. Bernard shoals some 45 miles to the south. The material will be transported to the -30 contour and pumped into the work area. The template crest will remain below water and no shaping of the material will be required. Approximately 2,500,000 c.y. of material will be placed each year. No other effort is required for this project. Summary----Fill 5,000,000 c.y.)			
17 Federal Costs	**1.00**	**LS**	**78,350,000**
			15.67
017 Beach Replenishment Dredging	**5,000,000.00**	**CY**	**78,350,000**
Mobilization, Demobilization, Preparatory Work	**1.00**	**LS**	**1,500,000**
(Note: Reference CEDEP for Cost Derivation. Mob / Demob to and from job (1 initial mob/demob plus one mob/demob equal 2 events).)			
			750,000.00
USR Mob & Demob - Marine Equipment	2.00	EA	1,500,000
(Note: Cost from CEDEP.)			
			15.37
Hopper Dredging	**5,000,000.00**	**CY**	**76,850,000**
(Note: Referenc CEDEP for Cost Derivation.)			
			15.25
USR Sand Burrow (by Hopper Dredge)	5,000,000.00	CY	76,250,000
(Note: Referenc CEDEP for Cost Derivation.)			
			200,000.00
USR GIS Support During Construction	2.00	YR	400,000
			100,000.00
USR Control & Placement Surveys	2.00	YR	200,000
(Note: Survey Cost base on historical cost from Operation Field Office.)			
			16.03
03 Contract 3 - Petit Bois Island Littoral Placement	**4,000,000.00**	**CY**	**64,100,000**
(Note: SCOPE OF WORK Contract 3 Petit Bois Island Littoral Placement – 4,000,000 cy (measured on the barges) placed in one area of approximately 2 square miles in up to a 3 foot lift. Source of sand borrow from St. Bernard Shoals. See LOD-1, Option C2 in the Engineering Appendix for quantities, but the source area has changed as indicated above. Award Jan 2012 Period of Performance – 2 years CONTRACT NO. 3 FILL 2 SQUARE MILE AREA OFFSHORE EAST OF PETIT BOIS ISLAND Work will commence January 2012. The work will be scheduled for 2 years. The material will be obtained by hopper dredge from the St. Bernard shoals some 45 miles to the south. The material will be transported to the -30 contour and pumped into the work area. The template crest will remain below water and no shaping of the material will be required. Approximately 2,000,000 c.y. of material will be placed each year. No other effort is required for this project. Summary----Fill 4,000,000 c.y.)			
17 Federal Costs	**1.00**	**LS**	**64,100,000**

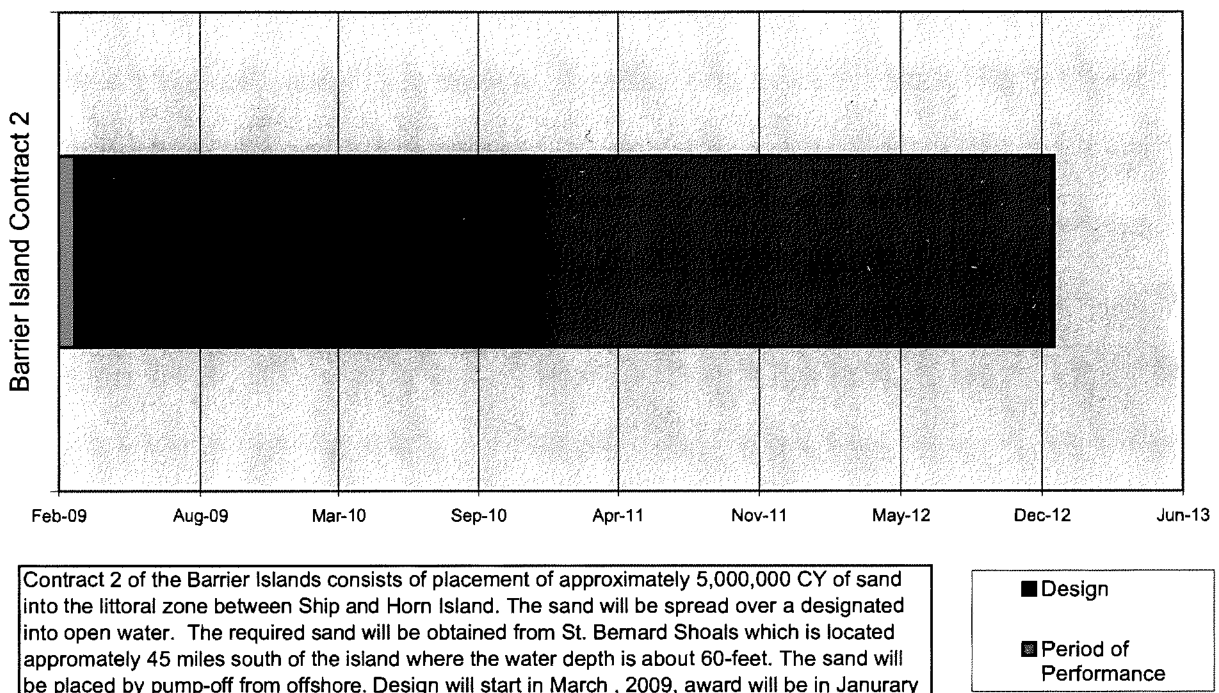
Currency in US dollars

Description	Quantity	UOM	ContractCost
			16.03
017 Beach Replenishment Dredging	**4,000,000.00**	**CY**	**64,100,000**
Mobilization, Demobilization, Preparatory Work	**1.00**	**LS**	**1,500,000**
(Note: Reference CEDEP for Cost Derivation. Mob / Demob to and from job (1 initial mob/demob plus one mob/demob equal 2 events).)			
			750,000.00
USR Mob & Demob - Marine Equipment	2.00	EA	1,500,000
(Note: Cost from CEDEP.)			
			15.65
Hopper Dredging	**4,000,000.00**	**CY**	**62,600,000**
(Note: Referenc CEDEP for Cost Derivation.)			
			15.50
USR Sand Borrow (by Hopper Dredge)	4,000,000.00	CY	62,000,000
(Note: Reference CEDEP for Cost Derivation.)			
			200,000.00
USR GIS Support During Construction	2.00	YR	400,000
			100,000.00
USR Control & Placement Surveys	2.00	YR	200,000
(Note: Survey Cost base on historical cost from Operation Field Office.)			

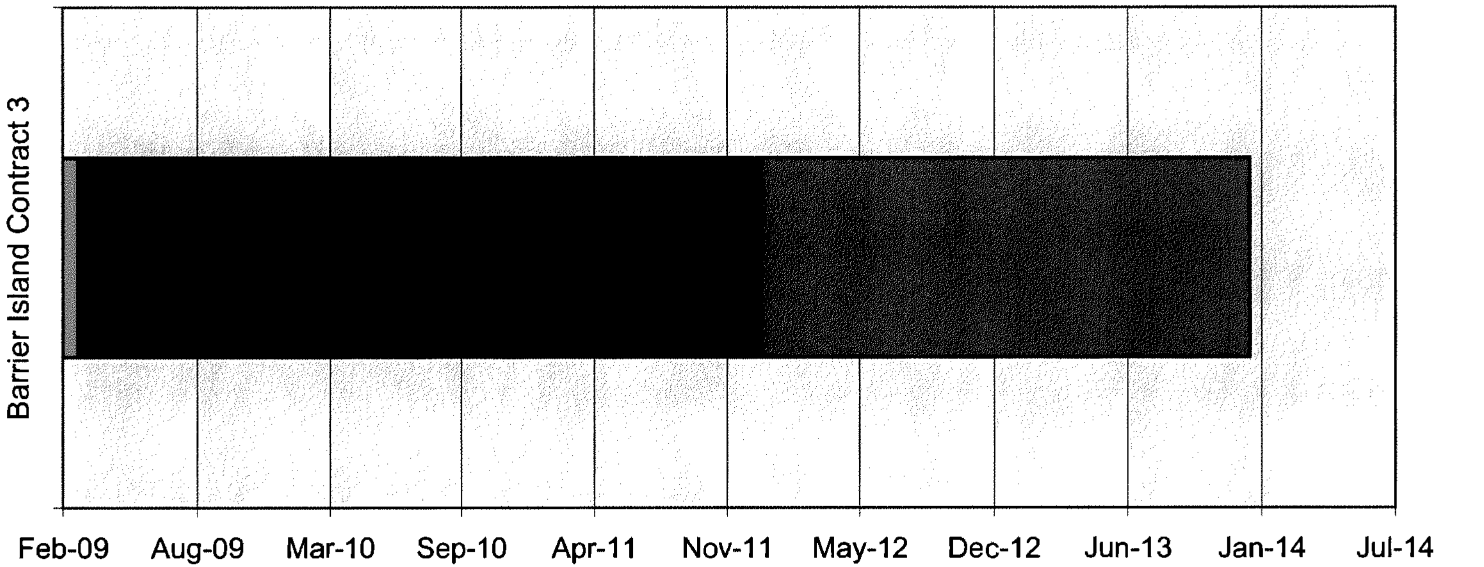
Labor ID: LB06NatFD EQ ID: EP06R08 | Currency in US dollars | TRACES MII Version 3.0



Contract 1 of the Barrier Islands consists of direct placement of approximately 13,000,000 CY of sand to fill the breach in Ship Island known as Camille Cut and along the north shore of the existing land surface. All of the constructed beach will be planted with a 60-foot wide swath of sea oats. The required sand will be obtained from St. Bernard Shoals which is located appromately 45 miles south of the island where the water depth is about 60-feet. The sand will be placed by pump-off from offshore. Design will start in March , 2009, award will be in Janurary 2010, and completion will be in December, 2011.



Contract 2 of the Barrier Islands consists of placement of approximately 5,000,000 CY of sand into the littoral zone between Ship and Horn Island. The sand will be spread over a designated into open water. The required sand will be obtained from St. Bernard Shoals which is located appromately 45 miles south of the island where the water depth is about 60-feet. The sand will be placed by pump-off from offshore. Design will start in March , 2009, award will be in Janurary 2011, and completion will be in January, 2012.



Contract 3 of the Barrier Islands consists of placement of approximately 4,000,000 CY of sand into the littoral zone east of Petit Bois Island. The sand will be spread over a designated into open water. The required sand will be obtained from St. Bernard Shoals which is located appromately 45 miles south of the island where the water depth is about 60-feet. The sand will be placed by pump-off from offshore. Design will start in March , 2009, award will be in Janurary 2012, and completion will be in December, 2013.

MsCIP Barrier Island Restoration - PDT Risk Register (Draft)

Risk Level

Likelihood of Occurrence					
Very Likely	Low	Moderate	High	High	High
Likely	Low	Moderate	High	High	High
Unlikely	Low	Low	Moderate	Moderate	High
Very Unlikely	Low	Low	Low	Low	High
	Negligible	Marginal	Significant	Critical	Crisis

Impact or Consequence of Occurrence

Risk No.	Risk/Opportunity Event	Discussion and Concerns	Project Cost: Likelihood*	Project Cost: Impact*	Project Cost: Risk Level*	Project Cost: Rough Order Impact ($)	Project Schedule: Likelihood*	Project Schedule: Impact*	Project Schedule: Risk Level*	Project Schedule: Rough Order Impact (mo)	Variance Distribution	Correlation to Other(s)	Responsibility/POC	Affected Project Component	Project Implications
	Internal Risks (Internal Risk Items are those that are generated, caused, or controlled within the PDT's sphere of influence.)														
I-1	Project competing with other programs	Project competing with other programs (CG funds) in other geographic locations, such as New Orleans, East Coast, and elsewhere.	Very Likely	Critical	High		Very Likely	Critical	High		Uniform	I-2, E-3, E-4	Project Mgr.	Project Schedule	Cost & Schedule
I-2	Project Schedule in question	Assumed funding received in emergency stimulus supplemental. However, still have 1.5 years before actual work can begin. Could be affected by COE receipt of funding as well as KTR's ability and availability to execute.	Likely	Significant	High		Likely	Critical	High		Triangular	I-1, I-6, I-16, E-4	Project Mgr.	Project Schedule	Cost & Schedule
I-3	Pressure to deliver project on accelerated schedule	Project is critical -- sponsor pressure to complete as soon as possible.	Likely	Marginal	Moderate		Likely	Marginal	Moderate		Triangular		Project Mgr.	Project Schedule	Cost & Schedule
I-4	Acquisition Strategy	PDT does not have a finalized strategy on contract type (IDIQ, rental-hour, etc.). However, confident that it will go full and open, sealed bid.	Unlikely	Marginal	Low		Unlikely	Marginal	Low		Uniform	I-6	Contracting	Project Cost & Schedule	Cost & Schedule
I-5	Validation of borrow sources (quality of material)	Still awaiting final sample results, indicating quality and suitability of material at all sites.	Unlikely	Significant	Moderate		Unlikely	Significant	Moderate		Triangular	I-6	Civil Design	Contract Cost & Schedule	Cost & Schedule
I-6	Identification of closer sources of material	Possible source 4-5 miles offshore. Otherwise, will have to rely on source that is significantly further away (45+ miles)	Likely	Significant	High		Likely	Significant	High		Triangular	I-2, I-4, I-5, I-12, I-16, I-17, E-1	Civil Design	Contract Cost & Schedule	Cost & Schedule
I-7	In-water pipeline conflicts	There are existing underground/in-water pipelines in the area. They will have to be mapped by geo-hazard survey. Could present challenges to KTR (depth concerns, esp. as related to weather).	Unlikely	Significant	Moderate		Unlikely	Significant	Moderate		Triangular	I-9	Civil Design	Contract Cost & Schedule	Cost & Schedule
I-8	Environmental work windows (turtle nesting periods)	Rigid windows established in the region that forbid operations during certain periods of the year.	Unlikely	Marginal	Low		Unlikely	Marginal	Low		Triangular		Planning/Environmental	Contract Cost & Schedule	Cost & Schedule
I-9	Incomplete data and surveys	The plan is currently based on worst case scenario, in terms of the source locations. More data could identify more favorable scenarios.	Likely	Significant	High		Likely	Significant	High		Triangular	I-7	Civil Design	Contract Cost & Schedule	Cost & Schedule
I-10	Historical sites	NPS owned and operated historical sites, located on Ship Islands (Contract 1). Design of project has taken into consideration to preserve these resources.	Very Unlikely	Significant	Low		Very Unlikely	Significant	Low		Triangular		Planning/Archaeology	Contract Cost & Schedule	Cost & Schedule
I-11	Endangered species	Gulf sturgeon and piping plover in the area. COE has begun consultation regarding issues. Design has accounted for issues to mitigate these concerns.	Unlikely	Significant	Moderate		Unlikely	Significant	Moderate		Triangular		Planning/Environmental	Contract Cost & Schedule	Cost & Schedule
I-12	Supplemental NEPA document	Will draft a supplemental NEPA document after borrow sites are identified.	Unlikely	Marginal	Low		Unlikely	Marginal	Low		Triangular	I-6	Project Mgr.	Contract Cost & Schedule	Cost & Schedule

I-13	Level of review assumed	PDT has already anticipated HQ level review required. Therefore, risk of unanticipated higher level reviews is mitigated.	Likely	Negligible	Low		Likely	Negligible	Low		Triangular		Project Mgr.	Project Schedule	Schedule
I-14	Sites in National Parks	Sites are in National Parks, but NPS is a partner in this program.	Very Unlikely	Negligible	Low		Very Unlikely	Negligible	Low		Triangular		Project Mgr.	Contract Cost & Schedule	Cost & Schedule
I-15	EIS not complete	EIS not complete. Also, there are other studies that have not been completed regarding geotechnical data and benthic studies.	Very Likely	Negligible	Low		Very Likely	Negligible	Low		Triangular		Project Mgr.	Project Schedule	Schedule
I-16	Construction schedules	Unforeseen or competing events (such as storms or emergencies) could impact schedule for contractors to complete the work as planned and schedules.	Likely	Marginal	Moderate		Likely	Significant	High		Triangular	I-6, I-17	Cost Engr.	Contract Schedule	Schedule
I-17	Dredge methodology	Estimate currently assumes that the work under Contract 1 will be performed by the Glen Edwards. The number of dredges and crew would increase significantly if this is not true.	Likely	Significant	High		Likely	Significant	High		Uniform	I-6, I-16, E-1	Cost Engr.	Contract Cost & Schedule	Cost & Schedule
	External Risks (External Risk Items are those that are generated, caused, or controlled exclusively outside the PDT's sphere of influence.)														
E-1	Limited number of contractors available to bid on Contract 1	Only large hopper dredge contractors would be available to bid on Contract 1, as currently configured.	Likely	Significant	High		Likely	Marginal	Moderate		Triangular	I-6, I-17, E-6	Cost Engr.	Contract Cost	Cost
E-2	Unusually severe weather	Risk of severe storms or hurricanes impacting the area.	Likely	Marginal	Moderate		Likely	Significant	High		Uniform		N/A	Contract Schedule	Schedule
E-3	Inadequate incremental (or full) funding	Risk of not receiving planned funding stream amounts or in a timely fashion.	Likely	Marginal	Moderate		Likely	Significant	High		Uniform	I-1, E-4	Project Mgr.	Project Cost & Schedule	Cost & Schedule
E-4	HQ-Level priority changes	Risk of program being tabled or postponed in favor of other programs.	Unlikely	Significant	Moderate		Unlikely	Significant	Moderate		Uniform	I-1, I-2	Project Mgr.	Project Cost & Schedule	Cost & Schedule
E-5	Fuel prices	Risk of continued high or exorbitant increased in fuel costs.	Likely	Significant	High		Likely	Negligible	Low		Triangular		Cost Engr.	Contract Cost	Cost
E-6	Availability of contractors/bid climate	Risk captures risk of competing programs and economic climate limiting competition for bidding on this program.	Unlikely	Significant	Moderate		Unlikely	Significant	Moderate		Uniform	E-1	Cost Engr.	Contract Cost & Schedule	Cost & Schedule

*Likelihood, Impact, and Risk Level to be verified through market research and analysis (conducted by cost engineer).

1. Risk/Opportunity identified with reference to the Risk Identification Checklist and through deliberation and study of the PDT.
2. Discussions and Concerns elaborates on Risk/Opportunity Events and includes any assumptions or findings (should contain information pertinent to eventual study and analysis of event's impact to project).
3. Likelihood is a measure of the probability of the event occurring -- **Very Unlikely**, **Unlikely**, **Moderately Likely**, **Likely**, **Very Likely**. The likelihood of the event will be the same for both Cost and Schedule, regardless of impact.
4. Impact is a measure of the event's effect on project objectives with relation to scope, cost, and/or schedule -- **Negligible**, **Marginal**, **Significant**, **Critical**, or **Crisis**. Impacts on Project Cost may vary in severity from impacts on Project Schedule.
5. Risk Level is the resultant of Likelihood and Impact **Low**, **Moderate**, or **High**. Refer to the matrix located at top of page.

6. Variance Distribution refers to the behavior of the individual risk item with respect to its potential effects on Project Cost and Schedule. For example, an item with clearly defined parameters and a solid most likely scenario would probably follow a
7. The responsibility or POC is the entity responsible as the Subject Matter Expert (SME) for action, monitoring, or information on the PDT for the identified risk or opportunity.
8. Correlation recognizes those risk events that may be related to one another. Care should be given to ensure the risks are handled correctly without a "double counting."
9. Affected Project Component identifies the specific item of the project to which the risk directly or strongly correlates.
10. Project Implications identifies whether or not the risk item affects project cost, project schedule, or both. The PDT is responsible for conducting studies for both Project Cost and for Project Schedule.
11. Results of the risk identification process are studied and further developed by the Cost Engineer, then analyzed through the Monte Carlo Analysis Method for Cost (Contingency) and Schedule (Escalation) Growth.

MS Coastal Barrier Islands Risk Summary

Background

The project delivery team (PDT) conducted the initial risk development meeting on uly 31,2008, identifying 23 separate risk items. Of these items, six are identified to be at a High Cost Risk level, nine at a Moderate Cost Risk level, and eight at a Low Cost Risk. In developing the Risk Analysis for the project, the High Cost Risk Items are the focus of attention.

The current scope of the project is to move 22 million yards of sand to restore the Barrier Islands off the coast of Mississippi. A gap in one of the islands will be repaired, additional sand will be placed around a Civil War era fort, and an offshore placement will be made to provide material to naturally wash ashore on the islands. The placement areas are all within a National Park Service (NPS) boundary. USACE and NPS are working together closely on this project and have agreed on the scope and conduct of the work proposed. The project scope and quantity of material to be moved and placed is fixed by agreement with NPS at 22 million yards. Once placed and accepted, the material will not be replenished under this program if damaged.

Risk Register Development

The estimates prepared for the feasibility study are based on the assumptions that the program will be authorized and receive adequate funding to execute three contracts to complete the project over a 4-year period. The intent is to allow contractors flexibility in schedule to minimize impact to the other normally scheduled dredging activities in the Gulf Region. The borrow source is identified as being approximately 45nm away in the open ocean. Several other closer deposits may be suitable for borrow sources. However, the survey has not been completed to determine the suitability of the sand deposits. The PDT has a high degree of confidence that the other potential areas identified as borrow sources will be suitable for usage. It should be noted that the PDT has developed the project in an attempt to mitigate many of the factors identified within the risk analysis. The high cost risk items identified by the team are

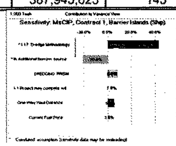
- Project Competing with other Programs
- Project Schedule
- Borrow source location
- Incomplete data and survey
- Dredge Methodology
- Fuel Pricing

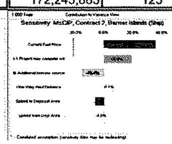
In examining these High Cost Risk items (Project Competing with other Programs), Project Schedule risk has been mitigated through the development of the current proposed contract structure and period of performance. The potential for local inflation rates higher than the national average is still of concern with respect to the project schedule. The Borrow Source and survey are interdependent, as the survey will determine the suitability of other borrow sources and are combined to one element for analysis. Dredge Methodology is directly correlated to the borrow source, as the distance to the source will have significant impact on the equipment used. Methodology has the largest impact on the proposed contract for Camille. Fuel price fluctuations are identified within the risk cells embedded into the CEDEP estimate with a range of 4 to 7.

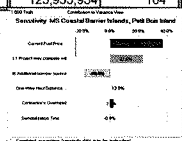
Results

Overall, the risk profile of the project is approximately 33 . Each of the three contracts was modeled separately, and the totals were summed to determine the overall risk for the project. The sensitivity of each of the contracts showed that the dredge methodology, fuel price, borrow source, and competing projects are the largest contributors to risk.

	MS Coastal Barrier Islands, Camille Cut		MS Coastal Barrier Islands, Little Dog Key		MS Coastal Barrier Islands, Petit Bois Island		Contracts Total	
Estimate Value		159,823,265		77,183,712		61,893,712		298,900,689
Confidence Level	Value	Contingency	Value	Contingency	Value	Contingency	Value	Contingency
0	79,659,080	-50	51,459,528	-33	43,678,348	-29	174,796,957	-42
5	112,207,908	-30	64,097,124	-17	52,334,170	-15	228,639,201	-24
10	120,594,695	-25	68,353,330	-11	55,531,571	-10	244,479,597	-18
15	127,189,613	-20	72,022,410	-7	57,681,945	-7	256,893,968	-14
20	134,923,638	-16	74,357,360	-4	59,463,970	-4	268,744,968	-10
25	140,706,707	-12	76,186,275	-1	60,732,675	-2	277,625,657	-7
30	145,307,869	-9	78,282,612	1	62,202,103	0	285,792,584	-4
35	150,815,322	-6	80,365,616	4	63,959,544	3	295,140,482	-1
40	156,458,134	-2	83,128,367	8	65,545,824	6	305,132,324	2
45	161,179,491	1	85,992,902	11	67,308,142	9	314,480,535	5
50	165,495,002	4	87,913,270	14	68,989,461	11	322,397,733	8
55	171,771,138	7	90,552,755	17	70,585,665	14	332,909,558	11
60	177,352,779	11	93,566,971	21	72,397,194	17	343,316,943	15
65	183,233,921	15	95,912,501	24	73,968,858	20	353,115,280	18
70	193,089,097	21	98,255,487	27	76,391,987	23	367,736,571	23
75	200,924,444	26	101,227,528	31	78,675,008	27	380,826,980	27
80	211,699,310	32	104,947,146	36	81,403,285	32	398,049,741	33
85	230,141,316	44	109,516,093	42	84,283,115	36	423,940,524	42
90	259,669,489	62	114,742,953	49	89,039,651	44	463,452,093	55
95	302,341,278	89	120,777,288	56	97,670,653	58	520,789,219	74
100	387,945,623	143	172,245,883	123	125,955,954	104	686,147,460	130







THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Mainland Beaches & Dunes -Environmental Restoration — DISTRICT: MOBILE

LOCATION: Harrison County, Mississippi — P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08			........FULLY FUNDED ESTIMATE........		
ACCOUNT NUM FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	75,000	18,750	25%	93,750	75,000	18,750	93,750	76,950	19,238	96,188
17--- BEACH Replenishment (Environmental Restoration) ***(Mainland Beaches & Dunes)***	16,244,000	4,061,000	25%	20,305,000	16,244,000	4,061,000	20,305,000	17,446,056	4,361,515	21,807,571
30--- PLANNING, ENGINEERING & DESIGN	1,299,520	324,880	25%	1,624,400	1,299,520	324,880	1,624,400	1,333,308	333,327	1,666,635
31--- CONSTRUCTION MANAGEMENT	974,640	243,660	25%	1,218,300	974,640	243,660	1,218,300	1,046,763	261,691	1,308,454
TOTAL PROJECT COST =======>	**18,593,160**	**4,648,290**		**23,241,450**	**16,593,160**	**4,648,290**	**23,241,450**	**19,903,077**	**4,975,771**	**24,878,848**

rounded

65% TOTAL FEDERAL COSTS ============> $16,185,000

35% TOTAL NON - FEDERAL COSTS ======> $8,715,000

TOTAL PROJECT COSTS ============> $24,900,000

DISTRICT APPROVED:

______________ CHIEF, COST ENGINEERING

______________ CHIEF, REAL ESTATE

______________ CHIEF, PLANNING

______________ CHIEF, ENGINEERING

______________ CHIEF, OPERATIONS

______________ CHIEF, CONSTRUCTION

______________ CHIEF, PROGRAMS MANAGEMENT

______________ PROJECT MANAGER

______________ DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Mainland Beaches & Dunes -Environmental Restoration DISTRICT: MOBILE

LOCATION: Harrison County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				........FULLY FUNDED ESTIMATE........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (PCA, 3 ea)	75,000	18,750	25%	93,750	0.0%	75,000	18,750	93,750	Apr 09	2.6%	76,950	19,238	96,188
Subtotal	75,000	18,750		93,750		75,000	18,750	93,750			76,950	19,238	96,188
17--- BEACH Replenishment (Environmental Restoration) ***(Jackson County, Ms)***	1,178,000	294,500	25%	1,472,500	0.0%	1,178,000	294,500	1,472,500	Jan 12	7.4%	1,265,172	316,293	1,581,465
17--- BEACH Replenishment (Environmental Restoration) ***(Harrison County, Ms)***	10,079,000	2,519,750	25%	12,598,750	0.0%	10,079,000	2,519,750	12,598,750	Jan 12	7.4%	10,824,846	2,706,212	13,531,058
17--- BEACH Replenishment (Environmental Restoration) ***(Hancock County, Ms)***	4,987,000	1,246,750	25%	6,233,750	0.0%	4,987,000	1,246,750	6,233,750	Jan 12	7.4%	5,356,038	1,339,010	6,695,048
Subtotal	16,244,000	4,061,000		20,305,000		16,244,000	4,061,000	20,305,000			17,446,056	4,361,515	21,807,571
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	1,299,520	324,880	25%	1,624,400	0.0%	1,299,520	324,880	1,624,400	Apr 09	2.6%	1,333,308	333,327	1,666,635
31--- CONSTRUCTION MANAGEMENT, 6% +-	974,640	243,660	25%	1,218,300	0.0%	974,640	243,660	1,218,300	Jan 12	7.4%	1,046,763	261,691	1,308,454

Period of Performance – 4 years

Award Date – March 2009

This alternative consists of combining Option K from each of the three counties under LOD-2 which was "60-foot Wide by 2-foot Berm w/ Plants and Fencing" into a single contract. The sand for Jackson & Hancock berm construction will be obtained from inland, commercial sources and will be trucked to the project. Sand for Harrison berm will be by small dredge from near shore borrow. The fencing will wooden dune fencing and will be constructed on both sides of the berm for the entire length. The project will consist of placing the sand into the 60 foot wide by 2-foot high berm, adding the plants on top of the berm on 30-inch centers, then adding the fencing on each side of the planted berm. There will be a one-year warranty for 75% survival rate that is included in the Period of Performance shown below.

Price Level ly Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/14/2008
Effective Date of Pricing 8/14/2008
Estimated Construction Time Days

project file:mainland-feasibility-14aug08.mlp

report file: feasibilty standard report.mrp

output file: mainland-feasibility-14aug08.doc

Date	Author	Note
--	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts. Price Level of Estimate is Aug 08. Project Life is assumed as 50 years in Cost Estimate. 30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report. 31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report. Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design. Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance. Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % +- of construction cost excluding the Misc Items cost. Dredging cost is derived by CEDEP. Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost Unit Prices, for such items as site work, planting, fencing, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.
8/5/2008	Joseph H. Ellsworth	Quantities listed within the estimates represent Major Elements of the Project Scope and were furnished by the Project Delivery Team. Where quantities were not available, assumptions were made based on historical information and Estimator's judgment. Beach & Dune Planting (Sea Oats & Grass) and Fencing are based on recent cost provided by the Local sponsor, Harrison County Public Works, Ms. Quantities were derived

Currency in US dollars

Date **Author** **Note**

from using historical photographs of the barrier islands and estimating that beach & dune area. The Corps worked with the National Park Service and also the State of Mississippi, Department of Marine Resources in order to come up with this required acre estimates. Sea oats are typically concentrated on the top of the dune and some on the slopes; thus, the team estimated that only approximately 140 plants would be planted per acre.

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Contractor's Field Overhead @ 12%

Contractor's Home Office (G&A) @ 8%

Profit @ 10%

Bond @ 1.2%

Miss. Gross Receipts Tax @ 3.5%

Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate.
Joseph H. Ellsworth, Lead Cost Engineer
Gary Payton, Cost Engineer
George F. Rush, Civil Engineer, Dredging
Michael A. McKown, Geo Tech Engineer
Lloyd Oliver, Structural Engineer
Richard W. Harvey, Mechanical Engineer
John R. Thomas, Real Estate Specialist
Donald A. Whitmore, Civil Engineer- Non-Structural Estimates
Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**11,655,510**	**1,398,661**	**1,044,334**	**1,409,850**	**186,100**	**549,306**	**16,243,761**
01 Mainland Beaches - Environmental Restoration	**1.00**	**LS**	**11,655,510**	**1,398,661**	**1,044,334**	**1,409,850**	**186,100**	**549,306**	**16,243,761**
17 Federal & Non-Federal Costs	**1.00**	**LS**	**11,655,510**	**1,398,661**	**1,044,334**	**1,409,850**	**186,100**	**549,306**	**16,243,761**
017 Mainland Beaches & Dunes	**1.00**	**LS**	**11,655,510**	**1,398,661**	**1,044,334**	**1,409,850**	**186,100**	**549,306**	**16,243,761**
01 Jackson County	**1.00**	**LS**	**845,027**	**101,403**	**75,714**	**102,214**	**13,492**	**39,825**	**1,177,677**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	15,000	1,800	1,344	1,814	240	707	20,905
			9.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.59*
USR Construct Sand (dunes), Washed material from Upland Commerical Borrow Site	45,496.00	CY	443,586	53,230	39,745	53,656	7,083	20,906	618,206
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
			3.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4.88*
USR Sand (dune) Construction, Grade & Shape	45,496.00	CY	159,236	19,108	14,268	19,261	2,542	7,505	221,920
			1.60	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2.23*
USR Sea Oats	111,672.00	EA	178,675	21,441	16,009	21,613	2,853	8,421	249,012
(Note: Plants are planted in a 60 foot swath at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 93,060 plants plus 20% replacement = 111,672 plants. Material price fob job site @ $0.28/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $1.55/plant. Use $1.60 / plant.)									
			2.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.48*
USR Fencing (both toes)	18,612.00	LF	46,530	5,584	4,169	5,628	743	2,193	64,847
USR Miscellaneous Site Items	1.00	LS	2,000	240	179	242	32	94	2,787
01 Harrison County	**1.00**	**LS**	**7,232,164**	**867,860**	**648,002**	**874,803**	**115,474**	**340,841**	**10,079,143**
USR Mobilization & Demobilization (Dredge Plant)	1.00	LS	290,000	34,800	25,984	35,078	4,630	13,667	404,160
USR Mobilization & Demobilization (Land Base Equipment)	1.00	LS	32,000	3,840	2,867	3,871	511	1,508	44,597
			5.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*7.67*
USR Construct Sand (dune), Dredge from near Shore Borrow Site	659,824.00	CY	3,629,032	435,484	325,161	438,968	57,944	171,031	5,057,619
(Note: Unit Price base on recent on-going similar project on Miss Coast project.)									
			1.60	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2.23*
USR Sea Oats	1,619,570.00	EA	2,591,312	310,957	232,182	313,445	41,375	122,124	3,611,395
(Note: Plants are planted in a 60 foot swath at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 1,349,641 plants plus 20% replacement = 1,619,570 plants. Material price fob job site @ $0.28/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $1.55/plant. Use $1.60 / plant.)									
			2.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.48*
USR Fencing (both toes)	269,928.00	LF	674,820	80,978	60,464	81,626	10,775	31,803	940,466
USR Miscellaneous Site Items	1.00	LS	15,000	1,800	1,344	1,814	240	707	20,905
01 Hancock County	**1.00**	**LS**	**3,578,319**	**429,398**	**320,617**	**432,833**	**57,134**	**168,641**	**4,986,942**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	30,000	3,600	2,688	3,629	479	1,414	41,810
			9.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.59*
USR Construct Sand (dunes), Washed material from Upland Commerical Borrow Site	194,578.00	CY	1,897,136	227,656	169,983	229,478	30,291	89,409	2,643,953
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
			3.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4.88*
USR Sand (dune) Construction, Grade & Shape	194,578.00	CY	681,023	81,723	61,020	82,377	10,874	32,096	949,111

Currency in US dollars

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
			1.60	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2.23*
USR Sea Oats	477,600.00	EA	764,160	91,699	68,469	92,433	12,201	36,014	1,064,976

(Note: Plants are planted in a 60 foot swath at 30 in centers. Planted in a 60 foot swath at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 398,000 plants plus 20% replacement = 477,600 plants. Material price fob job site @ $0.28/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $1.55/plant. Use $1.60 / plant.)

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
			2.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.48*
USR Fencing (both toes)	79,600.00	LF	199,000	23,880	17,830	24,071	3,177	9,379	277,337
USR Miscellaneous Site Items	1.00	LS	7,000	840	627	847	112	330	9,756

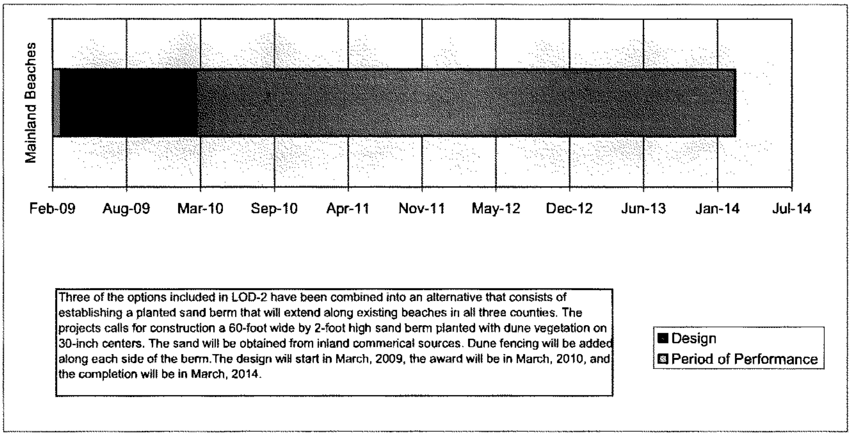
Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**11,655,510**	**11,655,510**
01 Mainland Beaches - Environmental Restoration	**1.00**	**LS**	**11,655,510**	**11,655,510**
17 Federal & Non-Federal Costs	**1.00**	**LS**	**11,655,510**	**11,655,510**
017 Mainland Beaches & Dunes	**1.00**	**LS**	**11,655,510**	**11,655,510**
01 Jackson County	**1.00**	**LS**	**845,027**	**845,027**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	15,000	15,000
			9.75	*9.75*
USR Construct Sand (dunes), Washed material from Upland Commerical Borrow Site	45,496.00	CY	443,586	443,586
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
			3.50	*3.50*
USR Sand (dune) Construction, Grade & Shape	45,496.00	CY	159,236	159,236
			1.60	*1.60*
USR Sea Oats	111,672.00	EA	178,675	178,675
(Note: Plants are planted in a 60 foot swath at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 93,060 plants plus 20% replacement = 111,672 plants. Material price fob job site @ $0.28/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $1.55/plant. Use $1.60 / plant.)				
			2.50	*2.50*
USR Fencing (both toes)	18,612.00	LF	46,530	46,530
USR Miscellaneous Site Items	1.00	LS	2,000	2,000
01 Harrison County	**1.00**	**LS**	**7,232,164**	**7,232,164**
USR Mobilization & Demobilization (Dredge Plant)	1.00	LS	290,000	290,000
USR Mobilization & Demobilization (Land Base Equipment)	1.00	LS	32,000	32,000
			5.50	*5.50*
USR Construct Sand (dune), Dredge from near Shore Borrow Site	659,824.00	CY	3,629,032	3,629,032
(Note: Unit Price base on recent on-going similar project on Miss Coast project.)				
			1.60	*1.60*
USR Sea Oats	1,619,570.00	EA	2,591,312	2,591,312
(Note: Plants are planted in a 60 foot swath at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 1,349,641 plants plus 20% replacement = 1,619,570 plants. Material price fob job site @ $0.28/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $1.55/plant. Use $1.60 / plant.)				
			2.50	*2.50*
USR Fencing (both toes)	269,928.00	LF	674,820	674,820
USR Miscellaneous Site Items	1.00	LS	15,000	15,000
01 Hancock County	**1.00**	**LS**	**3,578,319**	**3,578,319**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	30,000	30,000
			9.75	*9.75*
USR Construct Sand (dunes), Washed material from Upland Commerical Borrow Site	194,578.00	CY	1,897,136	1,897,136
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
			3.50	*3.50*
USR Sand (dune) Construction, Grade & Shape	194,578.00	CY	681,023	681,023
			1.60	*1.60*
USR Sea Oats	477,600.00	EA	764,160	764,160

Labor ID: LB06NatFD EQ ID: EP06R08 Currency in US dollars TRACES MII Version 3.0

Description	Quantity	UOM	SubBidCost	CostToPrime
(Note: Plants are planted in a 60 foot swath at 30 in centers. Planted in a 60 foot swath at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 398,000 plants plus 20% replacement = 477,600 plants. Material price fob job site @ $0.28/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $1.55/plant. Use $1.60 / plant.)				
			2.50	*2.50*
USR Fencing (both toes)	79,600.00	LF	199,000	199,000
USR Miscellaneous Site Items	1.00	LS	7,000	7,000

Currency in US dollars


Mainland Beaches
Feb-09
Aug-09
Mar-10
Sep-10
Apr-11
Nov-11
May-12
Dec-12
Jun-13
Jan-14
Jul-14
Three of the options included in LOD-2 have been combined into an alternative that consists of establishing a planted sand berm that will extend along existing beaches in all three counties. The projects calls for construction a 60-foot wide by 2-foot high sand berm planted with dune vegetation on 30-inch centers. The sand will be obtained from inland commerical sources. Dune fencing will be added along each side of the berm.The design will start in March, 2009, the award will be in March, 2010, and the completion will be in March, 2014.
Design
Period of Performance

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Forest Heights Level -Environmental Restoration — DISTRICT: MOBILE

LOCATION: Harrison County, Mississippi — P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08			.........FULLY FUNDED ESTIMATE.........		
ACCOUNT NUM FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	2,674,000	668,500	25%	3,342,500	2,674,000	668,500	3,342,500	2,716,784	679,196	3,395,980
11--- Levees & Floodwalls ***(Forest Heights Level)***	7,497,000	1,874,250	25%	9,371,250	7,497,000	1,874,250	9,371,250	7,796,880	1,949,220	9,746,100
30--- PLANNING, ENGINEERING & DESIGN	599,760	149,940	25%	749,700	599,760	149,940	749,700	621,951	155,488	777,439
31--- CONSTRUCTION MANAGEMENT	449,820	112,455	25%	562,275	449,820	112,455	562,275	472,761	118,190	590,951
TOTAL PROJECT COST =======>	**11,220,580**	**2,805,145**		**14,025,725**	**11,220,580**	**2,805,145**	**14,025,725**	**11,608,376**	**2,902,094**	**14,510,470**

rounded

65% TOTAL FEDERAL COSTS ============> $9,425,000

35% TOTAL NON - FEDERAL COSTS ======> $5,075,000

TOTAL PROJECT COSTS ============> $14,500,000

DISTRICT APPROVED:

________________ CHIEF, COST ENGINEERING

________________ CHIEF, REAL ESTATE

________________ CHIEF, PLANNING

________________ CHIEF, ENGINEERING

________________ CHIEF, OPERATIONS

________________ CHIEF, CONSTRUCTION

________________ CHIEF, PROGRAMS MANAGEMENT

________________ PROJECT MANAGER

________________ DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Forest Heights Level -Environmental Restoration DISTRICT: MOBILE

LOCATION: Harrison County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (price level, Oct 07)	2,674,000	668,500	25%	3,342,500	0.0%	2,674,000	668,500	3,342,500	Jun 09	1.6%	2,716,784	679,196	3,395,980
Subtotal	2,674,000	668,500		3,342,500		2,674,000	668,500	3,342,500			2,716,784	679,196	3,395,980
11--- Levees & Floodwalls	7,497,000	1,874,250	25%	9,371,250	0.0%	7,497,000	1,874,250	9,371,250	Jun 09	4.0%	7,796,880	1,949,220	9,746,100
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	599,760	149,940	25%	749,700	0.0%	599,760	149,940	749,700	Jun 10	3.7%	621,951	155,488	777,439
31--- CONSTRUCTION MANAGEMENT, 6% +-	449,820	112,455	25%	562,275	0.0%	449,820	112,455	562,275	Jan 09	5.1%	472,761	118,190	590,951
Subtotal	8,546,580	2,136,645		10,683,225		8,546,580	2,136,645	10,683,225			8,891,592	2,222,898	11,114,490

The project will also include selective clearing and snagging from the mouth of adjacent Turkey Creek upstream 4.5 miles. Selective clearing and snagging would remove obstructions such as debris dams and excessive sedimentation that hinders the flow through the Turkey Creek channel. The main purpose of the selective clearing and snagging is to make sure that induced damages do not occur due to the construction of the recommended levees. The selective clearing and snagging work will follow Stream Obstruction Removal Guidelines established by the American Fisheries Society.

The levee project consists of an earthen dike aronnd the northern, western, and southern side of the neighborhood, and a concrete "t"-wall structure along the eastern side. The structure will constructed to elevation 21 ft NAVD88. A pumping station will be included to relieve the interior flooding. New culverts will be installed in the levee. The earthen part of the levee will have a 12-ft top width and 1 vertical to 3 horizontal sideslopes. Ditches next to the levee will convey water ponding against the levee to the outlets. Closure gates will be installed on the two existing access streets to the subdivision. An emergency access/egress street will be included on the north side of the neighborhood. An overflow section will be included to provide for controlled overtopping.

Forest Heights Work Description

Price Level Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph H. Ellsworth
Preparation Date 8/7/2008
Effective Date of Pricing 8/7/2008
Estimated Construction Time 1,080 Days

project file:forest-feasibility-aug08.mlp

report file: feasibilty standard report.mrp

output file: forest-cumbest-feasibility-aug08.doc

Date **Author** **Note**

-- Joseph H. Ellsworth

BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08).

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % +- of construction cost excluding the Misc Items cost.

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent-- (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

Quantities listed within the estimates represent Major Elements of the Project Scope and were furnished by the Project Delivery Team. Where quantities were not available, assumptions were made based on historical information and Estimator's judgment.

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Contractor's Field Overhead @ 12%

Date	Author	Note
		Contractor's Home Office (G&A) @ 8%
		Profit @ 10%
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**5,379,528**	**645,543**	**482,006**	**650,708**	**85,893**	**253,529**	**7,497,207**
01 Forest Heights, Harrison County - Environmental Restoration	**1.00**	**LS**	**5,379,528**	**645,543**	**482,006**	**650,708**	**85,893**	**253,529**	**7,497,207**
11 Federal & Non-Federal Costs	**1.00**	**LS**	**5,379,528**	**645,543**	**482,006**	**650,708**	**85,893**	**253,529**	**7,497,207**
011 Levees & Floodwalls	**1.00**	**LS**	**5,379,528**	**645,543**	**482,006**	**650,708**	**85,893**	**253,529**	**7,497,207**
01 Levee Restoration	**1.00**	**LS**	**5,379,528**	**645,543**	**482,006**	**650,708**	**85,893**	**253,529**	**7,497,207**
Removals	**1.00**	**LS**	**17,033**	**2,044**	**1,526**	**2,060**	**272**	**803**	**23,738**
			3.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*5.23*
USR Asphalt removal 2" Thick(cross overs)	700.00	SY	2,625	315	235	318	42	124	3,658
			6.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*9.41*
USR 8" Water line removal	150.00	LF	1,013	122	91	122	16	48	1,411
			6.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*9.41*
USR 6" Sewer line removal	150.00	LF	1,013	122	91	122	16	48	1,411
			2.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.48*
USR 2" Gas line removal	150.00	LF	375	45	34	45	6	18	523
			9.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*12.89*
USR Electric line removal-3 phase 1440v	175.00	LF	1,619	194	145	196	26	76	2,256
			9.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*12.89*
USR 24" Storm drain removal	125.00	LF	1,156	139	104	140	18	54	1,611
			3.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4.18*
USR Demolished structures (avg. 1,500sf/ea @ 2 ea)	3,000.00	SF	9,000	1,080	806	1,089	144	424	12,543
			2.10	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2.93*
USR Disposal Fee-off site	111.00	CY	233	28	21	28	4	11	325
New Work	**1.00**	**LS**	**1,931,020**	**231,722**	**173,019**	**233,576**	**30,832**	**91,006**	**2,691,176**
USR Mobilization, Preparatory Work, Demobilization	1.00	LS	100,000	12,000	8,960	12,096	1,597	4,713	139,366
			21.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*29.62*
USR Vinyl sheet piling	39,550.00	SF	840,438	100,853	75,303	101,659	13,419	39,609	1,171,280
			12.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*17.77*
USR Compacted fill (levee)	51,000.00	CY	650,250	78,030	58,262	78,654	10,382	30,645	906,224
			75.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*104.52*
USR New asphalt 2" (at tunnels) 134cy, figure 2.0 tons/cy	20.00	TON	1,500	180	134	181	24	71	2,090
			45.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*62.71*
USR Base material 12" (cross overs)	100.00	CY	4,500	540	403	544	72	212	6,271
			76.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*106.61*
USR Riprap (12")	170.00	CY	13,005	1,561	1,165	1,573	208	613	18,124
			136.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*189.54*
USR Grouted riprap	125.00	CY	17,000	2,040	1,523	2,056	271	801	23,692
			1.70	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2.37*
USR Filter fabric	500.00	SY	850	102	76	103	14	40	1,185
			1,825.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2,543.42*
USR Grassing(seeding)	10.00	ACR	18,250	2,190	1,635	2,208	291	860	25,434

Currency in US dollars

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
			4,250.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*5,923.03*
USR Clearing and grubbing, off-site disposal	10.00	ACR	42,500	5,100	3,808	5,141	679	2,003	59,230
			40.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*55.75*
USR Crushed aggregate 6" thick(levee wearing surface)	2,000.00	CY	80,000	9,600	7,168	9,677	1,277	3,770	111,492
			17.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*23.69*
USR Selective clearing and snagging, soil removal and disposal	220.00	CY	3,740	449	335	452	60	176	5,212
			21,250.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*29,615.17*
USR Clearing and snagging(from mouth of Turkey Creek upstream)	5.00	MI	106,250	12,750	9,520	12,852	1,696	5,007	148,076
			34.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48.43*
USR New 8" water line	150.00	LF	5,213	626	467	631	83	246	7,264
			40.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*56.79*
USR New 6" sewer line	150.00	LF	6,113	734	548	739	98	288	8,519
			17.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*23.69*
USR New 2" gas line	150.00	LF	2,550	306	228	308	41	120	3,554
			37.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*52.26*
USR New electrical line-3 phase 1440v	175.00	LF	6,563	788	588	794	105	309	9,146
			100.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*139.37*
USR New 24" storm drain	125.00	LF	12,500	1,500	1,120	1,512	200	589	17,421
			5,500.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*7,665.10*
USR Mitigation non-tidal	3.60	ACR	19,800	2,376	1,774	2,395	316	933	27,594
			1,800,646.25						*2,509,479.93*
Pump Stations	**1.00**	**EA**	**1,800,646**	**216,078**	**161,338**	**217,806**	**28,750**	**84,862**	**2,509,480**
			595.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*829.22*
USR Structural concrete, complete all sites	194.00	CY	115,430	13,852	10,343	13,962	1,843	5,440	160,870
			6.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*8.36*
USR Form work, complete all sites	4,996.00	SF	29,976	3,597	2,686	3,626	479	1,413	41,776
			925.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*1,289.13*
USR Steel reinforcement, complete all sites	12.00	TON	11,100	1,332	995	1,343	177	523	15,470
			12.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*17.77*
USR Excavation	300.00	CY	3,825	459	343	463	61	180	5,331
			4.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*5.92*
USR Backfill	233.00	CY	990	119	89	120	16	47	1,380
			100,000.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*139,365.52*
USR Trash screens and miscellaneous metal items, all sites	2.00	EA	200,000	24,000	17,920	24,192	3,193	9,426	278,731
			222,200.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*309,670.18*
USR Pumps by installation site, P-1, pumps	2.00	EA	444,400	53,328	39,818	53,755	7,096	20,944	619,340
USR Pumps by installation site, P-1, discharge piping(42" Dia.; 154lf)	1.00	LS	30,800	3,696	2,760	3,726	492	1,452	42,925
USR Pumps by installation site, P-1, energy dissipation	1.00	LS	90,000	10,800	8,064	10,886	1,437	4,242	125,429
			242,000.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*337,264.55*
USR Pumps by installation site, P-1, electrical	2.00	EA	484,000	58,080	43,366	58,545	7,728	22,810	674,529

Labor ID: LB06NatFD EQ ID: EP06R08 Currency in US dollars TRACES MII Version 3.0

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
			900.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*1,254.29*
USR Concrete box culvert(5 ea) 4' x 3'	155.00	CY	139,500	16,740	12,499	16,874	2,227	6,574	194,415
			13,500.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*18,814.34*
USR Flap gates (4w x 3h)	5.00	EA	67,500	8,100	6,048	8,165	1,078	3,181	94,072
			31,500.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*43,900.14*
USR Cutoff valves (4w x 3h)	5.00	EA	157,500	18,900	14,112	19,051	2,515	7,423	219,501
			10.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*14.28*
USR Ditch excavation	2,500.00	CY	25,625	3,075	2,296	3,100	409	1,208	35,712
Structural	**1.00**	**LS**	**1,560,825**	**187,299**	**139,850**	**188,797**	**24,921**	**73,559**	**2,175,252**
			700.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*975.56*
USR Concrete wall	1,826.00	CY	1,278,200	153,384	114,527	154,611	20,409	60,240	1,781,370
			4,800.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*6,689.54*
USR Structural steel gates	6.00	TON	28,800	3,456	2,580	3,484	460	1,357	40,137
			925.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*1,289.13*
USR #6 Rebar (box culverts)	49.00	TON	45,325	5,439	4,061	5,483	724	2,136	63,167
USR Misc. removals at Russell Blvd. Entrance	1.00	LS	8,500	1,020	762	1,028	136	401	11,846
USR ATFP, signage, pavement marking, traffic control, etc.	1.00	LS	200,000	24,000	17,920	24,192	3,193	9,426	278,731
Levee Ramp(length of road-1950lf)	**1.00**	**LS**	**70,004**	**8,400**	**6,272**	**8,468**	**1,118**	**3,299**	**97,561**
			12.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*16.72*
USR Fill material(off-site)	2,167.00	CY	26,004	3,120	2,330	3,145	415	1,226	36,241
			45.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*62.71*
USR Gravel wearing surface	795.00	CY	35,775	4,293	3,205	4,327	571	1,686	49,858
			100.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*139.37*
USR 24" Dia. RCP	30.00	LF	3,000	360	269	363	48	141	4,181
			2,150.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2,996.36*
USR Clear & grub(off-site)	1.50	ACR	3,225	387	289	390	51	152	4,495
			4,000.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*5,574.62*
USR Off-site disposal	0.50	ACR	2,000	240	179	242	32	94	2,787

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**5,379,528**	**5,379,528**
01 Forest Heights, Harrison County - Environmental Restoration	**1.00**	**LS**	**5,379,528**	**5,379,528**
11 Federal & Non-Federal Costs	**1.00**	**LS**	**5,379,528**	**5,379,528**
011 Levees & Floodwalls	**1.00**	**LS**	**5,379,528**	**5,379,528**
01 Levee Restoration	**1.00**	**LS**	**5,379,528**	**5,379,528**
Removals	**1.00**	**LS**	**17,033**	**17,033**
			3.75	*3.75*
USR Asphalt removal 2" Thick(cross overs)	700.00	SY	2,625	2,625
			6.75	*6.75*
USR 8" Water line removal	150.00	LF	1,013	1,013
			6.75	*6.75*
USR 6" Sewer line removal	150.00	LF	1,013	1,013
			2.50	*2.50*
USR 2" Gas line removal	150.00	LF	375	375
			9.25	*9.25*
USR Electric line removal-3 phase 1440v	175.00	LF	1,619	1,619
			9.25	*9.25*
USR 24" Storm drain removal	125.00	LF	1,156	1,156
			3.00	*3.00*
USR Demolished structures (avg. 1,500sf/ea @ 2 ea)	3,000.00	SF	9,000	9,000
			2.10	*2.10*
USR Disposal Fee-off site	111.00	CY	233	233
New Work	**1.00**	**LS**	**1,931,020**	**1,931,020**
USR Mobilization, Preparatory Work, Demobilization	1.00	LS	100,000	100,000
			21.25	*21.25*
USR Vinyl sheet piling	39,550.00	SF	840,438	840,438
			12.75	*12.75*
USR Compacted fill (levee)	51,000.00	CY	650,250	650,250
			75.00	*75.00*
USR New asphalt 2" (at tunnels) 134cy, figure 2.0 tons/cy	20.00	TON	1,500	1,500
			45.00	*45.00*
USR Base material 12" (cross overs)	100.00	CY	4,500	4,500
			76.50	*76.50*
USR Riprap (12")	170.00	CY	13,005	13,005
			136.00	*136.00*
USR Grouted riprap	125.00	CY	17,000	17,000
			1.70	*1.70*
USR Filter fabric	500.00	SY	850	850
			1,825.00	*1,825.00*
USR Grassing(seeding)	10.00	ACR	18,250	18,250

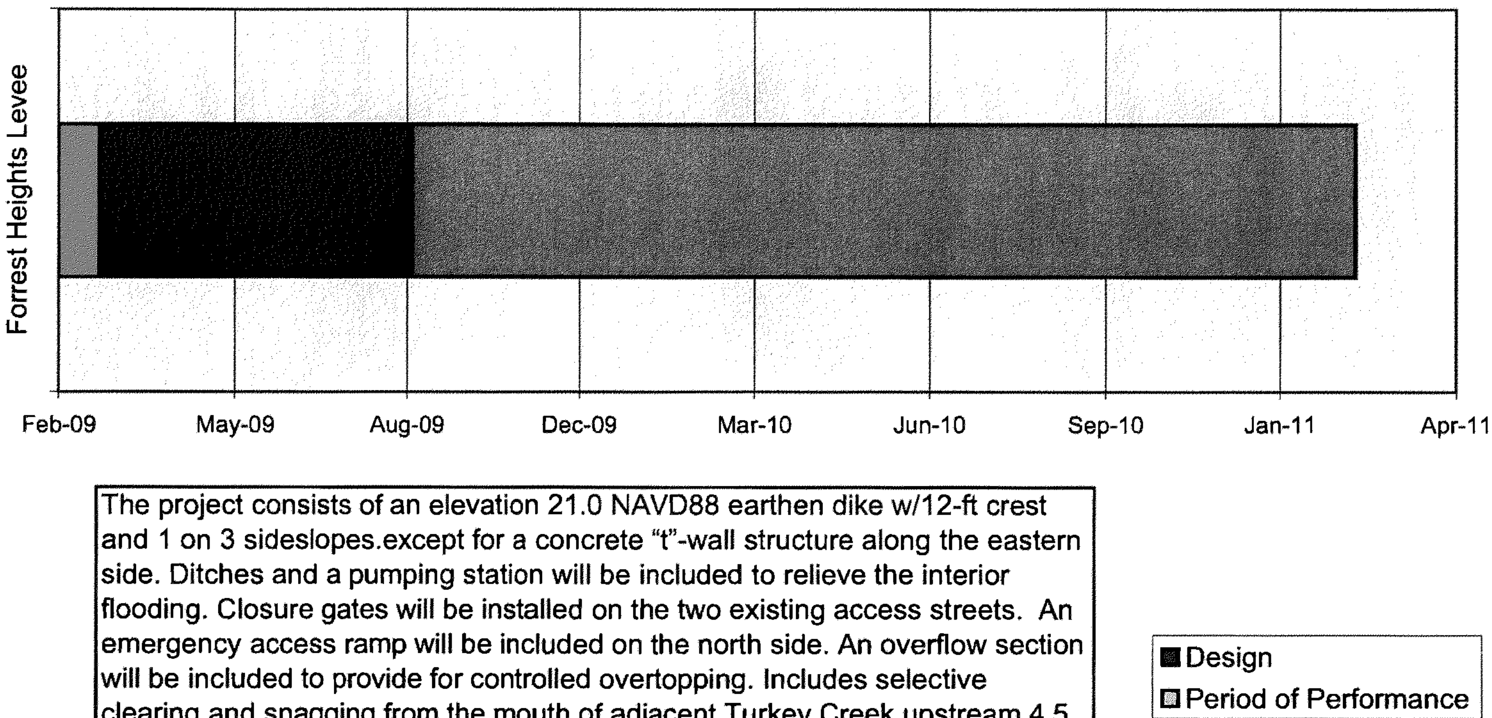
Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
USR Clearing and grubbing, off-site disposal	10.00	ACR	*4,250.00* 42,500	*4,250.00* 42,500
USR Crushed aggregate 6" thick(levee wearing surface)	2,000.00	CY	*40.00* 80,000	*40.00* 80,000
USR Selective clearing and snagging, soil removal and disposal	220.00	CY	*17.00* 3,740	*17.00* 3,740
USR Clearing and snagging(from mouth of Turkey Creek upstream)	5.00	MI	*21,250.00* 106,250	*21,250.00* 106,250
USR New 8" water line	150.00	LF	*34.75* 5,213	*34.75* 5,213
USR New 6" sewer line	150.00	LF	*40.75* 6,113	*40.75* 6,113
USR New 2" gas line	150.00	LF	*17.00* 2,550	*17.00* 2,550
USR New electrical line-3 phase 1440v	175.00	LF	*37.50* 6,563	*37.50* 6,563
USR New 24" storm drain	125.00	LF	*100.00* 12,500	*100.00* 12,500
USR Mitigation non-tidal	3.60	ACR	*5,500.00* 19,800	*5,500.00* 19,800
Pump Stations	**1.00**	**EA**	*1,800,646.25* **1,800,646**	*1,800,646.25* **1,800,646**
USR Structural concrete, complete all sites	194.00	CY	*595.00* 115,430	*595.00* 115,430
USR Form work, complete all sites	4,996.00	SF	*6.00* 29,976	*6.00* 29,976
USR Steel reinforcement, complete all sites	12.00	TON	*925.00* 11,100	*925.00* 11,100
USR Excavation	300.00	CY	*12.75* 3,825	*12.75* 3,825
USR Backfill	233.00	CY	*4.25* 990	*4.25* 990
USR Trash screens and miscellaneous metal items, all sites	2.00	EA	*100,000.00* 200,000	*100,000.00* 200,000
USR Pumps by installation site, P-1, pumps	2.00	EA	*222,200.00* 444,400	*222,200.00* 444,400
USR Pumps by installation site, P-1, discharge piping(42" Dia.; 154lf)	1.00	LS	30,800	30,800
USR Pumps by installation site, P-1, energy dissipation	1.00	LS	90,000	90,000
USR Pumps by installation site, P-1, electrical	2.00	EA	*242,000.00* 484,000	*242,000.00* 484,000

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
			900.00	*900.00*
USR Concrete box culvert(5 ea) 4' x 3'	155.00	CY	139,500	139,500
			13,500.00	*13,500.00*
USR Flap gates (4w x 3h)	5.00	EA	67,500	67,500
			31,500.00	*31,500.00*
USR Cutoff valves (4w x 3h)	5.00	EA	157,500	157,500
			10.25	*10.25*
USR Ditch excavation	2,500.00	CY	25,625	25,625
Structural	**1.00**	**LS**	**1,560,825**	**1,560,825**
			700.00	*700.00*
USR Concrete wall	1,826.00	CY	1,278,200	1,278,200
			4,800.00	*4,800.00*
USR Structural steel gates	6.00	TON	28,800	28,800
			925.00	*925.00*
USR #6 Rebar (box culverts)	49.00	TON	45,325	45,325
USR Misc. removals at Russell Blvd. Entrance	1.00	LS	8,500	8,500
USR ATFP, signage, pavement marking, traffic control, etc.	1.00	LS	200,000	200,000
Levee Ramp(length of road-1950lf)	**1.00**	**LS**	**70,004**	**70,004**
			12.00	*12.00*
USR Fill material(off-site)	2,167.00	CY	26,004	26,004
			45.00	*45.00*
USR Gravel wearing surface	795.00	CY	35,775	35,775
			100.00	*100.00*
USR 24" Dia. RCP	30.00	LF	3,000	3,000
			2,150.00	*2,150.00*
USR Clear & grub(off-site)	1.50	ACR	3,225	3,225
			4,000.00	*4,000.00*
USR Off-site disposal	0.50	ACR	2,000	2,000

Currency in US dollars



The project consists of an elevation 21.0 NAVD88 earthen dike w/12-ft crest and 1 on 3 sideslopes.except for a concrete “t”-wall structure along the eastern side. Ditches and a pumping station will be included to relieve the interior flooding. Closure gates will be installed on the two existing access streets. An emergency access ramp will be included on the north side. An overflow section will be included to provide for controlled overtopping. Includes selective clearing and snagging from the mouth of adjacent Turkey Creek upstream 4.5 miles. The design will start in March of 2009, the award will be in September, 2009, and the completion will be March, 2011.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Turkey Creek -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE

LOCATION: Harrison County, Mississippi P.O.C.: Joseph H. Ellsworth

ACCOUNT NUM	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ COST ($K)	CNTG ($K)	FULL ($K)
01---	Lands & Damages	777,000	194,250	25%	971,250	777,000	194,250	971,250	803,418	200,855	1,004,273
06---	Fish & Wildlife -Restore Wetlands (*Turkey Creek*)	4,105,000	1,026,250	25%	5,131,250	4,105,000	1,026,250	5,131,250	4,343,090	1,085,773	5,428,863
30---	PLANNING, ENGINEERING & DESIGN	328,400	82,100	25%	410,500	328,400	82,100	410,500	333,654	83,414	417,068
31---	CONSTRUCTION MANAGEMENT	246,300	61,575	25%	307,875	246,300	61,575	307,875	260,585	65,146	325,731
	TOTAL PROJECT COST =======>	**5,456,700**	**1,364,175**		**6,820,875**	**5,456,700**	**1,364,175**	**6,820,875**	**5,740,747**	**1,435,188**	**7,175,935**

rounded

65% TOTAL FEDERAL COSTS ============> $4,680,000

35% TOTAL NON - FEDERAL COSTS ======> $2,520,000

TOTAL PROJECT COSTS ============> $7,200,000

DISTRICT APPROVED:

_______________ CHIEF, COST ENGINEERING

_______________ CHIEF, REAL ESTATE

_______________ CHIEF, PLANNING

_______________ CHIEF, ENGINEERING

_______________ CHIEF, OPERATIONS

_______________ CHIEF, CONSTRUCTION

_______________ CHIEF, PROGRAMS MANAGEMENT

_______________ PROJECT MANAGER

_______________ DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Turkey Creek -Environmental Restoration, Restore Wetlands — DISTRICT: MOBILE

LOCATION: Harrison County, Mississippi — P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (price level, Oct 07)	777,000	194,250	25%	971,250	0.0%	777,000	194,250	971,250	Apr 09	3.4%	803,418	200,855	1,004,273
Subtotal	777,000	194,250		971,250		777,000	194,250	971,250			803,418	200,855	1,004,273
06--- Fish & Wildlife -Restore Wetlands	4,105,000	1,026,250	25%	5,131,250	0.0%	4,105,000	1,026,250	5,131,250	Apr 11	5.8%	4,343,090	1,085,773	5,428,863
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	328,400	82,100	25%	410,500	0.0%	328,400	82,100	410,500	Apr 09	1.6%	333,654	83,414	417,068
31--- CONSTRUCTION MANAGEMENT, 6% +-	246,300	61,575	25%	307,875	0.0%	246,300	61,575	307,875	Apr 11	5.8%	260,585	65,146	325,731
Subtotal	4,679,700	1,169,925		5,849,625		4,679,700	1,169,925	5,849,625			4,937,329	1,234,333	6,171,662

2. Maintain vegetation (Mandatory) by mowing 1st year and Burn 1st year; Burn every 3 years for life of project.

1. Filling in ditches (Mandatory to achieve overall restoration project).

The restoration site is primarily comprised of a degraded pine savannah wetland. Several miles of ditches have been excavated throughout the site. Additionally, an elevated railway berm fragments the wetland habitat substantially altering hydrology of the wetlands located to the north. The following measures were developed:

Turkey Creek Proposed Action

Price Level Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Russell Haynes
Preparation Date 8/8/2008
Effective Date of Pricing 8/8/2008
Estimated Construction Time Days

project file: turkey-feasibility-aug08.mlp

report file: feasibilty standard report.mrp

output file: turkey-feasibility-aug08.doc

Date	**Author**	**Note**
--	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE

BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts.

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

01 Feature Account, Real Estate Cost was prepared by the Savannah District COE.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % +- of construction cost excluding the Misc Items cost.

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, stone protection, concrete, reinforcing, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Contractor's Field Overhead @ 12%

Currency in US dollars

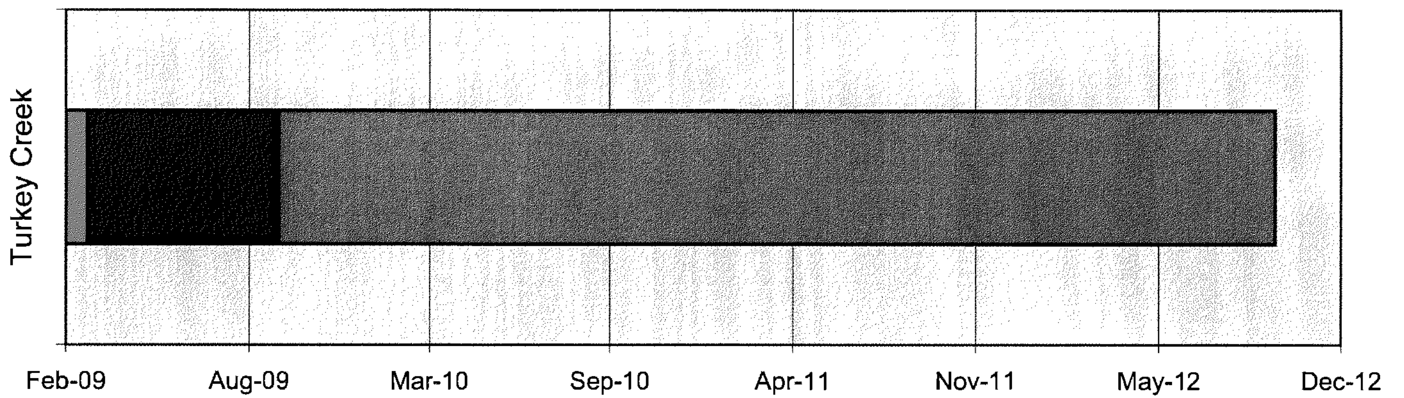
Date	Author	Note
		Contractor's Home Office (G&A) @ 8%
		Profit @ 10%
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**2,945,368**	**353,444**	**263,905**	**356,272**	**47,028**	**138,811**	**4,104,827**
01 Turkey Creek, Harrison County - Environmental Restoration	**1.00**	**LS**	**2,945,368**	**353,444**	**263,905**	**356,272**	**47,028**	**138,811**	**4,104,827**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**2,945,368**	**353,444**	**263,905**	**356,272**	**47,028**	**138,811**	**4,104,827**
006 Fish & Wildlife	**1.00**	**LS**	**2,945,368**	**353,444**	**263,905**	**356,272**	**47,028**	**138,811**	**4,104,827**
01 Environmental Restoration	**1.00**	**LS**	**2,945,368**	**353,444**	**263,905**	**356,272**	**47,028**	**138,811**	**4,104,827**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	20,000	2,400	1,792	2,419	319	943	27,873
			9.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.59*
USR Fill in ditches(from off-site borrow)	102,078.00	CY	995,261	119,431	89,175	120,387	15,891	46,905	1,387,050
			130.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*181.18*
USR Burn vegetation	689.00	ACR	89,570	10,748	8,025	10,834	1,430	4,221	124,830
			75.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*104.52*
USR Mow vegetation(annually)	689.00	ACR	51,675	6,201	4,630	6,251	825	2,435	72,017
			3.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4.18*
USR Remove structures(1,500 sf avg size@12 ea)	18,000.00	SF	54,000	6,480	4,838	6,532	862	2,545	75,257
			2.15	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.00*
USR Disposal Fee	667.00	CY	1,434	172	128	173	23	68	1,999
			12.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*16.72*
USR Remove roads(assume 24' wide)	35,924.00	LF	431,088	51,731	38,625	52,144	6,883	20,317	600,788
			35.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48.78*
USR Remove utilties	35,924.00	LF	1,257,340	150,881	112,658	152,088	20,076	59,256	1,752,298
USR Misc site items	1.00	LS	45,000	5,400	4,032	5,443	719	2,121	62,714

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**2,945,368**	**2,945,368**
01 Turkey Creek, Harrison County - Environmental Restoration	**1.00**	**LS**	**2,945,368**	**2,945,368**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**2,945,368**	**2,945,368**
006 Fish & Wildlife	**1.00**	**LS**	**2,945,368**	**2,945,368**
01 Environmental Restoration	**1.00**	**LS**	**2,945,368**	**2,945,368**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	20,000	20,000
			9.75	*9.75*
USR Fill in ditches(from off-site borrow)	102,078.00	CY	995,261	995,261
			130.00	*130.00*
USR Burn vegetation	689.00	ACR	89,570	89,570
			75.00	*75.00*
USR Mow vegetation(annually)	689.00	ACR	51,675	51,675
			3.00	*3.00*
USR Remove structures(1,500 sf avg size@12 ea)	18,000.00	SF	54,000	54,000
			2.15	*2.15*
USR Disposal Fee	667.00	CY	1,434	1,434
			12.00	*12.00*
USR Remove roads(assume 24' wide)	35,924.00	LF	431,088	431,088
			35.00	*35.00*
USR Remove utilties	35,924.00	LF	1,257,340	1,257,340
USR Misc site items	1.00	LS	45,000	45,000

Labor ID: LB06NatFD EQ ID: EP06R08 Currency in US dollars TRACES MII Version 3.0



The restoration is comprised of restoration of a degraded pine savannah wetland. Several miles of ditches at the site will be filled. Additionally, an elevated railway berm that fragments the wetland habitat will be removed along with roadbeds and any other fill. Invasive vegetation will be controlled by mowing and burning. The design will start in March of 2009, the award will be in October, 2009, and the completion will be October, 2012.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Dantzler -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE

LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08			.........FULLY FUNDED ESTIMATE.........		
ACCOUNT NUM FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	25,000	6,250	25%	31,250	25,000	6,250	31,250	25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands *(Dantzler)*	1,495,000	373,750	25%	1,868,750	1,495,000	373,750	1,868,750	1,605,630	401,408	2,007,038
30--- PLANNING, ENGINEERING & DESIGN	119,600	29,900	25%	149,500	119,600	29,900	149,500	123,666	30,917	154,583
31--- CONSTRUCTION MANAGEMENT	89,700	22,425	25%	112,125	89,700	22,425	112,125	96,338	24,084	120,422
TOTAL PROJECT COST =======>	**1,729,300**	**432,325**		**2,161,625**	**1,729,300**	**432,325**	**2,161,625**	**1,851,034**	**462,759**	**2,313,793**

rounded

65% TOTAL FEDERAL COSTS ============> $1,495,000

35% TOTAL NON - FEDERAL COSTS ======> $805,000

TOTAL PROJECT COSTS ============> $2,300,000

DISTRICT APPROVED:

__________ CHIEF, COST ENGINEERING

__________ CHIEF, REAL ESTATE

__________ CHIEF, PLANNING

__________ CHIEF, ENGINEERING

__________ CHIEF, OPERATIONS

__________ CHIEF, CONSTRUCTION

__________ CHIEF, PROGRAMS MANAGEMENT

__________ PROJECT MANAGER

__________ DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Dantzler -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE
LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				........FULLY FUNDED ESTIMATE........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (PCA)	25,000	6,250	25%	31,250	0.0%	25,000	6,250	31,250	Jun 09	1.6%	25,400	6,350	31,750
Subtotal	25,000	6,250		31,250		25,000	6,250	31,250			25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands	1,495,000	373,750	25%	1,868,750	0.0%	1,495,000	373,750	1,868,750	Jan 12	7.4%	1,605,630	401,408	2,007,038
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	119,600	29,900	25%	149,500	0.0%	119,600	29,900	149,500	Jun 09	3.4%	123,666	30,917	154,583
31--- CONSTRUCTION MANAGEMENT, 6% +-	89,700	22,425	25%	112,125	0.0%	89,700	22,425	112,125	Jan 12	7.4%	96,338	24,084	120,422
Subtotal	1,704,300	426,075		2,130,375		1,704,300	426,075	2,130,375			1,825,634	456,409	2,282,043

3. Filling in 100% of existing artificial ditches. (Mandatory)

2. 100% removal of exotics and plantation pine; maintain removal of exotic plant species in all areas over project lifetime. (Mandatory in all plans).

1. Maintain native savanna vegetation. (Mandatory) by mowing 1st year and Burn 1st year; Burn every 3 years for life of project.

The restoration site contains 385 acres to be restored to wet pine savanna. This area was planted in plantation pine during the 1960s and ditches and stormwater lines were constructed in the early 1970s in anticipation of residential development of the site. The long-term exclusion of fire and the invasion of non-native species such as Cogongrass and Chinese Tallowtree have severely degraded the site. The following measures were developed:

Dantzler Proposed Action

Price Level ly Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/6/2008
Effective Date of Pricing 8/6/2008
Estimated Construction Time 1,080 Days

project file: dantzler-feasibility-aug08.mlp

report file: feasibilty standard report.mrp

output file: dantzler-feasibility-aug08.doc

3120

Date	Author	Note
--	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts.

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

01 Feature Account, Real Estate Cost was prepared by the Savannah District COE.

06 Feature Account, Preservation - Mitigation-Tidal quantites were based on impacts of new footprint plus mitigated factor which was determined and coordinated by other agencies. Unit cost were derived and based on historical data.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % +- of construction cost excluding the Misc Items cost.

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, stone protection, concrete, reinforcing, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Currency in US dollars

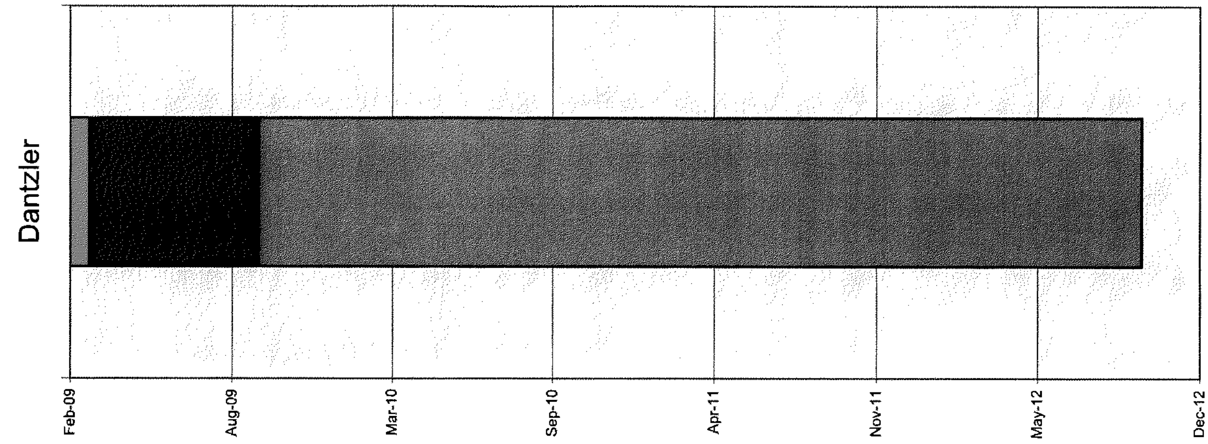
Date	Author	Note
		Contractor's Field Overhead @ 12%
		Contractor's Home Office (G&A) @ 8%
		Profit @ 10%
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist
8/6/2008		New Project Note
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate.
		Joseph H. Ellsworth

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**1,072,885**	**128,746**	**96,130**	**129,776**	**17,130**	**50,563**	**1,495,232**
Dantzler, Area A & B - Environmental Restoration	**1.00**	**LS**	**1,072,885**	**128,746**	**96,130**	**129,776**	**17,130**	**50,563**	**1,495,232**
Federal & Non-Federal Costs	**1.00**	**LS**	**1,072,885**	**128,746**	**96,130**	**129,776**	**17,130**	**50,563**	**1,495,232**
Fish & Wildlife	**1.00**	**LS**	**1,072,885**	**128,746**	**96,130**	**129,776**	**17,130**	**50,563**	**1,495,232**
			35,000.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48,777.93*
Mobilization, Preparatory Work, & Demobilization	1.00	ACR	35,000	4,200	3,136	4,234	559	1,649	48,778
			9.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.59*
Fill Existing Ditches with Off-Site Conmerical Borrow	66,560.00	CY	648,960	77,875	58,147	78,498	10,362	30,584	904,426
(Note: Unit price based on current un going Coastal Mississippi construction projects for similar work.)									
			130.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*181.18*
Burn Existing Vegetatin (surface only burn)	385.00	CY	50,050	6,006	4,484	6,054	799	2,359	69,752
			75.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*104.52*
Mow (bush-hog) Existing Vegetatin (initiallly)	385.00	CY	28,875	3,465	2,587	3,493	461	1,361	40,242
			12.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*16.72*
Remove Existing Roads (assume 24' width)	5,000.00	LF	60,000	7,200	5,376	7,258	958	2,828	83,619
			35.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48.78*
Remove Existing Utilities	5,000.00	LF	175,000	21,000	15,680	21,168	2,794	8,247	243,890
Miscellaneous Site Items	1.00	LS	75,000	9,000	6,720	9,072	1,198	3,535	104,524

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**1,072,885**	**1,072,885**
01 Dantzler, Area A & B - Environmental Restoration	**1.00**	**LS**	**1,072,885**	**1,072,885**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**1,072,885**	**1,072,885**
006 Fish & Wildlife	**1.00**	**LS**	**1,072,885**	**1,072,885**
			2,786.71	*2,786.71*
01 Restore Wetlands	**385.00**	**ACR**	**1,072,885**	**1,072,885**
			35,000.00	*35,000.00*
USR Mobilization, Preparatory Work, & Demobilization	1.00	ACR	35,000	35,000
			9.75	*9.75*
USR Fill Existing Ditches with Off-Site Commerical Borrow (Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)	66,560.00	CY	648,960	648,960
			130.00	*130.00*
USR Burn Existing Vegetatin (surface only burn)	385.00	CY	50,050	50,050
			75.00	*75.00*
USR Mow (bush-hog) Existing Vegetatin (initiallly)	385.00	CY	28,875	28,875
			12.00	*12.00*
USR Remove Existing Roads (assume 24' width)	5,000.00	LF	60,000	60,000
			35.00	*35.00*
USR Remove Existing Utilities	5,000.00	LF	175,000	175,000
USR Miscellaneous Site Items	1.00	LS	75,000	75,000

Currency in US dollars



The restoration site contains 385 acres to be restored to wet pine savanna. The long-term exclusion of fire and the invasion of non-native species such as Cogongrass and Chinese Tallowtree have severely degraded the site and will be removed along with other exotic plant species. Existing ditches will be filled. The site will be mowed and burned as part of the vegetation maintenance. The design will start in March of 2009, the award will be in October, 2009, and the completion will be October, 2012.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Admiral Island -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE

LOCATION: Hancock County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08			........FULLY FUNDED ESTIMATE.........		
ACCOUNT NUM FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	25,000	6,250	25%	31,250	25,000	6,250	31,250	25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands ***(Admiral Island)***	15,179,000	3,794,750	25%	18,973,750	15,179,000	3,794,750	18,973,750	16,302,246	4,075,562	20,377,808
30--- PLANNING, ENGINEERING & DESIGN	1,214,320	303,580	25%	1,517,900	1,214,320	303,580	1,517,900	1,255,607	313,902	1,569,509
31--- CONSTRUCTION MANAGEMENT	910,740	227,685	25%	1,138,425	910,740	227,685	1,138,425	978,135	244,534	1,222,669
TOTAL PROJECT COST =======>	**17,329,060**	**4,332,265**		**21,661,325**	**17,329,060**	**4,332,265**	**21,661,325**	**18,561,388**	**4,640,348**	**23,201,736**

rounded

65%	**TOTAL FEDERAL COSTS ============>**	**$15,080,000**
35%	**TOTAL NON - FEDERAL COSTS ======>**	**$8,120,000**
	TOTAL PROJECT COSTS ============>	**$23,200,000**

DISTRICT APPROVED:

__________ CHIEF, COST ENGINEERING

__________ CHIEF, REAL ESTATE

__________ CHIEF, PLANNING

__________ CHIEF, ENGINEERING

__________ CHIEF, OPERATIONS

__________ CHIEF, CONSTRUCTION

__________ CHIEF, PROGRAMS MANAGEMENT

__________ PROJECT MANAGER

__________ DDE (PM)

Non-Federal & Federal COSTS **** TOTAL CONTRACT COST SUMMARY **** PAGE 2 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Admiral Island -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE

LOCATION: Hancock County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08					AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08					.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No.	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01---	Lands & Damages (PCA)	25,000	6,250	25%	31,250	0.0%	25,000	6,250	31,250	Jun 09	1.6%	25,400	6,350	31,750
	Subtotal	25,000	6,250		31,250		25,000	6,250	31,250			25,400	6,350	31,750
06---	Fish & Wildlife -Restore Wetlands	15,179,000	3,794,750	25%	18,973,750	0.0%	15,179,000	3,794,750	18,973,750	Jan 12	7.4%	16,302,246	4,075,562	20,377,808
30---	PLANNING, ENGINEERING & DESIGN, 8%+-	1,214,320	303,580	25%	1,517,900	0.0%	1,214,320	303,580	1,517,900	Jun 09	3.4%	1,255,607	313,902	1,569,509
31---	CONSTRUCTION MANAGEMENT, 6% +-	910,740	227,685	25%	1,138,425	0.0%	910,740	227,685	1,138,425	Jan 12	7.4%	978,135	244,534	1,222,669
	Subtotal	17,304,060	4,326,015		21,630,075		17,304,060	4,326,015	21,630,075			18,535,988	4,633,998	23,169,986

4.□ative Vegetation Planting at 1 meter spacing

3.Ÿilling in 100% of existing artificial ditches/channels.

2.'00% removal of exotics from non-excavated areas and maintain removal of exotic plant species in all areas over project lifetime. (Mandatory in all plans).

1.žxcavation of old fill material (includes 90-95% removal of existing exotic species in excavated areas) (Mandatory).

The restoration site contains 62 acres of emergent tidal marsh to be restored. The remaining 61 acres of scrub shrub wetland habitat would remain. The tidal marshes in this area were ditched during the 1960s causing changes in the natural hydrology and subsequent changes in the species composition. Hurricane Katrina left extensive debris fields and sedimentation in the area and destroyed many native trees and vegetation. Due to the loss of native species this area has a severe infestation of the invasive Chinese Tallow tree, which is invading the marshes and the adjacent flatwoods. For increased habitat diversity, higher elevations containing shrub/scrub wetland plant species would remain in order to enhance diversity within the restoration site. The following measures were developed:
Admiral Island Proposed Action

Price Level ly Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/14/2008
Effective Date of Pricing 8/14/2008
Estimated Construction Time Days

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project file:mscip-admiral-feasibility-14aug08.mlp

report file: mscip-feasibilty standard report selections.mrp

output file: mscip-admiral-feasibility-14aug08.doc

Date	Author	Note
	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08).

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

06 Feature Account, Preservation - Mitigation-Tidal quantites were based on impacts of new footprint plus mitigated factor which was determined and coordinated by other agencies. Unit cost were derived and based on historical data.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % -- of construction cost excluding the Misc Items cost.

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent+- (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

Quantities listed within the estimates represent Major Elements of the Project Scope and were furnished by the Project Delivery Team. Where quantities were not available, assumptions were made based on historical information and Estimator's judgment.

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Labor ID: LB06NatFD EQ ID: EP06R08 Currency in US dollars TRACES MII Version 3.0

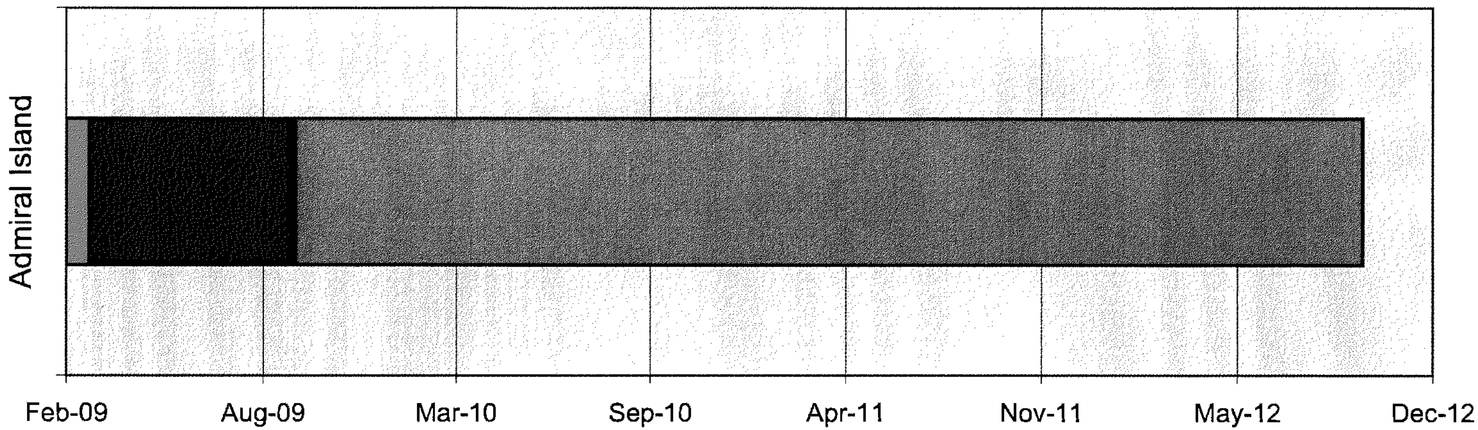
Date	Author	Note
		Contractor's Field Overhead @ 12%
		Contractor's Home Office (G&A) @ 8%
		Profit @ 10%
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**10,891,401**	**1,306,968**	**975,870**	**1,317,424**	**173,900**	**513,295**	**15,178,857**
01 Admiral Island, Hancock County - Environmental Restoration	**1.00**	**LS**	**10,891,401**	**1,306,968**	**975,870**	**1,317,424**	**173,900**	**513,295**	**15,178,857**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**10,891,401**	**1,306,968**	**975,870**	**1,317,424**	**173,900**	**513,295**	**15,178,857**
006 Fish & Wildlife	**1.00**	**LS**	**10,891,401**	**1,306,968**	**975,870**	**1,317,424**	**173,900**	**513,295**	**15,178,857**
01 Restore Wetlands	**1.00**	**LS**	**10,891,401**	**1,306,968**	**975,870**	**1,317,424**	**173,900**	**513,295**	**15,178,857**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	200,000	24,000	17,920	24,192	3,193	9,426	278,731
			10.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.94*
USR Excavation of existing area from -.5 to +2.0	916,483.00	CY	9,164,830	1,099,780	821,169	1,108,578	146,332	431,924	12,772,613
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
			12.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*16.72*
USR Removal of roads(assume 24' wide)	3,500.00	LF	42,000	5,040	3,763	5,080	671	1,979	58,534
			35.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48.78*
USR Remove utilties	3,500.00	LF	122,500	14,700	10,976	14,818	1,956	5,773	170,723
			2,700.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3,762.87*
USR Herbicide, application from truck	62.00	ACR	167,400	20,088	14,999	20,249	2,673	7,889	233,298
			4.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*5.92*
USR Filing of existing ditches & channels	7,000.00	CY	29,750	3,570	2,666	3,599	475	1,402	41,461
			2.15	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.00*
USR Environmental Planting	518,568.00	EA	1,114,921	133,791	99,897	134,861	17,802	52,544	1,553,816
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 432,140 plants plus 20% replacement = 518,568 plants. Material price fob job site @ $0.78/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.16 / plant. Use $2.15 / plant.)									
USR Misc site items	1.00	LS	50,000	6,000	4,480	6,048	798	2,356	69,683

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**10,891,401**	**10,891,401**
01 Admiral Island, Hancock County - Environmental Restoration	**1.00**	**LS**	**10,891,401**	**10,891,401**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**10,891,401**	**10,891,401**
006 Fish & Wildlife	**1.00**	**LS**	**10,891,401**	**10,891,401**
01 Restore Wetlands	**1.00**	**LS**	**10,891,401**	**10,891,401**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	200,000	200,000
			10.00	*10.00*
USR Excavation of existing area from -.5 to +2.0	916,483.00	CY	9,164,830	9,164,830
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
			12.00	*12.00*
USR Removal of roads(assume 24' wide)	3,500.00	LF	42,000	42,000
			35.00	*35.00*
USR Remove utilties	3,500.00	LF	122,500	122,500
			2,700.00	*2,700.00*
USR Herbicide, application from truck	62.00	ACR	167,400	167,400
			4.25	*4.25*
USR Filing of existing ditches & channels	7,000.00	CY	29,750	29,750
			2.15	*2.15*
USR Environmental Planting	518,568.00	EA	1,114,921	1,114,921
(Note: Plants are planted at 30 in centers. Contractor shall be reqnired to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 432,140 plants plus 20% replacement = 518,568 plants. Material price fob job site @ $0.78/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.16 / plant. Use $2.15 / plant.)				
USR Misc site items	1.00	LS	50,000	50,000

Currency in US dollars



The restoration site contains 62 acres of emergent tidal marsh to be restored by removing fill and planting native vegetation on 1-meter spacing and filling existing ditches. The remaining 61 acres of scrub shrub wetland habitat would remain. Due to the loss of native species this area has a severe infestation of the invasive Chinese Tallow tree, which is invading the marshes and the adjacent flatwoods. For increased habitat diversity, higher elevations containing shrub/scrub wetland plant species would remain in order to enhance diversity within the restoration site with 100% removal of exotics from non-excavated areas. The design will start in March of 2009, the award will be in October, 2009, and the completion will be October, 2012.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Bayou Cumbest -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE
LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

ACCOUNT NUM/FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	4,831,603	1,207,901	25%	6,039,504	4,831,603	1,207,901	6,039,504	4,933,067	1,233,267	6,166,334
06--- Fish & Wildlife -Restore Wetlands ***(Bayou Cumbest)***	13,564,000	3,391,000	25%	16,955,000	13,564,000	3,391,000	16,955,000	14,567,736	3,641,934	18,209,670
30--- PLANNING, ENGINEERING & DESIGN	1,085,120	271,280	25%	1,356,400	1,085,120	271,280	1,356,400	1,107,908	276,977	1,384,885
31--- CONSTRUCTION MANAGEMENT	813,840	203,460	25%	1,017,300	813,840	203,460	1,017,300	874,064	218,516	1,092,580
TOTAL PROJECT COST =======>	**20,294,563**	**5,073,641**		**25,368,204**	**20,294,563**	**5,073,641**	**25,368,204**	**21,482,775**	**5,370,694**	**26,853,469**

rounded

65% TOTAL FEDERAL COSTS ============> $17,485,000

35% TOTAL NON-FEDERAL COSTS ======> $9,415,000

TOTAL PROJECT COSTS ============> $26,900,000

DISTRICT APPROVED:

__________ CHIEF, COST ENGINEERING

__________ CHIEF, REAL ESTATE

__________ CHIEF, PLANNING

__________ CHIEF, ENGINEERING

__________ CHIEF, OPERATIONS

__________ CHIEF, CONSTRUCTION

__________ CHIEF, PROGRAMS MANAGEMENT

__________ PROJECT MANAGER

__________ DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Bayou Cumbest -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE
LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (price level, Oct 07)	4,831,603	1,207,901	25%	6,039,504	0.0%	4,831,603	1,207,901	6,039,504	Sep 09	2.1%	4,933,067	1,233,267	6,166,334
Subtotal	4,831,603	1,207,901		6,039,504		4,831,603	1,207,901	6,039,504			4,933,067	1,233,267	6,166,334
06--- Fish & Wildlife -Restore Wetlands	13,564,000	3,391,000	25%	16,955,000	0.0%	13,564,000	3,391,000	16,955,000	Jan 12	7.4%	14,567,736	3,641,934	18,209,670
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	1,085,120	271,280	25%	1,356,400	0.0%	1,085,120	271,280	1,356,400	Sep 09	2.1%	1,107,908	276,977	1,384,885
31--- CONSTRUCTION MANAGEMENT, 6% +-	813,840	203,460	25%	1,017,300	0.0%	813,840	203,460	1,017,300	Jan 12	7.4%	874,064	218,516	1,092,580
Subtotal	15,462,960	3,865,740		19,328,700		15,462,960	3,865,740	19,328,700			16,549,708	4,137,427	20,687,135

4. Native Vegetation Planting at 1 meter spacing

3. Filling in 100% of existing artificial ditches/channels

2. 100% removal of exotics from non-excavated areas and maintain removal of exotic species (Chinese Tallow, Phragmites, Cogon Grass) in all areas over project lifetime. (Mandatory in all plans).

1. Excavation of old fill material (includes 90-95% removal of existing exotic species in excavated areas) (Mandatory)

The restoration project consists of 110 acres to be restored to tidal marsh and while the remaining 38 acres would remain scrub/shrub wetland habitat. The area presently consists of previously filled marsh areas that were developed into a residential community. The majority of residences were severely damaged or completely destroyed during the hurricanes of 2005. The following measures were developed:

Bayou Cumbest

Price Level ly Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/14/2008
Effective Date of Pricing 8/14/2008
Estimated Construction Time Days

project file:mscip-bayou cumbest-feasibility-14aug08.mlp

report file: mscip-feasibilty standard report selections.mrp

output file: mscip-bayou cumbest-feasibility-14aug08.doc

Date	Author	Note
--	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). Price Level of Estimate is Aug 08. Project Life is assumed as 50 years in Cost Estimate. 30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report. 31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report. Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design. Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance. Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % +- of construction cost excluding the Misc Items cost. Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent +-(.25%) of construction cost excluding Mob & Demob Cost Unit Prices, for such items as site work, earthwork, planting, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.
8/5/2008	Joseph H. Ellsworth	The following Contractor Markups are applied to the Cost to Prime Direct Cost: Contractor's Field Overhead @ 12% Contractor's Home Office (G&A) @ 8% Profit @ 10% Bond @ 1.2% Miss. Gross Receipts Tax @ 3.5% Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate.

Currency in US dollars

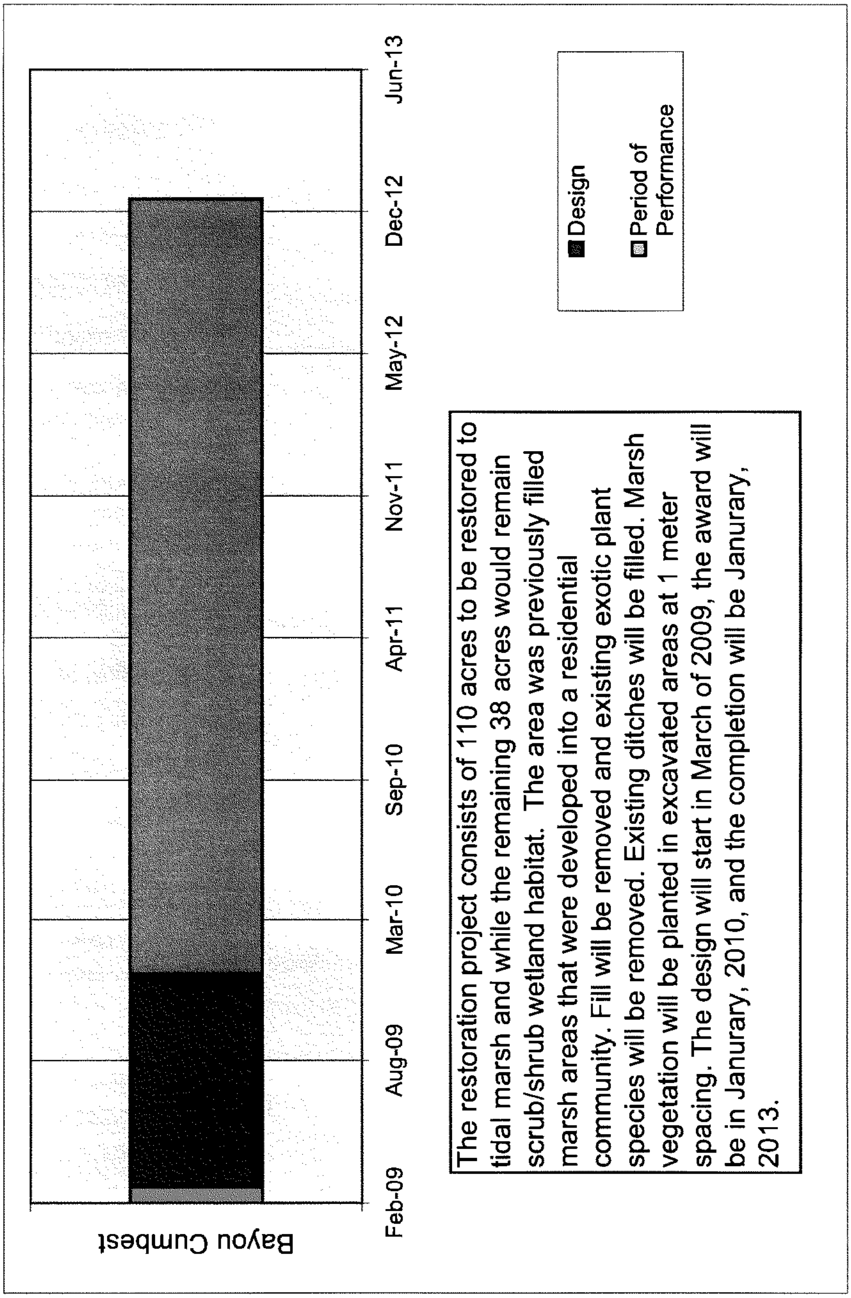
Date	Author	Note
		Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**9,732,957**	**1,167,955**	**872,073**	**1,177,298**	**155,403**	**458,699**	**13,564,385**
01 Bayou Cumbest Area 34, Environmental Restoration	**1.00**	**LS**	**9,732,957**	**1,167,955**	**872,073**	**1,177,298**	**155,403**	**458,699**	**13,564,385**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**9,732,957**	**1,167,955**	**872,073**	**1,177,298**	**155,403**	**458,699**	**13,564,385**
006 Fish & Wildlife	**1.00**	**LS**	**9,732,957**	**1,167,955**	**872,073**	**1,177,298**	**155,403**	**458,699**	**13,564,385**
			88,481.43						*123,312.59*
01 Restore Wetlands	**110.00**	**ACR**	**9,732,957**	**1,167,955**	**872,073**	**1,177,298**	**155,403**	**458,699**	**13,564,385**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	250,000	30,000	22,400	30,240	3,992	11,782	348,414
			10.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.94*
USR Removal Excavation Existing Area From -0.5 to+2.0	693,909.00	CY	6,939,090	832,691	621,742	839,352	110,795	327,028	9,670,699
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
			3.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4.18*
USR Removal of Structures Avg. 1500SF@18EA	27,000.00	SF	81,000	9,720	7,258	9,798	1,293	3,817	112,886
			2.15	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.00*
USR Removal Disposal Fee	1,000.00	CY	2,150	258	193	260	34	101	2,996
			12.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*16.72*
USR Removal of Roads 24FT Wide Assumed	6,439.00	LF	77,268	9,272	6,923	9,346	1,234	3,642	107,685
			35.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48.78*
USR Removal of Utilities	6,439.00	LF	225,365	27,044	20,193	27,260	3,598	10,621	314,081
			2,700.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3,762.87*
USR Herbicide, Hand Application Untouched Areas	32.00	ACR	86,400	10,368	7,741	10,451	1,380	4,072	120,412
			4.25	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*5.92*
USR Filling of Existing Ditches & Channels(from req'd. excavation)	2,023.00	CY	8,598	1,032	770	1,040	137	405	11,982
			2.15	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.00*
USR Environmental Planting	920,040.00	EA	1,978,086	237,370	177,237	239,269	31,584	93,224	2,756,770
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 766,700 plants plus 20% replacement = 920,040 plants. Material price fob job site @ $0.78/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.16 / plant. Use $2.15 / plant.)									
USR Miscellaneous Site Items	1.00	LS	85,000	10,200	7,616	10,282	1,357	4,006	118,461

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**9,732,957**	**9,732,957**
01 Bayou Cumbest Area 34, Environmental Restoration	**1.00**	**LS**	**9,732,957**	**9,732,957**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**9,732,957**	**9,732,957**
006 Fish & Wildlife	**1.00**	**LS**	**9,732,957**	**9,732,957**
			88,481.43	*88,481.43*
01 Restore Wetlands	**110.00**	**ACR**	**9,732,957**	**9,732,957**
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	250,000	250,000
			10.00	*10.00*
USR Removal Excavation Existing Area From -0.5 to+2.0	693,909.00	CY	6,939,090	6,939,090
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
			3.00	*3.00*
USR Removal of Structures Avg. 1500SF@18EA	27,000.00	SF	81,000	81,000
			2.15	*2.15*
USR Removal Disposal Fee	1,000.00	CY	2,150	2,150
			12.00	*12.00*
USR Removal of Roads 24FT Wide Assumed	6,439.00	LF	77,268	77,268
			35.00	*35.00*
USR Removal of Utilities	6,439.00	LF	225,365	225,365
			2,700.00	*2,700.00*
USR Herbicide, Hand Application Untouched Areas	32.00	ACR	86,400	86,400
			4.25	*4.25*
USR Filling of Existing Ditches & Channels(from req'd. excavation)	2,023.00	CY	8,598	8,598
			2.15	*2.15*
USR Environmental Planting	920,040.00	EA	1,978,086	1,978,086
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 766,700 plants plus 20% replacement = 920,040 plants. Material price fob job site @ $0.78/ea, Fertilizer @0.10/ea, Labor Cost @ $0.90/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.16 / plant. Use $2.15 / plant.)				
USR Miscellaneous Site Items	1.00	LS	85,000	85,000

Currency in US dollars


Bayou Cumbest
Feb-09
Aug-09
Mar-10
Sep-10
Apr-11
Nov-11
May-12
Dec-12
Jun-13
Design
Period of Performance
The restoration project consists of 110 acres to be restored to tidal marsh and while the remaining 38 acres would remain scrub/shrub wetland habitat. The area was previously filled marsh areas that were developed into a residential community. Fill will be removed and existing exotic plant species will be removed. Existing ditches will be filled. Marsh vegetation will be planted in excavated areas at 1 meter spacing. The design will start in March of 2009, the award will be in Janurary, 2010, and the completion will be Janurary, 2013.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Franklin Creek -Environmental Restoration, Restore Wetlands — DISTRICT: MOBILE

LOCATION: Jackson County, Mississippi — P.O.C.: Joseph H. Ellsworth

ACCOUNT NUM	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED ESTIMATE COST ($K)	CNTG ($K)	FULL ($K)
01---	Lands & Damages	25,000	6,250	25%	31,250	25,000	6,250	31,250	25,525	6,381	31,906
06---	Fish & Wildlife -Restore Wetlands (**Franklin Creek**)	1,271,000	317,750	25%	1,588,750	1,271,000	317,750	1,588,750	1,365,054	341,264	1,706,318
30---	PLANNING, ENGINEERING & DESIGN	101,680	25,420	25%	127,100	101,680	25,420	127,100	103,815	25,954	129,769
31---	CONSTRUCTION MANAGEMENT	76,260	19,065	25%	95,325	76,260	19,065	95,325	81,903	20,476	102,379
	TOTAL PROJECT COST =======>	**1,473,940**	**368,485**		**1,842,425**	**1,473,940**	**368,485**	**1,842,425**	**1,576,297**	**394,075**	**1,970,372**

rounded

65%	**TOTAL FEDERAL COSTS ============>**	**$1,300,000**
35%	**TOTAL NON-FEDERAL COSTS ======>**	**$700,000**
	TOTAL PROJECT COSTS ============>	**$2,000,000**

DISTRICT APPROVED:

_________________ CHIEF, COST ENGINEERING

_________________ CHIEF, REAL ESTATE

_________________ CHIEF, PLANNING

_________________ CHIEF, ENGINEERING

_________________ CHIEF, OPERATIONS

_________________ CHIEF, CONSTRUCTION

_________________ CHIEF, PROGRAMS MANAGEMENT

_________________ PROJECT MANAGER

_________________ DDE (PM)

Non-Federal & Federal COSTS **** TOTAL CONTRACT COST SUMMARY **** PAGE 2 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Franklin Creek -Environmental Restoration, Restore Wetlands DISTRICT: MOBILE

LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (PCA)	25,000	6,250	25%	31,250	0.0%	25,000	6,250	31,250	Sep 09	2.1%	25,525	6,381	31,906
Subtotal	25,000	6,250		31,250		25,000	6,250	31,250			25,525	6,381	31,906
06--- Fish & Wildlife -Restore Wetlands	1,271,000	317,750	25%	1,588,750	0.0%	1,271,000	317,750	1,588,750	Jan 12	7.4%	1,365,054	341,264	1,706,318
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	101,680	25,420	25%	127,100	0.0%	101,680	25,420	127,100	Sep 09	2.1%	103,815	25,954	129,769
31--- CONSTRUCTION MANAGEMENT, 6% +-	76,260	19,065	25%	95,325	0.0%	76,260	19,065	95,325	Jan 12	7.4%	81,903	20,476	102,379
Subtotal	1,448,940	362,235		1,811,175		1,448,940	362,235	1,811,175			1,550,772	387,694	1,938,466

4. Add culverts (Mandatory)

3. Excavate and remove existing roadbeds and any additional fill (Mandatory)

2. Maintain vegetation (Mandatory) by mowing 1st year and Burn 1st year; Burn every 3 years for life of project.

1. Filling in ditches (Mandatory)

The restoration site is an interim buy-out project currently being implemented. The site consists of 149 acres bisected by an elevated railroad atop an earthen berm. The site received severe flood damages during the hurricanes of 2005 and previous storm events. Historically, the site consisted of pine savannah wetlands. It is assumed that removal of utilities, building slabs, and roadways would be completed as part of the ongoing interim project. The following restoration measures were developed:

Franklin Creek

Price Level Aug 08

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph H. Ellsworth
Preparation Date 8/8/2008
Effective Date of Pricing 8/8/2008
Estimated Construction Time Days

project file: franklin-feasibility-aug08.mlp

report file: feasibilty standard report.mrp

output file: franklin-feasibility-aug08.doc

Date **Author** **Note**

-- Joseph H. Ellsworth

BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts.

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & appruved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Mobilization Preparatory Work & Demobilization are derived within the estimate generally at 2.5 % +- of construction cost excluding the Misc Items cost.

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, stone protection, concrete, reinforcing, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Contractor's Field Overhead @ 12%

Contractor's Home Office (G&A) @ 8%

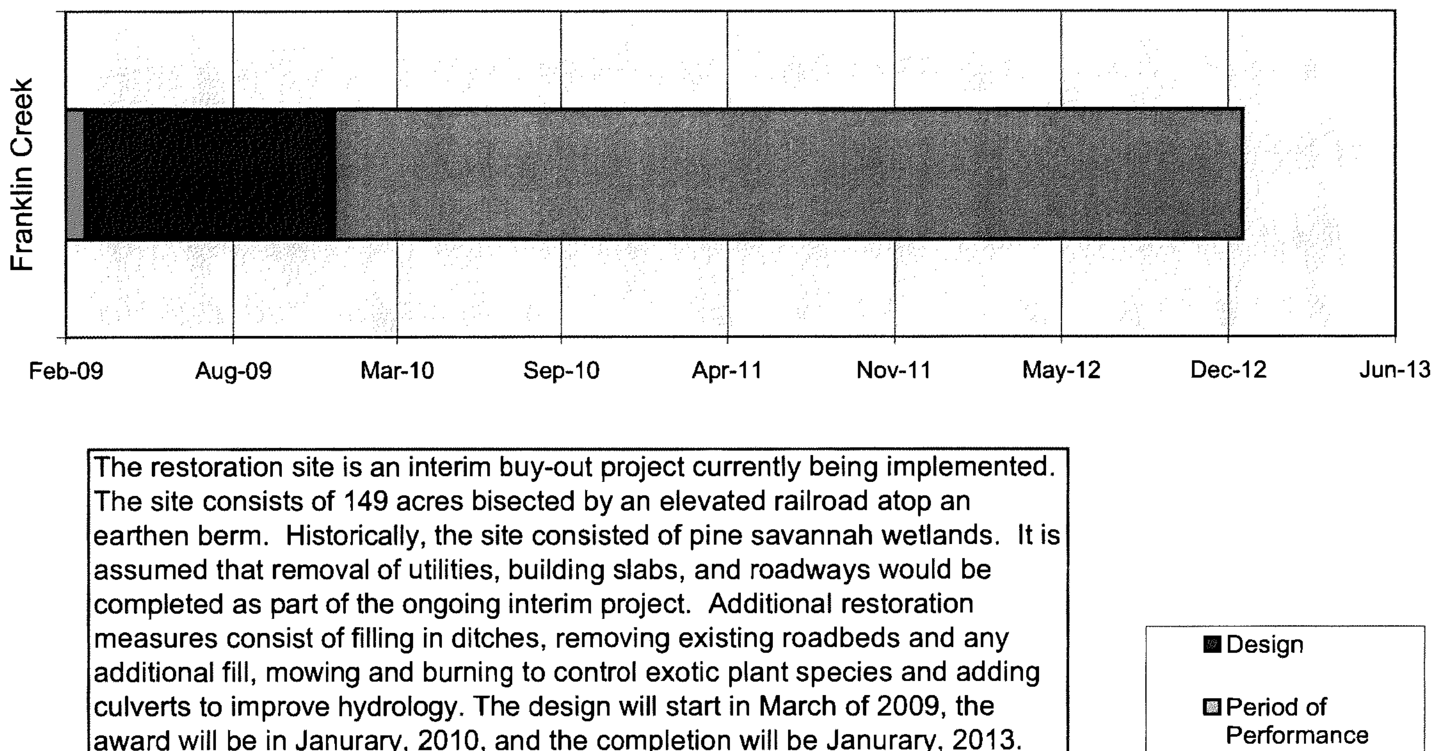
Date	Author	Note
		Profit @ 10%
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**912,045**	**109,445**	**81,719**	**110,321**	**14,562**	**42,983**	**1,271,076**
01 Franklin Creek, Jackson County - Environmental Restoration	**1.00**	**LS**	**912,045**	**109,445**	**81,719**	**110,321**	**14,562**	**42,983**	**1,271,076**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**912,045**	**109,445**	**81,719**	**110,321**	**14,562**	**42,983**	**1,271,076**
006 Fish & Wildlife	**1.00**	**LS**	**912,045**	**109,445**	**81,719**	**110,321**	**14,562**	**42,983**	**1,271,076**
01 Restore Wetlands	**1.00**	**LS**	**912,045**	**109,445**	**81,719**	**110,321**	**14,562**	**42,983**	**1,271,076**
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	40,000	4,800	3,584	4,838	639	1,885	55,746
			100.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*139.37*
USR 24" RCP culverts, (15@100' long ea)	1,500.00	LF	150,000	18,000	13,440	18,144	2,395	7,069	209,048
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
			9.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*13.59*
USR Fill in ditches(from off-site borrow)	26,000.00	CY	253,500	30,420	22,714	30,663	4,048	11,947	353,292
			130.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*181.18*
USR Burn vegetation	149.00	ACR	19,370	2,324	1,736	2,343	309	913	26,995
			75.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*104.52*
USR Mow vegetation(annually)	149.00	ACR	11,175	1,341	1,001	1,352	178	527	15,574
			12.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*16.72*
USR Remove roads(assume 24' wide)	9,000.00	LF	108,000	12,960	9,677	13,064	1,724	5,090	150,515
			35.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*48.78*
USR Remove utilties	9,000.00	LF	315,000	37,800	28,224	38,102	5,030	14,845	439,001
USR Misc site items	1.00	LS	15,000	1,800	1,344	1,814	240	707	20,905

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**912,045**	**912,045**
01 Franklin Creek, Jackson County - Environmental Restoration	**1.00**	**LS**	**912,045**	**912,045**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**912,045**	**912,045**
006 Fish & Wildlife	**1.00**	**LS**	**912,045**	**912,045**
01 Restore Wetlands	**1.00**	**LS**	**912,045**	**912,045**
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
USR Mobilization, Preparatory Work, & Demobilization	1.00	LS	40,000	40,000
			100.00	*100.00*
USR 24" RCP culverts, (15@100' long ea)	1,500.00	LF	150,000	150,000
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
			9.75	*9.75*
USR Fill in ditches(from off-site borrow)	26,000.00	CY	253,500	253,500
			130.00	*130.00*
USR Burn vegetation	149.00	ACR	19,370	19,370
			75.00	*75.00*
USR Mow vegetation(annually)	149.00	ACR	11,175	11,175
			12.00	*12.00*
USR Remove roads(assume 24' wide)	9,000.00	LF	108,000	108,000
			35.00	*35.00*
USR Remove utilties	9,000.00	LF	315,000	315,000
USR Misc site items	1.00	LS	15,000	15,000

Currency in US dollars



The restoration site is an interim buy-out project currently being implemented. The site consists of 149 acres bisected by an elevated railroad atop an earthen berm. Historically, the site consisted of pine savannah wetlands. It is assumed that removal of utilities, building slabs, and roadways would be completed as part of the ongoing interim project. Additional restoration measures consist of filling in ditches, removing existing roadbeds and any additional fill, mowing and burning to control exotic plant species and adding culverts to improve hydrology. The design will start in March of 2009, the award will be in Janurary, 2010, and the completion will be Janurary, 2013.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feesibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Deer Island Ecosystem Restoration — DISTRICT: MOBILE

LOCATION: Mississippi — P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08			.........FULLY FUNDED ESTIMATE.........		
ACCOUNT NUM FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	25,000	6,250	25%	31,250	25,000	6,250	31,250	25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands ***(Deer Island Ecosystem Restoration)***	14,964,000	3,741,000	25%	18,705,000	14,964,000	3,741,000	18,705,000	16,071,336	4,017,834	20,089,170
30--- PLANNING, ENGINEERING & DESIGN	1,197,120	299,280	25%	1,496,400	1,197,120	299,280	1,496,400	1,237,822	309,456	1,547,278
31--- CONSTRUCTION MANAGEMENT	897,840	224,460	25%	1,122,300	897,840	224,460	1,122,300	964,280	241,070	1,205,350
TOTAL PROJECT COST =======>	**17,083,960**	**4,270,990**		**21,354,950**	**17,083,960**	**4,270,990**	**21,354,950**	**18,298,838**	**4,574,710**	**22,873,548**

rounded

65%	**TOTAL FEDERAL COSTS ============>**	**$14,885,000**
35%	**TOTAL NON - FEDERAL COSTS ======>**	**$8,015,000**
	TOTAL PROJECT COSTS ============>	**$22,900,000**

DISTRICT APPROVED:

__________ CHIEF, COST ENGINEERING

__________ CHIEF, REAL ESTATE

__________ CHIEF, PLANNING

__________ CHIEF, ENGINEERING

__________ CHIEF, OPERATIONS

__________ CHIEF, CONSTRUCTION

__________ CHIEF, PROGRAMS MANAGEMENT

__________ PROJECT MANAGER

__________ DDE (PM)

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Deer Island Ecosystem Restoration DISTRICT: MOBILE
LOCATION: Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (PCA)	25,000	6,250	25%	31,250	0.0%	25,000	6,250	31,250	Jun 09	1.6%	25,400	6,350	31,750
Subtotal	25,000	6,250		31,250		25,000	6,250	31,250			25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands	14,964,000	3,741,000	25%	18,705,000	0.0%	14,964,000	3,741,000	18,705,000	Jan 12	7.4%	16,071,336	4,017,834	20,089,170
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	1,197,120	299,280	25%	1,496,400	0.0%	1,197,120	299,280	1,496,400	Jun 09	3.4%	1,237,822	309,456	1,547,278
31--- CONSTRUCTION MANAGEMENT, 6% +-	897,840	224,460	25%	1,122,300	0.0%	897,840	224,460	1,122,300	Jan 12	7.4%	964,280	241,070	1,205,350
Subtotal	17,058,960	4,264,740		21,323,700		17,058,960	4,264,740	21,323,700			18,273,438	4,568,360	22,841,798

Create additional marsh habitat area adjacent to the existing created marsh area.

Lengthen stone containment dikes on northern and southern ends as a result of Section 204; and

Analyze new stone training dikes on the northern and southern ends of the islands as a result of Section 204;

Add/Replace material in the Section 204 containment dike;

Repair/Replace the Section 204 containment dike;

Deer Island restoration consists of a combination of the following alternatives to form the recommended plan:

Deer Island also includes the following aspects in the MsCIP effort.

The proposed project for Deer Island will provide for ecosystem restoration as well as preservation of critical coastal wetlands by restoring portions of the island and its shoreline lost during storm events. The island also provides storm protection from surge, wave action and wind for the adjacent coastal portion of the City of Biloxi, Mississippi. The proposed project will consist of three components: shoreline restoration in the Grand Bayou area of Deer Island with beach, dune, marsh and maritime forest reestablishment; restoration of the west end breach area with reestablishment of maritime forest area; and, restoration of the remaining shoreline areas along the seaward shoreline with beach, dune, marsh and maritime forest reestablishment. Fill material will be obtained from an offshore borrow area located approximately 500 feet off the southern shoreline of Deer Island. The offshore borrow area adjacent to the island would be approximately 1,000 feet wide, 6 feet deep, with a distance equal to the length of the project area. The borrow site is far enough from and is of sufficiently shallow depth to not affect shoreline stability. The wind and wave attack at Deer Island is generally southwest to northeast which is expected to push material along the shoreline. Material from the borrow area will be cast on the existing shoreline for beach nourishment via a hydraulic dredge. After filling, environmental plantings will be made to establish the maritime forest and aquatic marsh in the restored area.

Price Level Aug 08

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/14/2008
Effective Date of Pricing 8/14/2008
Estimated Construction Time Days

project file: mscip-deer island-feasibility-14aug08.mlp

report file: MSCIP-feasibilty standard report selection.mrp

output file: mscip-deer islands-feasibility-14aug08.doc

FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Joseph Ellsworth
Preparation Date 8/14/2008
Effective Date of Pricing 8/14/2008
Estimated Construction Time Days

project file: mscip-deer island-feasibility-14aug08.mlp

report file: MSCIP-feasibilty standard report selection.mrp

output file: mscip-deer islands-feasibility-14aug08.doc

Date	Author	Note
	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts.

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Mobilization Preparatory Work & Demobilization are derived within the CEDEP estimate for the Dredging work and the land based equipment is based on recent on-going project at the proposed site.

Miscellaneous Items represent cost where quantities were not available. sueh items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, planting, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Contractor's Field Overhead @ 12%

Currency in US dollars

Date	Author	Note
		Contractor's Home Office (G&A) @ 8%
		Profit @ 10%
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**10,737,186**	**1,288,462**	**962,052**	**1,298,770**	**171,438**	**506,027**	**14,963,934**
01 Deer Island-Aquatic Ecosystem Restoration	**1.00**	**LS**	**10,737,186**	**1,288,462**	**962,052**	**1,298,770**	**171,438**	**506,027**	**14,963,934**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**10,737,186**	**1,288,462**	**962,052**	**1,298,770**	**171,438**	**506,027**	**14,963,934**
006 Fish & Wildlife	**1.00**	**LS**	**10,737,186**	**1,288,462**	**962,052**	**1,298,770**	**171,438**	**506,027**	**14,963,934**
01 Ecosystem Restoration	**1.00**	**LS**	**10,737,186**	**1,288,462**	**962,052**	**1,298,770**	**171,438**	**506,027**	**14,963,934**
Mobilization, Preparatory Work, & Demobilization	**1.00**	**LS**	**1,200,000**	**144,000**	**107,520**	**145,152**	**19,160**	**56,554**	**1,672,386**
USR Mobilization, Preparatory Work, Demobilizaiton(Dredge Plant, 27")	1.00	LS	950,000	114,000	85,120	114,912	15,168	44,772	1,323,972
USR Mobilization, Preparatory Work, Demobilization(Land Base Equipment)	1.00	LS	250,000	30,000	22,400	30,240	3,992	11,782	348,414
Seaward Shoreline	**1.00**	**LS**	**4,798,722**	**575,847**	**429,965**	**580,453**	**76,620**	**226,156**	**6,687,763**
			5.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*6.97*
USR Beach Fill, in-place, 27" Dredge	400,000.00	CY	2,000,000	240,000	179,200	241,920	31,933	94,257	2,787,310
(Note: Unit Cost based a recent on-going project at existing project proforming similar work. Work is being performed by a 27" pipeline dredge.)									
			3,400.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4,738.43*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	120.00	DAY	408,000	48,960	36,557	49,352	6,514	19,228	568,611
			2.80	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.90*
USR Environmental Planting (Marsh Grass)	652,392.00	EA	1,826,698	219,204	163,672	220,957	29,166	86,089	2,545,787
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 543,660 plants plus 20% replacement = 652,392 plants. Material price fob job site @ $0.95/ea, Fertilizer @ $0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.78/plant. Use $2.80 / plant.)									
			2.20	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.07*
USR Environmental Planting (SeaOats)	250,920.00	EA	552,024	66,243	49,461	66,773	8,814	26,016	769,331
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 209,100 plants plus 20% replacement = 250,920 plants. Material price fob job site @ $0.46/ea, Fertilizer @0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.19/plant. Use $2.20 / plant.)									
USR Misc. Site Items	1.00	LS	12,000	1,440	1,075	1,452	192	566	16,724
Repair/Replace Containment Dike	**1.00**	**LS**	**430,000**	**51,600**	**38,528**	**52,013**	**6,866**	**20,265**	**599,272**
			5.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*6.97*
USR Fill, in-place, 27" Dia. Dredge	4,200.00	CY	21,000	2,520	1,882	2,540	335	990	29,267
			3,400.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4,738.43*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	120.00	DAY	408,000	48,960	36,557	49,352	6,514	19,228	568,611
USR Misc. Site Items	1.00	LS	1,000	120	90	121	16	47	1,394
Add Material to Containment Area	**1.00**	**LS**	**1,243,030**	**149,164**	**111,375**	**150,357**	**19,847**	**58,582**	**1,732,355**
			5.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*6.97*
USR Fill, in-plaee, 27" Dia. Dredge	100,000.00	CY	500,000	60,000	44,800	60,480	7,983	23,564	696,828
			3,400.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4,738.43*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	15.00	DAY	51,000	6,120	4,570	6,169	814	2,404	71,076
			2.75	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.83*
USR Environmental Planting(Marsh Plants	250,920.00	EA	690,030	82,804	61,827	83,466	11,018	32,520	961,664
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 209,100 plants plus 20% replacement = 250,920 plants. Material price fob job site @ $0.93/ea, Fertilizer @ $0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.76/plant. Use $2.75 / plant.)									
USR Misc. Site Items	1.00	LS	2,000	240	179	242	32	94	2,787

Currency in US dollars

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Lengthen Stone Breakwater	**1.00**	**LS**	**888,050**	**106,566**	**79,569**	**107,419**	**14,179**	**41,852**	**1,237,635**
USR Analyze Stone Breakwater	1.00	LS	45,000	5,400	4,032	5,443	719	2,121	62,714
			5.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*6.97*
USR Fill, in-place, 27" Dia. Dredge	91,000.00	CY	455,000	54,600	40,768	55,037	7,265	21,443	634,113
			3,400.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4,738.43*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	30.00	DAY	102,000	12,240	9,139	12,338	1,629	4,807	142,153
			2.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.48*
USR Filter Fabric	1,500.00	SY	3,750	450	336	454	60	177	5,226
			93.50	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*130.31*
USR Riprap	3,000.00	CY	280,500	33,660	25,133	33,929	4,479	13,220	390,920
USR Misc. Site Items	1.00	LS	1,800	216	161	218	29	85	2,509
Create Additional Marsh Area	**1.00**	**LS**	**2,177,384**	**261,286**	**195,094**	**263,376**	**34,766**	**102,617**	**3,034,522**
			5.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*6.97*
USR Beach Fill, in-place, 27" Dia. Dredge	300,000.00	CY	1,500,000	180,000	134,400	181,440	23,950	70,693	2,090,483
			3,400.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*4,738.43*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	60.00	DAY	204,000	24,480	18,278	24,676	3,257	9,614	284,306
			2.80	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*3.90*
USR Environmental Planting(Marsh Grass)	167,280.00	EA	468,384	56,206	41,967	56,656	7,479	22,074	652,766
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 139,400 plants plus 20% replacement = 167280 plants. Material price fob job site @ $0.96/ea, Fertilizer @ $0.10/ea, Labor Cost @ $1.25/ea, Plos Subcontract Markups @ 21% Total Cost to Prime = $2.80/plant. Use $2.80 / plant.)									
USR Misc. Site Items	1.00	LS	5,000	600	448	605	80	236	6,968

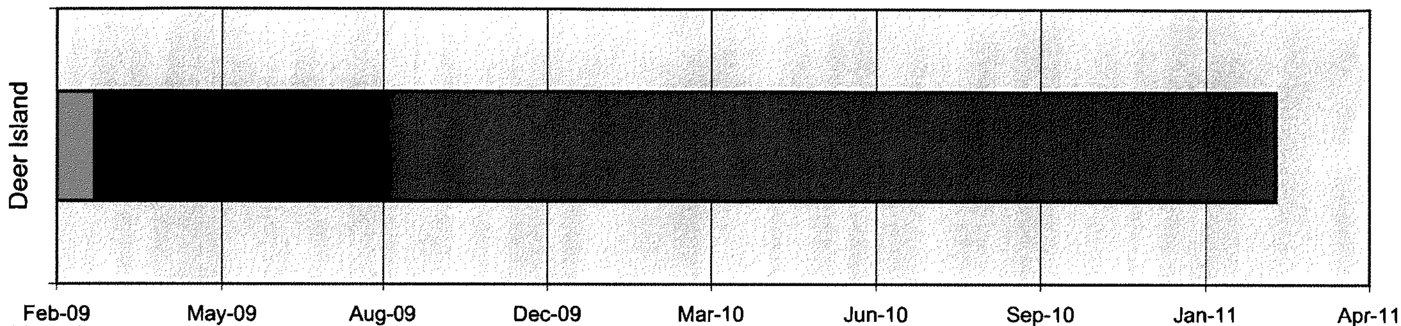
Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**10,737,186**	**10,737,186**
01 Deer Island-Aquatic Ecosystem Restoration	**1.00**	**LS**	**10,737,186**	**10,737,186**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**10,737,186**	**10,737,186**
006 Fish & Wildlife	**1.00**	**LS**	**10,737,186**	**10,737,186**
01 Ecosystem Restoration	**1.00**	**LS**	**10,737,186**	**10,737,186**
Mobilization, Preparatory Work, & Demobilization	**1.00**	**LS**	**1,200,000**	**1,200,000**
USR Mobilization, Preparatory Work, Demobilizaiton(Dredge Plant, 27")	1.00	LS	950,000	950,000
USR Mobilization, Preparatory Work, Demobilization(Land Base Equipment)	1.00	LS	250,000	250,000
Seaward Shoreline	**1.00**	**LS**	**4,798,722**	**4,798,722**
			5.00	*5.00*
USR Beach Fill, in-place, 27" Dredge	400,000.00	CY	2,000,000	2,000,000
(Note: Unit Cost based a recent on-going project at existing project proforming similar work. Work is being performed by a 27" pipeline dredge.)				
			3,400.00	*3,400.00*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	120.00	DAY	408,000	408,000
			2.80	*2.80*
USR Environmental Planting (Marsh Grass)	652,392.00	EA	1,826,698	1,826,698
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 543,660 plants plus 20% replacement = 652,392 plants. Material price fob job site @ $0.95/ea, Fertilizer @ $0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.78/plant. Use $2.80 / plant.)				
			2.20	*2.20*
USR Environmental Planting (SeaOats)	250,920.00	EA	552,024	552,024
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 209,100 plants plus 20% replacement = 250,920 plants. Material price fob job site @ $0.46/ea, Fertilizer @0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.19/plant. Use $2.20 / plant.)				
USR Misc. Site Items	1.00	LS	12,000	12,000
Repair/Replace Containment Dike	**1.00**	**LS**	**430,000**	**430,000**
			5.00	*5.00*
USR Fill, in-place, 27" Dia. Dredge	4,200.00	CY	21,000	21,000
			3,400.00	*3,400.00*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	120.00	DAY	408,000	408,000
USR Misc. Site Items	1.00	LS	1,000	1,000
Add Material to Containment Area	**1.00**	**LS**	**1,243,030**	**1,243,030**
			5.00	*5.00*
USR Fill, in-place, 27" Dia. Dredge	100,000.00	CY	500,000	500,000
			3,400.00	*3,400.00*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	15.00	DAY	51,000	51,000
			2.75	*2.75*
USR Environmental Planting(Marsh Plants	250,920.00	EA	690,030	690,030
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 209,100 plants plus 20% replacement = 250,920 plants. Material price fob job site @ $0.93/ea, Fertilizer @ $0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.76/plant. Use $2.75 / plant.)				
USR Misc. Site Items	1.00	LS	2,000	2,000

Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Lengthen Stone Containment Dikes	**1.00**	**LS**	**888,050**	**888,050**
USR Analyze Stone Containment Dikes	1.00	LS	45,000	45,000
			5.00	*5.00*
USR Fill, in-place, 27" Dia. Dredge	91,000.00	CY	455,000	455,000
			3,400.00	*3,400.00*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	30.00	DAY	102,000	102,000
			2.50	*2.50*
USR Filter Fabric	1,500.00	SY	3,750	3,750
			93.50	*93.50*
USR Riprap	3,000.00	CY	280,500	280,500
USR Misc. Site Items	1.00	LS	1,800	1,800
Create Additional Marsh Area	**1.00**	**LS**	**2,177,384**	**2,177,384**
			5.00	*5.00*
USR Beach Fill, in-place, 27" Dia. Dredge	300,000.00	CY	1,500,000	1,500,000
			3,400.00	*3,400.00*
USR Grade/Shape Berm, small Dozer-Trackhoe Work	60.00	DAY	204,000	204,000
			2.80	*2.80*
USR Environmental Planting(Marsh Grass)	167,280.00	EA	468,384	468,384
(Note: Plants are planted at 30 in centers. Contractor shall be required to guarantee that 80% of the planted vegetation is in good condition one (1) year after initial planting. Planting shall be accomplished by hand. Fertilizer shall be placed in the bottom of hole at required rate. Required plants 139,400 plants plus 20% replacement = 167280 plants. Material price fob job site @ $0.96/ea, Fertilizer @ $0.10/ea, Labor Cost @ $1.25/ea, Plus Subcontract Markups @ 21% Total Cost to Prime = $2.80/plant. Use $2.80 / plant.)				
USR Misc. Site Items	1.00	LS	5,000	5,000

Currency in US dollars



The proposed project will provide for ecosystem restoration and preservation of critical coastal wetlands. The island also provides storm protection from surge, wave action and wind for the adjacent coastal portion of the City of Biloxi, Mississippi. The proposed project will consist of three components: shoreline restoration in the Grand Bayou area of Deer Island with beach, dune, marsh and maritime forest reestablishment; restoration of the west end breach area with reestablishment of maritime forest area; and, restoration of the remaining shoreline areas along the seaward shoreline with beach, dune, marsh and maritime forest reestablishment. Fill material will be obtained from an offshore borrow area located approximately 500 feet off the southern shoreline of Deer Island. Material from the borrow area will be cast on the existing shoreline for beach nourishment via a hydraulic dredge. After filling, environmental plantings will be made to establish the maritime forest and aquatic marsh in the restored area. The design will start in March of 2009, the award will be in September, 2009, and the completion will be March, 2011.

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Bayou Cumbest SAV Pilot -Environmental Restoration, Restore Wet DISTRICT: MOBILE

LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

ACCOUNT NUM FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages	25,000	6,250	25%	31,250	25,000	6,250	31,250	25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands ***(Bayou Cumbest SAV Pilot Project)***	604,000	151,000	25%	755,000	604,000	151,000	755,000	648,696	162,174	810,870
30--- PLANNING, ENGINEERING & DESIGN	48,320	12,080	25%	60,400	48,320	12,080	60,400	49,093	12,273	61,366
31--- CONSTRUCTION MANAGEMENT	36,240	9,060	25%	45,300	36,240	9,060	45,300	36,922	9,730	46,652
TOTAL PROJECT COST ========>	**713,560**	**178,390**		**891,950**	**713,560**	**178,390**	**891,950**	**762,111**	**190,527**	**952,638**

rounded

65% TOTAL FEDERAL COSTS ============> $650,000

35% TOTAL NON - FEDERAL COSTS ======> $350,000

TOTAL PROJECT COSTS ============> $1,000,000

DISTRICT APPROVED:

______________ CHIEF, COST ENGINEERING

______________ CHIEF, REAL ESTATE

______________ CHIEF, PLANNING

______________ CHIEF, ENGINEERING

______________ CHIEF, OPERATIONS

______________ CHIEF, CONSTRUCTION

______________ CHIEF, PROGRAMS MANAGEMENT

______________ PROJECT MANAGER

______________ DDE (PM)

Non-Federal & Federal COSTS **** TOTAL CONTRACT COST SUMMARY **** PAGE 2 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Bayou Cumbest SAV Pilot -Environmental Restoration, Restore Wet DISTRICT: MOBILE

LOCATION: Jackson County, Mississippi P.O.C.: Joseph H. Ellsworth

	CURRENT MCACES ESTIMATE PREPARED: Aug 08 / EFFECTIVE PRICING LEVEL: Aug 08				AUTHORIZ./BUDGET YEAR: FY-09 / EFFECTIVE PRICING LEVEL: Aug 08				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT No. FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
01--- Lands & Damages (PCA)	25,000	6,250	25%	31,250	0.0%	25,000	6,250	31,250	Jun 09	1.6%	25,400	6,350	31,750
Subtotal	25,000	6,250		31,250		25,000	6,250	31,250			25,400	6,350	31,750
06--- Fish & Wildlife -Restore Wetlands	604,000	151,000	25%	755,000	0.0%	604,000	151,000	755,000	Mar 12	7.4%	648,696	162,174	810,870
30--- PLANNING, ENGINEERING & DESIGN, 8%+-	48,320	12,080	25%	60,400	0.0%	48,320	12,080	60,400	Jun 09	1.6%	49,093	12,273	61,366
31--- CONSTRUCTION MANAGEMENT, 6% +-	36,240	9,060	25%	45,300	0.0%	36,240	9,060	45,300	Mar 12	7.4%	38,922	9,730	48,652
Subtotal	688,560	172,140		860,700		688,560	172,140	860,700			736,711	184,177	920,886

The MsCIP environmental effort will: (1) restore SAV beds in Bayou Cumbest adjacent to the Grand Bay NERR that have been lost since the 2005 hurricanes through transplanting involving participation by the local community groups and students of the local universities and (2) determine the effectiveness of three transplanting methods (i.e. (1) a donor site, (2) harvesting plant sprigs with one or more meristems (growth regions), or (3) spreading seeds or mature flowering shoots over the restoration site) for restoring R. maritima in bayons, streams, and brackish marshes by quarterly monitoring using volunteers. After transplanting, quarterly monitoring for two years will be conducted to determine plant establishment, photosynthesis, growth, and expansion.
The first goal of the proposed community-based restoration project in the Grand Bay NERR will result in restoration of up to 5 acres of R. maritima resulting in the recovery of an equal amount of SAV habitat to that lost during the 2005 hurricane season (Figure 5.5.1-1). Secondly, the Corps, Mobile District proposed to evaluate 3 restoration techniques to demonstrate their feasibility for larger restoration projects. Finally, the volunteer involvement and educational outreach will increase awareness of the importance of SAV habitat in Mississippi Sound and provide coastal managers and restoration practitioners with the knowledge of techniques to maximize their return on dollars speot.
SAVs Write Up

Price Level Aug 08
FEASIBILITY STUDY

Estimated by CESAM-EN-E, Cost Engineering Branch
Designed by CESAM-EN-E, Mobile District, Corps of Engineers
Prepared by Russell Haynes
Preparation Date 8/8/2008
Effective Date of Pricing 8/8/2008
Estimated Construction Time Days

project file:sav-pilot-feasibility-aug08.mlp

report file: feasibilty standard report.mrp

output file: sav-pilot-feasibility-aug08.doc

Date	Author	Note
..	Joseph H. Ellsworth	BASIS of COST ESTIMATE and RATIONALE

Feasibility Estimate is based on Historical Data, Recent Pricing, and Estimator's Judgment. Estimate is structured and priced as a General Prime contractor supported by major subcontractors. Anticipated bidding conditions and construction duration with reasonable schedules are considered Normal. Unit cost as shown in estimate, are fair and reasonable rates based on fair market value. Estimates represent Current Contract Cost (price level Aug 08). The Non-structural and Real Estate Cost were prepared by the Savannah & Huntington Districts.

Price Level of Estimate is Aug 08.

Project Life is assumed as 50 years in Cost Estimate.

30 Feature Account, Planning, Engineering & Design was developed and assigned at 8% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Eight percent was used in the Interim MsCIP projects which was reviewed and approved and included in the Chief's Report.

31 Feature Account, Construction Management was developed and assigned at 6% by the PDT. This is the percentage that has historically been used for these types of civil works projects. Six percent was used in the Interim MsCIP projects which was reviewed & approved and included in the Chief's Report.

Contingency was jointly developed and assigned by the Project Delivery Team. The Contingency percentage at 25% reflects the possibility of changes in quantity estimates and unknowns associated with the unit price. The contingency factor used does not vary throughout the cost estimate. It was determined and agreed upon by the Project Delivery Team that a high rate be used primarily due to risk, degree of confidence, and the project not being of the normal design.

Markups for subcontractors are included in the unit prices and include such items as field overheads, home office expenses, profit, bond and insurance.

Miscellaneous Items represent cost where quantities were not available, such items as signage, construction site/staging restoration, silt fencing, site access, etc. These cost are derived within the estimate at .25 percent (.25%) of construction cost excluding Mob & Demob Cost

Unit Prices, for such items as site work, earthwork, stone protection, concrete, reinforcing, etc., were based on Historical Data, Recent Pricing, Estimator's Judgment, and Cost derivation using MCACES / MII estimating systems.

8/5/2008 Joseph H. Ellsworth

The following Contractor Markups are applied to the Cost to Prime Direct Cost:

Contractor's Field Overhead @ 12%

Contractor's Home Office (G&A) @ 8%

Profit @ 10%

Currency in US dollars

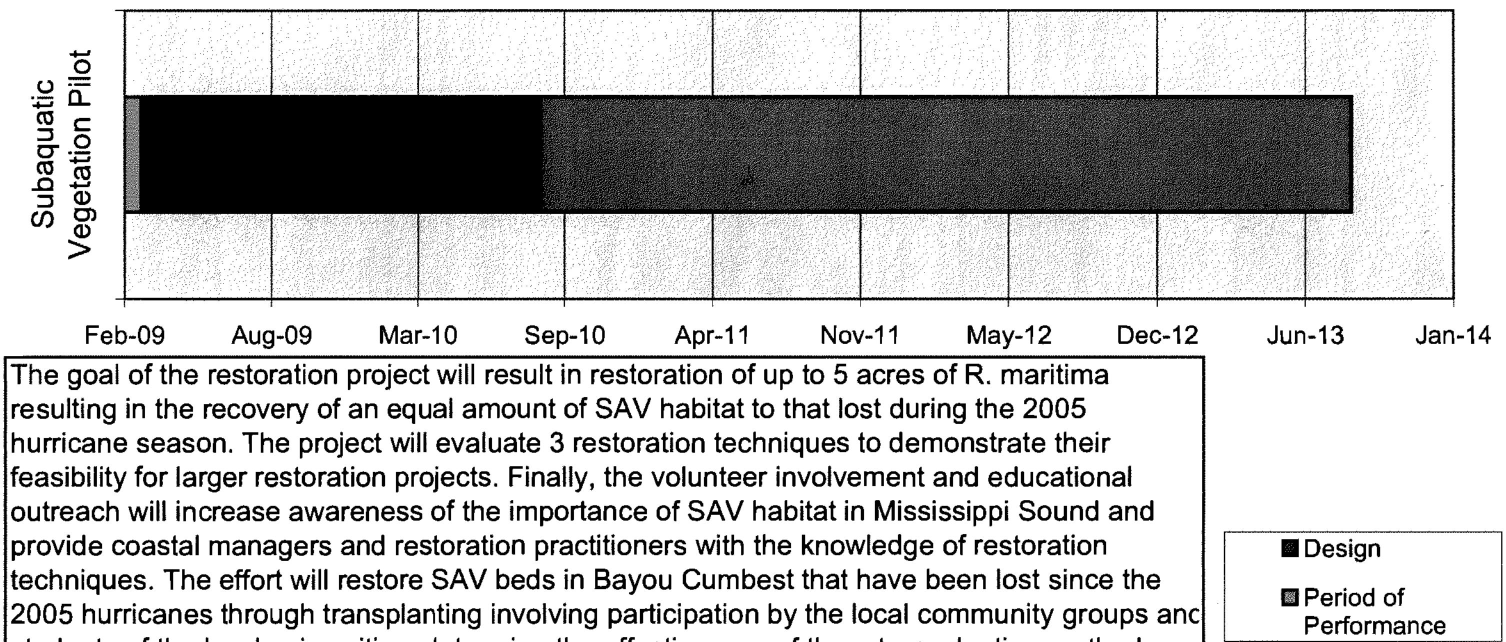
Date	Author	Note
		Bond @ 1.2%
		Miss. Gross Receipts Tax @ 3.5%
		Listed are all Cost Engineering Personnel that worked on the Feasibility Cost Estimate. Joseph H. Ellsworth, Lead Cost Engineer Gary Payton, Cost Engineer George F. Rush, Civil Engineer, Dredging Michael A. McKown, Geo Tech Engineer Lloyd Oliver, Structural Engineer Richard W. Harvey, Mechanical Engineer John R. Thomas, Real Estate Specialist Donald A. Whitmore, Civil Engineer- Non-Structural Estimates Jennifer L. Jacobson, Environmentalist

Description	Quantity	UOM	CostToPrime	JOOH	HOOH	Profit	Bond	Excise	ContractCost
Contract Cost Summary Report			**433,500**	**52,020**	**38,842**	**52,436**	**6,922**	**20,430**	**604,150**
01 Jackson County SAV Pilot Project- Environmental Restoration	**1.00**	**LS**	**433,500**	**52,020**	**38,842**	**52,436**	**6,922**	**20,430**	**604,150**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**433,500**	**52,020**	**38,842**	**52,436**	**6,922**	**20,430**	**604,150**
006 Fish & Wildlife	**1.00**	**LS**	**433,500**	**52,020**	**38,842**	**52,436**	**6,922**	**20,430**	**604,150**
01 Bayou Cumbest SAV Pilot Project	**1.00**	**LS**	**433,500**	**52,020**	**38,842**	**52,436**	**6,922**	**20,430**	**604,150**
(Note: 5 acres SAVcreation 3 planting sessions; 4 monitoring sessions)									
			30.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*41.81*
USR Planting sessions, 3@1500 mh per session	4,500.00	HR	135,000	16,200	12,096	16,330	2,156	6,362	188,143
			30.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*41.81*
USR Monitoring sessions, 4@1500 mh per session	6,000.00	HR	180,000	21,600	16,128	21,773	2,874	8,483	250,858
			7,000.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*9,755.59*
USR Professional oversight: Patrick Biber	8.00	MO	56,000	6,720	5,018	6,774	894	2,639	78,045
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)									
			2,000.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*2,787.31*
USR Grad Asst	9.00	MO	18,000	2,160	1,613	2,177	287	848	25,086
			50.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*69.68*
USR Vehicles, 2 x 25 days x7trips	350.00	DAY	17,500	2,100	1,568	2,117	279	825	24,389
			40.00	*12.00%*	*8.00%*	*10.00%*	*1.20%*	*3.50%*	*55.75*
USR Boat usage, 21', 25 trips	175.00	DAY	7,000	840	627	847	112	330	9,756
USR Misc supplies	1.00	LS	20,000	2,400	1,792	2,419	319	943	27,873

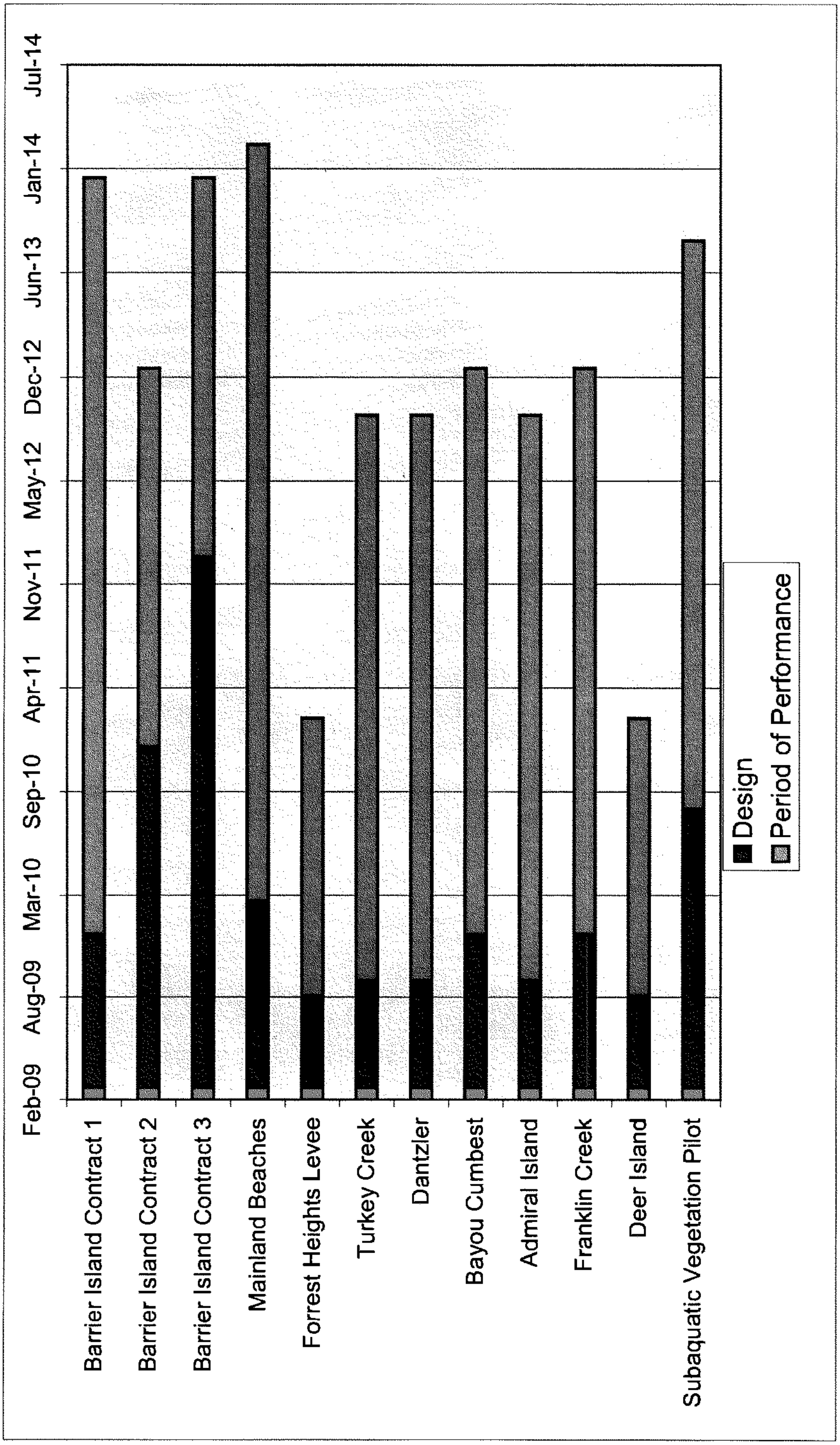
Currency in US dollars

Description	Quantity	UOM	SubBidCost	CostToPrime
Project Direct Costs Report			**433,500**	**433,500**
01 Jackson County SAV Pilot Project- Environmental Restoration	**1.00**	**LS**	**433,500**	**433,500**
06 Federal & Non-Federal Costs	**1.00**	**LS**	**433,500**	**433,500**
006 Fish & Wildlife	**1.00**	**LS**	**433,500**	**433,500**
01 Bayou Cumbest SAV Pilot Project	**1.00**	**LS**	**433,500**	**433,500**
(Note: 5 acres SAVcreation 3 planting sessions; 4 monitoring sessions)				
			30.00	*30.00*
USR Planting sessions, 3@1500 mh per session	4,500.00	HR	135,000	135,000
			30.00	*30.00*
USR Monitoring sessions, 4@1500 mh per session	6,000.00	HR	180,000	180,000
			7,000.00	*7,000.00*
USR Professional oversight: Patrick Biber	8.00	MO	56,000	56,000
(Note: Unit price based on current on going Coastal Mississippi construction projects for similar work.)				
			2,000.00	*2,000.00*
USR Grad Asst	9.00	MO	18,000	18,000
			50.00	*50.00*
USR Vehicles, 2 x 25 days x7trips	350.00	DAY	17,500	17,500
			40.00	*40.00*
USR Boat usage, 21', 25 trips	175.00	DAY	7,000	7,000
USR Misc supplies	1.00	LS	20,000	20,000

Currency in US dollars



The goal of the restoration project will result in restoration of up to 5 acres of R. maritima resulting in the recovery of an equal amount of SAV habitat to that lost during the 2005 hurricane season. The project will evaluate 3 restoration techniques to demonstrate their feasibility for larger restoration projects. Finally, the volunteer involvement and educational outreach will increase awareness of the importance of SAV habitat in Mississippi Sound and provide coastal managers and restoration practitioners with the knowledge of restoration techniques. The effort will restore SAV beds in Bayou Cumbest that have been lost since the 2005 hurricanes through transplanting involving participation by the local community groups anc students of the local universities, determine the effectiveness of three transplanting methods or by spreading seeds or mature flowering shoots over the restoration site. After transplanting, quarterly monitoring for two years will be conducted to determine plant establishment, photosynthesis, growth, and expansion. The design will start in March of 2009, the award will be in September, 2010, and the completion will be in September, 2010.


Feb-09
Aug-09
Mar-10
Sep-10
Apr-11
Nov-11
May-12
Dec-12
Jun-13
Jan-14
Jul-14
Barrier Island Contract 1
Barrier Island Contract 2
Barrier Island Contract 3
Mainland Beaches
Forrest Heights Levee
Turkey Creek
Dantzler
Bayou Cumbest
Admiral Island
Franklin Creek
Deer Island
Subaquatic Vegetation Pilot
Design
Period of Performance

FEASIBILITY COST ESTIMATE
Mississippi Coastal Improvements Program "MsCIP" Projects

Escalation Derivations
5-Aug-08
Joseph H. Ellsworth

	Project Feature Account Number	Price Level	(Cal mo.) Contruction Duration	Contr. Start	Price Level Index	Feature Midpoint	Midpoint Index	Escalation %	USE
Barrier Islands - Contract 1	01 Account - Real Estate								
	17 & 31 Account- Construction	Aug 08	36 mo	Apr 10	710.58	Apr 12	766.42	7.86%	7.9%
	30 Account- PED	Aug 08			710.58	Apr 09	721.51	1.54%	1.6%
Barrier Islands - Contract 2	01 Account - Real Estate								
	17 & 31 Account- Construction	Aug 08	36 mo	Apr 11	710.58	Apr 12	766.42	7.86%	7.9%
	30 Account- PED	Aug 08			710.58	Oct 10	743.91	4.69%	4.7%
Barrier Islands - Contract 3	01 Account - Real Estate								
	17 & 31 Account- Construction	Aug 08	36 mo	Apr 12	710.58	Apr 13	781.75	10.02%	10.1%
	30 Account- PED	Aug 08			710.58	Oct 11	758.78	6.78%	6.8%
Turkey Creek	01 Account - Real Estate	Oct 07			676.14	Apr 09	698.89	3.36%	3.4%
	06 & 31 Account- Construction	Aug 08	36 mo	Oct 09	688.31	Apr 11	727.84	5.74%	5.8%
	30 Account- PED	Aug 08			688.31	Apr 09	698.89	1.54%	1.6%
Dantzler	01 Account - Real Estate	Aug 08			688.31	Jun 09	698.89	1.54%	1.6%
	06 & 31 Account- Construction	Aug 08	36 mo	Oct 09	688.31	Jan 12	738.69	7.32%	7.4%
	30 Account- PED	Aug 08			688.31	Jun 09	698.89	1.54%	1.6%
Franklin Creek	01 Account - Real Estate	Aug 08			688.31	Sep 09	702.73	2.09%	2.1%
	06 & 31 Account- Construction	Aug 08	36 mo	Jan 10	688.31	Jan 12	738.69	7.32%	7.4%
	30 Account- PED	Aug 08			688.31	Sep 09	702.73	2.09%	2.1%
Admiral Island	01 Account - Real Estate	Aug 08			688.31	Jun 09	698.89	1.54%	1.6%
	06 & 31 Account- Construction	Aug 08	36 mo	Oct 09	688.31	Jan 12	738.69	7.32%	7.4%
	30 Account- PED	Aug 08			688.31	Jun 09	698.89	1.54%	1.6%
Bayou Cumbest	01 Account - Real Estate	Oct 07			676.14	Sep 09	702.73	3.93%	4.0%
	06 & 31 Account- Construction	Aug 08	36 mo	Jan 10	688.31	Jan 12	738.69	7.32%	7.4%
	30 Account- PED	Aug 08			688.31	Sep 09	702.73	2.09%	2.1%
Forest Heights Levee	01 Account - Real Estate	Oct 07			696.01	Jun 09	723.38	3.93%	4.0%
	11 & 31 Account- Construction	Aug 08	18 mo	Sep 09	708.54	Jun 10	734.63	3.68%	3.7%
	30 Account- PED	Aug 08			688.31	Jun 09	723.38	5.10%	5.1%
Subaquatic Vegetation Piolt	01 Account - Real Estate	Aug 08			688.31	Jun 09	698.89	1.54%	1.6%
	06 & 31 Account- Construction	Aug 08	36 mo	Sep 10	688.31	Mar 12	738.69	7.32%	7.4%
	30 Account- PED	Aug 08			688.31	Jun 09	698.89	1.54%	1.6%
***Mainland** Beach and Dunes*	01 Account - Real Estate	Aug 08			710.58	Oct 09	729.04	2.60%	2.6%
	17 & 31 Account- Construction	Aug 08	48 mo	Mar 10	710.58	Jan 12	762.6	7.32%	7.4%
	30 Account- PED	Aug 08			710.58	Oct 09	729.04	2.60%	2.6%
Deer Island	01 Account - Real Estate	Aug 08			710.58	Oct 09	729.04	2.60%	2.6%
	17 & 31 Account- Construction	Aug 08	48 mo	Mar 10	710.58	Jan 12	762.6	7.32%	7.4%
	30 Account- PED	Aug 08			710.58	Oct 09	729.04	2.60%	2.6%

Preliminary Estimate of Project Cost

for the

Floodproofing of Residential Structures

associated with the

Mississippi Coastal Improvement Program Comprehensive Study

at a Price Level equivalent to

1 October 2007

List of Tables

Attached

9/25/2007
5:48 PM

Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the
Mississippi Coastal Improvement Program
Comprehensive Study
at a Price Level equivalent to
1 October 2007

Table 1 - Cost and Structure Summary by Project Reach*

COUNTY	(All)
CAT_NAME	RES
FP	Y
COST_MODEL	(Multiple Items)

REACH	STRUCTURE COUNT	CONSTRUCTION	ADMIN	FP PROJECT COST	AVERAGE COST
1	369	58,129,150	9,225,000	**67,354,150**	182,532
2	2,741	509,470,389	68,525,000	**577,995,389**	210,870
3	293	70,275,578	7,325,000	**77,600,578**	264,848
4	7	1,742,670	175,000	**1,917,670**	273,953
5	99	20,080,584	2,475,000	**22,555,584**	227,834
6	549	142,864,220	13,725,000	**156,589,220**	285,226
7	180	27,636,910	4,500,000	**32,136,910**	178,538
8	1,680	417,349,546	42,000,000	**459,349,546**	273,422
9	12	2,961,448	300,000	**3,261,448**	271,787
10	61	15,978,706	1,525,000	**17,503,706**	286,946
11	8	1,527,008	200,000	**1,727,008**	215,876
12	1,010	228,675,524	25,250,000	**253,925,524**	251,411
13	-	-	-	-	-
14	-	-	-	-	-
15	-	-	-	-	-
16	121	28,690,348	3,025,000	**31,715,348**	262,110
17	-	-	-	-	-
18	4	763,504	100,000	**863,504**	215,876
19	-	-	-	-	-
20	1,768	406,122,655	44,200,000	**450,322,655**	254,707
21	380	73,753,926	9,500,000	**83,253,926**	219,089
22	85	19,037,106	2,125,000	**21,162,106**	248,966
23	39	6,386,176	975,000	**7,361,176**	188,748
24	172	32,714,846	4,300,000	**37,014,846**	215,203
25	-	-	-	-	-
26	937	214,641,981	23,425,000	**238,066,981**	254,074
27	1,020	188,257,732	25,500,000	**213,757,732**	209,566
28	110	17,189,150	2,750,000	**19,939,150**	181,265
29	154	23,446,802	3,850,000	**27,296,802**	177,252
30	430	95,294,119	10,750,000	**106,044,119**	246,614
31	399	62,565,104	9,975,000	**72,540,104**	181,805
32	198	30,510,800	4,950,000	**35,460,800**	179,095
33	-	-	-	-	-
34	-	-	-	-	-
35	1,273	190,166,536	31,825,000	**221,991,536**	174,385
36	-	-	-	-	-
37	-	-	-	-	-
38	65	9,533,024	1,625,000	**11,158,024**	171,662
39	6	841,302	150,000	**991,302**	165,217
40	-	-	-	-	-
41	-	-	-	-	-

*Price includes a net contingency of 24.9%

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Summary by Reach Page 1 of 2

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Table 1 - Cost and Structure Summary by Project Reach*

COUNTY	(All)
CAT_NAME	RES
FP	Y
COST_MODEL	(Multiple Items)

REACH	STRUCTURE COUNT	CONSTRUCTION	ADMIN	FP PROJECT COST	AVERAGE COST
42	-	-	-	-	-
43	1	145,304	25,000	**170,304**	170,304
44	-	-	-	-	-
45	-	-	-	-	-
46	-	-	-	-	-
47	-	-	-	-	-
48	2	316,298	50,000	**366,298**	183,149
49	-	-	-	-	-
50	821	160,688,629	20,525,000	**181,213,629**	220,723
51	691	114,306,392	17,275,000	**131,581,392**	190,422
52	6,025	1,199,525,170	150,625,000	**1,350,150,170**	224,091
53	277	46,582,670	6,925,000	**53,507,670**	193,168
54	682	106,347,144	17,050,000	**123,397,144**	180,934
Grand Total	**22,669**	**4,524,518,451**	**566,725,000**	**5,091,243,451**	**224,591**

*Price includes a net contingency of 24.9%

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Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the
Mississippi Coastal Improvement Program
Comprehensive Study
at a Price Level equivalent to
1 October 2007

Table 2 - Cost Summary by Project Reach and Feature Account*

COUNTY	(All)
CAT_NAME	RES
FP	Y
COST MODEL	(Multiple Items)

REACH	01 - LANDS & DAMAGES	11 - FLOODPROOFING	30 - E & D	31 - S & A	FP PROJECT COST
1	1,845,000	58,129,150	4,797,000	2,583,000	67,354,150
2	13,705,000	509,470,389	35,633,000	19,187,000	577,995,389
3	1,465,000	70,275,578	3,809,000	2,051,000	77,600,578
4	35,000	1,742,670	91,000	49,000	1,917,670
5	495,000	20,080,584	1,287,000	693,000	22,555,584
6	2,745,000	142,864,220	7,137,000	3,843,000	156,589,220
7	900,000	27,636,910	2,340,000	1,260,000	32,136,910
8	8,400,000	417,349,546	21,840,000	11,760,000	459,349,546
9	60,000	2,961,448	156,000	84,000	3,261,448
10	305,000	15,978,706	793,000	427,000	17,503,706
11	40,000	1,527,008	104,000	56,000	1,727,008
12	5,050,000	228,675,524	13,130,000	7,070,000	253,925,524
13	-	-	-	-	-
14	-	-	-	-	-
15	-	-	-	-	-
16	605,000	28,690,348	1,573,000	847,000	31,715,348
17	-	-	-	-	-
18	20,000	763,504	52,000	28,000	863,504
19	-	-	-	-	-
20	8,840,000	406,122,655	22,984,000	12,376,000	450,322,655
21	1,900,000	73,753,926	4,940,000	2,660,000	83,253,926
22	425,000	19,037,106	1,105,000	595,000	21,162,106
23	195,000	6,386,176	507,000	273,000	7,361,176
24	860,000	32,714,846	2,236,000	1,204,000	37,014,846
25	-	-	-	-	-
26	4,685,000	214,641,981	12,181,000	6,559,000	238,066,981
27	5,100,000	188,257,732	13,260,000	7,140,000	213,757,732
28	550,000	17,189,150	1,430,000	770,000	19,939,150
29	770,000	23,446,802	2,002,000	1,078,000	27,296,802
30	2,150,000	95,294,119	5,590,000	3,010,000	106,044,119
31	1,995,000	62,565,104	5,187,000	2,793,000	72,540,104
32	990,000	30,510,800	2,574,000	1,386,000	35,460,800
33	-	-	-	-	-
34	-	-	-	-	-
35	6,365,000	190,166,536	16,549,000	8,911,000	221,991,536
36	-	-	-	-	-
37	-	-	-	-	-
38	325,000	9,533,024	845,000	455,000	11,158,024
39	30,000	841,302	78,000	42,000	991,302
40	-	-	-	-	-
41	-	-	-	-	-
42	-	-	-	-	-
43	5,000	145,304	13,000	7,000	170,304

*Price includes a net contingency of 24.9%

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Table 2 - Cost Summary by Project Reach and Feature Account*

COUNTY	(All)
CAT_NAME	RES
FP	Y
COST MODEL	(Multiple Items)

REACH	01 - LANDS & DAMAGES	11 - FLOODPROOFING	30 - E & D	31 - S & A	FP PROJECT COST
44	-	-	-	-	-
45	-	-	-	-	-
46	-	-	-	-	-
47	-	-	-	-	-
48	10,000	316,298	26,000	14,000	366,298
49	-	-	-	-	-
50	4,105,000	160,688,629	10,673,000	5,747,000	181,213,629
51	3,455,000	114,306,392	8,983,000	4,837,000	131,581,392
52	30,125,000	1,199,525,170	78,325,000	42,175,000	1,350,150,170
53	1,385,000	46,582,670	3,601,000	1,939,000	53,507,670
54	3,410,000	106,347,144	8,866,000	4,774,000	123,397,144
Grand Total	**113,345,000**	**4,524,518,451**	**294,697,000**	**158,683,000**	**5,091,243,451**

*Price includes a net contingency of 24.9%

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Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the

Mississippi Coastal Improvement Program Comprehensive Study

at a Price Level equivalent to
1 October 2007

Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
1	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	11	286,946	3,156,406
	Slab, 6' Raise	204	170,304	34,742,016
	Slab, 15' Raise	143	195,994	28,027,142
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	2	192,148	384,296
	Trailer, 6' Raise	8	114,092	912,736
	Trailer, 15' Raise	1	131,554	131,554
1 Total		**369**		**67,354,150**
2	Slab, 6' Replacement	33	261,448	8,627,784
	Slab, 15' Replacement	812	286,946	233,000,152
	Slab, 6' Raise	947	170,304	161,277,888
	Slab, 15' Raise	775	195,994	151,895,350
	Trailer, 6' Replacement	5	177,157	885,785
	Trailer, 15' Replacement	22	192,148	4,227,256
	Trailer, 6' Raise	72	114,092	8,214,624
	Trailer, 15' Raise	75	131,554	9,866,550
2 Total		**2,741**		**577,995,389**
3	Slab, 6' Replacement	71	261,448	18,562,808
	Slab, 15' Replacement	171	286,946	49,067,766
	Slab, 6' Raise	1	170,304	170,304
	Slab, 15' Raise	50	195,994	9,799,700
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
3 Total		**293**		**77,600,578**
4	Slab, 6' Replacement	-	-	-

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Slab, 15' Replacement	6	286,946	1,721,676
	Slab, 6' Raise	-	-	-
	Slab, 15' Raise	1	195,994	195,994
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
4 Total		**7**		**1,917,670**
5	Slab, 6' Replacement	1	261,448	261,448
	Slab, 15' Replacement	42	286,946	12,051,732
	Slab, 6' Raise	17	170,304	2,895,168
	Slab, 15' Raise	34	195,994	6,663,796
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	1	192,148	192,148
	Trailer, 6' Raise	2	114,092	228,184
	Trailer, 15' Raise	2	131,554	263,108
5 Total		**99**		**22,555,584**
6	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	539	286,946	154,663,894
	Slab, 6' Raise	-	-	-
	Slab, 15' Raise	1	195,994	195,994
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	9	192,148	1,729,332
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
6 Total		**549**		**156,589,220**
7	Slab, 6' Replacement	1	261,448	261,448
	Slab, 15' Replacement	1	286,946	286,946
	Slab, 6' Raise	35	170,304	5,960,640
	Slab, 15' Raise	112	195,994	21,951,328
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	23	114,092	2,624,116
	Trailer, 15' Raise	8	131,554	1,052,432
7 Total		**180**		**32,136,910**
8	Slab, 6' Replacement	235	261,448	61,440,280
	Slab, 15' Replacement	1,282	286,946	367,864,772
	Slab, 6' Raise	28	170,304	4,768,512
	Slab, 15' Raise	93	195,994	18,227,442

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*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Trailer, 6' Replacement	8	177,157	1,417,256
	Trailer, 15' Replacement	22	192,148	4,227,256
	Trailer, 6' Raise	10	114,092	1,140,920
	Trailer, 15' Raise	2	131,554	263,108
8 Total		**1,680**		**459,349,546**
9	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	10	286,946	2,869,460
	Slab, 6' Raise	-	-	-
	Slab, 15' Raise	2	195,994	391,988
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
9 Total		**12**		**3,261,448**
10	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	61	286,946	17,503,706
	Slab, 6' Raise	-	-	-
	Slab, 15' Raise	-	-	-
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
10 Total		**61**		**17,503,706**
11	Slab, 6' Replacement	4	261,448	1,045,792
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	4	170,304	681,216
	Slab, 15' Raise	-	-	-
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
11 Total		**8**		**1,727,008**
12	Slab, 6' Replacement	489	261,448	127,848,072
	Slab, 15' Replacement	312	286,946	89,527,152
	Slab, 6' Raise	140	170,304	23,842,560
	Slab, 15' Raise	54	195,994	10,583,676
	Trailer, 6' Replacement	2	177,157	354,314
	Trailer, 15' Replacement	3	192,148	576,444
	Trailer, 6' Raise	7	114,092	798,644

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Trailer, 15' Raise	3	131,554	394,662
12 Total		**1,010**		**253,925,524**
13	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
13 Total		**-**		**-**
14	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
14 Total		**-**		**-**
15	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
15 Total		**-**		**-**
16	Slab, 6' Replacement	68	261,448	17,778,464
	Slab, 15' Replacement	41	286,946	11,764,786
	Slab, 6' Raise	7	170,304	1,192,128
	Slab, 15' Raise	5	195,994	979,970
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
16 Total		**121**		**31,715,348**

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
17	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
17 Total		**-**		**-**
18	Slab, 6' Replacement	2	261,448	522,896
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	2	170,304	340,608
	Slab, 15' Raise	-	-	-
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
18 Total		**4**		**863,504**
19	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
19 Total		**-**		**-**
20	Slab, 6' Replacement	1,398	261,448	365,504,304
	Slab, 15' Replacement	181	286,946	51,937,226
	Slab, 6' Raise	130	170,304	22,139,520
	Slab, 15' Raise	38	195,994	7,447,772
	Trailer, 6' Replacement	13	177,157	2,303,041
	Trailer, 15' Replacement	1	192,148	192,148
	Trailer, 6' Raise	7	114,092	798,644
	Trailer, 15' Raise	-	-	-
20 Total		**1,768**		**450,322,655**
21	Slab, 6' Replacement	92	261,448	24,053,216
	Slab, 15' Replacement	75	286,946	21,520,950
	Slab, 6' Raise	149	170,304	25,375,296

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Slab, 15' Raise	58	195,994	11,367,652
	Trailer, 6' Replacement	4	177,157	708,628
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	2	114,092	228,184
	Trailer, 15' Raise	-	-	-
21 Total		**380**		**83,253,926**
22	Slab, 6' Replacement	30	261,448	7,843,440
	Slab, 15' Replacement	33	286,946	9,469,218
	Slab, 6' Raise	18	170,304	3,065,472
	Slab, 15' Raise	4	195,994	783,976
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
22 Total		**85**		**21,162,106**
23	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	11	170,304	1,873,344
	Slab, 15' Raise	28	195,994	5,487,832
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
23 Total		**39**		**7,361,176**
24	Slab, 6' Replacement	23	261,448	6,013,304
	Slab, 15' Replacement	41	286,946	11,764,786
	Slab, 6' Raise	75	170,304	12,772,800
	Slab, 15' Raise	32	195,994	6,271,808
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	1	192,148	192,148
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
24 Total		**172**		**37,014,846**
25	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
25 Total		**-**		**-**
26	Slab, 6' Replacement	210	261,448	54,904,080
	Slab, 15' Replacement	522	286,946	149,785,812
	Slab, 6' Raise	120	170,304	20,436,480
	Slab, 15' Raise	8	195,994	1,567,952
	Trailer, 6' Replacement	1	177,157	177,157
	Trailer, 15' Replacement	31	192,148	5,956,588
	Trailer, 6' Raise	39	114,092	4,449,588
	Trailer, 15' Raise	6	131,554	789,324
26 Total		**937**		**238,066,981**
27	Slab, 6' Replacement	217	261,448	56,734,216
	Slab, 15' Replacement	175	286,946	50,215,550
	Slab, 6' Raise	624	170,304	106,269,696
	Slab, 15' Raise	1	195,994	195,994
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	3	114,092	342,276
	Trailer, 15' Raise	-	-	-
27 Total		**1,020**		**213,757,732**
28	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	43	170,304	7,323,072
	Slab, 15' Raise	59	195,994	11,563,646
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	8	131,554	1,052,432
28 Total		**110**		**19,939,150**
29	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	80	170,304	13,624,320
	Slab, 15' Raise	63	195,994	12,347,622
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	7	114,092	798,644
	Trailer, 15' Raise	4	131,554	526,216
29 Total		**154**		**27,296,802**

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*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
30	Slab, 6' Replacement	127	261,448	33,203,896
	Slab, 15' Replacement	180	286,946	51,650,280
	Slab, 6' Raise	106	170,304	18,052,224
	Slab, 15' Raise	11	195,994	2,155,934
	Trailer, 6' Replacement	1	177,157	177,157
	Trailer, 15' Replacement	3	192,148	576,444
	Trailer, 6' Raise	2	114,092	228,184
	Trailer, 15' Raise	-	-	-
30 Total		**430**		**106,044,119**
31	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	1	286,946	286,946
	Slab, 6' Raise	205	170,304	34,912,320
	Slab, 15' Raise	186	195,994	36,454,884
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	2	114,092	228,184
	Trailer, 15' Raise	5	131,554	657,770
31 Total		**399**		**72,540,104**
32	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	76	170,304	12,943,104
	Slab, 15' Raise	102	195,994	19,991,388
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	6	114,092	684,552
	Trailer, 15' Raise	14	131,554	1,841,756
32 Total		**198**		**35,460,800**
33	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
33 Total		**-**		**-**
34	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
34 Total		**-**		**-**
35	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	938	170,304	159,745,152
	Slab, 15' Raise	291	195,994	57,034,254
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	33	114,092	3,765,036
	Trailer, 15' Raise	11	131,554	1,447,094
35 Total		**1,273**		**221,991,536**
36	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
36 Total		**-**		**-**
37	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
37 Total		**-**		**-**
38	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	52	170,304	8,855,808
	Slab, 15' Raise	10	195,994	1,959,940
	Trailer, 6' Replacement	-	-	-

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	3	114,092	342,276
	Trailer, 15' Raise	-	-	-
38 Total		**65**		**11,158,024**
39	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	4	170,304	681,216
	Slab, 15' Raise	1	195,994	195,994
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	1	114,092	114,092
	Trailer, 15' Raise	-	-	-
39 Total		**6**		**991,302**
40	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
40 Total		**-**		**-**
41	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
41 Total		**-**		**-**
42	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-

*Price includes a net contingency of 24.9%

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*Table 3 - Cost Summary by Project Reach and Cost Model Used**

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
42 Total		**-**		**-**
43	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	1	170,304	170,304
	Slab, 15' Raise	-	-	-
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
43 Total		**1**		**170,304**
44	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
44 Total		**-**		**-**
45	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
45 Total		**-**		**-**
46	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
46 Total		**-**		**-**
47	Slab, 6' Replacement	-		-

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
47 Total		**-**		**-**
48	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	-	-	-
	Slab, 6' Raise	1	170,304	170,304
	Slab, 15' Raise	1	195,994	195,994
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	-	-	-
	Trailer, 15' Raise	-	-	-
48 Total		**2**		**366,298**
49	Slab, 6' Replacement	-		-
	Slab, 15' Replacement	-		-
	Slab, 6' Raise	-		-
	Slab, 15' Raise	-		-
	Trailer, 6' Replacement	-		-
	Trailer, 15' Replacement	-		-
	Trailer, 6' Raise	-		-
	Trailer, 15' Raise	-		-
49 Total		**-**		**-**
50	Slab, 6' Replacement	305	261,448	79,741,640
	Slab, 15' Replacement	97	286,946	27,833,762
	Slab, 6' Raise	220	170,304	37,466,880
	Slab, 15' Raise	161	195,994	31,555,034
	Trailer, 6' Replacement	1	177,157	177,157
	Trailer, 15' Replacement	1	192,148	192,148
	Trailer, 6' Raise	28	114,092	3,194,576
	Trailer, 15' Raise	8	131,554	1,052,432
50 Total		**821**		**181,213,629**
51	Slab, 6' Replacement	7	261,448	1,830,136
	Slab, 15' Replacement	86	286,946	24,677,356
	Slab, 6' Raise	469	170,304	79,872,576
	Slab, 15' Raise	128	195,994	25,087,232

*Price includes a net contingency of 24.9%

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Table 3 - Cost Summary by Project Reach and Cost Model Used*

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	1	114,092	114,092
	Trailer, 15' Raise	-	-	-
51 Total		**691**		**131,581,392**
52	Slab, 6' Replacement	2,453	261,448	641,331,944
	Slab, 15' Replacement	837	286,946	240,173,802
	Slab, 6' Raise	2,585	170,304	440,235,840
	Slab, 15' Raise	136	195,994	26,655,184
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	2	192,148	384,296
	Trailer, 6' Raise	12	114,092	1,369,104
	Trailer, 15' Raise	-	-	-
52 Total		**6,025**		**1,350,150,170**
53	Slab, 6' Replacement	1	261,448	261,448
	Slab, 15' Replacement	25	286,946	7,173,650
	Slab, 6' Raise	18	170,304	3,065,472
	Slab, 15' Raise	192	195,994	37,630,848
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	1	114,092	114,092
	Trailer, 15' Raise	40	131,554	5,262,160
53 Total		**277**		**53,507,670**
54	Slab, 6' Replacement	-	-	-
	Slab, 15' Replacement	2	286,946	573,892
	Slab, 6' Raise	323	170,304	55,008,192
	Slab, 15' Raise	326	195,994	63,894,044
	Trailer, 6' Replacement	-	-	-
	Trailer, 15' Replacement	-	-	-
	Trailer, 6' Raise	9	114,092	1,026,828
	Trailer, 15' Raise	22	131,554	2,894,188
54 Total		**682**		**123,397,144**
Grand Total		**22,669**		**5,091,243,451**

*Price includes a net contingency of 24.9%

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Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the
Mississippi Coastal Improvement Program
Comprehensive Study
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1 October 2007

Table 4 - Structure Summary by Project Reach and Cost Model Used

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	Slab, 6' Replacement	Slab, 15' Replacement	Slab, 6' Raise	Slab, 15' Raise	Trailer, 6' Replacement	Trailer, 15' Replacement	Trailer, 6' Raise	Trailer, 15' Raise	Grand Total
1	-	11	204	143	-	2	8	1	369
2	33	812	947	775	5	22	72	75	2,741
3	71	171	1	50	-	-	-	-	293
4	-	6	-	1	-	-	-	-	7
5	1	42	17	34	-	1	2	2	99
6	-	539	-	1	-	9	-	-	549
7	1	1	35	112	-	-	23	8	180
8	235	1,282	28	93	8	22	10	2	1,680
9	-	10	-	2	-	-	-	-	12
10	-	61	-	-	-	-	-	-	61
11	4	-	4	-	-	-	-	-	8
12	489	312	140	54	2	3	7	3	1,010
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-
16	68	41	7	5	-	-	-	-	121
17	-	-	-	-	-	-	-	-	-
18	2	-	2	-	-	-	-	-	4
19	-	-	-	-	-	-	-	-	-
20	1,398	181	130	38	13	1	7	-	1,768
21	92	75	149	58	4	-	2	-	380
22	30	33	18	4	-	-	-	-	85
23	-	-	11	28	-	-	-	-	39
24	23	41	75	32	-	1	-	-	172
25	-	-	-	-	-	-	-	-	-
26	210	522	120	8	1	31	39	6	937
27	217	175	624	1	-	-	3	-	1,020
28	-	-	43	59	-	-	-	8	110
29	-	-	80	63	-	-	7	4	154
30	127	180	106	11	1	3	2	-	430
31	-	1	205	186	-	-	2	5	399
32	-	-	76	102	-	-	6	14	198

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Table 4 - Structure Summary by Project Reach and Cost Model Used

COUNTY	(All)
CAT_NAME	RES
FP	Y

REACH	Slab, 6' Replacement	Slab, 15' Replacement	Slab, 6' Raise	Slab, 15' Raise	Trailer, 6' Replacement	Trailer, 15' Replacement	Trailer, 6' Raise	Trailer, 15' Raise	Grand Total
33	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-
35	-	-	938	291	-	-	33	11	1,273
36	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-
38	-	-	52	10	-	-	3	-	65
39	-	-	4	1	-	-	1	-	6
40	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-	-
43	-	-	1	-	-	-	-	-	1
44	-	-	-	-	-	-	-	-	-
45	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	-
48	-	-	1	1	-	-	-	-	2
49	-	-	-	-	-	-	-	-	-
50	305	97	220	161	1	1	28	8	821
51	7	86	469	128	-	-	1	-	691
52	2,453	837	2,585	136	-	2	12	-	6,025
53	1	25	18	192	-	-	1	40	277
54	-	2	323	326	-	-	9	22	682
Grand Total	**5,767**	**5,543**	**7,633**	**3,106**	**35**	**98**	**278**	**209**	**22,669**

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Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the

Mississippi Coastal Improvement Program Comprehensive Study

at a Price Level equivalent to
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Table 5 - Cost Summary by County*

CAT_NAME	RES
FP	Y
REACH	(All)
COST_MODEL	(Multiple Items)

COUNTY	STRUCTURE COUNT	AVERAGE COST	FP PROJECT COST
Hancock	4,303	220,150	947,307,525
Harrison	5,493	255,096	1,401,239,968
Jackson	12,873	213,058	2,742,695,958
Grand Total	**22,669**	**224,591**	**5,091,243,451**

*Price includes a net contingency of 24.9%

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Preliminary Estimate of Project Cost
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Table 6 - Cost Summary by County and Cost Model Used*

CAT_NAME	RES
FP	Y
REACH	(All)

COUNTY	COST MODEL	STRUCTURE COUNT	UNIT PRICE	FP PROJECT COST
Hancock	Slab, 6' Replacement	106	261,448	27,713,488
	Slab, 15' Replacement	1,582	286,946	453,948,572
	Slab, 6' Raise	1,256	170,304	213,901,824
	Slab, 15' Raise	1,126	195,994	220,689,244
	Trailer, 6' Replacement	5	177,157	885,785
	Trailer, 15' Replacement	34	192,148	6,533,032
	Trailer, 6' Raise	108	114,092	12,321,936
	Trailer, 15' Raise	86	131,554	11,313,644
Hancock Total		**4,303**		**947,307,525**
Harrison	Slab, 6' Replacement	2,501	261,448	653,881,448
	Slab, 15' Replacement	1,984	286,946	569,300,864
	Slab, 6' Raise	536	170,304	91,282,944
	Slab, 15' Raise	355	195,994	69,577,870
	Trailer, 6' Replacement	24	177,157	4,251,768
	Trailer, 15' Replacement	27	192,148	5,187,996
	Trailer, 6' Raise	53	114,092	6,046,876
	Trailer, 15' Raise	13	131,554	1,710,202
Harrison Total		**5,493**		**1,401,239,968**
Jackson	Slab, 6' Replacement	3,160	261,448	826,175,680
	Slab, 15' Replacement	1,977	286,946	567,292,242
	Slab, 6' Raise	5,841	170,304	994,745,664
	Slab, 15' Raise	1,625	195,994	318,490,250
	Trailer, 6' Replacement	6	177,157	1,062,942
	Trailer, 15' Replacement	37	192,148	7,109,476
	Trailer, 6' Raise	117	114,092	13,348,764
	Trailer, 15' Raise	110	131,554	14,470,940
Jackson Total		**12,873**		**2,742,695,958**
Grand Total		**22,669**		**5,091,243,451**

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Preliminary Estimate of Project Cost
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Table 7 - Structure Summary by Cost Model Used and County

CAT_NAME	RES
FP	Y
ECO_REA	(All)

STRUCTURE COUNT COST MODEL	COUNTY Hancock	Harrison	Jackson	Grand Total
Slab, 6' Replacement	106	2,501	3,160	5,767
Slab, 15' Replacement	1,582	1,984	1,977	5,543
Slab, 6' Raise	1,256	536	5,841	7,633
Slab, 15' Raise	1,126	355	1,625	3,106
Trailer, 6' Replacement	5	24	6	35
Trailer, 15' Replacement	34	27	37	98
Trailer, 6' Raise	108	53	117	278
Trailer, 15' Raise	86	13	110	209
Grand Total	**4,303**	**5,493**	**12,873**	**22,669**

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Preliminary Estimate of Project Cost
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Table 8 - Structure Summary by Project Reach and County

COST_MODEL	(Multiple Items)
FP	Y
CAT_NAME	RES

STRUCTURE COUNT	COUNTY			
REACH	Hancock	Harrison	Jackson	Grand Total
1	369	-	-	369
2	2,741	-	-	2,741
3	293	-	-	293
4	7	-	-	7
5	99	-	-	99
6	549	-	-	549
7	180	-	-	180
8	-	1,680	-	1,680
9	-	12	-	12
10	-	61	-	61
11	-	8	-	8
12	-	1,010	-	1,010
13	-	-	-	-
14	-	-	-	-
15	-	-	-	-
16	-	121	-	121
17	-	-	-	-
18	-	4	-	4
19	-	-	-	-
20	-	1,768	-	1,768
21	-	-	380	380
22	-	-	85	85
23	-	-	39	39
24	-	-	172	172
25	-	-	-	-
26	-	-	937	937
27	-	-	1,020	1,020

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Table 8 - Structure Summary by Project Reach and County

COST_MODEL	(Multiple Items)
FP	Y
CAT_NAME	RES

STRUCTURE COUNT	COUNTY			
REACH	Hancock	Harrison	Jackson	Grand Total
28	-	-	110	110
29	-	-	154	154
30	-	-	430	430
31	-	-	399	399
32	-	-	198	198
33	-	-	-	-
34	-	-	-	-
35	-	-	1,273	1,273
36	-	-	-	-
37	-	-	-	-
38	65	-	-	65
39	-	6	-	6
40	-	-	-	-
41	-	-	-	-
42	-	-	-	-
43	-	-	1	1
44	-	-	-	-
45	-	-	-	-
46	-	-	-	-
47	-	-	-	-
48	-	2	-	2
49	-	-	-	-
50	-	821	-	821
51	-	-	691	691
52	-	-	6,025	6,025
53	-	-	277	277
54	-	-	682	682
Grand Total	**4,303**	**5,493**	**12,873**	**22,669**

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Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the
Mississippi Coastal Improvement Program
Comprehensive Study
at a Price Level equivalent to
1 October 2007

Table 9 - Cost and Structure Summary by Cost Model Used*

CAT_NAME	RES
FP	Y
ECO_REA	(All)
COUNTY	(All)

COST MODEL	STRUCTURE COUNT	CONSTRUCTION	ADMIN	FP PROJECT COST	UNIT PRICE
Slab, 6' Replacement	5,767	1,363,595,616	144,175,000	1,507,770,616	261,448
Slab, 15' Replacement	5,543	1,451,966,678	138,575,000	1,590,541,678	286,946
Slab, 6' Raise	7,633	1,109,105,432	190,825,000	1,299,930,432	170,304
Slab, 15' Raise	3,106	531,107,364	77,650,000	608,757,364	195,994
Trailer, 6' Replacement	35	5,325,495	875,000	6,200,495	177,157
Trailer, 15' Replacement	98	16,380,504	2,450,000	18,830,504	192,148
Trailer, 6' Raise	278	24,767,576	6,950,000	31,717,576	114,092
Trailer, 15' Raise	209	22,269,786	5,225,000	27,494,786	131,554
Grand Total	**22,669**	**4,524,518,451**	**566,725,000**	**5,091,243,451**	

*Price includes a net contingency of 24.9%

Prepared by: Don Whitmore
S:\Projects\Gulf Coast FP\MsCIP FP Pivot Summaries.xls, Summary by Cost Model
Summary by Cost Model Page 1 of 1

Preliminary Estimate of Project Cost
for the
Floodproofing of Residential Structures
associated with the

Mississippi Coastal Improvement Program Comprehensive Study

at a Price Level equivalent to
1 October 2007

Model Cost Estimates

Spreadsheet Summaries

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	Mississippi Coastal Improvement Program "MsCIP"	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	Mississippi	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***New Site Built Structure, 6' off low ground***	BASIS of ESTIMATE:		by project delv'd. team	
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Timber Piles*	60	ea	815.66	$48,940
4x4 Cross Bracing*	990	lf	4.36	$4,317
Treated Lumber, 2x10*	640	lf	2.64	$1,691
Structure Above Sill Plate**	1,600	sf	70.28	$112,451
Misc.- Other***	1	job	12,425.27	$12,425
Misc.- Utility hookups	1	job	5,091.63	$5,092
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

*Assume a 6' grid for a house that is 25' x 64' (i.e., a 1600 SF house).

**Cost estimated by Marshall-Swift for an average quality 1600 SF structure in the Gulfport, MS area. Price is assumed to include all setup and prep work such as mob/de-mob. Foundation costs have been subtracted from the Marshall-Swift estimate.

***This price has been taken from LRH's floodproofing model in MCACES 5.31 and includes items such as site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanup.

Current Contract Cost, FY 07				$189,159
CONTINGENCY		@	**25.0%**	47,290
01 Account, Lands & Damage	Real Estate		**LS**	5,000
02 Account, Relocations	Relocations		**LS**	0
xx Account, Environmental Mitigation			**LS**	0
30 Account, Plan, Engr.& Design		@	**6.9%**	13,000
31 Account, Constr. Management		@	**3.7%**	7,000
ESCALATION, FY-06		@	**0.0%**	0
				$261,448
				rounded
TOTAL PROJECT COST, FY-2007				**$261,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Infrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	**Mississippi**	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***New Site Built Structure, 15' off low ground***	BASIS of ESTIMATE:	by project delv'd. team		
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Timber Piles*	60	ea	978.79	$58,728
4x4 Cross Bracing*	1,980	lf	4.36	$8,634
Treated Lumber, 2x10*	640	lf	2.64	$1,691
Structure Above Sill Plate**	1,600	sf	70.28	$112,451
Misc.- Storage Area	300	sf	15.17	$4,552
Misc.- Other***	1	job	14,166.60	$14,167
Misc.- Utility hookups	1	job	5,091.63	$5,092
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

*Assume a 6' grid for a house that is 25' x 64' (i.e., a 1600 SF house).

**Cost estimated by Marshall-Swift for an average quality 1600 SF structure in the Gulfport, MS area. Price is assumed to include all setup and prep work such as mob/de-mob. Foundation costs have been subtracted from the Marshall-Swift estimate.

***This price has been taken from LRH's floodproofing model in MCACES 5.31 and includes items such as site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanup.

Current Contract Cost, FY 07				$209,557
CONTINGENCY		@	**25.0%**	$52,389
01 Account, Lands & Damage	Real Estate		**LS**	5,000
02 Account, Relocations	Relocations		**LS**	0
xx Account, Environmental Mitigation			**LS**	0
30 Account, Plan, Engr.& Design		@	**6.2%**	13,000
31 Account, Constr. Management		@	**3.3%**	7,000
ESCALATION, FY-06		@	**0.0%**	0
				$286,946
				rounded
TOTAL PROJECT COST, FY-2007				**$287,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Intrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	**Mississippi**	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***Existing Structure, 6' off low ground***	BASIS of ESTIMATE:		by project delv'd. team	
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Raise Structure on Segmented Piles*	1,600	sf	70.00	$112,000
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

* Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house.

Current Contract Cost, FY 07			$116,243
CONTINGENCY	@	**25.0%**	29,061
01 Account, Lands & Damage	Real Estate	**LS**	5,000
02 Account, Relocations	Relocations	**LS**	0
xx Account, Environmental Mitigation		**LS**	0
30 Account, Plan, Engr.& Design	@	**11.2%**	13,000
31 Account, Constr. Management	@	**6.0%**	7,000
ESCALATION, FY-06	@	**0.0%**	0
			$170,304
			rounded
TOTAL PROJECT COST, FY-2007			**$170,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Infrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	**Mississippi**	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***Existing Structure, 15' off low ground***	BASIS of ESTIMATE:	by project delv'd. team		
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Raise Structure on Segmented Piles*	1,600	sf	80.00	$128,000
Misc.- Storage Area	300	sf	15.17	$4,552
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

* Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house. He said that costs would likely be higher than this for a raise as high as 15' off low ground. Therefore, add $10/SF to cover this higher raise.

Current Contract Cost, FY 07				136,795
CONTINGENCY		@	**25.0%**	34,199
01 Account, Lands & Damage	Real Estate		**LS**	5,000
02 Account, Relocations	Relocations		**LS**	0
xx Account, Environmental Mitigation			**LS**	0
30 Account, Plan, Engr.& Design		@	**9.5%**	13,000
31 Account, Constr. Management		@	**5.1%**	7,000
ESCALATION, FY-06		@	**0.0%**	0
				$195,994
				rounded
TOTAL PROJECT COST, FY-2007				**$196,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Infrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	**Mississippi**	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***New Prefab Structure, 6' off low ground***	BASIS of ESTIMATE:		by project delv'd. team	
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Timber Piles*	38	ea	815.66	$30,995
4x4 Cross Bracing*	620	lf	4.36	$2,703
Treated Lumber, 2x10*	400	lf	2.64	$1,057
Structure Above Sill Plate**	1,000	sf	70.28	$70,282
Misc.- Other***	1	job	12,425.27	$12,425
Misc.- Utility hookups	1	job	5,091.63	$5,092
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

*Assume a 6' grid for a house that is 25' x 40' (i.e., a 1000 SF house).

**Cost estimated by Marshall-Swift for an average quality 1000 SF structure in the Gulfport, MS area. Price is assumed to include all setup and prep work such as mob/de-mob. Foundation costs have been subtracted from the Marshall-Swift estimate.

***This price has been taken from LRH's floodproofing model in MCACES 5.31 and includes items such as site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanup.

Current Contract Cost, FY 07			$126,797
CONTINGENCY	@	**20.0%**	25,359
01 Account, Lands & Damage	Real Estate	**LS**	5,000
02 Account, Relocations	Relocations	**LS**	0
xx Account, Environmental Mitigation		**LS**	0
30 Account, Plan, Engr.& Design	@	**10.3%**	13,000
31 Account, Constr. Management	@	**5.5%**	7,000
ESCALATION, FY-06	@	**0.0%**	0
			$177,157
			rounded
TOTAL PROJECT COST, FY-2007			**$177,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Intrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	Mississippi Coastal Improvement Program "MsCIP"	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	Mississippi	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***New Prefab Structure, 15' off low ground***	BASIS of ESTIMATE:		by project delv'd. team	
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Timber Piles*	38	ea	978.79	$37,194
4x4 Cross Bracing*	620	lf	4.36	$2,703
Treated Lumber, 2x10*	400	lf	2.64	$1,057
Structure Above Sill Plate**	1,000	sf	70.28	$70,282
Misc.- Storage Area	300	sf	15.17	$4,552
Misc.- Other***	1	job	14,166.60	$14,167
Misc.- Utility hookups	1	job	5,091.63	$5,092
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

*Assume a 6' grid for a house that is 25' x 40' (i.e., a 1000 SF house).

**Cost estimated by Marshall-Swift for an average quality 1000 SF structure in the Gulfport, MS area. Price is assumed to include all setup and prep work such as mob/de-mob. Foundation costs have been subtracted from the Marshall-Swift estimate.

***This price has been taken from LRH's floodproofing model in MCACES 5.31 and includes items such as site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanup.

Current Contract Cost, FY 07			$139,290
CONTINGENCY	@	**20.0%**	$27,858
01 Account, Lands & Damage	Real Estate	**LS**	5,000
02 Account, Relocations	Relocations	**LS**	0
xx Account, Environmental Mitigation		**LS**	0
30 Account, Plan, Engr.& Design	@	**9.3%**	13,000
31 Account, Constr. Management	@	**5.0%**	7,000
ESCALATION, FY-06	@	**0.0%**	0
			$192,148
			rounded
TOTAL PROJECT COST, FY-2007			**$192,000**

Notes.

Estimate Excludes:

Operational & Maintenance Cost
Permanent Intrastructure
Relocations (pipelines, etc.)
Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	**Mississippi**	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***Existing Structure, 6' off low ground***	BASIS of ESTIMATE:		by project delv'd. team	
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Raise Structure on Segmented Piles*	1,000	sf	70.00	$70,000
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

* Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house.

Current Contract Cost, FY 07			$74,243
CONTINGENCY	@	**20.0%**	$14,849
01 Account, Lands & Damage	Real Estate	**LS**	5,000
02 Account, Relocations	Relocations	**LS**	0
xx Account, Environmental Mitigation		**LS**	0
30 Account, Plan, Engr.& Design	@	**17.5%**	13,000
31 Account, Constr. Management	@	**9.4%**	7,000
ESCALATION, FY-06	@	**0.0%**	0
			$114,092
			rounded
TOTAL PROJECT COST, FY-2007			**$114,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Infrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

PROGRAMMING & PLANNING COST ESTIMATE

PROJECT:	**Mississippi Coastal Improvement Program "MsCIP"**	ITEM NO.	--	DATE	22-Sep-07
LOCATION:	**Mississippi**	SHEET NO.		OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***Existing Structure, 15' off low ground***	BASIS of ESTIMATE:	by project delv'd. team		
		FILE NAME:			

DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Raise Structure on Segmented Piles*	1,000	sf	80.00	$80,000
Misc.- Storage Area	300	sf	15.17	$4,552
Aerator System - Assume to be installed on 10% on the structures	0.1	job	8,486.04	$849
Asbestos Abatement	1	job	1,697.21	$1,697
Temporary Housing Allowance	2	mo	848.60	$1,697
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

Note: See MII reports for unit price backup and justification.

* Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house. He said that costs would likely be higher than this for a raise as high as 15' off low ground. Therefore, ad

Current Contract Cost, FY 07				88,795
CONTINGENCY		@	**20.0%**	$17,759
01 Account, Lands & Damage	Real Estate		**LS**	5,000
02 Account, Relocations	Relocations		**LS**	0
xx Account, Environmental Mitigation			**LS**	0
30 Account, Plan, Engr.& Design		@	**14.6%**	13,000
31 Account, Constr. Management		@	**7.9%**	7,000
ESCALATION, FY-06		@	**0.0%**	0
				$131,554
				rounded
TOTAL PROJECT COST, FY-2007				**$132,000**

Notes.

Estimate Excludes:

- Operational & Maintenance Cost
- Permanent Infrastructure
- Relocations (pipelines, etc.)
- Equipment (by Other Appropriations)

Preliminary Estimate of Project Cost

for the

Floodproofing of Residential Structures

associated with the

Mississippi Coastal Improvement Program Comprehensive Study

at a Price Level equivalent to

1 October 2007

Model Cost Estimates

MII Estimates

Recon level cost estimate for the floodproofing of Residential Structures by means of elevating structure or replacing structure.

Estimated by CELRH-ECT
Designed by CELRH-PD, CELRH-ECD
Prepared by Donald Whitmore, P.E.
Preparation Date 9/22/2007
Effective Date of Pricing 10/1/2007
Estimated Construction Time Days

Date	Author	Note
9/22/2007	Don Whitmore	SCOPE

This cost estimate is comprised of 8 model estimates. Each of these estimates pertains to the floodproofing of residential structures on the Gulf Coast.

1. New house construction on pier foundation at a finished first floor of 6 FT above low ground.

2. New house construction on pier foundation at a finished first floor of 15 FT above low ground.

3. Raising of existing house on slab foundation to a finished first floor of 6 Ft above low ground.

4. Reising of existing house on slab foundation to a finished first floor of 15 Ft above low ground.

5. New mobile home construction on pier foundation at a finished first floor of 6 FT above low ground.

6. New mobile home construction on pier foundation at a finished first floor of 15 FT above low ground.

7. Raising of existing mobile home to a finished first floor of 6 Ft above low ground.

8. Raising of existing mobile home to a finished first floor of 15 Ft above low ground.

ASSUMPTION AND EXCLUSIONS

1. All existing structures are assumed to be either a permanent structure with a slab foundation or a mobile home.

2. For the permanent structure alternatives (models 1 - 4), each structure is assumed to have a living area of 1,600 SF. This assumption applies to either the structure replacement alternative or the structure raise alternative. For the purposes of this estimate, the cost engineer has assumed a simple rectangular house with outside dimensions of 25' x 64'. This yields an area of 1,600 SF and a perimeter of 178 LF.

3. The replacement of permanent structures is based on wooden pier construction to the appropriate elevation (in this case, either 6' or 15' above low ground) and the construction of a new house on this foundation. The foundation quantities and costs for this alternative were detailed by the cost engineer based on the above assumptions. The cost of the new structure above the sill plate was estimated using the Marshall & Swift Residential Estimator 7 software, assuming the construction of an average quality home in the Gulfport, MS area.

4. The raising of an existing permanent construction home has been based on a segmental conrete pile foundation. The prime example of this technology is the "Davie Shoring" system (see www.davieshoring.com). It involves tunneling by hand under the slab foundation, cutting existing pile (if applicable), and installing the conrete piles one segment at a time by hydraulic jack until the piles reach refusal. The house is then raised on these piles and a new foundation is constructed. Depending on the structure's final height above low ground, the final foundation would be either the concrete segmental piles with a decorative facade or it would be CIP reinforced concrete with continuous grade beams. For these alternatives, the cost engineer simply obtained a quote from Davie for cost of providing a turnkey structure elevation.

5. For the mobile home construction (models 5 - 8), the replacement of eligible structures would be to construct a wooden pier foundation and place a modular home on this foundation. The structure is assumed to have a living area of 1,000 SF. For the purposes of this estimate, the cost engineer has assumed a simple rectangular mobile home with outside dimension of 14' x 72', which is very conservative by most standards for mobile homes. This yields an area of 1,008 SF and a perimeter of 172 LF. The foundation and living area cost has been estimated in a manner similar to that of the permanent structures (assumption #3), which is also considered by the cost engineer to be very conservative for modular home construction.

6. The raising of an existing mobel home assumes the same method of raising as the permanent construction approach (assumption #4, above). The primary difference is the structure area has been reduced from 1,600 SF to 1,000 SF.

Currency in US dollars

Date Author **Note**

7. In each of the higher elevation alternatives (i.e., those involving a structure whose first floor elevation is 15' above low ground), a 300 SF storage area has been included as part of the foundation.

8. In all cases, allowances have been made for the following:
- asbestos abatement ($1000 per structure)
- aerator systems to be installed on 10% of the structures
- temporary housing
- utility connections (except for the raise alternatives whose quoted price already included utility hookup)

9. Site work costs for items such as landscaping, sidewalks and driveways as well as exterminating, landscaping and construction cleanup have been based on LRH's 202 floodproofing cost model. Parameters were used as input into the model that would fit each of the above descriptions (models 1 - 8), and the total values for these items have been included in this estimate as lump sums.

10. Davis-Bacon labor rates were not used in this estimate. According to the PDT, the project will be formulated such that the requirement to use Davis-Bacon will not apply. At this time, the precise labor rate requirement is unknown. Consequently, the cost engineer left the labor rates undisturbed for each of the various cost sources. As an example, the MEANS cost manuals are based on national average labor rates. However, no attempt was made to adjust the items priced by the MEANS cost manual to account for a different labor rate.

FEATURE ACCOUNTS

01 Lands & Demages: Since these estimates only apply to the floodproofing of structures on site and not the acquisition and demolition of structures, the only costs shown in this account are for administration purposes. An allowance of $5,000 per structure has been made based on LRH's Section 202 floodproofing program. This price would include contingencies.

11 Levees, Floodwalls, & Floodproofing: Costs have been developed in accordance with the above assumptions.

30 Preconstruction Engineering & Design: An allowance of $13,000 per structure has been made based on LRH's Section 202 floodproofing program. This price would include contingencies.

31 Supervision & Administration: An allowance of $7,000 per structure has been made based on LRH's Section 202 floodproofing program. This price would include contingencies.

LEVEL OF EFFORT

This estimate is considered to be preliminary in nature and is to be used as such. The scopes provided to the cost engineer were very general. Indeed, the level of effort put forth by the cost engineer is commensurate to the general nature of the design.

PRICE LEVEL

The costs contained within this estimate have been prepared at a Price Level equivalent to 1 October 2007. Contingency has been included at 25% for model estimates 1 - 4. For the mobile home alternatives, however, a contingency of only 20% was applied due to the very conservative nature of the approach in estimating.

COST SOURCES

A variety of cost sources were used in preparing this estimate. The primary sources were:

- Marshall & Swift Residential Estimator 7
- LRH's Section 202 Implementation Floodproofing Cost Model

Date	Author	Note
		- MEANS Heavy Construction, 2005

Summary Report

Description	Quantity	UOM	ContractCost	Contingency	ProjectCost
Summary			1,280,877.95	248,763.24	1,529,641.19
			133.85		*163.41*
Construct New Site Built Structure - 6 feet off low ground	1,600.00	SF	214,158.55	47,289.64	261,448.18
			146.60		*179.34*
Construct New Site Built Structure - 15 feet off low ground	1,600.00	SF	234,556.53	52,389.13	286,945.67
			88.28		*106.44*
Raise Existing Slab Foundation Structure - 6 feet off low ground	1,600.00	SF	141,243.02	29,060.76	170,303.78
			101.12		*122.50*
Raise Existing Slab Foundation Structure - 15 feet off low ground	1,600.00	SF	161,794.94	34,198.73	195,993.67
			151.80		*177.16*
Construct New Modular Structure - 6 feet off low ground	1,000.00	SF	151,797.34	25,359.47	177,156.81
			164.29		*192.15*
Construct New Modular Structure - 15 feet off low ground	1,000.00	SF	164,289.62	27,857.92	192,147.54
			99.24		*114.09*
Raise Existing Prefab Structure - 6 feet off low ground	1,000.00	SF	99,243.02	14,848.60	114,091.63
			113.79		*131.55*
Raise Existing Prefab Structure - 15 feet off low ground	1,000.00	SF	113,794.94	17,758.99	131,553.92

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
Detail			**1,115,594.43**	**165,283.52**	**1,280,877.95**	**248,763.24**	**1,529,641.19**
			105.39		*133.85*		*163.41*
Construct New Site Built Structure - 6 feet off low ground	**1,600.00**	**SF**	**168,629.89**	**45,528.65**	**214,158.55**	**47,289.64**	**261,448.18**
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			143,629.89		*189,158.55*		*236,448.18*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**143,629.89**	**45,528.65**	**189,158.55**	**47,289.64**	**236,448.18**
			53.19		*70.28*		*87.85*
Structure Above Sill Plate	**1,600.00**	**SF**	**85,104.00**	**27,346.85**	**112,450.85**	**28,112.71**	**140,563.57**
			53.19		*70.28*	*25.00*	*87.85*
New Structure - Above Sill Plate	1,600.00	SF	85,104.00	27,346.85	112,450.85	28,112.71	140,563.57
(Note: Cost estimated by Marshall-Swift for an average quality 1600 SF structure in the Gulfport, MS area. See backup sheet from Marshall Swift. Estimated unit price is $68.35/SF including O&P. Since the pier foundation is estimated elsewhere in this estimate, the standard CIP wall foundation should be deleted from this Marshall-Swift estimate. Also, the overhead and profit should be deleted here. MII will add O&P to the direct cost unit price under the Project Item tab. O&P is estimated to be 14.5% in the Marshall-Swift program. The foundation is estimated to cost $67/LF of perimeter (MEANS), including O&P. $67/LF x (25x2 + 64x2) = $11,926. Now, $11,926 / 1600 SF = $7.45/SF that is to be deducted from the estimated unit price for new construction. So, $68.35/SF - $7.45/SF = $60.90/SF (w/ O&P) Subtracting O&P, $60.90/SF / 1.145 = $53.19/SF<---)							
			41,585.06		*54,947.78*		*68,684.73*
Foundation & Structure Below Sill Plate	**1.00**	**EA**	**41,585.06**	**13,362.72**	**54,947.78**	**13,736.95**	**68,684.73**
			617.30		*815.66*		*1,019.58*
Timber Piles	**60.00**	**EA**	**37,038.06**	**11,901.61**	**48,939.67**	**12,234.92**	**61,174.59**
(Note: Assume a 6' grid for a house that is 25' x 64' (i.e., a 1600 SF house).)							
			13.72		*18.13*	*25.00*	*22.66*
Timber Piles	2,700.00	VLF	37,038.06	11,901.61	48,939.67	12,234.92	61,174.59
(Note: Material price taken from MEANS. Piles are assumed to be 12" diameter at the head and are to be embedded 40' into the ground.)							
			4,547.00		*6,008.11*		*7,510.14*
Pressure Treated Lumber	**1.00**	**EA**	**4,547.00**	**1,461.11**	**6,008.11**	**1,502.03**	**7,510.14**
(Nota: Assume 2 9' braces per span. A 6x6 grid for a 25 x 64 house yields 60 piles with 55 spans. Therefore, total bracing = 2 x 9 x 55 = 990 LF of 4x4 bracing<---)							
			2.00		*2.64*	*25.00*	*3.30*
Pressure Treated Lumber, 2x10	640.00	LF	1,280.00	411.31	1,691.31	422.83	2,114.14
(Note: Reference LRH's 202 floodproofing implementation model.)							
			3.30		*4.36*	*25.00*	*5.45*
4x4 Cross Bracing	990.00	LF	3,267.00	1,049.80	4,316.80	1,079.20	5,396.00
(Note: Reference LRH's 202 floodproofing implemantation model for cost. Assume 2 9' braces per span. A 6x6 grid for a 25 x 64 house yields 60 piles with 55 spans. Therefore, total bracing = 2 x 9 x 55 = 990 LF of 4x4 bracing<---)							
Misc	**1.00**	**LS**	**16,940.83**	**4,819.08**	**21,759.91**	**5,439.98**	**27,199.89**
Misc - 6' off low ground	1.00	LS	9,673.49	2,751.78	12,425.27	3,106.32	15,531.58
(Note: This item of work covers the cost of site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanup for a structure whose first floor is 6' off low ground. Price estimated by LRH's 202 floodproofing implementation model.)							
			3,964.00		*5,091.63*	*25.00*	*6,364.53*
Utility Hookups	1.00	EA	3,964.00	1,127.62	5,091.63	1,272.91	6,364.53
(Note: This is an allowance to cover the costs of installing (or having installed) the water, electric, and gas meters.)							

Labor ID: LB04NatFD EQ ID: EP05R03 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
Aerator System	0.10	LS	660.67	187.94	848.60	212.15	1,060.76
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*25.00*	*1,060.76*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			115.13		*146.60*		*179.34*
Construct New Site Built Structure - 15 feet off low ground	**1,600.00**	**SF**	**184,204.02**	**50,352.52**	**234,556.53**	**52,389.13**	**286,945.67**
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			159,204.02		*209,556.53*		*261,945.67*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**159,204.02**	**50,352.52**	**209,556.53**	**52,389.13**	**261,945.67**
			53.19		*70.28*		*87.85*
Structure Above Sill Plate	**1,600.00**	**SF**	**85,104.00**	**27,346.85**	**112,450.85**	**28,112.71**	**140,563.57**
			53.19		*70.28*	*25.00*	*87.85*
New Structure - Above Sill Plate	1,600.00	SF	85,104.00	27,346.85	112,450.85	28,112.71	140,563.57
(Note: Cost estimated by Marshall-Swift for an average quality 1600 SF structure in the Gulfport, MS area. See backup sheet from Marshall Swift. Estimated unit price is $68.35/SF including O&P. Since the pier foundation is estimated elsewhere in this estimate, the standard CIP wall foundation should be deleted from this Marshall-Swift estimate. Also, the overhead and profit should be deleted here. MII will add O&P to the direct cost unit price under the Project Item tab. O&P is estimated to be 14.5% in the Marshall-Swift program. The foundation is estimated to cost $67/LF of perimeter (MEANS), including O&P. $67/LF x (25x2 + 64x2) = $11,926. Now, $11,926 / 1600 SF = $7.45/SF that is to be deducted from the estimated unit price for new construction. So, $68.35/SF - $7.45/SF = $60.90/SF (w/ O&P) Subtracting O&P, $60.90/SF / 1.145 = $53.19/SF<---)							
			52,259.68		*69,052.52*		*86,315.64*
Foundation & Structure Below Sill Plate	**1.00**	**EA**	**52,259.68**	**16,792.84**	**69,052.52**	**17,263.13**	**86,315.64**
			740.76		*978.79*		*1,223.49*
Timber Piles	**60.00**	**EA**	**44,445.68**	**14,281.93**	**58,727.61**	**14,681.90**	**73,409.51**
(Note: Assume a 6' grid for a house that is 25' x 64' (i.e., a 1600 SF house).)							
			13.72		*18.13*	*25.00*	*22.66*
Timber Piles	3,240.00	VLF	44,445.68	14,281.93	58,727.61	14,681.90	73,409.51
(Note: Material price taken from MEANS. Piles are assumed to be 12" diameter at the head and are to be embedded 40' into the ground.)							
			7,814.00		*10,324.91*		*12,906.13*
Pressure Treated Lumber	**1.00**	**EA**	**7,814.00**	**2,510.91**	**10,324.91**	**2,581.23**	**12,906.13**
			2.00		*2.64*	*25.00*	*3.30*

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
Pressure Treated Lumber, 2x10	640.00	LF	1,280.00	411.31	1,691.31	422.83	2,114.14
(Note: Reference LRH's 202 floodproofing implementation model.)							
			3.30		*4.36*	*25.00*	*5.45*
4x4 Cross Bracing	1,980.00	LF	6,534.00	2,099.60	8,633.60	2,158.40	10,792.00
(Note: Reference LRH's 202 floodproofing implementation model. Assume 4 9' braces per span. A 6x6 grid for a 25 x 64 house yields 60 piles with 55 spans. Therefore, total bracing = 4 x 9 x 55 = 1980 LF of 4x4 bracing<---)							
Misc	**1.00**	**LS**	**21,840.34**	**6,212.82**	**28,053.16**	**7,013.29**	**35,066.45**
			11.81		*15.17*		*18.97*
300 SF Stoarge Area	**300.00**	**SF**	**3,543.82**	**1,008.09**	**4,551.91**	**1,137.98**	**5,689.89**
(Note: This would only apply to structures that area greater than 6 FT above low ground. In this estimate, that means that it only applies to the 6' - 15' raise category.)							
			6.53		*8.38*	*25.00*	*10.48*
4" Concrete Pad	300.00	SF	1,958.22	557.05	2,515.26	628.82	3,144.08
(Note: Price from LRH's floodproofing model for 4" concrete = $370/CY, direct cost. SAY = $400/CY for the gulf coast. Now, $400/CY x (4in/36in/yd) = $44.44/SY. So, $44.44/SY / 9 SF/SY = $4.94/SF<---)							
			13.21		*16.97*	*25.00*	*21.22*
Siding	80.00	EA	1,057.07	300.70	1,357.77	339.44	1,697.21
(Note: = 10 x 2 + 30 x 2 = 80 SF)							
			264.27		*339.44*	*25.00*	*424.30*
Door	1.00	EA	264.27	75.17	339.44	84.86	424.30
Electrical Allowance	1.00	LS	264.27	75.17	339.44	84.86	424.30
			18,296.52		*23,501.25*		*29,376.56*
Other	**1.00**	**EA**	**18,296.52**	**5,204.73**	**23,501.25**	**5,875.31**	**29,376.56**
			3,964.00		*5,091.63*	*25.00*	*6,364.53*
Utility Hookups	1.00	EA	3,964.00	1,127.62	5,091.63	1,272.91	6,364.53
(Note: This is an allowance to cover the costs of installing (or having installed) the water, electric, and gas meters.)							
Misc - 15' off low ground	1.00	LS	11,029.18	3,137.42	14,166.60	3,541.65	17,708.25
(Note: This item of work covers the cost of site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanupfor a structure whose first floor is 15' off low ground. Price estimated by LRH's 202 floodproofing implementation model.)							
Aerator System	0.10	LS	660.67	187.94	848.60	212.15	1,060.76
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*25.00*	*1,060.76*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			87.69		*88.28*		*106.44*

Labor ID: LB04NatFD EQ ID: EP05R03 | Currency in US dollars | TRACES MII Version 2.2

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
Raise Existing Slab Foundation Structure - 6 feet off low ground	**1,600.00**	**SF**	**140,303.34**	**939.69**	**141,243.02**	**29,060.76**	**170,303.78**
(Note: This price already includes all contractor markups. Therefore, none have been added here.)							
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			115,303.34		*116,243.02*		*145,303.78*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**115,303.34**	**939.69**	**116,243.02**	**29,060.76**	**145,303.78**
			112,000.00		*112,000.00*		*140,000.00*
Raise	**1.00**	**EA**	**112,000.00**	**0.00**	**112,000.00**	**28,000.00**	**140,000.00**
			70.00		*70.00*	*25.00*	*87.50*
Raise Structure on Segmented Piles to 6' off low ground	1,600.00	SF	112,000.00	0.00	112,000.00	28,000.00	140,000.00
(Note: Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house. This price would be for a slab foundation struture whose finished first floor would be greater than 4' above low ground. It is suspected that Pat pays significantly less than Davis-Bacon wages. PD was consulted on this issue. PD recommended that since this project is to be formulated on the basis that Davis-Bacon is not a requirement, the pricing info provided by Mr. Davie is acceptable.)							
			3,303.34		*4,243.02*		*5,303.78*
Misc	**1.00**	**EA**	**3,303.34**	**939.69**	**4,243.02**	**1,060.76**	**5,303.78**
Aerator System	0.10	LS	660.67	187.94	848.60	212.15	1,060.76
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*25.00*	*1,060.76*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			99.90		*101.12*		*122.50*
Raise Existing Slab Foundation Structure - 15 feet off low ground	**1,600.00**	**SF**	**159,847.16**	**1,947.78**	**161,794.94**	**34,198.73**	**195,993.67**
(Note: This price already includes all contractor markups. Therefore, none have been added here.)							
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			134,847.16		*136,794.94*		*170,993.67*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**134,847.16**	**1,947.78**	**136,794.94**	**34,198.73**	**170,993.67**
			128,000.00		*128,000.00*		*160,000.00*
Raise	**1.00**	**EA**	**128,000.00**	**0.00**	**128,000.00**	**32,000.00**	**160,000.00**

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
			80.00		*80.00*	*25.00*	*100.00*
Raise Structure on Segmented Piles to 15' off low ground	1,600.00	SF	128,000.00	0.00	128,000.00	32,000.00	160,000.00
(Note: Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house. He said that costs would likely be higher than this for a raise as high as 15' off low ground. Therefore, add $10/SF to cover this higher raise. This price would be for a slab foundation struture whose finished first floor would be greater than 15' above low ground. PD was consulted on this issue. PD recommended that since this project is to be formulated on the basis that Davis-Bacon is not a requirement, the pricing info provided by Mr. Davie is acceptable.)							
			11.81		*15.17*		*18.97*
300 SF Stoarge Area	**300.00**	**SF**	**3,543.82**	**1,008.09**	**4,551.91**	**1,137.98**	**5,689.89**
(Note: This would only apply to structures that area greater than 6 FT above low ground. In this estimate, that means that it only applies to the 6' - 15' raise category.)							
			6.53		*8.38*	*25.00*	*10.48*
4" Concrete Pad	300.00	SF	1,958.22	557.05	2,515.26	628.82	3,144.08
(Note: Price from LRH's floodproofing model for 4" concrete = $370/CY, direct cost. SAY = $400/CY for the gulf coast. Now, $400/CY x (4in/36in/yd) = $44.44/SY. So, $44.44/SY / 9 SF/SY = $4.94/SF<---)							
			13.21		*16.97*	*25.00*	*21.22*
Siding	80.00	EA	1,057.07	300.70	1,357.77	339.44	1,697.21
(Note: = 10 x 2 + 30 x 2 = 80 SF)							
			264.27		*339.44*	*25.00*	*424.30*
Door	1.00	EA	264.27	75.17	339.44	84.86	424.30
Electrical Allowance	1.00	LS	264.27	75.17	339.44	84.86	424.30
			3,303.34		*4,243.02*		*5,303.78*
Misc	**1.00**	**EA**	**3,303.34**	**939.69**	**4,243.02**	**1,060.76**	**5,303.78**
Aerator System	0.10	LS	660.67	187.94	848.60	212.15	1,060.76
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*25.00*	*1,060.76*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	424.30	2,121.51
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			121.43		*151.80*		*177.16*
Construct New Modular Structure - 6 feet off low ground	**1,000.00**	**SF**	**121,434.27**	**30,363.07**	**151,797.34**	**25,359.47**	**177,156.81**
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			96,434.27		*126,797.34*		*152,156.81*

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**96,434.27**	**30,363.07**	**126,797.34**	**25,359.47**	**152,156.81**
			53.19		*70.28*		*84.34*
Structure Above Sill Plate	**1,000.00**	**SF**	**53,190.00**	**17,091.78**	**70,281.78**	**14,056.36**	**84,338.14**
			53.19		*70.28*	*20.00*	*84.34*
New Structure - Above Sill Plate	1,000.00	SF	53,190.00	17,091.78	70,281.78	14,056.36	84,338.14
(Note: Cost estimated by Marshall-Swift for an average quality 1000 SF structure in the Gulfport, MS area. See backup sheet from Marshall Swift. Estimated unit price is $68.35/SF including O&P. Since the pier foundation is estimated elsewhere in this estimate, the standard CIP wall foundation should be deleted from this Marshall-Swift estimate. Also, the overhead and profit should be deleted here. MII will add O&P to the direct cost unit price under the Project Item tab. O&P is estimated to be 14.5% in the Marshall-Swift program. The foundation is estimated to cost $67/LF of perimeter (MEANS), including O&P. $67/LF x (25x2 + 64x2) = $11,926. Now, $11,926 / 1600 SF = $7.45/SF that is to be deducted from the estimated unit price for new construction. So, $68.35/SF - $7.45/SF = $60.90/SF (w/ O&P) Subtracting O&P, $60.90/SF / 1.145 = $53.19/SF<---)							
			26,303.44		*34,755.64*		*41,706.77*
Foundation & Structure Below Sill Plate	**1.00**	**EA**	**26,303.44**	**8,452.20**	**34,755.64**	**6,951.13**	**41,706.77**
			617.30		*815.66*		*978.79*
Timber Piles	**38.00**	**EA**	**23,457.44**	**7,537.69**	**30,995.13**	**6,199.03**	**37,194.15**
(Note: Assume a 6' grid.)							
			13.72		*18.13*	*20.00*	*21.75*
Timber Piles	1,710.00	VLF	23,457.44	7,537.69	30,995.13	6,199.03	37,194.15
(Note: Material price taken from MEANS. Piles are assumed to be 12" diameter at the head and are to be embedded 40' into the ground.)							
			2,846.00		*3,760.52*		*4,512.62*
Pressure Treated Lumber	**1.00**	**EA**	**2,846.00**	**914.52**	**3,760.52**	**752.10**	**4,512.62**
(Note: Assume 2 9' braces per span.)							
			3.30		*4.36*	*20.00*	*5.23*
4x4 Cross Bracing	620.00	LF	2,046.00	657.45	2,703.45	540.69	3,244.14
(Note: Reference LRH's 202 floodproofing implementation model.)							
			2.00		*2.64*	*20.00*	*3.17*
Pressure Treated Lumber, 2x10	400.00	LF	800.00	257.07	1,057.07	211.41	1,268.48
(Note: Reference LRH's 202 floodproofing implementation model.)							
Misc	**1.00**	**LS**	**16,940.83**	**4,819.08**	**21,759.91**	**4,351.98**	**26,111.90**
Misc	1.00	LS	9,673.49	2,751.78	12,425.27	2,485.05	14,910.32
(Note: This item of work covers the cost of site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanup for a structure whose first floor is 6' off low ground. Price estimated by LRH's 202 floodproofing implementation model.)							
			3,964.00		*5,091.63*	*20.00*	*6,109.95*
Utility Hookups	1.00	EA	3,964.00	1,127.62	5,091.63	1,018.33	6,109.95
(Note: This is an allowance to cover the costs of installing (or having installed) the water, electric, and gas meters.)							
Aerator System	0.10	LS	660.67	187.94	848.60	169.72	1,018.33
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*20.00*	*1,018.33*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00

Labor ID: LB04NatFD EQ ID: EP05R03 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			131.03		*164.29*		*192.15*
Construct New Modular Structure - 15 feet off low ground	**1,000.00**	**SF**	**131,025.27**	**33,264.35**	**164,289.62**	**27,857.92**	**192,147.54**
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			106,025.27		*139,289.62*		*167,147.54*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**106,025.27**	**33,264.35**	**139,289.62**	**27,857.92**	**167,147.54**
			53.19		*70.28*		*84.34*
Structure Above Sill Plate	**1,000.00**	**SF**	**53,190.00**	**17,091.78**	**70,281.78**	**14,056.36**	**84,338.14**
			53.19		*70.28*	*20.00*	*84.34*
New Structure - Above Sill Plate	1,000.00	SF	53,190.00	17,091.78	70,281.78	14,056.36	84,338.14
(Note: Cost estimated by Marshall-Swift for an average quality 1000 SF structure in the Gulfport, MS area. See backup sheet from Marshall Swift. Estimated unit price is $68.35/SF including O&P. Since the pier foundation is estimated elsewhere in this estimate, the standard CIP wall foundation should be deleted from this Marshall-Swift estimate. Also, the overhead and profit should be deleted here. MII will add O&P to the direct cost unit price under the Project Item tab. O&P is estimated to be 14.5% in the Marshall-Swift program. The foundation is estimated to cost $67/LF of perimeter (MEANS), including O&P. $67/LF x (25x2 + 64x2) = $11,926. Now, $11,926 / 1600 SF = $7.45/SF that is to be deducted from the estimated unit price for new construction. So, $68.35/SF - $7.45/SF = $60.90/SF (w/ O&P) Subtracting O&P, $60.90/SF / 1.145 = $53.19/SF<---)							
			30,994.93		*40,954.67*		*49,145.60*
Foundation & Structure Below Sill Plate	**1.00**	**EA**	**30,994.93**	**9,959.74**	**40,954.67**	**8,190.93**	**49,145.60**
			740.76		*978.79*		*1,174.55*
Timber Piles	**38.00**	**EA**	**28,148.93**	**9,045.22**	**37,194.15**	**7,438.83**	**44,632.98**
(Note: Assume a 6' grid.)							
			13.72		*18.13*	*20.00*	*21.75*
Timber Piles	2,052.00	VLF	28,148.93	9,045.22	37,194.15	7,438.83	44,632.98
(Note: Material price taken from MEANS. Piles are assumed to be 12" diameter at the head and are to be embedded 40' into the ground.)							
			2,846.00		*3,760.52*		*4,512.62*
Pressure Treated Lumber	**1.00**	**EA**	**2,846.00**	**914.52**	**3,760.52**	**752.10**	**4,512.62**
			3.30		*4.36*	*20.00*	*5.23*
4x4 Cross Bracing	620.00	LF	2,046.00	657.45	2,703.45	540.69	3,244.14
(Note: Reference LRH's 202 floodproofing implementation model. Assume 2 9' braces per span.)							
			2.00		*2.64*	*20.00*	*3.17*
Pressure Treated Lumber, 2x10	400.00	LF	800.00	257.07	1,057.07	211.41	1,268.48
(Note: Reference LRH's 202 floodproofing implementation model.)							
Misc	**1.00**	**LS**	**21,840.34**	**6,212.82**	**28,053.16**	**5,610.63**	**33,663.80**
			11.81		*15.17*		*18.21*
300 SF Stoarge Area	**300.00**	**SF**	**3,543.82**	**1,008.09**	**4,551.91**	**910.38**	**5,462.30**
(Note: This would only apply to structures that area greater than 6 FT above low ground. In this estimate, that means that it only applies to the 6' - 15' raise category.)							

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
			6.53		*8.38*	*20.00*	*10.06*
4" Concrete Pad	300.00	SF	1,958.22	557.05	2,515.26	503.05	3,018.32
(Note: Price from LRH's floodproofing model for 4" concrete = $370/CY, direct cost. SAY = $400/CY for the gulf coast. Now, $400/CY x (4in/36in/yd) = $44.44/SY. So, $44.44/SY / 9 SF/SY = $4.94/SF<---)							
			13.21		*16.97*	*20.00*	*20.37*
Siding	80.00	EA	1,057.07	300.70	1,357.77	271.55	1,629.32
(Note: = 10 x 2 + 30 x 2 = 80 SF)							
			264.27		*339.44*	*20.00*	*407.33*
Door	1.00	EA	264.27	75.17	339.44	67.89	407.33
Electrical Allowance	1.00	LS	264.27	75.17	339.44	67.89	407.33
			18,296.52		*23,501.25*		*28,201.50*
Other	**1.00**	**EA**	**18,296.52**	**5,204.73**	**23,501.25**	**4,700.25**	**28,201.50**
			3,964.00		*5,091.63*	*20.00*	*6,109.95*
Utility Hookups	1.00	EA	3,964.00	1,127.62	5,091.63	1,018.33	6,109.95
(Note: This is an allowance to cover the costs of installing (or having installed) the water, electric, and gas meters.)							
Misc - 15' off low ground	1.00	LS	11,029.18	3,137.42	14,166.60	2,833.32	16,999.92
(Note: This item of work covers the cost of site work concrete, porches, as well as other items such as landscaping, exterminating, and construction cleanupfor a structure whose first floor is 15' off low ground. Price estimated by LRH's 202 floodproofing implementation model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
Aerator System	0.10	LS	660.67	187.94	848.60	169.72	1,018.33
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
			660.67		*848.60*	*20.00*	*1,018.33*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			98.30		*99.24*		*114.09*
Raise Existing Prefab Structure - 6 feet off low ground	**1,000.00**	**SF**	**98,303.34**	**939.69**	**99,243.02**	**14,848.60**	**114,091.63**
(Note: This price already includes all contractor markups. Therefore, none have been added here.)							
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			73,303.34		*74,243.02*		*89,091.63*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**73,303.34**	**939.69**	**74,243.02**	**14,848.60**	**89,091.63**
			70,000.00		*70,000.00*		*84,000.00*

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
Raise	**1.00**	**EA**	**70,000.00**	**0.00**	**70,000.00**	**14,000.00**	**84,000.00**
			70.00		*70.00*	*20.00*	*84.00*
Raise Structure on Segmented Piles to 6' off low ground	1,000.00	SF	70,000.00	0.00	70,000.00	14,000.00	84,000.00
(Note: Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house. This price would be for a slab foundation struture whose finished first floor would be greater than 4' above low ground. It is suspected that Pat pays significantly less than Davis-Bacon wages. PD was consulted on this issue. PD recommended that since this project is to be formulated on the basis that Davis-Bacon is not a requirement, the pricing info provided by Mr. Davie is acceptable.)							
			3,303.34		*4,243.02*		*5,091.63*
Misc	**1.00**	**EA**	**3,303.34**	**939.69**	**4,243.02**	**848.60**	**5,091.63**
Aerator System	0.10	LS	660.67	187.94	848.60	169.72	1,018.33
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*20.00*	*1,018.33*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			111.85		*113.79*		*131.55*
Raise Existing Prefab Structure - 15 feet off low ground	**1,000.00**	**SF**	**111,847.16**	**1,947.78**	**113,794.94**	**17,758.99**	**131,553.92**
(Note: This price already includes all contractor markups. Therefore, none have been added here.)							
			5,000.00		*5,000.00*		*5,000.00*
01 - Lands & Damages	**1.00**	**EA**	**5,000.00**	**0.00**	**5,000.00**	**0.00**	**5,000.00**
Real Estate Admin	1.00	LS	5,000.00	0.00	5,000.00	0.00	5,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			86,847.16		*88,794.94*		*106,553.92*
11 - Levees, Floodwalls, and Floodproofing	**1.00**	**EA**	**86,847.16**	**1,947.78**	**88,794.94**	**17,758.99**	**106,553.92**
			80,000.00		*80,000.00*		*96,000.00*
Raise	**1.00**	**EA**	**80,000.00**	**0.00**	**80,000.00**	**16,000.00**	**96,000.00**
			80.00		*80.00*	*20.00*	*96.00*
Raise Structure on Segmented Piles to 15' off low ground	1,000.00	SF	80,000.00	0.00	80,000.00	16,000.00	96,000.00
(Note: Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house. He said that costs would likely be higher than this for a raise as high as 15' off low ground. Therefore, add $10/SF to cover this higher raise. This price would be for a slab foundation struture whose finished first floor would be greater than 15' above low ground. PD was consulted on this issue. PD recommended that since this project is to be formulated on the basis that Davis-Bacon is not a requirement, the pricing info provided by Mr. Davie is acceptable.)							
			11.81		*15.17*		*18.21*
300 SF Stoarge Area	**300.00**	**SF**	**3,543.82**	**1,008.09**	**4,551.91**	**910.38**	**5,462.30**
(Note: This would only apply to structures that area greater than 6 FT above low ground. In this estimate, that means that it only applies to the 8' - 15' raise category.)							

Currency in US dollars

Description	Quantity	UOM	CostToPrime	PrimeCMU	ContractCost	Contingency	ProjectCost
			6.53		*8.38*	*20.00*	*10.06*
4" Concrete Pad	300.00	SF	1,958.22	557.05	2,515.26	503.05	3,018.32
(Note: Price from LRH's floodproofing model for 4" concrete = $370/CY, direct cost. SAY = $400/CY for the gulf coast. Now, $400/CY x (4in/36in/yd) = $44.44/SY. So, $44.44/SY / 9 SF/SY = $4.94/SF<---)							
			13.21		*16.97*	*20.00*	*20.37*
Siding	80.00	EA	1,057.07	300.70	1,357.77	271.55	1,629.32
(Note: = 10 x 2 + 30 x 2 = 80 SF)							
			264.27		*339.44*	*20.00*	*407.33*
Door	1.00	EA	264.27	75.17	339.44	67.89	407.33
Electrical Allowance	1.00	LS	264.27	75.17	339.44	67.89	407.33
			3,303.34		*4,243.02*		*5,091.63*
Misc	**1.00**	**EA**	**3,303.34**	**939.69**	**4,243.02**	**848.60**	**5,091.63**
Aerator System	0.10	LS	660.67	187.94	848.60	169.72	1,018.33
(Note: Assume that 1 out of every 10 houses will need an aerator system installed. The price of $5000 has been taken from LRH's 202 floodproofing model.)							
Asbestos Abatement	1.00	LS	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: This is an allowance based on historical data from LRH's 202 program for an average cost per structure for asbestos abatement of a large sample of structures.)							
			660.67		*848.60*	*20.00*	*1,018.33*
Temporary Housing Allowance	2.00	MO	1,321.33	375.87	1,697.21	339.44	2,036.65
(Note: Assume $500 per month.)							
			13,000.00		*13,000.00*		*13,000.00*
30 - Preconstruction Engineering & Design	**1.00**	**EA**	**13,000.00**	**0.00**	**13,000.00**	**0.00**	**13,000.00**
Engineering & Design	1.00	LS	13,000.00	0.00	13,000.00	0.00	13,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							
			7,000.00		*7,000.00*		*7,000.00*
31 - Supervision & Administration	**1.00**	**EA**	**7,000.00**	**0.00**	**7,000.00**	**0.00**	**7,000.00**
Supervision & Administration	1.00	LS	7,000.00	0.00	7,000.00	0.00	7,000.00
(Note: This is an allowance based on historical data from LRH's 202 program.)							

Currency in US dollars

Annual Funding Stream by Federal Fiscal Year
Fully Funded Project Costs - Waveland, Mississippi Coastal Improvement Program
Federal Fiscal Year Calendar
(1 October - 30 September)

	Cost ($1000's)				
Feature Account	FY09	FY10	FY11	FY12	Grand Total
Non-Fully Funded (10/1/2008)					
01 Lands and Damages	0	60	67	7	**134**
02 Relocations		1,252	1,408	469	**3,130**
30 Engineering and Design	341	223	223	106	**893**
31 Supervision and Administration		107	121	40	**268**
Non-Fully Funded (10/1/2008) Total	**341**	**1,643**	**1,819**	**622**	**4,425**
Fully Funded Estimate (Including Inflation)					
01 Lands and Damages	0	63	72	8	**143**
02 Relocations		1,279	1,469	500	**3,248**
30 Engineering and Design	341	232	241	119	**933**
31 Supervision and Administration		111	130	45	**287**
Fully Funded Estimate (Including Inflation) Total	**341**	**1,686**	**1,913**	**671**	**4,611**

Annual Funding Stream by Federal Fiscal Year

Fully Funded Project Costs - Moss Pointe, Mississippi Coastal Improvement Program

Federal Fiscal Year Calendar
(1 October - 30 September)

	Cost ($1000's)					
Feature Account	FY09	FY10	FY11	FY12	FY13	Grand Total
Non-Fully Funded (10/1/2008)						
01 Lands and Damages	0	40	47	40	7	**134**
02 Relocations		1,686	2,950	2,950	843	**8,429**
30 Engineering and Design	311	401	401	401	90	**1,603**
31 Supervision and Administration		129	226	226	65	**646**
Non-Fully Funded (10/1/2008) Total	**311**	**2,256**	**3,624**	**3,617**	**1,004**	**10,811**
Fully Funded Estimate (Including Inflation)						
01 Lands and Damages	0	42	51	45	8	**145**
02 Relocations		1,723	3,077	3,139	915	**8,854**
30 Engineering and Design	311	417	433	450	105	**1,716**
31 Supervision and Administration		134	244	254	75	**708**
Fully Funded Estimate (Including Inflation) Total	**311**	**2,316**	**3,805**	**3,888**	**1,103**	**11,424**

Municipal Facilitiy	Total Floor Area	Cost at PL 1 October 2008 (Rounded to nearest Thousand) Estimated ($)	Contingency (25.0%)	Total ($)	Unit ($/SF)
City Hall & Public Works Facility	7,400	1,349,000	338,000	1,687,000	227.97
Police Station & Courthouse	10,400	3,008,000	752,000	3,760,000	361.54
Fire Station	5,900	1,196,000	299,000	1,495,000	253.39
Recreation Center	17,000	2,847,000	711,000	3,558,000	209.29
<< Additional PED >>	-	249,000	62,000	311,000	n/a
TOTAL	**40,700**	**8,649,000**	**2,162,000**	**10,811,000**	**265.63**

Feature Account	Cost at PL 1 October 2008 (Rounded to nearest Thousand) Estimated ($)	Contingency (25.0%)	Total ($)	Unit Cost ($/SF) (Average for Total Floor Area)
01 - Lands & Damages	107,000	27,000	134,000	3.29
02 - Relocations	6,743,000	1,685,000	8,428,000	207.08
-Substructure	*435,181*	*108,795*	*543,977*	*13.37*
-Shell	*2,077,773*	*519,443*	*2,597,216*	*63.81*
-Interiors	*1,063,169*	*265,792*	*1,328,961*	*32.65*
-Services	*1,974,393*	*493,598*	*2,467,992*	*60.64*
-Equipment & Furnishings	*191,027*	*47,757*	*238,784*	*5.87*
-Special Construction	*0*	*0*	*0*	*0.00*
-Additives	*406,253*	*101,563*	*507,816*	*12.48*
-Site Work	*493,312*	*123,328*	*616,640*	*15.15*
-Associated Items	*102,021*	*25,505*	*127,526*	*3.13*
30 - Engineering & Design	1,282,000	321,000	1,603,000	39.39
-PED per Structure	*1,033,382*	*258,346*	*1,291,728*	*31.74*
-Advance Engineering (Prepare Report)	*197,248*	*49,312*	*246,560*	*6.06*
-Implementation	*34,304*	*8,576*	*42,880*	*1.05*
-Project Closeout	*17,152*	*4,288*	*21,440*	*0.53*
31 - Supervision & Administration	517,000	129,000	646,000	15.87
TOTAL	**8,649,000**	**2,162,000**	**10,811,000**	**265.62**

Note: This cost estimate was originally developed using the RS MEANS Square Foot Costs Cost 2007 Manual, 28th Annual Edition. Subsequent to this initial effort, the estimate has been updated to FY 2009 costs (PL 1 October 2008) using OMB inflation factors. The factors used were 1.072 (7.2%) for labor costs and 1.050 (5.0%) for non-labor costs. The cost model used can be found on pages 220 and 221. USACE-CELRH-EC-CE provided parametric inputs such as building construction type, building size, and a basic description of site work and land requirements. The MEANS model has been replicated in this worksheet so as to readily make the proper adjustments.

Structure Function: City Hall & Public Works Facility

Input Parameters:

Price Level (PL) =	1-Oct-2008
Area of New Building (SF) =	7,400
Length of Building (LF) =	110.00
Number of Stories (EA) =	1
Story Height (FT) =	12.00
Total Area of New Site (ACR) =	1.00
Existing Facility to Be Demolished (SF) =	5,000
Interior Partition Height (FT) =	10.00
Roof / Footprint Ratio (SF/SF) =	1.10

Calculated Parameters:

Width of Building (LF) =	67.00
Perimeter of New Building (LF) =	354
Area-Perimeter Ratio (SF/LF) =	20.90
Width-Length Ratio (LF/LF) =	0.61
Exterior Wall Area (SF) =	4,248
Unit Price, Project Cost ($/SF) =	227.95
Roof Area (SF) =	8,140

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Substructure:							
Standard Foundations	Poured concrete; strip and spread footings	7,400	S.F. Ground	1.51	11,185	1.51	02
Slab on Grade	4" reinforced concrete with vapor barrier and granular base	7,400	S.F. Slab	4.67	34,563	4.67	02
Foundation Excavation	Site preparation for slab and trench for foundation wall and footing	7,400	S.F. Ground	0.25	1,864	0.25	02
Foundation Walls	4' foundation wall	354	L.F. Wall	72.42	25,638	3.46	02
Shell							
Superstructure:							
Floor Construction	N/A	-	S.F. Floor	-	-	-	02
Roof Construction	Metal deck, open web steel joists, beams, interior columns	7,400	S.F. Roof	6.65	49,243	6.65	02
Exterior Closure:							
Walls	Face brick with concrete block backup	2,970	S.F. Wall	27.29	81,050	10.95	02
Exterior Windows	Metal outward projecting	40	Each	661.25	26,450	3.57	02
Exterior Doors	Metal and glass with transom	3	Each	2,335.36	7,006	0.95	02
-	N/A		-	-			
Roofing:							
Roof Coverings	Built-up tar & gravel with flashing; perlite/EPS composite insulation	8,140	S.F. Roof	5.43	44,171	5.97	02
Roof Openings	Skylights, roof hatches	8,140	S.F. Roof	-	-	-	02
Interiors:							
Partitions	Gypsum board on metal studs	4,440	S.F. Partition	8.31	36,909	4.99	02
Interior Doors	Wood solid core	37	Each	546.84	20,233	2.73	02
Fittings	Toilet partitions	7,400	S.F. Floor	0.49	3,651	0.49	02
Stair Construction	N/A	-	Flight	-	-	-	02
Wall Finishes	90% paint, 10% ceramic tile	8,880	S.F. Surface	1.33	11,837	1.60	02
Floor Finishes	70% carpet tile, 15% terrazzo, 15% vinyl composition tile	7,400	S.F. Floor	7.36	54,447	7.36	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Ceiling Finishes	Mineral fiber tile on concealed zee bars	7,400	S.F. Ceiling	4.94	36,583	4.94	02
Services							
Conveying:							
Elevators & Lifts	N/A	-	Each	-	-	-	02
Plumbing:							
Plumbing, fixtures	Kitchen, Toilet and Service Fixtures, supply and drainage	15	Each	2,760.45	41,407	5.60	02
Domestic Water Distribution	Gas fired water heater	7,400	S.F. Floor	1.10	8,155	1.10	02
Rain Water Drainage	Roof drains	8,140	S.F. Roof	0.68	5,553	0.75	02
HVAC							
Energy Supply	N/A		-	-			-
Heat Generating Systems	N/A		-	-			-
Cooling Generating Systems	N/A		-	-			-
Terminal & Package Units	Multizone unit, gas heating, electric cooling	7,400	S.F. Floor	8.33	61,670	8.33	02
Other HVAC Sys. & Equipment	N/A		-	-			-
Fire Protection							
Sprinklers	Wet pipe sprinkler system	7,400	S.F. Floor	2.52	18,641	2.52	02
Standpipes	N/A		-	-			-
Electrical:							
Service & Distribution	400 ampere service, panel board and feeders	7,400	S.F. Floor	1.77	13,126	1.77	02
Lighting & Power	Fluorescent fixtures, receptacles, switches, A.C. and misc. power	7,400	S.F. Floor	9.44	69,826	9.44	02
Communications & Security	Alarm systems, communications systems and emergency lighting	7,400	S.F. Floor	2.52	18,641	2.52	02
Other Electrical Systems	Emergency generator, 15 kW	7,400	S.F. Floor	0.14	1,010	0.14	-
Additives							
Directory Boards	Aluminum 48" x 32"	1	EA	928.90	929	0.13	02
Flagpoles, Complete	Aluminum, 20' high	1	EA	3,280.00	3,280	0.44	02
Smoke Detectors	Duct type	15	EA	461.82	6,927	0.94	02
					-	-	
					-	-	
					-	-	
					-	-	
					-	-	
Storage:							
Safe, Office Type	4-hour rating, 30" x 18" x 18"	1	EA	4,277.12	4,277	0.58	02
Vaults	Door & frame, 4-hour test, 32" door	2	Openings	6,008.96	12,018	1.62	02
Vaults	Time lock movement ; two movements	1	EA	1,941.76	1,942	0.26	02
Electrical:							
Emergency Lighting	25 watt, nickel cadmium battery	8	EA	808.19	6,466	0.87	02
		-	EA	-	-	-	02
Site Work:							
Cut/Fill Site Excavation	Excavation to prepare site for construction	1	LS	52,480.00	52,480	7.09	02
Roads & Parking	Construct New Roads & Parking.	800	SY	20.99	16,794	2.27	02
Site Improvements	Clearing, Grubbing, Hardscaping, and Landscaping	1	LS	31,488.00	31,488	4.26	02
Utilities	Sewage Treatment	-	SY	-	-	-	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Utilities	Telephone Service	-	Job	-	-	-	02
Utilities	Electric Service	-	Job	-	-	-	02
Utilities	Water Filtration & Purification System, w/ Building	-	Job	-	-	-	02
Utilities	Cable Service	-	Job	-	-	-	02
		-	Job	-	-	-	02
Associated Items:							
Demo of Existing Building	Demolish existing building and restore site	5,000	SF	8.40	41,984	5.67	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
	SUB-TOTALS =				861,443	116.41	

Contractor's Markups @ 25.0% =	215,361	29.10
Total Estimate Contract Cost =	1,076,803	145.51
Contingency @ 25% =	269,201	36.38
Total Construction Cost =	1,346,004	181.89
Real Estate Costs to acquire 1 acre(s) of land =	31,488	4.26
Engineering & Design @ 15.3% =	206,249	27.87
Supervision & Administration @ 7.7% =	103,124	13.94

Total Estimated Cost (PL 1-Oct-2008) = $ 1,686,865 $ 227.95

	Cost (PL 1-Oct-2008)		
Feature Account	Estimated	Contingency	Total
01 - Lands & Damages	25,190	6,298	31,488
02 - Relocations	1,076,803	269,201	1,346,004
30 - Engineering & Design	164,999	41,250	206,249
31 - Supervision & Administration	82,499	20,625	103,124
TOTAL	**1,349,492**	**337,373**	**1,686,865**

Therefore, the total estimated cost at PL 1-Oct-2008 to relocate a 7,400 SF city hall & public works facility is $1,687,000 which equates to $228 per SF. This estimate is based on assumed dimensions of 110 LF by 67 LF yielding a perimeter of 354 LF. Also, the structure was assumed to be 1 story tall with an assumed story height of 12.00 FT. The demo of a 5,000 SF existing structure has been included. The purchase and development of 1.00 acre of land is included.

Note: This cost estimate was originally developed using the RS MEANS Square Foot Costs Cost 2007 Manual, 28th Annual Edition. Subsequent to this initial effort, the estimate has been updated to FY 2009 costs (PL 1 October 2008) using OMB inflation factors. The factors used were 1.072 (7.2%) for labor costs and 1.050 (5.0%) for non-labor costs. The cost model used can be found on pages 184 and 185. USACE-CELRH-EC-CE provided parametric inputs such as building construction type, building size, and a basic description of site work and land requirements. The MEANS model has been replicated in this worksheet so as to readily make the proper adjustments.

Structure Function: Police Station & Courthouse

Input Parameters:

Price Level (PL) =	1-Oct-2008
Area of New Building (SF) =	10,400
Length of Building (LF) =	120.00
Number of Stories (EA) =	2
Story Height (FT) =	12.00
Total Area of New Site (ACR) =	0.75
Existing Facility to Be Demolished (SF) =	0
Interior Partition Height (FT) =	10.00
Roof / Footprint Ratio (SF/SF) =	1.10

Calculated Parameters:

Width of Building (LF) =	87.00
Perimeter of New Building (LF) =	414
Area-Perimeter Ratio (SF/LF) =	25.12
Width-Length Ratio (LF/LF) =	0.73
Exterior Wall Area (SF) =	9,936
Unit Price, Project Cost ($/SF) =	361.54
Roof Area (SF) =	5,720

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Substructure:							
Standard Foundations	Poured concrete; strip and spread footings	5,200	S.F. Ground	2.54	13,208	1.27	02
Slab on Grade	4" reinforced concrete with vapor barrier and granular base	5,200	S.F. Slab	4.67	24,288	2.34	02
Basement Excavation	Site preparation for slab and trench for foundation wall and footing	5,200	S.F. Ground	0.25	1,310	0.13	02
Basement Walls	4' foundation wall	207	L.F. Wall	72.42	14,991	1.44	02
Shell							
Superstructure:							
Floor Construction	Open web steel joists, slab form, concrete	5,200	S.F. Floor	10.79	56,107	5.39	02
Roof Construction	Metal deck on open web steel joists	5,200	S.F. Roof	4.26	22,159	2.13	02
Exterior Enclosure:							
Exterior Walls	Limestone with concrete block backup	7,950	S.F. Wall	66.12	525,692	50.55	02
Exterior Windows	Metal horizontal sliding	63	Each	956.19	60,240	5.79	02
Exterior Doors	Hollow metal	10	Each	2,169.52	21,695	2.09	02
-	N/A		-	-			-
Roofing:							
Roof Coverings	Built-up tar & gravel with flashing; perlite/EPS composite insulation	5,720	S.F. Roof	5.94	33,981	3.27	02
Roof Openings	N/A		S.F. Roof	-			02
Interiors:							
Partitions	Concrete block	6,240	S.F. Partition	8.08	50,431	4.85	02
Interior Doors	Single leaf kalamein fire door	52	Each	855.42	44,482	4.28	02
Fittings	Toilet partitions	10,400	S.F. Floor	0.91	9,497	0.91	02
Stair Construction	Concrete filled metal pan	1	Flight	14,484.48	14,484	1.39	02
Wall Finishes	90% paint, 10% ceramic tile	12,480	S.F. Surface	3.32	41,393	3.98	02
Floor Finishes	70% vinyl tile, 20% carpet tile, 10% ceramic tile	10,400	S.F. Floor	4.15	43,118	4.15	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Ceiling Finishes	Mineral fiber tile on concealed zee bars	5,200	S.F. Ceiling	4.94	25,707	2.47	02
Services							
Conveying:							
Elevators & Lifts	One hydraulic passenger elevator	1	Each	69,389.06	69,389	6.67	02
Plumbing:							
Plumbing, fixtures	Toilet and Service Fixtures, supply and drainage	18	Each	2,787.74	50,179	4.82	02
Domestic Water Distribution	Oil fired water heater	10,400	S.F. Floor	2.53	26,307	2.53	02
Rain Water Drainage	Roof drains	5,720	S.F. Roof	1.97	11,287	1.09	02
HVAC							
Energy Supply	Oil fired hot water, wall fin radiation	10,400	S.F. Floor	9.04	93,985	9.04	-
Heat Generating Systems	N/A		-	-			-
Cooling Generating Systems	N/A		-	-			-
Terminal & Package Units	Split systems with air cooled condensing units	10,400	S.F. Floor	9.45	98,243	9.45	02
Other HVAC Sys. & Equipment	N/A		-	-			-
Fire Protection							
Sprinklers	Wet pipe sprinkler system	10,400	S.F. Floor	2.71	28,153	2.71	02
Standpipes	N/A		-	-			-
Electrical:							
Electrical Service/Distribution	400 ampere service, panel board and feeders	10,400	S.F. Floor	1.77	18,448	1.77	02
Lighting & Branch Wiring	Fluorescent fixtures, receptacles, switches, A.C. and misc. power	10,400	S.F. Floor	10.00	104,020	10.00	02
Communications & Security	Alarm systems and emergency lighting	10,400	S.F. Floor	0.66	6,877	0.66	02
Other Electrical Systems	Emergency generator, 15kW	10,400	S.F. Floor	0.19	1,965	0.19	-
Equipment & Furnishings							
Institutional Equipment	lockers, detention rooms, cells, gasoline despensers	10,400	S.F. Floor	12.62	131,208	12.62	02
Vehicular Equipment	Gasoline dispenser system	10,400	S.F. Floor	2.08	21,613	2.08	02
Lockers & Accessories	N/A	-	EA	64.03	-	-	02
							02
Special Construction							
Integrated Construction	N/A	-	S.F. Floor	-	-	-	02
Special Facilities	N/A	-	S.F. Floor	-	-	-	02
Additives							
Cells Prefabricated	5'-6" wide, 7'-8' high, 7'-8' deep	5	EA	11,440.64	57,203	5.50	02
Elevators, Hydraulic Passenger	2 stops, 2500# capacity	1	EA	56,258.56	56,259	5.41	02
Flagpoles, Complete	Aluminum, 20' high	1	EA	3,280.00	3,280	0.32	02
		-	EA	-	-	-	02
Storage:							
Lockers & Accessories	Lockers, steel, single tier, 72"	20	Openings	306.48	6,130	0.59	02
Lockers & Accessories	Locker, bench, lam. maple top only	15	LF	20.99	315	0.03	02
Lockers & Accessories	Pedestals, steel pipe	5	EA	64.03	320	0.03	02
Safe, Office Type	4-hour rating, 30" x 18" x 18"	1	EA	4,277.12	4,277	0.41	02
Shooting Range	Including bullet traps, targets provisions and control	1	EA	32,642.56	32,643	3.14	02
Smoke Detectors	Duct type	21	EA	461.82	9,698	0.93	02
Electrical:							

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Sound System	Amplifier, 250 watts	1	EA	2,230.40	2,230	0.21	02
Sound System	Speaker, trumpet	1	EA	351.62	352	0.03	02
Emergency Lighting	25 watt, nickel cadmium battery	8	EA	808.19	6,466	0.62	03
Site Work:							
Cut/Fill Site Excavation	Excavation to prepare site for construction	1	LS	52,480.00	52,480	5.05	02
Roads & Parking	Construct New Roads & Parking:	800	SY	20.99	16,794	1.61	02
Site Improvements	Clearing, Grubbing, Hardscaping, and Landscaping	1	LS	31,488.00	31,488	3.03	02
Utilities	Sewage Treatment	-	Job	-	-	-	02
Utilities	Telephone Service	-	Job	-	-	-	02
Utilities	Electric Service	-	Job	-	-	-	02
Utilities	Water Filtration & Purification System, w/ Building	-	Job	-	-	-	02
Utilities	Cable Service	-	Job	-	-	-	02
Associated Items:							
Demo of Existing Building	Demolish existing building and restore site	-	SF	8.40	-	-	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
	SUB-TOTALS =				1,944,410	186.96	
				Contractor's Markups @ 25.0% =	486,102	46.74	
				Total Estimate Contract Cost =	2,430,512	233.70	
				Contingency @ 25% =	607,628	58.43	
				Total Construction Cost =	3,038,140	292.13	
				Real Estate Costs to acquire 0.75 acre(s) of land =	23,616	2.27	
				Engineering & Design @ 15.3% =	465,534	44.76	
				Supervision & Administration @ 7.7% =	232,767	22.38	
				Total Estimated Cost (PL 1-Oct-2008) =	**$ 3,760,057**	**$ 361.54**	

	Cost (PL 1-Oct-2008)		
Feature Account	**Estimated**	**Contingency**	**Total**
01 - Lands & Damages	18,893	4,723	23,616
02 - Relocations	2,430,512	607,628	3,038,140
30 - Engineering & Design	372,427	93,107	465,534
31 - Supervision & Administration	186,214	46,553	232,767
TOTAL	**3,008,046**	**752,011**	**3,760,057**

Therefore, the total estimated cost at PL 1-Oct-2008 to relocate a 10,400 SF police station & courthouse is $3,760,000 which equates to $362 per SF. This estimate is based on assumed dimensions of 120 LF by 87 LF yielding a perimeter of 414 LF. Also, the structure was assumed to be 2 stories tall with an assumed story height of 12.00 FT. The demo of no existing structure has been included. The purchase and development of 0.75 acres of land is included.

Note: This cost estimate was originally developed using the RS MEANS Square Foot Costs Cost 2007 Manual, 28th Annual Edition. Subsequent to this initial effort, the estimate has been updated to FY 2009 costs (PL 1 October 2008) using OMB inflation factors. The factors used were 1.072 (7.2%) for labor costs and 1.050 (5.0%) for non-labor costs. The cost model used can be found on pages 126 and 127. USACE-CELRH-EC-CE provided parametric inputs such as building construction type, building size, and a basic description of site work and land requirements. The MEANS model has been replicated in this worksheet so as to readily make the proper adjustments.

Structure Function: Fire Station

Input Parameters:

Price Level (PL) =	1-Oct-2008
Area of New Building (SF) =	5,900
Length of Building (LF) =	98.00
Number of Stories (EA) =	1
Story Height (FT) =	14.00
Total Area of New Site (ACR) =	0.50
Existing Facility to Be Demolished (SF) =	4,720
Interior Partition Height (FT) =	10.00
Roof / Footprint Ratio (SF/SF) =	1.10

Calculated Parameters:

Width of Building (LF) =	60.00
Perimeter of New Building (LF) =	316
Area-Perimeter Ratio (SF/LF) =	18.67
Width-Length Ratio (LF/LF) =	0.61
Exterior Wall Area (SF) =	4,424
Unit Price, Project Cost ($/SF) =	253.38
Roof Area (SF) =	6,490

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Substructure:							
Standard Foundations	Poured concrete; strip and spread footings	5,900	S.F. Ground	2.96	17,463	2.96	02
Slab on Grade	6" reinforced concrete with vapor barrier and granular base	5,900	S.F. Slab	6.19	36,537	6.19	02
Foundation Excavation	Site preparation for slab and trench for foundation wall and footing	5,900	S.F. Ground	0.44	2,601	0.44	02
Foundation Walls	4" reinforced concrete with vapor barrier and granular base	316	L.F. Wall	72.42	22,885	3.88	02
Shell							
Superstructure:							
Floor Construction	N/A	-	S.F. Floor	-	-	-	02
Roof Construction	Metal deck, open web steel joists, beams, interior columns	5,900	S.F. Roof	8.76	51,709	8.76	02
Exterior Closure:							
Walls	Face brick with concrete block backup	3,320	S.F. Wall	16.27	54,012	9.15	02
Exterior Windows	Aluminum insulated glass	14	Each	776.70	10,874	1.84	02
Doors	Single aluminum and glass, overhead, hollow metal	664	S.F. Door	32.54	21,592	3.66	02
-	N/A	-	-	-	-	-	
Roofing:							
Roof Coverings	Built-up tar & gravel with flashing; perlite/EPS composite insulation	6,490	S.F. Roof	5.90	38,283	6.49	02
Roof Openings	Skylights, roof hatches	6,490	S.F. Roof	0.17	1,090	0.18	02
Interiors:							
Partitions	Concrete block	4,859	S.F. Partition	8.08	39,269	6.66	02
Interior Doors	Single leaf hollow metal	12	Each	855.42	10,265	1.74	02
Fittings	Toilet partitions	5,900	S.F. Floor	0.57	3,344	0.57	02
Stair Construction	N/A	-	Flight	-	-	-	02
Wall Finishes	Paint	9,718	S.F. Surface	1.84	17,849	3.03	02
Floor Finishes	50% vinyl tile, 50% paint	5,900	S.F. Floor	2.44	14,367	2.44	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Ceiling Finishes	Fiberglass board on exposed grid, suspended	2,950	S.F. Ceiling	4.94	14,584	2.47	02
Services							
Conveying:							
Elevators & Lifts	N/A	-	Each	-	-	-	02
				-			
Plumbing:				-			
Plumbing, fixtures	Kitchen, Toilet and Service Fixtures, supply and drainage	16	Each	2,668.08	42,689	7.24	02
Domestic Water Distribution	Gas fired water heater	5,900	S.F. Floor	1.58	9,322	1.58	02
Rain Water Drainage	Roof drains	6,490	S.F. Roof	0.72	4,673	0.79	02
HVAC							
Energy Supply	N/A	-	-	-	-	-	-
Heat Generating Systems	N/A	-	-	-	-	-	-
Cooling Generating Systems	N/A	-	-	-	-	-	-
Terminal & Package Units	Rooftop multizone unit system	5,900	S.F. Floor	22.58	133,204	22.58	02
Other HVAC Sys. & Equipment	N/A	-	-	-	-	-	-
Fire Protection							
Sprinklers	Wet pipe sprinkler system	5,900	S.F. Floor	3.24	19,135	3.24	02
Standpipes	N/A	-	-	-	-	-	-
Electrical:							
Service & Distribution	200 ampere service, panel board and feeders	5,900	S.F. Floor	1.35	7,989	1.35	02
Lighting & Power	Fluorescent fixtures, receptacles, switches, A.C. and misc. power	5,900	S.F. Floor	6.13	36,165	6.13	02
Communications & Security	Alarm systems, communications systems and emergency lighting	5,900	S.F. Floor	0.40	2,353	0.40	02
Other Electrical Systems	N/A	-	-	-	-	-	-
Additives							
Appliances:							
Stoves/Ranges	Cooking range, 30" free standing, 1 oven	1	EA	1,968.00	1,968	0.33	02
Stoves/Ranges	Hood for range, 2 speed, vented, 30" wide	1	EA	1,028.61	1,029	0.17	02
Stoves/Ranges	Microwave oven	1	EA	755.71	756	0.13	02
Disposers/Compactors	Compactor, residential, 4-1 compaction	1	EA	760.96	761	0.13	02
Disposers/Compactors	Garbage disposer, sink type	1	EA	294.94	295	0.05	02
Dishwashers	Dishwashers, built-in, 4 cycles	1	EA	1,180.80	1,181	0.20	02
Refrigerators	Refrigerator, no frost, 18-20 CF	1	EA	1,102.08	1,102	0.19	02
Storage:							
Lockers & Accessories	Lockers, steel, single tier, 72"	30	Openings	306.48	9,194	1.56	02
Lockers & Accessories	Locker, bench, lam. maple top only	25	LF	20.99	525	0.09	02
Lockers & Accessories	Pedestals, steel pipe	6	EA	64.03	384	0.07	02
Electrical:							
Sound System	Amplifier, 250 watts	1	EA	2,230.40	2,230	0.38	02
Sound System	Speaker, trumpet	5	EA	351.62	1,758	0.30	02
Site Work:							
Cut/Fill Site Excavation	Excavation to prepare site for construction	1	LS	52,480.00	52,480	8.89	02
Roads & Parking	Construct New Roads & Parking;	600	SY	20.99	12,595	2.13	02
Site Improvements	Clearing, Grubbing, Hardscaping, and Landscaping	1	LS	31,488.00	31,488	5.34	02
Utilities	Sewage Treatment	-	Job	-	-	-	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Utilities	Telephone Service	-	Job	-	-	-	02
Utilities	Electric Service	-	Job	-	-	-	02
Utilities	Water Filtration & Purification System, w/ Building	-	Job	-	-	-	02
Utilities	Cable Service	-	Job	-	-	-	02
Associated Items:							
Demo of Existing Building	Demolish existing building and restore site	4,720	SF	8.40	39,633	6.72	02

Building Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
	SUB-TOTALS =				769,632	130.45	
				Contractor's Markups @ 25.0% =	192,408	32.61	
				Total Estimate Contract Cost =	962,041	163.06	
				Contingency @ 25% =	240,510	40.76	
				Total Construction Cost =	1,202,551	203.82	
				Real Estate Costs to acquire 0.5 acre(s) of land =	15,744	2.67	
				Engineering & Design @ 15.3% =	184,433	31.26	
				Supervision & Administration @ 7.7% =	92,217	15.63	
				Total Estimated Cost (PL 1-Oct-2008) =	**$ 1,494,944**	**$ 253.38**	

	Cost (PL 1-Oct-2008)		
Feature Account	Estimated	Contingency	Total
01 - Lands & Damages	12,595	3,149	15,744
02 - Relocations	962,041	240,510	1,202,551
30 - Engineering & Design	147,546	36,887	184,433
31 - Supervision & Administration	73,773	18,443	92,217
TOTAL	**1,195,955**	**298,989**	**1,494,944**

Therefore, the total estimated cost at PL 1-Oct-2008 to relocate a 5,900 SF fire station is $1,495,000 which equates to $253 per SF. This estimate is based on assumed dimensions of 98 LF by 60 LF yielding a perimeter of 316 LF. Also, the structure was assumed to be 1 story tall with an assumed story height of 14.00 FT. The demo of a 4,720 SF existing structure has been included. The purchase and development of 0.50 acres of land is included.

Note: This cost estimate was originally developed using the RS MEANS Square Foot Costs Cost 2007 Manual, 28th Annual Edition. Subsequent to this initial effort, the estimate has been updated to FY 2009 costs (PL 1 October 2008) using OMB inflation factors. The factors used were 1.072 (7.2%) for labor costs and 1.050 (5.0%) for non-labor costs. The cost model used can be found on pages 144 and 145. USACE-CELRH-EC-CE provided parametric inputs such as building construction type, building size, and a basic description of site work and land requirements. The MEANS model has been replicated in this worksheet so as to readily make the proper adjustments.

Structure Function: Recreation Center

Input Parameters:

Price Level (PL) =	1-Oct-2008
Area of New Building (SF) =	17,000
Length of Building (LF) =	150.00
Number of Stories (EA) =	1
Story Height (FT) =	25.00
Total Area of New Site (ACR) =	2.00
Existing Facility to Be Demolished (SF) =	0
Interior Partition Height (FT) =	10.00
Roof / Footprint Ratio (SF/SF) =	1.10

Calculated Parameters:

Width of Building (LF) =	113.00
Perimeter of New Building (LF) =	526
Area-Perimeter Ratio (SF/LF) =	32.32
Width-Length Ratio (LF/LF) =	0.75
Exterior Wall Area (SF) =	13,150
Unit Price, Project Cost ($/SF) =	209.32
Roof Area (SF) =	18,700

ding Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Substructure:							
Standard Foundations	Poured concrete; strip and spread footings	17,000	S.F. Ground	1.56	26,566	1.56	02
Slab on Grade	4" reinforced concrete with vapor barrier and granular base	17,000	S.F. Slab	4.67	79,402	4.67	02
Basement Excavation	Site preparation for slab and trench for foundation wall and footing	17,000	S.F. Ground	0.15	2,498	0.15	02
Basement Walls	4" foundation wall	526	L.F. Wall	62.98	33,125	1.95	02
Shell							
Superstructure:							
Floor Construction	N/A	-	-	-	-	-	02
Roof Construction	Wood deck on laminated wood arches	17,000	S.F. Roof	17.78	302,264	17.78	02
Exterior Closure:							
Walls	Reinforced concrete block (end walls included)	11,570	S.F. Wall	11.56	133,704	7.86	02
Exterior Windows	Metal horizontal pivoted	42	Each	472.32	19,837	1.17	02
Doors	Aluminum and glass, hollow metal, steel overhead	7	Each	1,651.02	11,557	0.68	02
-	N/A	-	-	-	-	-	
Roofing:							
Roof Coverings	EPDM, 60 mils, fully adhered, polyisocyanurate insulation	18,700	S.F. Roof	4.79	89,501	5.26	02
Roof Openings	N/A	-	-	-	-	-	
Interiors:							
Partitions	Concrete block	3,400	S.F. Partition	8.08	27,479	1.62	02
Interior Doors	Single leaf hollow metal	34	Each	855.42	29,084	1.71	02
Fittings	Toilet partitions	17,000	S.F. Floor	0.35	5,888	0.35	02
Stair Construction	N/A	-	Flight	-	-	-	02
Wall Finishes	50% paint, 50% ceramic tile	6,800	S.F. Surface	8.95	60,881	3.58	02
Floor Finishes	90% hardwood, 10% ceramic tile	17,000	S.F. Floor	13.07	222,148	13.07	02

ding Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Ceiling Finishes	Mineral fiber tile onconcealed zee bars	2,550	S.F. Ceiling	4.94	12,606	0.74	02
Services							
Conveying:							
Elevators & Lifts	N/A	-	Each	-	-	-	-
Escalators & Moving Walks	N/A	-	Each	-	-	-	-
Plumbing:							
Plumbing, fixtures	Toilet and Service Fixtures, supply and drainage	34	Each	2,583.07	87,824	5.17	02
Domestic Water Distribution	Electric water heater	17,000	S.F. Floor	4.62	78,510	4.62	02
Rain Water Drainage	N/A	-	S.F. Roof	-	-	-	-
HVAC							
Energy Supply	N/A	-	-	-	-	-	-
Heat Generating Systems	N/A	-	-	-	-	-	-
Cooling Generating Systems	N/A	-	-	-	-	-	-
Terminal & Package Units	Single zone rooftop unit, gas heating, electric cooling	17,000	S.F. Floor	10.37	176,291	10.37	02
Other HVAC Sys. & Equipment	N/A	-	-	-	-	-	-
Fire Protection							
Sprinklers	Wet pipe sprinkler system	17,000	S.F. Floor	2.52	42,824	2.52	02
Standpipes	N/A	-	-	-	-	-	-
Electrical:							
Electrical Service & Distribution	400 ampere service, panel board and feeders	17,000	S.F. Floor	0.98	16,594	0.98	02
Lighting & Branch Wiring	Fluorescent fixtures, receptacles, switches, A.C. and misc. power	17,000	S.F. Floor	8.37	142,219	8.37	02
Communications & Security	Alarm systems, sound systems and emergency lighting	17,000	S.F. Floor	1.76	29,977	1.76	02
Other Electrical Systems	Emergency generator, 7.5 kW	17,000	S.F. Floor	0.17	2,855	0.17	-
Equipment & Furnishings							
Commercial Equipment	N/A	-	S.F. Floor	-	-	-	02
Institutional Equipment	N/A	-	S.F. Floor	-	-	-	02
Vehicular Equipment	N/A	-	S.F. Floor	-	-	-	02
Other Equipment	Bleachers, sauna, weight room	-	S.F. Floor	5.77	-	-	02
Special Construction							
Integrated Construction	N/A	-	S.F. Floor	-	-	-	02
Special Facilities	N/A	-	S.F. Floor	-	-	-	02
Additives							
Gym divider Curtain, Mesh top	Manual roll-up	2,833	S.F. Curtain	11.97	33,902	1.99	02
Gym Mats	2" Nylon	850	S.F. Mat	7.19	6,111	0.36	02
Gym Mats	1-1/2" wall pads	660	S.F. Mat	9.39	6,200	0.36	02
Gym Mats	1" wrestling mats	850	S.F. Mat	6.35	5,398	0.32	02
Scoreboard	Basketball, one side	1	EA	7,347.20	7,347	0.43	02
Basketball Backstop	Swing up, wall mtd.	2	EA	6,848.64	13,697	0.81	02
Storage:							
Lockers & Accessories	Lockers, steel, single tier, 72"	25	Openings	306.48	7,662	0.45	02
Lockers & Accessories	Locker, bench, lam, maple top only	20	LF	20.99	420	0.02	02
Lockers & Accessories	Pedestals, steel pipe	10	EA	64.03	640	0.04	02
Electrical:							
Sound System	Amplifier, 250 watts	1	EA	2,230.40	2,230	0.13	02

ding Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
Sound System	Speaker, trumpet	1	EA	351.62	352	0.02	02
Emergency Lighting	25 watt, nickel cadmium battery	6	EA	808.19	4,849	0.29	02
Site Work:							
Cut/Fill Site Excavation	Excavation to prepare site for construction	1	LS	52,480.00	52,480	3.09	02
Roads & Parking	Construct New Roads & Parking:	600	SY	20.99	12,595	0.74	02
Lockers	2 tier, 72" total w benchs 15 openings, 30' of bench	1	LS	31,488.00	31,488	1.85	02
Site Improvements	Clearing, Grubbing, Hardscaping, and Landscaping	-	SY	-	-	-	02
Utilities	Sewage Treatment	-	Job	-	-	-	02
Utilities	Telephone Service	-	Job	-	-	-	02
Utilities	Electric Service	-	Job	-	-	-	02
Utilities	Water Filtration & Purification System, w/ Building	-	Job	-	-	-	02
Utilities	Cable Service	-	Job	-	-	-	02
Associated Items:							
Demo of Existing Building	Demolish existing building and restore site	-	SF	8.40	-	-	02

ding Element	Construction Task	Quantity	Unit	Unit Cost	Total Direct Cost (PL 1 Oct 2007)	Cost Per S.F.	Feature Account
	SUB-TOTALS =				1,819,019	107.00	

Contractor's Markups @ 25.0% =	454,755	26.75
Total Estimate Contract Cost =	2,273,774	133.75
Contingency @ 25% =	568,443	33.44
Total Construction Cost =	2,842,217	167.19
Real Estate Costs to acquire 2 acre(s) of land =	62,976	3.70
Engineering & Design @ 15.3% =	435,513	25.62
Supervision & Administration @ 7.7% =	217,757	12.81
Total Estimated Cost (PL 1-Oct-2008) =	**$ 3,558,463**	**$ 209.32**

	Cost (PL 1-Oct-2008)		
Feature Account	**Estimated**	**Contingency**	**Total**
01 - Lands & Damages	50,381	12,595	62,976
02 - Relocations	2,273,774	568,443	2,842,217
30 - Engineering & Design	348,410	87,103	435,513
31 - Supervision & Administration	174,205	43,551	217,757
TOTAL	**2,846,770**	**711,693**	**3,558,463**

Therefore, the total estimated cost at PL 1-Oct-2008 to relocate a 17,000 SF recreation center is $3,558,000 which equates to $209 per SF. This estimate is based on assumed dimensions of 150 LF by 113 LF yielding a perimeter of 526 LF. Also, the structure was assumed to be 1 story tall with an assumed story height of 25.00 FT. The demo of no existing structure has been included. The purchase and development of 2.00 acres of land is included.

PROGRAMMING & PLANNING COST ESTIMATE

(Updated July 2008)

PROJECT:	**Mississippi Coastal Improvement Project "MsCIP"**	ITEM NO.	Structure W01	DATE	11-Dec-07
LOCATION:	**Hancock County, MS**	SHEET NO.	N/A	OF	
		PREPARED:	Don Whitmore	CHECKED:	
WORK ITEM:	***Waveland Proposed Pilot Project***	BASIS of ESTIMATE:	Survey Data (attached)		
		FILE NAME:	Waveland_Field_Data.pdf		

DESCRIPTION	Quantity	Unit	Unit Price*	ESTIMATED AMOUNT
Raise Structure on Segmented Piles, 6.24 FT above low ground**	3,000	SF	77.95	$233,852
Misc.- Storage Area	300	SF	15.93	$4,780
Aerator System	0.1	EA	8,910.30	$891
Asbestos Abatement	1	EA	1,782.07	$1,782
Temporary Housing	1	LS	1,782.07	$1,782
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0

* Price includes all contractor markups, but no contingency.

** Reference Pat Davie of Davie Shoring. Pat said that costs for a turnkey job would normally run about $70/SF to raise a slab foundation house 4 FT abouve low ground. He stated that the price would increase from there based on

Current Contract Cost, FY 07			243,087
CONTINGENCY	@	**25.0%**	60,772
01 Account, Lands & Damage	Real Estate	**LS**	5,360
02 Account, Relocations	Relocations	**LS**	0
xx Account, Environmental Mitigation		**LS**	0
30 Account, Plan, Engr.& Design	@	**6.6%**	16,080
31 Account, Constr. Management	@	**4.4%**	10,720
ESCALATION, FY-08	@	**0.0%**	0
			$336,019
			rounded
TOTAL PROJECT COST, Oct 2008			**$336,000**

Notes.

Estimate Excludes:

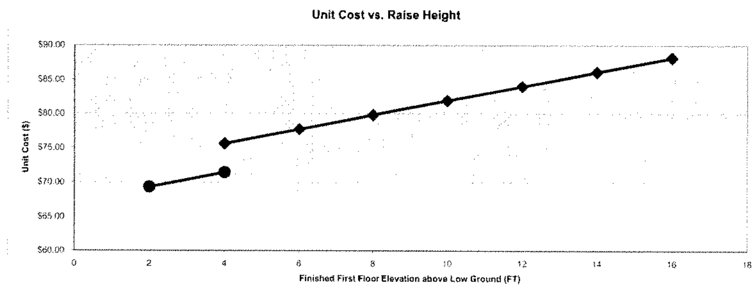
Operational & Maintenance Cost
Permanent Infrastructure
Relocations (pipelines, etc.)
Equipment (by Other Appropriations)

	STRUCTURE DATA								
Estimate Number	Structure Number	Parcel Number	LENGTH	WIDTH	First Floor Area	FFE Above LGE	Foundation Type	Aerator Factor	Asbestos Factor
1	W01	162K-0-10-006.000	60	50	3,000	6.24	Slab	0.1	1.0
2	W02	162K-0-10-007.002	42	28	1,176	6.57	Slab	0.1	1.0
3	W03	162K-0-10-007.001	40	28	1,120	6.00	Slab	0.1	1.0
4	W04	162K-0-10-007.003	28	42	1,176	6.00	Slab	0.1	1.0
5	W05	162G-0-03-300.006	24	40	960	6.00	Slab	0.1	1.0
6	W06	162G-0-03-300.004	24	40	960	6.00	Slab	0.1	1.0
7	W07	162G-0-03-300.003	24	36	864	6.00	Slab	0.1	1.0
8	W08	162G-0-03-300.002	24	40	960	6.00	Slab	0.1	1.0
9	W09	162G-0-03-300.000	28	40	1,120	6.00	Slab	0.1	1.0
10	W10	162G-0-03-283.001	30	50	1,500	5.00	Slab	0.1	1.0
11	W11	162G-0-03-283.000	28	40	1,120	5.00	Slab	0.1	1.0
12	W12	162G-0-03-300.001	42	30	1,260	6.00	Slab	0.1	1.0
13	W13	162G-0-03-300.005	40	20	800	6.00	Slab	0.1	1.0
14	W14	162G-0-03-293.002	45	30	1,350	6.00	Slab	0.1	1.0
15	W15	162G-0-03-293.001	30	42	1,260	5.42	Slab	0.1	1.0
16	W16	162G-0-03-294.000	36	50	1,800	6.00	Slab	0.1	1.0
17	W17	162G-0-03-295.000	24	35	840	6.00	Slab	0.1	1.0
18	W18	162G-0-03-291.000	20	42	840	5.57	Slab	0.1	1.0
19	W19	162G-0-03-290.000	20	42	840	6.00	Slab	0.1	1.0
20	W20	162F-1-04-163.000	25	35	875	6.00	Slab	0.1	1.0
21	W21	162F-1-04-162.000	25	35	875	6.00	Slab	0.1	1.0
22	W22	162F-1-04-161.000	25	35	875	6.00	Slab	0.1	1.0
23	W23	162F-1-04-158.000	45	30	1,350	6.00	Slab	0.1	1.0
24	W24	162F-1-04-157.000	60	30	1,800	6.32	Slab	0.1	1.0
25	W25	162F-1-04-156.000	20	40	800	6.19	Slab	0.1	1.0

							CONSTRUCTION COSTS, PL 1 October 2008								NON-CONSTRUCTION COSTS, PL 1 October 2008				
Estimate Number	Structure Number	Gross Floor Area	Foundation Type	FFE [illegible]	[illegible] Factor	Asbestos Factor	Raise	[illegible]	[illegible] System	[illegible] Abatement	Temporary Housing	Sub-Total	Contingency (35%)	Total Construction (02 Acct)	Real Estate (01 Acct)	PED (30 Acct)	S&A (31 Acct)	Total Non-Construction	TOTAL COST
1	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32,160	330,017
2	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	126,840	[illegible]	[illegible]	[illegible]	32,160	158,600
3	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	120,323	[illegible]	[illegible]	[illegible]	32,160	152,483
4	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	125,732	[illegible]	[illegible]	[illegible]	32,160	157,922
5	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	104,783	[illegible]	[illegible]	[illegible]	32,160	136,943
6	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	104,783	[illegible]	[illegible]	[illegible]	32,160	136,943
7	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	95,458	[illegible]	[illegible]	[illegible]	32,160	127,619
8	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	104,783	[illegible]	[illegible]	[illegible]	32,160	136,943
9	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	120,323	[illegible]	[illegible]	[illegible]	32,160	152,483
10	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	149,288	[illegible]	[illegible]	[illegible]	32,160	181,448
11	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	112,873	[illegible]	[illegible]	[illegible]	32,160	145,032
12	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	133,921	[illegible]	[illegible]	[illegible]	32,160	166,081
13	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	89,243	[illegible]	[illegible]	[illegible]	32,160	121,403
14	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	142,632	[illegible]	[illegible]	[illegible]	32,160	174,822
15	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	126,983	[illegible]	[illegible]	[illegible]	32,160	159,143
16	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32,160	218,626
17	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	93,126	[illegible]	[illegible]	[illegible]	32,160	125,286
18	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	86,477	[illegible]	[illegible]	[illegible]	32,160	118,637
19	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	93,126	[illegible]	[illegible]	[illegible]	32,160	125,286
20	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	96,528	[illegible]	[illegible]	[illegible]	32,160	128,688
21	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	96,528	[illegible]	[illegible]	[illegible]	32,160	128,688
22	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	96,528	[illegible]	[illegible]	[illegible]	32,160	128,688
23	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	142,632	[illegible]	[illegible]	[illegible]	32,160	174,822
24	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	187,174	[illegible]	[illegible]	[illegible]	32,160	219,374
25	[illegible]	[illegible]	Slab	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	89,447	[illegible]	[illegible]	[illegible]	32,160	121,602
			TOTALS				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	804,000	3,933,603

Height of Raise (FT)	Unit Price (< 4 FT)	Unit Price (>= 4 FT)
2	$ 69.30	
4	$ 71.40	$ 75.60
6		$ 77.70
8		$ 79.80
10		$ 81.90
12		$ 84.00
14		$ 86.10
16		$ 88.20

For x < 4'	y = mx + b	$m_{<4'}$ 1.05	$b_{<4'}$ 67.20	**Therefore, the Unit Price per SF = 1.05 x Height of raise + 67.20 for heights of raise less than 4 FT.**
For x >= 4'	y = mx + b	$m_{>=4'}$ 1.05	$b_{>=4'}$ 71.40	**Therefore, the Unit Price per SF = 1.05 x Height of raise + 71.40 for heights of raise equal to or greater than 4 FT.**



Estimated Total Project Costs
Moss Pointe and Waveland, Mississippi Coastal Improvement Program
PL 1 October 2008 (FY 2009)

Pilot	FeatID	FeatAccount	December 2007	January 2008	July 2008	Grand Total
Moss Pointe			**9,966,000**	**290,000**	**555,177**	**10,811,177**
	01	Lands & Damages	128,000	-	5,824	133,824
	02	Relocations	8,031,000	-	397,913	8,428,913
	30	Engineering & Design	1,205,000	290,000	107,575	1,602,575
	31	Supervision & Administration	602,000	-	43,865	645,865
Waveland			**3,730,765**	**458,000**	**236,014**	**4,424,779**
	01	Lands & Damages	125,000	-	9,000	134,000
	02	Relocations	2,980,765	-	149,038	3,129,803
	30	Engineering & Design	375,000	458,000	59,976	892,976
	31	Supervision & Administration	250,000	-	18,000	268,000
Grand Total			**13,696,765**	**748,000**	**791,191**	**15,235,955**

Notes:
1. The December 2007 effort amounted to the development of the original estimate.
2. Costs were added in January 2008 to account for LRH's participation during the implementation of the projects.
3. In July 2008, the cost estimates were inflated from PL 1 October 2007 to PL 1 October 2008 (FY 2008 to FY 2009)

MsCIP - Waveland FP and Moss Point Relocations Pilot Projects

Study/Report Costs

Waveland Floodproofing Pilot	Rate per hour fully loaded	Total Hours	Labor costs	Total Travel & Per Diem	Other Admin costs	Total cost
GS-13 Gene	$ 121.00	480	$ 58,080	$ 2,957		
GS-13 Don	$ 105.00	480	$ 50,400	$ 2,045		
GS-13 RE	$ 121.00	240	$ 29,040	$ 2,045		
GS-13 Gus	$ 121.00	480	$ 58,080	$ 2,045		
GS-12 LRH	$ 100.00	480	$ 48,000	$ 2,045		
GS-12 (Mobile District)	$ 100.00	300	$ 30,000	$ -		
Subtotal (Labor and Travel)			$ 273,600	$ 11,139	5,000	
Contingency 10%			$ 27,360	$ 1,114		
Total			$ 300,960	$ 12,253	55,000	$ 318,213
						Rounded $318,000

Moss Point Relocations Pilot	Rate per hour fully loaded	Total Hours	Labor Costs	Total Travel and per diem	Other Admin costs	Total Cost
GS-13 Gene	$ 121.00	400	$ 48,400	$ 1,935		
GS-13 Don	$ 105.00	400	$ 42,000	$ 1,023		
GS-13 Wyatt	$ 129.00	400	$ 51,600	$ 1,023		
GS-12 LRH	$ 100.00	400	$ 40,000	$ 1,023		
GS-12 (Mobile District)	$ 100.00	200	$ 20,000	$ -		
Subtotal			$ 202,000	$ 5,004	2,500	
Contingency 10%			$ 20,200	$ 500		
Total			$ 222,200	$ 5,504	$2,500	$ 230,204
						Rounded $ 230,000

Implementation Costs

Waveland MS Floodproofing Pilot

Tasks	Labor	Per Diem	Mileage	Subtotals	Rounded	Total Implementation Cost
Public Workshop with Homeowners, contractor, AE's and public officials and program sign-up - onetime event	$ 8,800.00	$ 1,460.00	$ 922.00	$ 11,182.00	$ 12,000.00	
Site Inspections and meeting with Homeowners and AE's	$ 8,800.00	$ 1,460.00	$ 922.00	$ 11,182.00	$ 12,000.00	
Execution of FP agreements, site inspections of next groupings of structures and or inspections during construction and coordination of FP	$ 8,800.00	$ 1,460.00	$ 922.00	$ 11,182.00	$ 12,000.00	
Final Inspections, closeouts and disbursement of payment and coordination with local officials	$ 8,800.00	$ 1,460.00	$ 922.00	$ 11,182.00	$ 12,000.00	
					$ [illegible]	
					25 structures being implemented in three groups requires a minimum of 3 sets of trips	$ 120,000.00

Moss Point Relocations Pilot Implementation Costs

Tasks	Labor	Per Diem	Mileage	Subtotals	Rounded
Initial Trip to coordinate Plans with Municipal Officials (3 people)	$ 14,400.00	$ 3,066.00	$ 922.00	$ 18,388.00	$ 18,000.00
Meetings with AE and Contractors (2 people)	$ 9,600.00	$ 1,460.00	$ 922.00	$ 11,982.00	$ 12,000.00
Final Inspection trip (2 people)	$ 7,680.00	$ 876.00	$ 922.00	$ 9,478.00	$ 9,500.00
				Total Implementation cost	$ 39,500.00
					Say $40,000

Summary costs	Waveland Floodproofing	Moss Point Relocations	Total
Report costs	$ 318,000	$ 230,000	$ 548,000
Implementation Costs	$ 120,000	$40,000	$ 160,000

Project Closeout Report	$ 20,000	$20,000		$ 40,000		
Totals	$ 458,000	$ 290,000		**$ 748,000**		

Remarks
Waveland study will include consideration of various raising heights above the regulatory BFE.
Moss Point study will consider minimum BFE level of protection and 500 year level depending on available relocation sites.


US Army Corps
of Engineers
Mobile District
June 2009
Mississippi Coastal
Improvements Program
(MsCIP)
Hancock, Harrison, and Jackson
Counties, Mississippi
Comprehensive Plan and Integrated Programmatic
Environmental Impact Statement
VOLUME 7 - APPENDIX G: RISK
APPENDIX H: BARRIER ISLANDS
APPENDIX I: RESERVED
APPENDIX J: RESERVED
APPENDIX K: PLAN FORMULATION
APPENDIX L: COMMENTS AND RESPONSES
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US Army Corps
of Engineers
Mobile District
June 2009
Mississippi Coastal
Improvements Program
(MsCIP)
Hancock, Harrison, and Jackson
Counties, Mississippi
APPENDIX G RISK APPENDIX
MsCIP

Appendix G

Risk Appendix

Mississippi Coastal Improvements Program (MsCIP)

Comprehensive Plan Report
and
Integrated Environmental Impact Statement

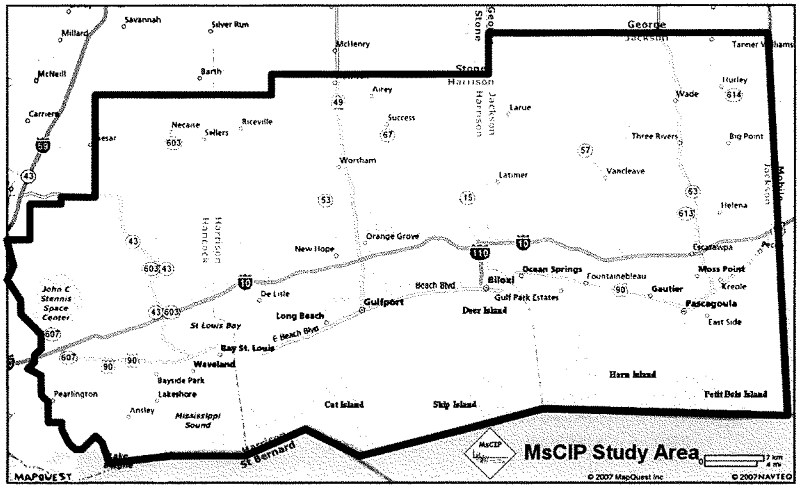
AUGUST 2008

**Planning, Environmental, Engineering, and Economics Sections; Mobile District;
Planning, Environmental and Economics Sub-CoPS; South Atlantic Division; and,
Engineer Research and Development Center
U.S. Army Corps of Engineers**

FOREWORD

This document is one of a number of technical appendices to the *Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan and Integrated Feasibility Report and Environmental Impact Statement.*

The *Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan Integrated Feasibility Report and Environmental Impact Statement* provides systems-based solutions and recommendations that address: hurricane and storm damage reduction, ecosystem restoration and fish and wildlife preservation, reduction of damaging saltwater intrusion, and reduction of coastal erosion. The recommendations contained in the Main Report/EIS also provide measures that aid in: greater coastal environmental and societal resiliency, regional economic re-development, and measures to reduce long-term risk to the public and property, as a consequence of hurricanes and coastal storms. The recommendations cover a comprehensive package of projects and activities, which treat the environment, wildlife, and people, as an integrated system that requires a multi-tiered and phased approach to recovery and risk reduction, irrespective of implementation authority or agency.



The MsCIP Study Area

The purpose of the Comprehensive Plan Report is to present, to the Congress of the United States, the second of two packages of recommendations (i.e., the first being the "interim" recommendations funded in May 2007, and the second, this "final" response, as directed by the Congress), directed at recovery of vital water and related land resources damaged by the hurricanes of 2005, and development of recommendations for long-term risk reduction and community and environmental resiliency, within the three-county, approximately 70 mile-long coastal zone, including Mississippi Sound and its barrier islands, of the State of Mississippi.

This appendix, the Main Report/EIS, and all other appendices and supporting documentation, were subject to Agency Technical Review (ATR) and an Independent External Peer Review (IEPR). Both review processes will have been conducted in accordance with the Corps "Peer Review of Decision Documents" process, has been reviewed by Corps staff outside the originating office, conducted by a Regional and national team of experts in the field, and coordinated by the National Center of Expertise in Hurricane and Storm Damage Protection, North Atlantic Division, U.S. Army Corps of Engineers.

The report presents background on the counties that comprise the Mississippi coastline most severely impacted by the Hurricanes of 2005, their pre-hurricane conditions, a summary of the effects of the 2005 hurricane season, problem areas identified by stakeholders and residents of the study area, a summary of the approach used in analyzing problems and developing recommendations directed at assisting the people of the State of Mississippi in recovery, recommended actions and projects that would assist in the recovery of the physical and human environments, and identification of further studies and immediate actions most needed in a comprehensive plan of improvements for developing a truly resilient future for coastal Mississippi.

This Risk Appendix contains a discussion of the risk-based planning approach used by the MsCIP study team, for the analysis and characterization to the public and stakeholders of risks associated with existing and future without-project conditions, the potential risks, uncertainties and consequences associated with potential problem-solving measures (also known as "with-project" conditions), the incorporation of, and use of a stakeholder-involved risk-aware "weighting" process, referred to as a "Risk-Informed Decision Framework", or RIDF, that elicited stakeholder preferences on specific metrics used in the analysis, evaluation, and comparison of alternatives; and finally, the incorporation and consideration of all information received as stakeholder input, and a full consideration of all factors, in the screening of the final array of alternatives, and ultimately, the selection of recommendations contained in the Main Report/EIS.

The use of the Risk-Informed Decision Framework (RIDF) in the Mississippi Coastal Improvements Project, comprehensive plan development, was done better inform and involve stakeholders in the planning process, with the ultimate goal of creating solutions to reduce the potential for continued residual risk from flood and storm surge inundation, coastal wetlands loss and degradation, erosion, and saltwater intrusion, in ways that would promote greater resiliency in the future. The RIDF provided procedures that have aided decision makers in identifying planning objectives, performance metrics, and stakeholder priorities, in a transparent format. The RIDF utilizes techniques from the fields of risk and decision analysis to simply and clearly show decision makers and the public the risks, costs and consequences of flood control, coastal restoration, and hurricane protection by accommodating multiple objectives, conflicting stakeholder values, both qualitative and quantitative assessments of performance, and uncertainty in the natural, social, and economic environment.

Each appendix functions as a complete technical document, but is meant to support one particular aspect of the feasibility study process. However, because of the complexity of the plan formulation process used in this planning study, the information contained herein should not be used without parallel consideration and integration of all other appendices, and the Main Report/EIS that summarizes all findings and recommendations.

EXECUTIVE SUMMARY

This Risk Appendix outlines the approach taken in the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan study effort, to evaluating, communicating, and incorporating consideration of risks, uncertainties, and consequences, in the comparison, screening, and selection of alternative plans.

The MsCIP approach utilized a multi-step process, which incorporated:

1) Evaluation and assessment of potential risks, uncertainties and consequences associated with existing conditions, future "without-project" conditions, and numerous "with-project" plans;

2) Application of the Corps' "Risk and Uncertainty" analysis procedures, which assess and incorporate probabilities and uncertainties in the technical evaluation process;

3) Education of the public, agencies and other interests, in the inherent risks, uncertainties and potential consequences or any course of action, (including doing nothing), in various public forums and workshops;

4) Incorporation of the newly-implemented "Risk-Informed Decision Framework" (RIDF) methodology, that considered the factors (or "metrics") of greatest importance to the stakeholders and technical evaluators, solicitation of public and agency input on potential plans, and their prioritization (i.e., "Stakeholder Preferences") and potential selection of Locally-Preferred Plans, and finally;

5) Comparison of alternative plans, including all risk factors, in a "System of Accounts" format, screening, and selection of Federally-recommended plans, as part of the full consideration of all economic, environmental, technical, societal, risk factors, and explicit requirements (including Congressional) directed at the study effort.

Risk Analysis using this set of procedures was a new approach for a Corps of Engineers study, as it required a more thorough assessment of all the risk factors involved, but also integration of more public and agency involvement in the discussion of, and prioritization of risk factors, in a better articulated explanation of how risk may determine alternative recommendation in the plan selection process, in some cases with clear direction resulting from the risks and consequences possible under various plans.

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PART 1 – EVALUATION AND ASSESSMENT OF RISKS, UNCERTAINTIES, AND CONSEQUENCES

Evaluation and assessment of risk, uncertainties and consequences was the first step in the MsCIP risk assessment process.

The MsCIP team used standard conventions and definitions used in risk assessment, although some leeway was incorporated into the overall use of risk terminology, due to the on-going use of certain terms, such as "risk", in ways that are much broader than those in the risk assessment arena might use them. The broadest use of the term "Risk", as used in the MsCIP study, could be characterized as the potential for negative outcomes, under certain action and no-action conditions, both now and in the future. The public uses this term to refer to their own personal risks, be it risks to their health, income, residences, cultural integrity, or community, and thus, the MsCIP team had to adopt this convention. The MsCIP team also had to similarly use this term to characterize risks of environmental outcomes, such as functional damage to ecosystems, loss of species (or multiple species) integrity and survival, and many other negative outcomes. Because the public and stakeholders had to understand the nature of their risks and potential consequences for a large range of possible future conditions that by their nature were, in many cases, only qualitatively defined, the use of "risk" in this broader framework was by necessity, adopted.

"Risk ", in a narrower definition also used in the MsCIP study, could be defined as the probability of a certain outcome, under certain conditions. An example of this would be the probability (5% in any given year, for example) of a certain damage level, expressed in dollars ($10,000,000, for example), occurring in the event of a certain-sized hurricane-caused surge and wave depth and extent event. This could be expressed both as a probability of a certain outcome given a certain event, but can also be expressed as a sum of damages expected under a range of events, such as an average of all damages expected, over a time horizon such as fifty years, were nothing to be done to prevent those damages.

Risk, or the probability of certain events or outcomes, was more readily defined for some type of outcomes, such as hurricane-caused surge and wave depth, than for other types of outcomes, such as human reactions, or the number of deaths caused, by an oncoming hurricane. For some factors, probabilities were defined quantitatively; in many other cases, they could only be estimated qualitatively, as a range of possible outcomes.

The first phase of the data collection and characterization step involved the collection of all data associated with human and environmental outcomes to past hurricanes in this area of the Gulf Coast. Data collected included damages caused by various events, environmental conditions created by hurricanes and other large storm events, salinity and freshwater effects, erosion effects, and the human impacts of events, including deaths caused, human health and mental health effects, and human and environmental responses over time, economic (local, regional and national outcomes), response over time to relative sea level rise and developmental pressures, income and minority community responses, and many other probabilistic outcomes.

Most difficult to determine, were the hypothetical outcomes, both positive and negative, expected under future "without-project" conditions. This involved the development of outcomes in consideration of the numerous technical and environmental studies being developed in the course of the MsCIP study. In some cases, "risk" data were developed in express direction to expected negative outcomes resulting from certain course of action, particularly those concerned with human impacts as a result of certain plans being implemented.

The MsCIP study team used data furnished by a broad range of sources, to define risks associated with a large number of existing and future conditions, including the "No-Action", and future with-project conditions for a large number of alternative plans. Many potential outcomes were developed in detailed discussions as to the nature of conditions under many future scenarios, and what the effects might be on the large array of resources. This data was used to populate a database, summarized in the System of Accounts tables given in the Main Report, where both quantitative and qualitative determinations of positive and negative outcomes are displayed, and the risks, uncertainties, and potential consequences of each, are compared.

"Uncertainty" as used in Corps studies, refers to the degree of uncertainty expressed by technical evaluators (or even in some cases by the public), that a certain outcome will occur under and certain condition. This could be expressed as a range of outcomes given a certain condition, an example being that experts predict that water depth may be as much as 20 feet and as little as 12 feet deep, under circumstances of a certain-magnitude hurricane event, at a certain location. In many cases, however, uncertainties regarding a certain outcome, could only be expressed in the broadest of terms. An example of this would the uncertainties regarding threats to human life under conditions such as the implementation of ring levees or surge barriers. It is, of course, highly uncertain as to how human beings will react to the approach of a hurricane event, given the uncertainties as to landfall, intensity, and other factors. This is complicated by the intervention of certain conditions like a surge barrier, behind which people may feel "protected", or alternatively, very mush at risk. These determinations of risk and uncertainty played a large, although heavily dependent on qualitative assessment, role in decision-making on the part of the Federal response.

Assessment and characterization of risk and uncertainties led, as expected, to their incorporation in the technical analyses conducted under the MsCIP study effort, the second step of this process.

PART 2 – TECHNICAL RISK AND UNCERTAINTY

The second step of the risk assessment process was the incorporation of what the Corps refers to as "Risk and Uncertainty Analysis". This aspect of the risk analysis focuses on the evaluation of technical aspects of potential plans that includes not only estimation of probabilities of certain outcomes, but also the determination of uncertainties in any estimated outcome. Technical risk and uncertainty also included a measure of risk and uncertainty inherent in cost estimation.

Risk and uncertainty analysis is a comprehensive, statistically-based approach directed at identifying and incorporating uncertainties associated with key factors that are inherent in the determination of plans addressing flooding, hurricane surge, waves, and other destructive events, as well as those comprising key elements of ecosystem restoration planning, economic analysis, and cost estimating.

Key factors evaluated in the Risk and Uncertainty analysis conducted under the MsCIP study include: evaluating uncertainties in estimating surge (water surface) elevations and wave contributions to surge height, the extent of surge inundation by frequency of event (by use of multiple event modeling), the first floor elevation of structures, the magnitude of damages to both structures and contents, and risks in the estimation of costs associated with future events, including those of project or program implementation. In addition, uncertainty was an inherent factor in the environmental processes used to identify possible restoration sites. This uncertainty was primarily related to the scale of the existing data used to populate the GIS based Spatial Decision Support System (SDSS). In addition there is uncertainty in the benefit evaluation system used, the Hydrogeomorphic Methodology (HGM), due to the lack of time to completely ground truth the sites in question.

Risk and Uncertainty is a rigorous part of Corps of Engineer analyses and the planning process. Engineer Regulation 1105-2-101 defines risk as, "The probability an area will be flooded, resulting in undesirable consequences," and uncertainty as, "A measure of imprecision of knowledge of parameters and functions used to describe the hydraulic, hydrologic, geotechnical, and economic aspects of a project plan."

For the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan, both risk and uncertainty played a vital role throughout the planning and selection process as well as the work conducted by each of the various technical aspects. While this section will paint a broad picture of the application of techniques used to address risk and uncertainty, the engineering, environmental, real estate, and economic appendices go into greater detail on how each discipline addressed these issues.

Estimation of risks and uncertainties associated with the MsCIP Comprehensive Plan study area, as defined by Congress, included estimation of physical outcomes across the three coastal counties of Mississippi; Hancock, Harrison and Jackson Counties from west to east respectively. Hancock, Harrison, and Jackson Counties include over 1,361 square miles, roughly 100 square miles larger than the state of Rhode Island and populations of 40,421, 171,875, and 130,577 respectively. The Maximum Probable Intensity (MPI) footprint, or the estimate of the maximum surge footprint, includes over 138,000 residential and commercial structures. Within these areas, surge from Hurricane Katrina significantly destroyed (50% or more structural damage) 32,446 structures, with another 15,000 to 25,000 sustaining moderate to minor damage. The sheer magnitude and scale of this area, along with the extent of the damage sustained, set the stage for much larger degrees of risk and uncertainty than exist in typical Corps Feasibility Studies.

Forecasting future scenarios is an important part of the Corps planning process. In order to evaluate the true risk and impacts over the period of analysis, all forecasts were created based on historic and existing information, as well as quantitative and qualitative assessments of what is most likely to happen within the study area in the future. One method used was to identify the 'most likely' future, or the best guess about what may happen based on observed variables and assumptions of both natural and human behaviors. Another method used was to conduct scenario planning, where multiple future scenarios are created in order to evaluate what would happen if observed variables or assumptions do not happen as projected. Scenario planning attempts to answer the 'what if' questions that arise when making forecasting assumptions and predictions. For the MsCIP Comprehensive Study, the former method was chosen due to the size, scope, and complexity of the overall analysis, but with scenario testing used for the multiple possible futures possible under sea level rise and re-development possibilities.

The use of scenario planning allowed the MsCIP PDT the ability to evaluate the impacts of large uncertainties such as varying redevelopment types and the effects of relative sea level rise. Four future without-project scenarios were developed based on two redevelopment scenarios and two potential relative sea level rise scenarios. Redevelopment was assumed as either the rebuilding of the study area exactly as it was pre-Hurricane Katrina (residential redevelopment) or rebuilding similar to pre-Hurricane Katrina levels except for the vast waterfront coastline, which would rebuild as either condominiums or casinos (commercial redevelopment). Sea level rise and land surface subsidence have been taken into account as part of this study and is reported as "relative sea level rise" which accounts for both as a single value.

After the identification of the four potential future without-project scenarios, the next step was the evaluation of those scenarios using hydrodynamic and economic models. Hydraulic and hydrologic modeling efforts by a team of USACE, FEMA, NOAA, private sector and academic researchers have been working toward the definition of a new system for estimating hurricane inundation probabilities. Their work includes the use of multiple models such as the Planetary Boundary Layer Model (TC-96) which evaluates wind pressure fields, the Wave Attenuation Model (WAM) which evaluates offshore waves, the STWAVE near shore wave model, and the Advanced Circulation (ADCIRC) model which incorporates output from the other models into the storm surge modeling effort. Modeling inputs included a storm suite of over 150 storms covering ranges in variable drivers such as central pressure, radius to maximum winds, and forward speed. Outputs of the models were statistically analyzed using a modified Joint Probability Method with Optimal Sampling (JPM-OS). The underlying concept of the JPM-OS methodology is to provide a good estimate of the surge in as small a number of dimensions as possible, while retaining the effects of additional dimensions by including a ε term within the estimated Cumulative Distribution Function (CDF) for surges. The ε term is considered to include, at a minimum, tides, random variations in the Holland B parameter, track variations not captured in storm set, model errors (including errors in bathymetry, errors in model physics, etc.), and errors in wind fields due to neglect of variations not included in the Planetary Boundary Layer model winds. More detail on the JPM-OS method can be found in the Engineering Appendix (Appendix E)

The output of the JPM-OS modeling effort was provided to the Mobile District Engineering Division for the estimation of exceedence probability functions that were incorporated into the Hydrologic Engineering Center – Flood Damage Analysis (HEC-FDA) program. The HEC-FDA program uses risk-based analysis methods for evaluating flood damage and flood damage reduction alternatives. The program relies on hydrologic, hydraulic, and economic data input. Uncertainties in these data are input and used by the model for computing expected annual damages. HEC-FDA input variables that include uncertainty are the exceedence probability functions, depth damage relationships, first floor elevations, and structure and content values. The program's risk-based analysis methods conform to Corps of Engineers policy regulations. Outputs of the HEC-FDA program for each of the future without-project scenarios are detailed in the Economic Appendix

(Appendix B), and are included in the Risk Informed Decision Framework (RIDF) process outlined in later sections of this appendix.

Although there is some uncertainty associated with the environmental restoration evaluation process it is felt that these uncertainties are within the ranges of values used within the various models. The environmental team ground-truthed a portion of each of the recommended sites to ensure that the proposed restoration activities would be achievable and that the restored sites would function as designed. The project is also recommending implementation of an adaptive management process and monitoring for all the proposed environmental restoration project elements. The techniques being proposed for restoration, e.g. excavation of fill, filling man-made ditches, mowing and burning etc., are tried and true proven restoration methods. Further only sites that contain wetland soils and are in the near vicinity of water courses are proposed for restoration. This will increase the probability of success for those sites proposed for restoration as tidal fringe wetlands.

Risk and Uncertainty outcomes were also incorporated into the risk database, summarized in the System of Accounts tables given in the Main Report. All of this data was used in the later phases of risk assessment and screening of alternatives ultimately leading to the selection of recommended actions.

PART 3 – EDUCATION OF STAKEHOLDERS

The third step of the risk assessment process was the characterization of risk, in terms that everyone could understand, and the dissemination of this information to the stakeholders. This was an extremely important part of the process, since the stakeholders were so interested in the planning process and its potential outcomes, but was doubly important given their participation in the next phase of study, the integration of Risk-Informed Decision Framework (RIDF), in which they would very actively participate, and for which good information on risks, uncertainties, and consequences was so important.

Data on the potential risks and consequences of the no-action plan, and the large number of potential alternatives plans addressing numerous identified problem areas and sites, was assembled and discussed by members of the study team, agency participants, and technical experts in each field. It was recognized that much of the data would be confusing to the public, and in fact, could actually cause the public to believe information that would run contrary to what the study team believed was in the best interests of the stakeholders. Key among this was the discussion of "protection" and "100-year" storms. Both these concepts have negative outcomes, as the public interprets them. Early attempts at educating the stakeholders on risk led the study team to the recognition that the public would believe themselves to be "protected" from storm events, in the event of various structural plans being implemented, and that the concept of a "100-year level of protection" was guaranteed to result in many members of the public believing that a "100-year" hurricane was only possible 100 years in the future, since "we just had one."

The study team convened a group to re-characterize event frequency, and the risks and consequences of various magnitude events occurring, in terms that everyone in the study area could relate to. Frequency-inundation mapping was developed, to characterize events in terms of their depth, and re-occurrence based on past events the community has suffered, rather than an arbitrary frequency that the public could not understand. Risks and consequences associated with many other factors were also discussed and then re-characterized in simple, easy to understand terms.

The MsCIP team shared this information, through a series of public workshops. These workshops are discussed in greater detail in the Public Involvement Appendix. The key outcome of the initial public workshops, in regards to the education of stakeholders on risk issues, was the better understanding of all the factors involved in the eventuality of either no action, or any number of potential plans, in terms of both human and environmental impacts, risks or probabilities of certain outcomes given certain circumstances, and what that might mean to the individuals concerned, their institutions, and communities.

Education of the stakeholders was understood to be one important part of the process, but requiring additional tools to enlist greater public participation, and expression of stakeholder preferences on plans, in a risk-aware environment. This led to the following step in this process.

PART 4 – RISK INFORMED DECISION FRAMEWORK

Risk-Informed Decision Framework (RIDF) refers to a guided process by which stakeholders can "weigh in" on their preferences, in regards to concepts, measures, and alternative plans, in a manner that leads to group decision-making, at least in regards to stakeholder preferred actions.

The RIDF provides a robust and comprehensive approach toward identifying plans that the public and agencies feel best achieve the particular goals and objectives of that population, and draws from current practice in the fields of multi-criteria decision analysis (MCDA) and risk and uncertainty analysis. The RIDF is solidly grounded in and supports the Corps of Engineers' six-step planning process closely, in augmenting this planning process by incorporating specific techniques and methods from risk analysis and MCDA, to solicit and incorporate public and agency preferences in plan evaluation and selection. RIDF is the logical next step in the process of evaluating and incorporating risk in the planning process, in that it involves the public in the evaluation of potential measures that might be used to address problems, further educates them to the risks and consequences of each potential action, including a No-Action scenario, and allows them to weigh-in on a prioritization process that allows local decision-makers to see what the public desires, and how that might be used in the determination of preferred plans and activities.

The RIDF enhances the level of communication and collaboration among decision-makers and stakeholders by providing structured opportunities for interaction. The RIDF uses the information gained through the initial steps involving the public and agencies to develop a set of factors of importance (referred to as "metrics") in the analysis of specific problems and sites, for which the Study team then develops units of measurement for which to compare each metric later in the process, and solicits publically-, and agency-determined "weights" or preferences that reflect stakeholder priorities. This provides an analytically sound, defensible, and quantitative approach to aid in local decision-making. In this way, decision outcomes can more adequately satisfy the interests, values, and objectives of most importance to the individuals and agencies weighing in on each alternative plan.

Metrics evaluated during the MsCIP RIDF process included measures of the total cost as well as local implementation costs, acres of habitat lost or restored by No-Action or various restoration plan opportunities, potential impacts to physical and mental health, impacts to cultural integrity, regional economic well-being, residual risks and risk of failure of a given plan, and other factors.

The RIDF also incorporated information about uncertainty into the decision process and facilitates discussion of residual risks, which include the expected damages or consequences resulting from events, and which might result even in the event of construction of a large project or implementation of a program. Accurate forecasts about the future are difficult, and decisions that ignore these uncertainties may differ from and perform less well than those that do not. The MsCIP RIDF process also incorporated uncertainty originating from two additional sources of particular importance in this area, those of relative sea level rise (resulting from both global sea level rise and sinking of the land relative to the sea's surface) and the future potential patterns of re-development. Information about these uncertainties manifests itself in the outcome metrics and in the scoring and ranking of alternative plans.

Ultimately, the optimality of a prospective public and agency decision outcome depends upon values and beliefs that can vary across different stakeholder groups. Since the MsCIP decision process involves a broad spectrum of stakeholders, the RIDF evaluates the sensitivity of the recommendations to these values and beliefs to help decision-makers and stakeholders understand the prioritization of factors by any group or individual, and their emotion about each plan and its potential outcomes. Use of RIDF may further help to identify what additional studies may be needed and what communication and negotiation efforts could be improved. These efforts help to build confidence in the planning process, involve the public and agencies in decision-making, and may enhance commitment to selected alternatives. RIDF also educates and obtains input on the role that adaptive management can play in the long-term outcomes of potential plans, and incorporates public and agency input on monitoring and maintaining the performance of projects and programs over longer planning horizons.

Detailed discussion on the models used, the creation, selection and characterization of metrics used, and the outcome of stakeholder weighting sessions, is contain in the attachment to this appendix.

PART 5 – COMPARISON, SCREENING, AND CONSIDERATION OF RISK, IN THE PLAN SELECTION PROCESS

The Fifth and final phase of Risk Analysis in the MsCIP Study process involved comparison of no-action and alternative plans, in a side-by-side trade-off presentation of plan outcomes, potential inherent and residual risks, associated with various No-Action and with-project scenarios, through display in a System of Accounts format. Screening of alternatives, by use of the System of Accounts tables, and consideration of all apparent risks, uncertainties, potential consequences and outcomes, led to screening of alternatives, weighing of the outcomes of each alternative, and identification, by Stakeholders, of a "Stakeholder-Preferred" (where applicable) Plan, and "Federally-recommended" courses of action for each problem area, based on the best-balance of objective outcomes, achievement of high cost-effectiveness, and inclusion as a key element of a comprehensive package of recommendations, directed at achieving a lower-risk, higher sustainability environment. The goal of this process was to generate a full range of tiered recommendations aimed at achievement of the study objectives, and identification of those measures for immediate or longer-term action as a result of the decision document being acted upon by Congress.

The Accounts displayed and used in this final part of the process, included the standard four accounts identified in the USACE Plan Formulation Guidance: "National Economic Development" (NED), "Regional Economic Development" (RED), "Environmental Quality" (EQ), "Other Social Effects" (OSE). In addition a "Risk" (RISK) account was added to fully identify the inherent risks associated with no action or the implementation of any one of the measures. The System of Accounts tables also display the Stakeholder Preference "scores" resulting from the public and agency RIDF process, as well as a final discussion of the selection result, based on those factors of greatest importance in that selection, for both "Stakeholder", and "Federally-Recommended" actions.

The stakeholder "scores" from the public and agency RIDF process, presented in the System of Accounts tables, resulted from a summary of the most recent series of public/agency workshops, and the application of the multi-criteria decision analysis. The summary of those scores was presented as the Stakeholder Preference score, for each of the final array of plans. This number rates each alternative, in concept, as a percentage of a theoretical "perfect plan" (in the eyes of the stakeholder group). The higher the score reflects the stakeholder belief that the alternative provides the best fit to their value judgments of the metrics. In other words, the higher the score, the more acceptable the alternative should be to that stakeholder group.

Because the stakeholders may possess very different life experiences and also may not have possessed full information on the nature and magnitude of potential risks associated with any plan of action, the MsCIP study application of the planning process required that the Corps' study team have ultimate responsibility for a Federally-recommended plan selection, based on full consideration of risk factors and potential consequences of plan implementation. This was determined to be especially important in the consideration of alternatives that had potentially negative outcomes under various future scenarios.

The study team engaged Corps and outside experts, to characterize residual or inherent risks, and to potentially recommend actions based on these over-riding criteria, in meeting the original mission as detailed by the Congress. This final part of the process was considered to be the key final level of input to the planning process, particularly in this high-risk situation.

An example of the evaluation, comparison, and rationale leading identification of plans recommended for implementation, as formulated to deal with a particular problem set at a specific site, is illustrated below, and also provided for each recommendation, within the body of the Main Report.

The Barrier Islands of the Gulf Coast form an important attribute in the system of islands, water bodies and mainland features of the coast of Mississippi. They function as a barrier to saltwater intrusion, maintaining a delicate salinity balance on which many species depend for survival within Mississippi Sound. The barrier islands attenuate wave and surge height. They also provide for a host of unique environmental conditions, both terrestrial and aquatic, and create unique conditions on which mainland values depend. Most of the barrier islands are managed by the National Park Service, with some being designated Wilderness Areas, and protected by stringent regulation.

Analysis of the effects of hurricanes Katrina, Rita, and others indicated a large number of problems caused by their erosion and degradation. Loss of the barrier islands has led to increased salinity within Mississippi Sound, increased potential wave and surge effects within the study area, and loss of aquatic species viability. Degradation of the many functions and values provided by the barrier islands, and their identification as a large focus of study effort, lead to the creation of a large number of potential measures by which restoration of the islands, and protection of resources might be achieved.

Many potential measures would be intrusive, and would violate Wilderness Act protections, due their active interference in natural processes. The list of potential measures was rapidly screened by the joint interagency sub-committee created to evaluate barrier islands options, to a shorter list containing only a No-Action Plan, restoration of the pre-hurricane island footprint plan (Plan A), a sand replenishment plan (Plan C), restoration of Ship Island breach only (Plan G), and a combination plan that would address sand replenishment and repair of Ship Island (Plan H).

Data on costs, benefits (both monetary damages prevented and ecological damages prevented), environmental quality issues, societal effects, "Stakeholder Preference" scores generated during the RIDF stakeholder involvement process, and risk factors assessment, were entered into the System of Accounts table shown below. This information was discussed with stakeholders, ranging from members of the public, to the State, and Federal agencies.

The final phase of risk incorporation in the MsCIP planning process, leading to plan selection for the barrier islands element, began with the side-by-side comparison of No-Action and action plan outcomes, with no one factor taking precedence. Examination of possible outcomes indicated that Plan H appeared to provide the most complete, effective, efficient and acceptable alternative plan. Plan H would achieve a high degree of restoration benefit, at less than half the cost of Plan A, and virtual identical damage reduction and protection of fisheries. It is a more complete solution than plans C or G, particularly in regards to protection of fisheries and restoration of tidal and non-tidal habitat. Plan H also would create positive monetary net benefits, demonstrating its cost-effectiveness (one of the primary charges given by Congress), with damage reduction benefits of approximately $18.8 million annually, protection of fisheries benefits of approximately $44 million annually, and restoration of 456 acres of tidal, and 694 acres of non-tidal habitat. Plan H would provide similar cultural, environmental quality, societal, and community benefits, at a lesser cost than Plan A. Stakeholder preference scores for Plan A and Plan H were almost identical, with Plan H receiving a marginally higher mean score. Evaluation of risks indicate that Plans A and H would provide similar reductions in several risk factors, including reduction of residual damages (primarily to reduction of wave effects on mainland development), will be minimally impacted by relative sea level rise, and have a low risk of failure (of plan outcomes). While no plan provides for significant positive benefits to life and safety, those are not factors that would be influenced strongly by this element of the comprehensive plan, but by others included in the package of recommendations.

Weighing of all considered factors above provided a clear indicator that Plan H provides the best balance, and indeed, the greatest number and magnitude of positive outcomes, of all plans considered, including the No-Action Plan.

System of Accounts table for Barrier Islands

Ecosystem Restoration and Hurricane and Storm Damage Reduction

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi					
Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.					
Item	**No Action**	**Plan A**	**Plan C**	**Plan G**	**Plan H**
A. PLAN DESCRIPTION	No Federal Action	Restore Island Footprint	Replenish Sand in Littoral Zone (Off-Shore & Inland River Sand Source)	Restoration of Ship Island Breach	Combination of C + G
B. IMPACT ASSESSMENT					
1. National Economic Development					
a. Beneficial Impacts					
(1) Damages Prevented	$0	$18,866,000	$10,468,000	$7,616,000	$18,866,000
(2) Emergency Costs Avoided	$0				
(3) Recreation	$0	$466,000	$117,000	$466,000	$466,000
(4) Total Beneficial Impacts	None.	$19,332,000	$10,585,000	$8,082,000	$19,332,000
b. Adverse Impacts					
(1) Project Cost	$0	$942,200,000	$147,400,000	$181,400,000	$328,800,000
(2) Interest During Construction	$0	$119,317,000	$18,667,000	$22,972,000	$41,639,000
(3) Average Annual First Cost	N/A	$58,376,000	$9,133,000	$11,239,000	$20,372,000
(4) Annual O&M	$0	$0	$0	$0	$0
(5) Total Avg. Annual Costs	$0	**$58,376,000**	**$9,133,000**	**$11,239,000**	**$20,372,000**
2. Environmental Quality (EQ)					
(1) Ecosystem Restoration	No benefit	Restoration of 644 acres of tidal habitat and 2036 acres of nontidal habitat.	Restoration of 326 acres of tidal habitat and 217 acres of nontidal habitat.	Restoration of 130 acres of tidal habitat and 477 acres of nontidal habitat.	Restoration of 456 acres of tidal habitat and 694 acres of nontidal habitat.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
(2) Protection of Fisheries	**Loss of $43,618,143** in average annual fishery landings	Avoidance of **$43,618,143** in lost fishery landings.	Avoidance of **$6,542,721** in lost fishery landings.	Avoidance of **$21,809,072** in lost fishery landings.	Avoidance of **$43,618,143** in lost fishery landings.
(3) Water Circulation	Area would become more open Gulf in nature as islands erode	No anticipated effect.	No anticipated effect.	No anticipated effect.	No anticipated effect.
(4) Noise Level Changes	No change in noise levels	Temporary increase in noise levels during construction	Temporary increase in noise levels during construction	Temporary increase in noise levels during construction	Temporary increase in noise levels during construction
(5) Public Facilities	Loss of the barrier islands would result in loss of National Parks	National Parks would be preserved.	National Parks would be enhanced by supplemental sand supply.	National Parks would be enhanced by supplemental sand supply.	National Parks would be preserved.
(6) Aesthetic Values	Continued degradation of aesthetic values	Significant aesthetic improvement	Moderate aesthetic improvement	Moderate aesthetic improvement	Significant aesthetic improvement
(7) Natural Resources	Continued degradation of islands and loss of function of MS Sound.	Significant reduction in loss of island and function of MS Sound.	Minor reduction in loss of island and function of MS Sound.	Moderate reduction in loss of island and function of MS Sound.	Significant reduction in loss of island and function of MS Sound.
(8) Biological Resources	Continued degradation and loss of biological resources.	Significant improvement in biological resources.	Moderate improvement in biological resources.	Moderate improvement in biological resources.	Significant improvement in biological resources.
(9) Air Quality	No anticipated effect on air quality	Air emission would be *de minimus*	Air emission would be *de minimus*	Air emission would be *de minimus*	Air emission would be *de minimus*
(10) Water Quality	Water quality is anticipated to deteriorate with future loss of the island system (salinity increase will decrease size of estuarine zone).	Temporary negative impacts to water quality due to construction but overall long-term improvements to water quality are anticipated.	Temporary negative impacts to water quality due to construction but overall long-term improvements to water quality are anticipated.	Temporary negative impacts to water quality due to construction but overall long-term improvements to water quality are anticipated.	Temporary negative impacts to water quality due to construction but overall long-term improvements to water quality are anticipated.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
(11) Public Services	Possible increase in interruption of services as islands continue to erode	Increased stability of barrier islands would reduce likelihood of interruption of public services.	Increased stability of barrier islands would reduce likelihood of interruption of public services.	Increased stability of barrier islands would reduce likelihood of interruption of public services.	Increased stability of barrier islands would reduce likelihood of interruption of public services.
(12) Cultural and Historical Preservation	Alternative would result in future loss of important cultural resources at Ship Island.	Alternative would preserve cultural and historical artifacts, including Fort Massachusetts and the French Warehouse.	Alternative would provide some reduction in impact to cultural and historical artifacts, including Fort Massachusetts and the French Warehouse.	Alternative would preserve cultural and historical artifacts, including Fort Massachusetts and the French Warehouse.	Alternative would preserve cultural and historical artifacts, including Fort Massachusetts and the French Warehouse.
(13) Total Quality of the Environment	Significant negative impact on the total quality of this environment if the islands erode away	Significant positive impacts on the total quality of environment (i.e. future production of Mississippi Sound)	Significant positive impacts on the total quality of environment (i.e. future production of Mississippi Sound)	Significant positive impacts on the total quality of environment (i.e. future production of Mississippi Sound)	Significant positive impacts on the total quality of environment (i.e. future production of Mississippi Sound)
3. Regional Economic Development (RED)					
(1) Impact on Sales Volume	No impact to the local economy.	Increase of **$2,289,546,000** in additional sales volume.	Increase of **$358,182,000** in additional sales volume.	Increase of **$440,802,000** in additional sales volume.	Increase of **$798,984,000** in additional sales volume.
(2) Impact on Income	Negative impact to individuals involved in fishing industry as islands erode and MS Sound environment changes.	Increase of **$480,984,800** in additional local income.	Increase of **$75,246,410** in additional local income.	Increase of **$92,603,120** in additional local income.	Increase of **$167,849,530** in additional local income.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
(3) Impact on Employment	Negative impact to individuals involved in fishing industry as islands erode and MS Sound environment changes.	Increase of **14,100** new jobs.	Increase of **2,206** new jobs.	Increase of **2,714** new jobs.	Increase of **4,920** new jobs.
(4) Tax Changes	Possible negative impacts as islands erode and chance of storm damage increases	None	None	None	None
4. Other Social Effects (OSE)					
a. Beneficial Impacts					
(1) Security of Life, Health, and Safety	Continued risks to life, health and safety	Significant decrease in risks to life, health and safety.	Moderate decrease in risks to life, health and safety.	Moderate decrease in risks to life, health and safety.	Significant decrease in risks to life, health and safety.
(2) Community Cohesion	Negative impacts as islands continue to erode and damages from waves and storms increase above the existing level.	Positive impact as community observes coastal resources being restored and stability of barrier islands and MS Sound increased.	Positive impact as community observes coastal resources being restored and stability of barrier islands and MS Sound increased.	Positive impact as community observes coastal resources being restored and stability of barrier islands and MS Sound increased.	Positive impact as community observes coastal resources being restored and stability of barrier islands and MS Sound increased.
(3) Tax Values	Negative impacts as islands erode and chance of storm damage increases	Moderate increase in tax values due to decreased risk to properties.	Small increase in tax values due to decreased risk to properties.	Small increase in tax values due to decreased risk to properties.	Moderate increase in tax values due to decreased risk to properties.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
(4) Community Growth	Could have negative impact on growth as islands continue to erode	Moderate positive impact to community growth	Small positive impact to community growth	Small positive impact to community growth	Moderate positive impact to community growth
(5) Property Values	Negative impacts as islands erode and chance of storm damage increases	Moderate increase in property values due to decreased risk to properties.	Small increase in property values due to decreased risk to properties.	Small increase in property values due to decreased risk to properties.	Moderate increase in property values due to decreased risk to properties.
(6) Displacement of Businesses	Potential impacts to businesses from increased risk of surge damage.	Reduced risk of displacement of businesses.	Reduced risk of displacement of businesses.	Reduced risk of displacement of businesses.	Reduced risk of displacement of businesses.
(7) Public Facilities	Negative impacts to public facilities from increased risk of surge damage.	Reduced risk to public facilities.	Reduced risk to public facilities.	Reduced risk to public facilities.	Reduced risk to public facilities.
(8) Injurious Displacement of Farms	N/A	N/A	N/A	N/A	N/A
b. Preservation of life	Not anticipated to contribute to loss of life.	Not anticipated to contribute to loss of life.	Not anticipated to contribute to loss of life.	Not anticipated to contribute to loss of life.	Not anticipated to contribute to loss of life.
C. PLAN EVALUATION					
1. Contributions to Planning Objectives					
a. Flood, Hurricane and/or Storm Damage Reduction	Increased risk in damage reduction from further degradation of islands.	Significant avoidance of increased risk.	Minor avoidance of increased risk.	Moderate avoidance of increased risk.	Significant avoidance of increased risk.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
b. Recovery of lost environmental resources	Alternative will result in continued loss of environmental resources.	Barrier Island restoration will accrue unquantified benefits.	Barrier Island restoration will accrue unquantified benefits.	Barrier Island restoration will accrue unquantified benefits.	Barrier Island restoration will accrue unquantified benefits.
2. Response to Planning Constraints					
a. Avoid environmental impacts and minimize induced damages	Continued loss of pre-Katrina environmental resources.	Beneficial effect on environmental resources.	Beneficial effect on environmental resources.	Beneficial effect on environmental resources.	Beneficial effect on environmental resources.
b. Institutional Acceptability	Is not supported by state or local government	Is supported by local and state governments	Is supported by local and state governments	Is supported by local and state governments	Is supported by local and state governments
3. Response to Evaluation Criteria					
a. Acceptability	NO	No, does not meet all Federal policies and regulations (i.e. Wilderness Act)	YES	YES	YES
b. Completeness	NO	YES	NO, it does not avoid all of the future degradation.	NO, it does not avoid all of the future degradation.	YES
c. Effectiveness	NO	YES	NO, not a completely effective solution.	NO, not a completely effective solution.	YES
d. Efficiency (Cost-Effectiveness; i.e., most efficient use of Federal and Non-Federal Funds)	NO	No, over 2 1/2 times as expensive as plan H	No, less efficient than plan A and H.	No, less efficient than plan A and H.	YES, most efficient / cost effective plan.
e. Integration	N/A	Seamless addition to system.	Seamless addition to system.	Seamless addition to system.	Seamless addition to system.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
f. Reversibility	This issue does not apply	Alternative could be reversible, given means to remove sand.	Alternative could not be reversible, given placement in open-water.	Alternative could be reversible, given means to remove sand.	A portion of this alternative could not be reversible, given placement in open-water.
4. Stakeholder Preference Score (From MCDA weightings analysis)					
a. Summary Score	**15.53%**	**71.69%**	**62.28%**	**41.70%**	**72.03%**
Cluster Group A	27.16%	67.62%	63.08%	47.53%	73.93%
Cluster Group B	18.82%	70.58%	63.58%	45.57%	73.93%
Cluster Group C	11.83%	74.03%	63.92%	41.81%	73.58%
Cluster Group D	4.30%	74.51%	58.55%	31.90%	66.66%
b. Stakeholder Preference	All groups ranked this plan lowest	Plan ranked very high, but less than H.	Plan ranked lower than A and H.	Plan ranked lowest of all action plans.	Plan ranked highest overall
D. Implementation Responsibility	Does not have any implementation responsibilities	Elements would be joint Federal/Non-Federal implementation responsibility.	Elements would be joint Federal/Non-Federal implementation responsibility.	Elements would be joint Federal/Non-Federal implementation responsibility.	Elements would be joint Federal/Non-Federal implementation responsibility.
E. State and other Non-Federal Coordination	Would require no State or other Non-Federal coordination activities	Would require significant State or other Non-Federal coordination activities	Would require significant State or other Non-Federal coordination activities	Would require significant State or other Non-Federal coordination activities	Would require significant State or other Non-Federal coordination activities
F. Risk Evaluation					
1. Risk and Vulnerabilities					
a. Risk of Failure	N/A	Low	Moderate	Moderate	Low

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
b. Residual Risk	All barrier islands will overtop during large surge events, and will not provide significant reduction of surge and waves.	All barrier islands will overtop during large surge events, and will not provide significant reduction of surge. Plan A would provide a significant reduction to waves.	All barrier islands will overtop during large surge events, and will not provide significant reduction of surge and waves.	All barrier islands will overtop during large surge events, and will not provide significant reduction of surge and waves.	All barrier islands will overtop during large surge events, and will not provide significant reduction of surge. Plan A would provide a moderate reduction to waves.
c. Reliability	N/A	Plan A would provide a moderate level of reliability, would be resistant to damage from storm events, and would not require significant maintenance.	This plan would provide a low level of reliability, would receive damage from storm events, and would require significant maintenance.	This plan would provide a low level of reliability, would receive damage from storm events, and would require significant maintenance.	Plan A would provide a moderate level of reliability, would be resistant to damage from storm events, and would not require significant maintenance
d. Relative Sea Level Rise	Problems will be substantially exacerbated by an increasing relative rise of sea level	This Plan will be minimally impacted by an increasing relative rise of sea level over the period of analysis	This Plan will be moderately impacted by an increasing relative rise of sea level over the period of analysis	This Plan will be moderately impacted by an increasing relative rise of sea level over the period of analysis	This Plan will be minimally impacted by an increasing relative rise of sea level over the period of analysis
e. Risk of Ecosystem Damage	Ecosystem damage will continue to accrue at a rate at least that of recent history with substantial negative	Risk of ecosystem damage will be minimal throughout the period of analysis.	Risk of ecosystem damage will be moderate throughout the period of analysis.	Risk of ecosystem damage will be moderate throughout the period of analysis.	Risk of ecosystem damage will be minimal throughout the period of analysis.

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
	outcomes.				
f. Risk to Life and Safety	Significant threats to Life and Safety from storm surge will continue to rise due to continued deterioration of the Barrier Islands.	Significant threats to Life and Safety from storm surge will still exist, but this plan will provide the least risk to life and safety.	Significant threats to Life and Safety from storm surge will still exist, but this plan will provide less risk to life and safety than the No Action Plan.	Significant threats to Life and Safety from storm surge will still exist, but this plan will provide less risk to life and safety than the No Action Plan and Plan C.	Significant threats to Life and Safety from storm surge will still exist, but this plan will provide the least risk to life and safety, except for Plan A.
g. Risk to Mental and Physical Health	Significant threats to Mental and Physical Health from storm surge will continue to rise due to continued deterioration of the Barrier Islands.	Significant threats to Mental and Physical Health from storm surge will still exist, but this plan will provide the least risk to Mental and Physical Health.	Significant threats to Mental and Physical Health from storm surge will still exist, but this plan will provide less risk to Mental and Physical Health than the No Action Plan.	Significant threats to Mental and Physical Health from storm surge will still exist, but this plan will provide less risk to Mental and Physical Health than the No Action Plan and Plan C.	Significant threats to Mental and Physical Health from storm surge will still exist, but this plan will provide the least risk to Mental and Physical Health, except for Plan A.
2. Recommendations and Preferences					

Problem Area: Barrier Island Restoration, Hancock, Harrison, and Jackson Counties, Mississippi

Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.

Item	No Action	Plan A	Plan C	Plan G	Plan H
a. Federal Recommendation					This Plan has the highest NED benefits, substantial RED benefits, substantial EQ benefits, the greatest achievement of OSE outcomes, does not violate any local, state, or Federal statues, laws, and regulations, and is the most cost effective and efficient recommendation of the Barrier Island component of the Comprehensive Plan
b. Stakeholder Preference					This Plan has the highest stakeholder preference score, and creates a low risk environment.

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ATTACHMENT 1

Risk-Informed Decision Framework for the Mississippi Coastal Improvements Program (MsCIP)

Prepared for Mobile District, US Army Corps of Engineers

January 2008

Engineer Research and Development Center
U.S. Army Corps of Engineers
Vicksburg, MS

Table of Contents

GLOSSARY

Cluster: A set of data that share a common trait.

Eustatic: Changes in sea-level that are caused by global forces such as climate change.

Isostatic: Changes in sea-level that are caused by local forces such as land subsidence and glacial rebound.

Measure: A component of plans for risk reduction. Categories of risk reduction measures include structural, non-structural and coastal restoration.

Metric: A parameter for quantifying the performance of plans in respect to planning objectives.

Natural variability: The heterogeneity of some attribute in a population.

Plan: Any detailed scheme, program, or method worked out beforehand to accomplish an objective. A plan could incorporate structural, non-structural, and/or coastal restoration measures or combination of measures for risk reduction. Plans emerge from the plan formulation process.

Residual risk: The portion of risk remaining after the recommended plan has been implemented.

Risk: Risk is fully defined by an event probability, a set of factors on which that event probability is conditioned (scenarios), and the consequences of that event.

Uncertainty: A lack of knowledge that originates from an incomplete understanding of the structure and function of natural or manmade systems, the choice of a model to represent those systems, and the choice of the input values for the parameters of the chosen model.

Variance: A measure of statistical dispersion, averaging the squared distance of its possible values from the expected value (mean). Variance captures the mean's scale or degree of being spread out.

EXECUTIVE SUMMARY

This part of the Risk Appendix outlines a Risk-Informed Decision Framework (RIDF) for the Mississippi Coastal Improvements Program (MsCIP) effort. The RIDF provides a robust and comprehensive approach toward identifying plans that the public and agency stakeholders feel best achieve the particular goals and objectives of that population and draws from current practice in the fields of multi-criteria decision analysis (MCDA) and risk/uncertainty analysis. The RIDF is solidly grounded in and follows closely the Corps of Engineers six-step planning process closely, but augments this planning process by incorporating specific techniques and methods from risk analysis and MCDA. There are numerous advantages to this approach.

The RIDF enhances the level of communication and collaboration among decision-makers and stakeholders by providing structured opportunities for interaction. The RIDF uses the information gained through this process to define a set of decision objectives, outcome metrics, and preference weights that reflect stakeholder priorities and provide an analytically sound, defensible, and quantitative approach to decision making. In this way, decision outcomes can more adequately satisfy the interests, values, and objectives germane to the decision. The RIDF also incorporates information about uncertainty into the decision process and facilitates discussion of residual risks, which are the expected damages from storms that will remain after a storm defense is built. Accurate forecasts about the future are difficult, and decisions that ignore these uncertainties may differ from and perform less well than those that do not. Therefore, the RIDF explicitly considers uncertainty originating from two sources including relative sea level rise and the future pattern of development. Information about these uncertainties manifests itself in the outcome metrics and in the scoring and ranking of alternative plans.

The optimality of a prospective decision outcome depends upon values and beliefs that can vary across different stakeholder groups. Since the MsCIP decision process involves a broad spectrum of stakeholders, the RIDF evaluates the sensitivity of the recommendations to these values and beliefs to help decision-makers and stakeholders understand the robustness of recommendations and anticipated outcomes. In this way, the RIDF helps to identify what further studies may be needed and what communication and negotiation efforts could be improved. These efforts also build confidence in the planning process and commitment to the selected plans. We also recognize the role that adaptive management can play in connection with the RIDF as a mechanism for monitoring and maintaining the performance of decisions over longer planning horizons.

1. INTRODUCTION

1.1 Background

This report summarizes the results of a risk-informed decision framework (RIDF) as applied in the Mississippi Coastal Improvements Project (MsCIP) as part of the development of a comprehensive plan to reduce the residual risks from flood and storm surge inundation and coastal wetlands loss and degradation. The intent of the RIDF is to "**develop a decision framework in such a manner as to simply and clearly show to decision makers and the public the risks, costs and consequences of flood control, coastal restoration, and hurricane protection measures...[and] recommendations...will be supported...using the risk informed decision framework.**"

A comprehensive plan addresses a full range of risks to people, environment, property, and economy as well as infrastructure construction, operations, and maintenance costs. Risk is fully defined by an event probability, a set of factors on which that event probability is conditioned (scenarios), and the consequences of that event (Kaplan and Garrick 1981). With respect to flood risk management, residual risk has been defined by the National Research Council (2000) as that risk that remains after a flood damage reduction project is implemented.

This part of the Risk Appendix develops the risk-informed decision framework (RIDF). The RIDF has been developed by the Engineer Research and Development Center (ERDC) to integrate risk and decision science methods into the US Army Corps of Engineers (USACE) planning process while emphasizing consistency with existing USACE planning guidance.

The MsCIP decision process must consider a comprehensive set of planning objectives that include: 1) the reduction of risks to human life, property, and the regional economy; 2) the protection of the region's natural resources, and environmental quality; and 3) the construction, operations, and maintenance costs associated with any particular alternative. In addition to these numerous diverse interests that must be addressed through the planning process, the Mississippi coastal area is a dynamic environment that is rapidly changing in ways that are difficult to predict. Prudent decision makers will therefore take account of the uncertainty regarding economic, environmental, and other conditions that may affect the outcome of a project during the planning horizon.

The MsCIP decision problem is to recommend a comprehensive plan that will reduce the risks of flooding caused by storm surge and coastline degradation while considering a full range of risks to people, environment, property, and economy as well as infrastructure construction, operations, and maintenance costs. The RIDF is responsive to these and other decision support needs of MsCIP for which conventional decision support methods are poorly suited. The RIDF offers a decision approach that accounts for a comprehensive set of coastal assets in Mississippi and acknowledges the presence of a diverse group of stakeholders who exhibit conflicting interests and objectives. The RIDF approach also addresses uncertainty in certain environmental, social, and economic trends over the planning horizon that can affect the desirability of risk reduction strategies.

Conventional approaches to decision making have emphasized cost-benefit analysis, which is suitable only when decision outcomes can be fully monetized. There is now an increasing level of consideration given to assets that are difficult to quantify in economic terms, such as wildlife habitat and cultural diversity, and tend to confound the application of that approach. Conventional decision methods have also emphasized a single decision objective built around national economic development objectives. However, the MsCIP planning guidance requires an accounting of regional economic development, environmental, and other social effects objectives as well. Therefore, a multi-attribute decision analysis method is needed. In addition to presence of multiple objectives, there is diverse set of stakeholders whose interests must also be taken into account. Conventional approaches to decision making have also tended to ignore uncertainty. By evaluating and communicating uncertainty during the planning process, RIDF helps lead decision makers to more well-reasoned and rational choices. The RIDF attempts to addresses all of the shortcomings of conventional decision approaches in a manner that is consistent with the USACE planning guidelines.

1.2 Overview of the Risk-Informed Decision Framework

1.2.1 RIDF is based on the Corps Planning Process, Outfitted to Incorporate Risk Analysis and Decision Analysis

The Risk-Informed Decision Framework (RIDF) is rooted in the Corps' standard approach to planning, but augments that approach with insights and techniques drawn from the fields of decision and risk analysis. RIDF provides procedures to help decision makers identify planning objectives, performance metrics, and stakeholder priorities.

RIDF draws on multi-criteria decision analysis (MCDA) techniques (specifically, multi-attribute utility theory (MAUT), because plan selection involves multiple, competing objectives denominated in in-commensurate terms. For example, this is the case when some attributes of an objective such as life-cycle infrastructure costs can be expressed in monetary terms and others, such as environmental quality, cannot.

RIDF draws on risk analysis (RA) techniques to characterize and assess the uncertainties that complicate the MsCIP decision. These include uncertainties in the economic and environmental conditions that will influence the outcome of a decision (such as the rate of sea-level rise) as well as the stochastic nature of storm surge events. The objective is to help planners characterize the critical uncertainties most important to the choice among plans and to identify robust risk reduction strategies, which are decision alternatives that perform relatively well across a wide range of future conditions.

1.2.2 Why is RIDF "Risk-Informed?"

RIDF is risk-informed because it:

- accounts for the consequences of low-probability storms including expected property damages, population at risk, and regional economic impacts.

1.2.3 What are the Advantages of RIDF?

The RIDF has several advantages.

- The framework engages stakeholders and decision makers in a process of issue identification and priority setting to formally establish project goals. The process helps decision makers to:
    - Identify and reveal hidden agendas
    - Identify, acknowledge and, when possible, fill data gaps that, if filled, could influence decisions;
- Objectives are expressed in the form of a multi-attribute utility function that:
    - gives objectives that are difficult to monetize the same consideration as monetary objectives, enabling environmental and social decision objectives to receive equal consideration with economic objectives.
    - allows decision makers to make explicit tradeoffs between objectives because progress on one objective can be used to compensate for lack of progress on another objective.

1.3 Scope of Risk Informed Decision Framework

Part 2 of the Risk Appendix provides an overview of the six planning steps in terms of the MsCIP risk-informed decision framework including:

- Introduction, background and scope
- Methods used to implement MCDA and the RIDF
- Detailed descriptions of metrics and scenarios
- Results of rankings and uncertainty
- Discussion
- Tables and figures showing outputs

2. BACKGROUND

2.1 Planning in the USACE – The Six-Step Planning Process

The *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (also known as Principles and Guidelines or P&G) and Engineering Regulation (ER) 1105-2-100, *Guidance for Conducting Civil Works Planning Studies* sets out a six-step planning process:

1. Specify problems and opportunities;
2. Inventory, forecast and analyze conditions relevant to the identified problems and opportunities;
3. Formulate alternative plans;
4. Evaluate the effects of the alternative plans;
5. Compare alternative plans;
6. Recommend a plan from the compared alternatives.

Since publication of the P&G in 1983, U.S. Army Corps of Engineers (USACE) planning and decision-making have been based, primarily, on a comparison of alternatives using economic factors (USACE 2003a). Planners have also been confronted with the challenge to provide for integrated systems that serve multiple objectives (e.g., a coastal system that provides for flood and storm damage reduction, navigation, and ecosystem restoration).

2.2 Changes to the Planning Landscape

In response to a USACE request for a review of P&G planning procedures, the National Research Council (1999) provided recommendations for streamlining planning processes, revising P&G guidelines, analyzing cost-sharing requirements and estimating the effects of risk and uncertainty integration in the planning process. Implementation guidance of the Environmental Operating Principles (EOP) (http://www.hq.usace.army.mil/cepa/envprinciples.htm) within USACE civil works planning directs that projects adhere to a concept of environmental sustainability that is defined as "a synergistic process whereby environmental and economic considerations are effectively balanced through the life of project planning, design, construction, operation and maintenance to improve the quality of life for present and future generations" (USACE 2003a). While adhering to the overall P&G methodology, USACE (2003b) advises project delivery teams to formulate acceptable, combined economic development/ecosystem restoration alternatives through use of multi-criteria/trade-off methods.

2.3 Corps Efforts to Address Planning Needs

Over the last several years, the Corps has been developing approaches and guidance for implementing multi-criteria decision analysis (MCDA) approaches for planning (Yoe, 2002; Linkov et al. 2004; Kiker et. al. 2005). This approach utilizes a comprehensive decision analytic framework that considers a broad array of objectives and criteria/metrics, including those associated with ecosystem restoration (Males, 2002). Guidance contained in *Trade-Off Analysis Planning and Procedures Guidebook (2002)* lays out a multi-criterion decision analytic approach for comparing and deciding between alternative plans and relates the P&G six-step planning process described above to outputs of the RIDF, as depicted in Figure 2-1.

Over the last several years, the Corps has been developing approaches and guidance for implementing multi-criteria decision analysis (MCDA) approaches for planning (Yoe, 2002; Linkov et al. 2004; Kiker et. al. 2005). The challenge has been to select and implement an analytical approach that best serves the Corps' needs and provides outputs that can be incorporated into existing decision-making processes, which are laid out in the Corp's *Trade-Off Analysis Planning and Procedures Guidebook (2002)*. In addition to serving the needs of Corps planning, the decision framework should provide structure and tools for interacting and communicating with partners, stakeholders, and the public about planning and risk. The approach utilizes a comprehensive decision analytic framework that considers a broad array of objectives and criteria/metrics, including those associated with ecosystem restoration (Males, 2002).

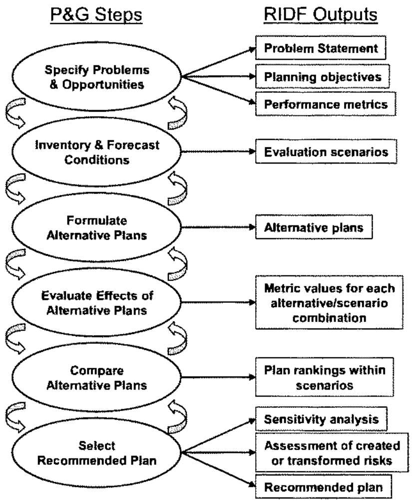


Figure 2-1: The 6 steps of the P&G and resultants outputs of the risk-informed decision framework.

2.4 How is RIDF an Incremental Improvement in Addressing Planning Needs?

Making effective and credible flood and storm damage reduction planning decisions requires an explicit structure for jointly considering the positive/negative impacts and risks, along with associated uncertainties, relevant to the selection of alternative plans. The complexity of flood and storm damage reduction and coastal landscape stabilization in south Mississippi requires integration of multiple models and tools as well as expert judgment. Integrating this heterogeneous and uncertain information demands a systematic and understandable framework to organize complex and often limited technical information and expert judgment.

Having the right combination of ***people*** is the first essential element in the decision process. The activity and involvement levels of three basic groups of people (decision makers, scientists and engineers [e.g., the MsCIP technical team], and stakeholders) are symbolized in Figure 2 by dark lines for direct involvement and dotted lines for less direct involvement. While the actual membership and function of these three groups may overlap or vary, the roles of each are essential in maximizing the utility of human input into the decision process. Each group has its own way of viewing the world, its own method of envisioning solutions, and its own societal responsibility. Policy- and decision-makers spend most of their effort defining the restoration planning context and the overall constraints on the decision. In addition, they may have responsibility for final plan selection and implementation. Scientists and engineers, including the MsCIP technical team, have the most focused role in that they provide the measurements for metrics that quantify the degree to which the various alternatives satisfy the objectives of the project; while they may take a secondary role as stakeholders or decision-makers, their primary role is to provide the technical input necessary to inform the decision process. Stakeholders contribute the most input in helping formulate performance metrics and making value judgments for weighting the various metrics. Depending on the problem and restoration context, stakeholders may have some responsibility in ranking and selecting the final option.

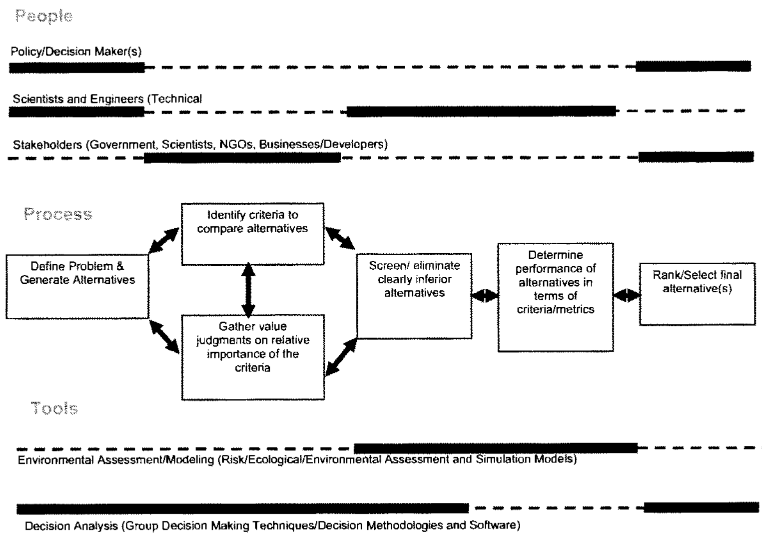


Figure 2-2: Proposed decision process (adapted from Linkov et al. 2004 and Kiker et al. 2005). Dark lines indicate direct involvement / applicability and dotted lines indicate less direct involvement / applicability.

The ***process*** depicted in Figure 2-2 is composed of two major elements: (i) generating alternative restoration scenarios, performance metrics, and value judgments and (ii) ranking the alternatives by applying value weights. The process generates and defines choices, performance levels, and preferences. The process also methodically screens non-feasible alternatives by first applying screening mechanisms (*e.g.*, excessive cost, performance below minimal levels or unacceptable social consequences) and then evaluating, in detail, the remaining alternative restoration plans through the use of decision criteria/metrics that are parameterized with data from engineering models, experimental data, or expert judgment and then ranking those plans through use of MCDA techniques. MCDA separates out judgments about scaling the relative performance of alternatives using a metric from judgments about weighting those metrics (Clemen, 1995). We discuss scaling and weighting in subsection 3.5.1. While it is reasonable to expect that the process may vary in specific details for different planning projects (i.e., based on project needs), the planning accomplished through use of this framework operates within an overall adaptive management structure whereby learning, accomplished through additional study and monitoring, is being used to ensure that the process is responsive to changes in decision priorities or new knowledge that can affect alternative selection or implementation strategies.

The ***tools*** used within group decision making and scientific research are essential elements of the overall decision process. The applicability of the tools is symbolized in Figure 2-2 by solid lines (direct involvement) and dotted lines (indirect involvement). Decision analysis tools help to generate and map technical data as well as individual judgments into organized structures that can be linked with other technical tools from risk analysis, modeling, monitoring, and cost estimations. Decision analysis tools can also provide useful graphical techniques and visualization methods to express the gathered information in understandable formats. When changes occur in the requirements or the decision process, decision analysis tools can respond efficiently to the new inputs. Flood and storm damage reduction planning requires the use of multiple mechanistic, empirical, and stochastic models, and combinations thereof, for examining flood and storm inundation stage-frequencies to assess the performance of alternatives under several uncertain future conditions. Output from these models has been combined to calculate specific risk factors affecting coastal Mississippi. Finally, decision models incorporated individual risk model predictions and reconciled conflicting priorities expressed by different stakeholder groups through transparent and reproducible valuation protocols. The decision analysis tools were used to compare the alternative plans and conduct sensitivity analysis to assess the robustness in relative performance across future scenarios of the resulting rankings.

The entire process results in a comprehensive, structured process for selecting the optimal alternative in any given situation, drawing from stakeholder preferences and value judgments as well as scientific modeling and risk analysis.

2.5 Adaptive Management

The consequences of Hurricane Katrina have motivated the Corps to examine both its processes and institutional culture. The Corps' must be responsive and reliable, and change will be required to ensure that Corps remains so. Actions for Change were identified that will serve as catalysts for that change (see http://www.hq.usace.army.mil/cepa/releases/News_Release_-_USACE_12_Actions_for_Change.pdf). Key to the successful implementation of these actions is use of integrative and comprehensive systems-based approaches, adaptive planning, stakeholder involvement and risk communication.

3. IMPLEMENTATION OF THE RIDF

The Risk-Informed Decision Framework (RIDF) assists decision makers by condensing the decision process into a transparent and tractable format. RIDF can be described in terms that are closely aligned with the standard Corps approach to planning, but utilize techniques from the fields of risk and decision analysis to accommodate multiple objectives, conflicting stakeholder values, both qualitative and quantitative assessments of performance, and uncertainty in the natural, social, and economic environment in which decisions will be played out.

As implemented for MsCIP, the RIDF procedure can be summarized as follows. Decision makers and stakeholders establish an objectives hierarchy to fully and uniquely characterize the important outcomes of each decision alternative. A set of outcome measures of performance is then chosen to represent the performance of each alternative in terms of achieving each of the decision objectives. The outcomes of the alternative plans is modeled and, to the extent there are uncertainties present that may significantly affect performance outcomes, this evaluation of plans would be replicated over a set of scenarios that represent a range of possible conditions during the performance phase. Once all of these evaluations are complete, a multi-attribute utility function is developed to assess the overall utility of each plan given its performance in terms of achieving the objectives.

The relationship between the six steps of the Corps planning process and RIDF is illustrated in Figure 2-1. In general, RIDF activities are closely related to the six step Corps planning process as follows:

1. Specify Problems & Opportunities: Frame the decision by developing a problem statement and identifying the spatial and temporal boundaries of analysis. Establish planning objectives and choose outcome measures of performance, or metrics, which reflect progress toward achieving the planning objectives.

2. Inventory and Forecast Conditions: Select models of physical and economic systems or other appropriate tools to simulate decision outcomes in terms of the selected performance metrics. Identify important sources of uncertainty in physical and economic models.

3. Formulate Alternative Plans: Formulate decision alternatives by identifying potential measures for flood risk reduction and environmental restoration, pre-screening infeasible measures, and formulating coast-wide plans from remaining measures.

4. Evaluate Effects of Alternative Plans: Model the outcome measures of performance for each alternative and each scenario.

5. Compare Alternative Plans: Obtain weights on objectives from the decision maker and/or stakeholder groups. Calculate multi-attribute utility and implement the decision analysis for each alternative, each scenario, and each stakeholder group. Screen out plans that are consistently dominated.

6. Select a Recommended Plan: Develop recommendations based on the analysis.

3.1 Step 1: Specify the problem and opportunities

Framing the problem to be solved is often one of the most difficult and critical tasks in the planning process because it forces planners to clarify their objectives. Framing also helps to identify what attributes should be considered in judging decision outcomes and what metrics should be used in assessing progress toward objectives. Framing helps to establish what spatial and temporal scales are needed for modeling decision outcomes. For example, the preferred alternative may change with the spatial resolution chosen for an analysis; therefore, factoring such spatial variation into how the framework is used along the coast should be considered. Similarly, the most preferred decision may vary as a function of the timeframe under consideration: a longer planning timeframe may lead to a preference for alternatives with higher fixed costs and lower operational/maintenance costs.

3.1.1 Problem Statement

Catastrophic impacts of the 2005 Atlantic Tropical Cyclone season in the Gulf of Mexico identified the need for investment in flood and storm damage risk reduction and coastal ecosystem restoration.

Traditional investigation methods were recognized as insufficient to identify plans for action in averting future disasters directly impacting major metropolitan centers, strategic regional national assets, and significant coastal resources located in south Mississippi. A new planning methodology based on risk and uncertainty would be required to augment traditional approaches, addressing direct adverse impacts as well as large indirect adverse effects of coastal disasters in Mississippi on the rest of the United States. A multi-objective, long range, comprehensive system-scale analysis is needed to identify a full range of measures for risk reduction and coastal landscape stabilization in the event of moderate/frequent and severe/rare storms.

The following problem statement was drafted with the above issues in mind: The people, economy, environment, and culture of coastal Mississippi, as well as the Nation, are at risk from severe and catastrophic hurricane storm events as manifested by:

1. Storm impacts to residential, public, and commercial infrastructure.
2. Storm impacts to people's quality of life.
3. Habitats damaged by saltwater intrusion.
4. Storm-caused erosion of coastal shoreline.
5. Degradation of fish and wildlife habitats that support an array of commercial and recreational activities coast wide.

The risks associated with the problem can rarely be eliminated or entirely prevented. Thus, residual risk remains and must be considered. The nature of the risks to the planning area is identified in the problem statement.

3.1.2 Planning Objectives

The purpose of this section is to delineate the objectives appropriate to a sound solution to the MsCIP decision problem that can be readily articulated to an array of audiences.

As a group, a good set of planning objectives must be collectively exhaustive. That is, nothing that really matters can be left out. However, and again with an eye to simplification, the list must be limited to only the ones that really do matter. A hierarchical arrangement of objectives (e.g., a principal objective branching to a tier or two of sub objectives) is often useful for structuring a complex decision. Each objective should be specific and succinct (Keeney and Raffia 1976). An objective must be unambiguous yet still succinctly stated, as brevity helps communication and clarifies thinking. Each objective must be amenable to measurement using one or a few metrics so that predictions can be quantified and performance ultimately can be assessed. Simultaneously, objectives must be realistically achievable and relevant. Finally, there must be concordance with practical time frames (Hobbs and Meier 2000). In other words, predictions must be possible within the planning time frame or monitoring of performance must be possible within a useful time frame.

The planning objectives for MsCIP are:

- Reduce risk to public health and safety from catastrophic storm inundation;
- Reduce storm damages to infrastructure from catastrophic storm inundation;
- Restore and protect upland and tidal wetland habitats, and;
- Reduce residual risk from catastrophic storm damage.

The objectives identified in the preceding paragraph were organized within the RIDF framework using the USACE P&G System of Accounts (Yoe and Orth 1996), which guides an evaluation of the effects of a project with respect to National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE). Establishing the system of accounts 1) shows all effects important to decision-making, 2) explicitly shows the NED effects as the basis for establishing the economic feasibility of the plan, 3) offers a rational, organized framework for presenting the results of the MsCIP analysis, and 4) provides a means for comparing plan effects. The plans' effects presented in the system of accounts relate to the plans' contributions toward planning objectives. The effects of the plans are arranged such that the differences among the plans are easily discerned.

In recent history, USACE planners have been guided to select the NED plan (the one maximizing national economic development benefits) as the preferred alternative, while still meeting National Environmental Policy Act requirements. The Mobile District has received slightly different and more flexible guidance for the critical MsCIP project. Namely, choice is not constrained to an NED plan but rather more broadly to a cost-effective plan that best meets objectives across the NED, RED, EQ, and OSE accounts. Metrics proposed in the subsequent section for evaluating project effects in MsCIP are categorized according to these four accounts.

3.1.3 Outcome Metrics of Performance

Metrics to be used to guide the MsCIP evaluation are presented in Table 1A-1E. These metrics were used to score and then rank flood and storm damage reduction and environmental restoration measures and plans. In selecting this set of metrics, we strove to represent the best available information for evaluating alternatives in the MsCIP, keeping in mind the characteristics of effective metrics (see Roy, 1985; Seager et al. 2007, Graedel and Allenby 2002, Seager and Theis 2004; Yoe 2002). Effective metrics are:

- **Comprehensive and complete:** The metric set should capture the entire range of the decision maker's priorities. No relevant priorities should be unaccounted-for.
- **Preferentially independent:** Changes in one attribute or metric should not affect the decision maker's preferences for another attribute or metric.
- **Verifiable:** Two independent assessments yield similar results.
- **Cost-effective**: Evaluation of the metrics should not require an intensive deployment of resources or unavailable technology.
- **Easy to communicate to a wide audience**: The public understands the scale and context of the metric and can interpret the metric with little additional explanation.
- **Changeable by human intervention**. The metric has a causal relationship between the state of the system and the variables that are under the decision-maker's control. Metrics that are independent of human action do not inform a management, policy-making, or design process.
- **Credible**: Stakeholders perceive that the metric accurately measures that which it is intended to measure.
- **Appropriate scale:** The metric is applicable at the spatial and temporal scales chosen for analysis.
- **Directed**: Metric scales whether they are qualitative or quantitative, are bi-directional polar scales,
- **Relevant**: The metric reflects stakeholder priorities and enhances the ability of managers and regulators to faithfully execute their stewardship responsibilities. There is no point assembling a metric no one cares about.
- **Sensitive:** enough to capture the minimum meaningful level of change or make the smallest distinctions that are still significant, and it would have uncertainty bounds that are easy to communicate.
- **Minimally redundant:** A smaller metric set is preferred to a larger metric set to avoid interactions or correlations with other metrics.
- **Transparent:** The metric should not be designed to serve a "hidden agenda."

It is important to acknowledge here that there will be "conflicts" among metrics, resulting in the need to make tradeoffs. For example, a tradeoff exists between achieving any significant benefit from a project and minimizing cost. The tradeoff concept is discussed in Step 5. As a consequence of such "conflicts", a given measure or alternative may not take clear precedence over other measures or alternatives in respect to every metric for evaluating performance. This may present a dilemma to decision-makers, who are trying to choose a single measure. It is important to place development of metrics prior to the development of measures because the "hard thinking" that goes into developing the metrics can create an improved set of measures; this in turn permits stakeholders to focus on thinking about the objectives rather than anchoring themselves to favored measures (Keeney and Raiffa 1976).

In the following sections and in Tables 3-1A thru 3-1E the metrics for the MsCIP are listed and described.

3.1.3.1 *Environmental Quality (EQ) Metrics*

Table 3-1A.
MsCIP Objectives and Metrics for Environmental Quality

Plan Performance Objectives for Risk Reduction		Metrics	(Units)	Description	Data Source
Environmental Quality	Restore and protect tidal and non-tidal habitats.	Tidal Habitat Restored	Functional units	This metric measures positive changes to the tidally-influenced wetlands that result from the implementation of a measure or plan.	Models
		Tidal Habitat Lost	Functional units	This metric measures adverse impacts to the tidally-influenced wetlands that result from the implementation of a measure or plan.	Models
		Non-tidal Habitat Restored	Functional units	This metric measures positive changes to the non-tidal ecosystem that result from the implementation of a measure or plan.	Models
		Non-tidal Habitat Lost	Functional units	This metric measures adverse impacts to the non-tidal ecosystem that result from the implementation of a measure or plan.	Models

1. <u>Tidal Habitat Restored</u> - This metric measures positive changes to the tidally-influenced wetlands that result from the implementation of a measure or plan. These are positive benefits from implementing a restoration plan or a combination of plans. Ecosystem components included in this metric are tidal wetlands (i.e., tidal fringes), associated threatened and endangered and other species associated with essential fish and other tidal habitats, and related losses that require mitigation due from implementation of structural plans. Units are in acres.

2. <u>Tidal Habitat Lost</u> - This metric measures adverse impacts to the tidally-influenced wetlands that result from the implementation of a measure or plan. Ecosystem components included in this metric are tidal wetlands (i.e., tidal fringes), associated threatened and endangered and other species associated with essential fish and other tidal habitats, and related losses that require mitigation from the implementation of structural plans. Units are in acres.

3. <u>Non-tidal Habitat Restored</u> - This metric measures positive changes to the non-tidal ecosystem that result from the implementation of a measure or plan. These are positive benefits from implementing a restoration plan or a combination of plans. Ecosystem components included in this metric are maritime forests, wetland pine savannah, beach and dune habitats, and associated threatened, endangered and other species in non-tidal habitats. Units for this metric are the percentage increase of quality fish and wildlife habitat in acres.

4. Non-tidal Habitat Lost- This metric measures adverse impacts to the non-tidal ecosystem that results from the implementation of a measure or plan. This has a negative impact of implementation of an array of alternatives as part of the comprehensive plan. Ecosystem components included in this metric are maritime forests, wetland pine savannah, beach and dunes, threatened, endangered and other species and their non-tidal habitats, and related losses that require mitigation due to implementation of structural plans. Units for this metric are the percentage decrease of quality fish and wildlife habitat in acres.

3.1.3.2 National Economic Development (NED) Metrics

Table 3-1B.
MsCIP Objectives and Metrics for National Economic Development

Plan Performance Objectives for Risk Reduction		**Metrics**	**(Units)**	**Description**	**Data Source**
National Economic Development	Reduce damages from catastrophic storm inundation.	Expected Annual Damages Avoided	$	The amount of storm damages reduced/avoided by a plan expressed as annualized dollars. Annualized dollars are calculated by comparing a future without a project in place versus a future with a project in place.	HEC-FDA Model
		Residual Damage	$	This metric describes what a plan does not account for (or what happens if a plan is exceeded). Residual damage is defined as the storm damage that is not prevented with the implemented plan in place (expressed as annualized dollars).	Model
		Cost of Implementation	$	The amount of money in dollars needed to implement the plan. This metric measures the cost in today's dollars to local and Federal governments to implement the recommended plan.	Empirical Data

1. Expected Annual Damages Avoided - The amount of storm damages reduced/avoided by a plan expressed as annualized dollars. Annualized dollars are calculated by comparing a future without a project in place versus a future with a project in place.

2. Residual Damage – This metric describes what a plan does not account for (or what happens if a plan is exceeded). Residual damage is defined as the storm damage that is not prevented with the implemented plan in place (expressed as annualized dollars).

3. Cost to Implement Plan – The amount of money in dollars needed to implement the plan. This metric measures the cost in today's dollars to local and Federal governments to implement the recommended plan.

3.1.3.3 Other Social Effects (OSE) Metrics

These OSE metrics focus on the preservation of people's quality of life. OSE metrics were developed addressing impacts to cultural heritage and preservation of historical structures, disruptions to public service and infrastructure and impacts to personal effects.

Table 3-1C.
MsCIP Objectives and Metrics for Other Social Effects

Plan Performance Objectives for Risk Reduction		Metrics	(Units)	Description	Data Source
Other Social Effects	Protect public health and safety from catastrophic storm inundation.	Cultural and Historical Heritage Impacts	Unitless	This metric addresses impacts to social groups, church congregations and groups with common heritages. This metric also includes impacts to aesthetics and the destruction of the human-created landscape such as historical structures.	Expert Judgment
		Public Service and Infrastructure Disruptions	Unitless	This metric includes post-flood event disruptions to schools, fire and police service, access to hospitals, libraries and community centers, and use of roads, bridges, and utilities.	Expert Judgment
		Personal Impacts	Unitless	This metric includes loss of family possessions, photographs, and impacts to people's emotional and mental health.	Expert Judgment

1. Cultural and historical heritage impacts – This metric addresses impacts to social groups, church congregations and groups with common heritages. This metric also includes impacts to aesthetics and the destruction of the human-created landscape such as historical structures. Units are presented as a quantitative scale where a score of 10 is best, 1 is worst. (i.e., 10 is least impacts to structures, 1 is most impacts).

2. Public service and infrastructure disruptions – This metric includes post-flood event disruptions to schools, fire and police service, access to hospitals, libraries and community centers, and use of roads, bridges, and utilities. Units are presented as a quantitative scale where a score of 10 is best, 1 is worst (i.e., 10 is least disruption, 1 is most disruption).

3. Personal impacts – This metric includes loss of family possessions, photographs, and impacts to people's emotional and mental health. Units are presented as a quantitative scale where a score of 10 is best, 1 is worst. (i.e., 10 is least impacts to people, 1 is most impacts).

3.1.3.4 *Regional Economic Development (RED) Metrics*

The RED metrics measure both positive and negative impacts to the regional economy. Positive impacts are captured by impacts to sales volume, personal income and employment and negative impacts by local cost burdens. Sales volume, income and employment will be sub-metrics under RED, and will be equally weighted. This metric is termed Positive regional economic benefits and will combine these 3 sub-metrics. The local cost burdens metric is also a sub-metric under RED and will receive a weight equal to combined weighting of the positive metrics under regional economic benefits.

Table 3-1D.
MsCIP Objectives and Metrics Regional Economic Development

Plan Performance Objectives for Risk Reduction		**Metrics**	**(Units)**	**Description**	**Data Source**
Regional Economic Development	Reduce damages from catastrophic storm inundation.	Local Cost Burden	Unitless	This metric assesses the costs that will be born locally. This includes the local cost-share with the Federal government to implement the alternative and local costs for ongoing operations and maintenance (O&M) related to the alternative. It also accounts economic impacts on the gross sales volume, personal income, and number of individuals employed in the workforce. These measures are incorporated into unitless scale.	Model/Expert Judgment
		Positive Regional Economic Benefits	Unitless	Economic benefits to the region with regards to sales volume, income and employment. This metric assesses the potential impacts of sales volume change and personal income in dollars and regional employment change in number of jobs to the local economy.	Expert Judgment

1. Local Cost Burdens – This metric represents costs born locally. This includes cost-sharing with the Federal government to implement the recommended plan and local costs for ongoing operations and maintenance (O&M) related to the implemented plan. The local cost burdens may include costs associated with maintenance workers needed to maintain infrastructure of the recommended plan. Units are a unitless quantitative scale where a score of 10 is best, 1 is worst.

2. Positive regional economic benefits – Economic benefits to the region with regards to sales volume, income and employment. This metric assesses the potential impacts of sales volume change and personal income in dollars and regional employment change in number of jobs to the local economy. Units are a unitless quantitative scale where a score of 10 is best, 1 is worst.

3.1.3.5 Comprehensive Risk Metrics

The following risk metrics serve as additional information to decision makers. They are a way to address extreme cases of uncertainty.

Table 3-1E.
MsCIP Objectives and Metrics for Comprehensive Risk

Plan Performance Objectives for Risk Reduction		Metrics	(Units)	Description	Data Source
Comprehensive Risk	Reduce plan risk.	Long-term Sustainability of Plan	Unitless	The risk that features associated with the recommended plan will not perform as intended (over time) due to factors such as cost, human behavior, technical level of maintenance required, political concerns, resource availability, local funding per year, and operational reliability.	Expert Judgment
		Residual Risk	Unitless	This metric describes what a plan does not account for (or what happens if a plan is exceeded). Residual risk is defined as the storm damage risk that remains with the implemented plan in place (expressed as annualized dollars).	Empirical Data/Expert Judgment
		Consequences of Plan Failing	Unitless	This metric describes what happens if a plan does not work as intended. It describes consequences to humans and the environment due to a catastrophic failure of an implemented plan under design conditions or other sets of circumstances from a storm event.	Expert Judgment

1. Long-term Sustainability of Plan – The risk that features associated with the recommended plan will not perform as intended (over time) due to factors such as cost, human behavior, technical level of maintenance required, political concerns, resource availability, local funding per year, and operational reliability. Units are a unitless quantitative scale where a score of 10 is best, 1 is worst (i.e., 10 is least risk, 1 is most risk).

2. Residual Risk – This metric describes what a plan does not account for (or what happens if a plan is exceeded). Residual risk is defined as the storm damage risk that remains with the implemented plan in place (expressed as annualized dollars). It accounts for the following factors: erosion, wildlife species, wildlife habitat, salt water intrusion, surge damages, drainage, wind, maximum probable intensity (MPI) plan (accounts for more intense storm), cultural heritage, and infrastructure. Units are a unitless quantitative scale where a score of 10 is best, 1 is worst.

3. Consequences of Plan Failing – This metric describes what happens if a plan does not work as intended. In other words, it describes consequences to humans and the environment due to a catastrophic failure of an implemented plan under design conditions or other sets of circumstances from a storm event. The greatest risk is risk of failure to structural measures, such as levees, flood gates, etc. Consequences and likelihood of failure vary depending on the line of defense. For example, risk of Line 2 failure is more likely, but consequences are relatively low; risk of Line 4 failure is highly unlikely, but consequences are very high. It includes the following factors: injuries to population, loss of infrastructure, loss of habitat, and loss of wildlife species. Units are a unitless quantitative scale where a score of 10 is best, 1 is worst.

3.2. Step 2: Inventory and Forecast to Establish Baseline Conditions

In this step of the planning process, models and tools are selected to simulate decision outcomes in terms of the selected performance metrics. There is often uncertainty in projecting decision outcomes and, when planning horizons are long, a considerable amount of uncertainty may be unavoidable. Nominal forecasts of decision outcomes, those forecasts made assuming baseline conditions or "business as usual" conditions, should therefore be qualified by considering what implications uncertainty in these assumptions may have for the decision recommendations. Uncertainty is a lack of knowledge that originates from an incomplete understanding of the structure and function of natural or manmade systems (*e.g.*, coastal hydraulics at the mouth of the Mississippi). [1] Uncertainty is often classified as either model uncertainty or parameter uncertainty. Model uncertainty is a lack of knowledge about the proper structure of a model (*e.g.*, choice of a two vs. a three dimensional model to simulate hydrodynamics). Parameter uncertainty is the lack of knowledge about the best value to use as an input parameter value for the chosen model.

One of the advantages of decision analysis is its ability to assist decision makers to make rational decisions in the face of uncertainty. A full uncertainty analysis of the decision would culminate in a probability distribution over the utility of decision outcomes. However, considerable effort may be needed to reach such a conclusion. Often, a sensitivity analysis that considers how the decision recommendations might change under different assumptions may be adequate. Neither sensitivity nor uncertainty analysis of this decision were undertaken for MsCIP at this point.

1 Although the mathematics used to describe variability and uncertainty is essentially similar, uncertainty is widely recognized as being distinct from natural variability. Variability describes the heterogeneity in an inherently random value. For example, the heterogeneity of some size attribute within a population. This variability is, in principle, not reducible (Morgan and Henrion 1990). In contrast, uncertainty can be thought of as a lack of knowledge about what parameter value to use in a model or how to represent a process in a mechanistic model. This lack of knowledge might in principle be reduced, although reducing some uncertainties can often be difficult in practice.

3.3 Step 3: Formulate alternative plans

3.3.1 Plan Formulation

Plan formulation is the process of building plans that meet planning objectives and avoid planning constraints. It requires the knowledge, experience, and judgments from many professional disciplines, as well as the views of stakeholders, other agencies and non-governmental organizations (NGOs), and the public. Plan formulation capitalizes on imagination and creativity wherever it is found, across technical backgrounds and group affiliations. Formulating plans includes developing management measures (e.g., structural and non-structural), identifying planning units, conducting screening of measures, and combining measures into alternative plans. Plans include abilities to be modified into the future within the adaptive management framework. For more details on the formulation of plans and planning units for MsCIP, refer to the Main Report.

3.4 Step 4: Evaluate effects of alternative plans

Once the plans have been formulated, the performance of each plan with respect to each metric is estimated for each decision alternative and scenario. The SAM Technical Team accomplished this step using mechanistic or empirical models of physical, economic, and social systems where available and expert judgment where such models were not available. Sources of metric data are presented in Tables 3-1A thru 3-1E.

3.5 Step 5: Compare alternative plans

In this step, the objective is to rank the decision alternatives (plans) using an abstract utility measure that integrates information about anticipated performance outcomes and stakeholder interests. The MCDA approach used for MsCIP is multi-attribute utility theory (MAUT) (Keeney and Raiffa 1976). With respect to its applications in MCDA, the advantage of MAUT is that it converts a multi-objective decision with competing objectives to a single objective problem for which the objective is to maximize utility given information about the decision maker's preferences. The purpose of this section is to provide an overview of the approach. Sub-section 3.5.1 describes how information on stakeholder preferences is brought into the decision making process. Sub-section 3.5.2 describes the calculation of a multi-attribute utility score, the ranking of decision alternatives, and decision analysis. Sub-section 3.5.3 describes how sensitivity and uncertainty analysis can be used in conjunction with MCDA specifically to support risk-informed decision making. Specific details about this application of RIDF are provided in Section 4.0.

3.5.1 Stakeholder Preferences

The first step toward developing a multi-attribute utility function is to collect information on stakeholder preferences by finding out how much importance stakeholders place on the various decision objectives. Information about stakeholder preferences is obtained through workshops during which stakeholders participate in a series of assessments designed to obtain information on their preferences. These preferences are expressed as relative weights on decision objectives. These weights are subsequently incorporated into a multi-attribute utility function that is then used to calculate the utility score by which decision alternatives are ranked. This process gives stakeholders an active role in the decision making process because, if stakeholder weights are used in the utility function, the ranking of plans is then tied directly to their preferences.

Since stakeholders can exhibit a diverse set of preference patterns, it is important to consider how this diversity of preference will be treated in the decision analysis. If there are many stakeholders, their sheer number may make it very difficult to consider each ones preferences individually. In addition, there would be much redundancy in such an approach because most stakeholders appear to have some recognizable preference patterns. On the other hand, aggregating stakeholders into a single group and averaging their weights to represent an amalgamated public interest is also not a good strategy, particularly if diverse values have been expressed in the stakeholder population. An averaged set of weights would tend to converge on an equal distribution of weights across the decision objectives and/or a set of weights that is not likely to represent anybody's interests in particular.

The approach used in this analysis is to analyze the sets of weights obtained from individual stakeholders and then classify them based on their expressions of common preference patterns. For classification purposes, we rely on a set of multivariate statistical techniques known as cluster analysis to identify distinct preference patterns that exist within the stakeholder population. Once stakeholders have been segregated based on their preferences, the patterns of preference that are characteristic of each group can be represented by averaging their weights on decision objectives. At this time, no particular consideration is given to the prevalence of each preference pattern in the MsCIP project area. The primary concern is to understand what patterns of preference exist in the project area and what affect these different patterns of preference might have on the choice of a risk-reduction plan.

3.5.2 Multi-attribute Utility and MCDA

The multi-attribute utility function transforms the metrics for the several objectives to a single, aggregate measure of utility. The utility function is compensatory in the sense that it allows progress on one objective to substitute for lack of progress on another objective. The rate of compensation depends upon the relative weight on each objective, which depends upon the preferences of the decision maker. Multi-attribute utility (*U*) is the weighted sum of *L* outcome measures of performance,

$$V(m_{jkl}) : U_{jk} = \sum_{l} w_l V(m_{jkl}) .$$

Outcome measures of performance are evaluated through modeling studies for

$$j = \{1,2,3,\ldots,J\}$$

decision alternatives and

$$k = \{1,2,3,\ldots,K\}$$

planning scenarios. Planning scenarios represent the range of possible futures under which plan performance may be realized. A set of weights (*w*) that reflects the relative importance of each decision objective is elicited from the decision maker and/or stakeholders using a direct weighting procedure (see Section 3.5.1). Weights may take any value between zero and one, but must sum exactly to one. Value scores are then calculated from a linear utility function for each metric,

$$V(m_{jkl}),$$

that is either increasing or decreasing with that metric, m_{jkl}. For an economic "good" (*i.e.*, more is better):

$$V(m_{jkl}) = \frac{m_{jkl} - \underset{jk}{MIN}(m_{jkl})}{\underset{jk}{MAX}(m_{jkl}) - \underset{jk}{MIN}(m_{jkl})}$$

and for an economic "bad":

$$V(m_{jkl}) = 1 - \frac{m_{jkl} - \underset{jk}{MIN}(m_{jkl})}{\underset{jk}{MAX}(m_{jkl}) - \underset{jk}{MIN}(m_{jkl})},$$

where the *MIN* and *MAX* functions are over all decision alternatives and scenarios. Each scenario is represented by a set of possible values for uncertain variables in hydrologic and economic models used to simulate outcome measures of performance. Value and utility scores, which are bounded by 0 and 1 so that scores closer to 0 indicate less desirable outcomes, are calculated for the outcome of each alternative and scenario, including a "No Action" alternative.

In MCDA without uncertainty, the objective is to maximize the multi-attribute utility function for a set of stakeholder preferences by choosing the "best" decision alternative. Results of the analysis can also be presented more comprehensively by ranking the alternatives by their utility score. This is useful because much can be learned about the alternatives themselves by observing how the utility score varies from one alternative to another. For example, it is possible that some alternatives may yield as much utility as the preferred alternative, but do so because they accentuate performance on a different set of objectives. Just as results of a decision analysis are conditioned on the assumptions used to simulate performance outcomes, the results of the decision analysis and plan rankings also depend in part upon what set of stakeholder weights are used in the multi-attribute utility function. Thus, it is also useful to examine the sensitivity of plan rankings to the weights on decision objectives. If plan rankings are not sensitive to the weights, this may suggest that the alternative may have a broad base of support among stakeholders.

3.6 Step 6: Select recommended plan

Analysis of the project selection decision using the risk-informed decision process should provide a basis for recommending a risk-reduction plan for each planning unit. This recommendation will be based on all of the information assembled during the planning process including information on stakeholder preferences, performance outcomes, and both risk and uncertainty. An advantage of the RIDF is that the process of plan selection is a transparent and rational one. Decision makers should be able to rely on the results of RIDF analysis as long as all of the factors, issues, and concerns of relevance have been accounted for among the decision objectives. Care should be taken to minimize the number of factors germane to a decision that remain outside the formal scoring and ranking process. In other words, the decision model implemented using MAUT should include as many of the concerns, objectives, and factors that are relevant to decision-making as possible. Given the large number of parties relevant to the decisions under consideration (The Corps, other Federal agencies, Congress, state, counties, cities, stakeholders, the public), great care must be taken to ensure that the planning process is comprehensive in its approach to the interests and values of these parties.

4. APPLICATION OF RIDF TO MSCIP PROJECT SELECTION

4.1 Stakeholder Workshops Activities Summary

The purpose of the weight elicitation workshop held on 10-11 September 2007 was to develop a transparent process to provide decision makers with key stakeholder group perspectives (traditional process used mainly NED and RED criteria to select a plan). We wanted to capture stakeholder value information that guides the ranking of plans and recommendations. We also wanted to document differences among stakeholders so that we can identify consensus areas and potential compromises. This makes it easier to find common ground in selecting a plan. We documented these differences by comparing the performance of different plans by looking at different metrics for each plan. A common set of metrics was used to facilitate negotiation. Stakeholders were actively engaged in weighting the metrics during the workshop.

The workshop involved using questionnaires (survey instruments) to elicit weights of individuals from key stakeholder groups. The objective of the workshop was to conduct sessions with key stakeholders where their weights were elicited and their weight judgments summarized. Both the direct score and swing weight methods were used to elicit these weights. The workshop was held in Biloxi, MS at the Mississippi Department of Marine Resources building, Room 205.

Stakeholder groups were selected for participation in this effort based on their participation in previous MsCIP stakeholder meetings. These groups and individuals were selected by the MsCIP team in advance to ensure diversity of opinions. Key stakeholder groups included individuals from government (Federal, state, and local), non-governmental organizations (NGOs), and individuals representing various environmental, business, development, and academic institutions. The Corps (MsCIP technical team and the ERDC) also submitted weights.

To kick off the stakeholder session, the MsCIP technical team and ERDC described the background and purpose of the workshop and answered questions or concerns that arose. We discussed the metric set, its importance and clarified metric definitions as appropriate. We also described through specific hypothetical examples the swing weight process and how stakeholder weights will be generated using this method. Draft data for the set of 15 metrics were included in the matrix. Weights were obtained for the final set of 15 metrics (see Tables 4-1). We elicited and received input from each of the stakeholder groups on the metric set and its completeness.

A series of "polls" were conducted. In the first of these, participants were asked to provide an ordinal ranking of the 15 individual metrics from most to least important, where each participant was asked to "wear the hat" of their job within their organization. The results were shared and discussed briefly. Next, the stakeholders were asked to allocate points to each metric, thus providing finer distinction of the relative importance of metrics. Allocation was done with three rules. First, no individual metric could be given more than 70 points. Second, 100 points was available for the sum total of points given to all metrics. Third, all 100 points must be used. The same process was used of first ranking and then allocating points to the "categorical" metrics (NED, RED, OSE, and EQ). Thus, each of the stakeholder sessions progressed according to the following weight elicitation activities:

- Round 1: ranks were obtained for the list of 15 metrics.
- Round 2: rate (allocate) 15 metrics using 0-100 scale.
- Round 3: rank 15 metrics from 1-15.
- Round 4: rate (allocate) these metrics using 0-100 scale.

An intranet-based system was used to gather weight data from participants. Each participant accessed a dedicated PC to rank metrics. These results were compiled real-time and shared with the group so that weights could be discussed.

The RIDF and SAM Technical Team members attended to answer technical questions that arose and to document the process. Group Solutions, a Corps contractor, facilitated each session and electronically elicited the weights from each of the stakeholder groups. Group Solutions compiled the resultant weights and submitted all results electronically to ERDC for analysis and reporting.

Following the workshops, input values for metrics were combined with information about values and weighting functions for the various metrics to generate an overall score for each plan being considered. These scores will allow for direct comparisons to be made across all measures/plans and to rank plans in relation to each other in terms of the degree to which they satisfy the objectives the MsCIP metrics represent. Such scores can be used to evaluate measures or plans against the without project condition, as well as to compare the performance of individual measures or plans (see more detailed discussion below).

<u>Session Participants and Organizations</u>

Tables A1-1 to A1-6 in Annex 1 list in alphabetical order the people (and corresponding affiliation) who participated in the MsCIP stakeholder sessions. Some of those listed in the tables collaborated while others started but did not complete the weighting process.

4.2 Stakeholder Weightings

The MsCIP weight elicitation sessions yielded 45 complete sets of weights on fifteen metrics. We used a cluster analysis, an exploratory data reduction technique, to classify stakeholders with similar preference patterns expressed through their allocation of weights to metrics. These results enable us to identify and characterize patterns of preferences that exist in the project area.

Several different clustering techniques are available and applications of these methods would lead to alternative cluster solutions. The standard for evaluating solutions is whether or not the resulting solutions can be explained and are meaningful in the context of their purpose. In this case, the objective of the analysis is to identify and document the existence of distinct patterns of preferences within the subject population and characterize preference patterns. Characteristic preference patterns are then used to analyze the sensitivity of the decision to stakeholder preferences. This enables the sensitivity analysis to focus only on those preference patterns that have been observed, while excluding from the analysis those that have not been observed. The data reduction also eliminates the duplication of effort associated with carrying out sensitivity analysis for preference patterns that are essentially similar.

A number of clustering techniques were tested to evaluate the sensitivity of clusters to the choice of clustering method. The selected method employs a hierarchical agglomerative clustering technique called Ward's minimum variance method. In this method, an initial cluster of two individuals is formed by considering all possible clusters of size two and combining those individuals that produce the least impairment in an objective function. In the subsequent stage, all possible combinations of two individuals and all possible combinations of three individuals that include the initial cluster are formed and the cluster that results in least impairment of the objective function is accepted. At each level of the hierarchy, the objective function is minimized over all partitions of the data (Dillon and Goldstein 1984, SAS 2004). Although slightly different methods might produce clusters consisting of somewhat different individuals, we found that different methods identified a set of clusters that differed in similar ways.

Clusters were tested using two versions of the weight data. We used the raw weights that were allocated through direct weight elicitation to the fifteen metrics and we also used an aggregate weight statistic in which the fifteen metrics were aggregated into four metrics that correspond to the USACE system of accounts. Aggregate weights by planning objective are the sum of weights allocated to individual metrics associated with National Economic Objectives (NED), Regional Economic Objectives (RED), Environmental Objectives (EQ), and Other Social Effects (OSE). When the weights are aggregated this way, the data have fewer dimensions and the clusters are more clearly delineated. For this analysis, the comprehensive risk metrics that were identified in Section 3.1.3.5 were subsumed into one of the system of accounts. Long-term sustainability (Metric 13) and consequences of plan failing (Metric 14) are subsumed into the RED account. Residual risk (Metric 15) was subsumed into the NED account.

4.2.1 Analysis of Stakeholder Weights

The MsCIP weight elicitation sessions yielded 45 complete sets of stakeholder weights on the set of fifteen metrics (Annex 2). Four clusters emerged from the weight elicitation results. Mean weights are summarized in Table 4-1 for each metric and in Table 4-2 for each aggregation of weights by planning objective. The smallest cluster, D, contains six individuals and the largest cluster, B, contains 15 individuals. The formation of each cluster explains at least five percent of the variation in respondent's allocation of weights to the aggregate planning objectives. Five respondents were classified as outliers and therefore are not included in any particular cluster. Figure 4-1 shows the mean weight for each aggregate planning objective and each cluster. This graph can be used to help develop explanations for why the different clusters emerged. For example, group A places the highest weight on RED and Group D places the highest weight on EQ.

Table 4-1.
Mean Weight for each Metric by Cluster

Metric Description		Category	Cluster A	Cluster B	Cluster C	Cluster D
1	Tidal Habitat Restored	EQ	0.02	0.07	0.12	0.21
2	Tidal Habitat Lost	EQ	0.02	0.09	0.17	0.18
3	Non-Tidal Habitat Restored	EQ	0.02	0.05	0.09	0.13
4	Non Tidal Habitat Lost	EQ	0.02	0.06	0.12	0.18
5	Damage Reduced/Avoided	NED	0.14	0.11	0.05	0.04
6	Residual Damages	NED	0.06	0.07	0.03	0.04
7	Cost to Implement Plan	NED	0.10	0.09	0.06	0.02
8	Local Cost Burden	RED	0.12	0.07	0.05	0.02
9	Regional Economic Benefits	RED	0.08	0.06	0.03	0.02
10	Cultural and Historical Heritage	OSE	0.05	0.04	0.05	0.02
11	Public Service Disruptions	OSE	0.08	0.06	0.04	0.02
12	Personal Impacts	OSE	0.05	0.05	0.03	0.02
13	Long-Term Sustainability	RED	0.13	0.08	0.09	0.05
14	Consequences of Plan Failure	RED	0.08	0.07	0.06	0.03
15	Residual Risk	NED	0.04	0.06	0.02	0.03

Table 4-2.
Mean Weight for each Aggregate Planning Objective by Cluster

Cluster	Respondents (Number)	Aggregate Planning Objective			
		NED	RED	EQ	OSE
A	9	0.34	0.42	0.07	0.17
B	15	0.32	0.27	0.27	0.15
C	10	0.17	0.24	0.48	0.12
D	6	0.12	0.12	0.70	0.06

(5 respondents are outliers)

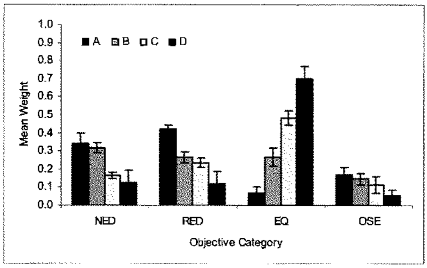
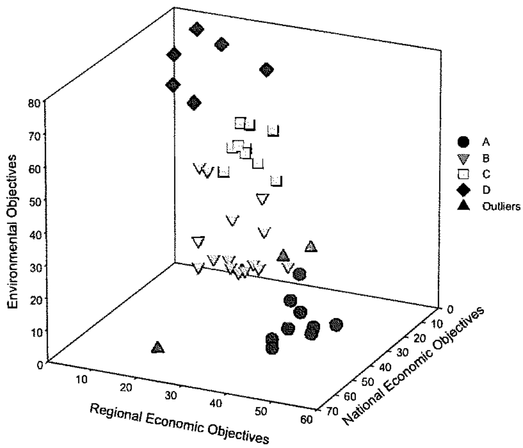


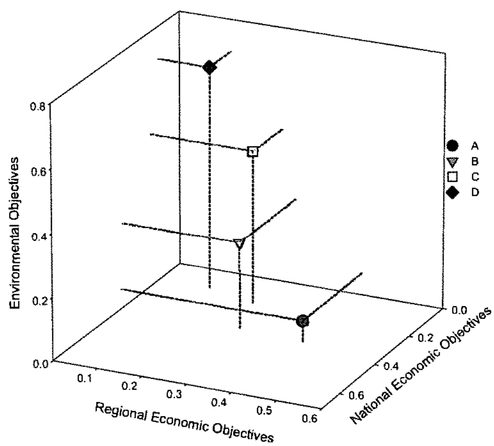
Figure 4-1. Mean weights by aggregate planning objective for four clusters, A through D. Uncertainty bounds represent 95% confidence limits on the estimated mean weight.

Differences among the clusters are further illustrated in Figures 4-2(a) and 4-2(b) which show the individual respondent weights arrayed in three-dimensional space. These results are not displayed in the OSE dimension because of relatively small differences in that dimension.

Performing the cluster analysis in this manner identifies distinct stakeholder group preferences across the Mississippi coast. These four groups represent differing stakeholder values and each will be used to rank alternative plans. This will permit us to document differences among stakeholders and identify areas for consensus and potential compromise. This information guides the ranking of plans and recommendations, as described below.



(a)



(b)

Figure 4-2: Weight allocation arrayed in three dimensions showing four clusters (a) and mean weight allocation for each cluster (b)

4.2.2 Cluster Groups

The cluster analysis identified four (4) distinct groups (or clusters) of stakeholders using stakeholder's allocation of weights across the fifteen metrics. Each group is described below relative to each of the four system of accounts, or objective categories on a 0-1 scale (see Table 4-2 and Figure 4-1).

- Cluster A: This group's focus was on economic development at both the regional and national levels. It had the highest NED weighting of 0.42 and the highest RED weighting of 0.34. This group also had the highest OSE weight (0.17) and the lowest weight for EQ (0.07).
- Cluster B: This group was intermediate (not highest or lowest weight for any category), allocating at least a weight of 0.15 to each category. It was unique in that it provided the second-highest weights for three categories: NED (0.32), RED (0.27) and OSE (0.15).
- Cluster C: While this group focused on EQ, giving it the second-highest weight (0.48), this group also weighted (balanced) each of the other categories with at least a 0.12 weighting, which sets it apart from Cluster D.
- Cluster D: This group is the most focused on the EQ category, showing the highest EQ weight of 0.70. This high EQ weighting comes at the expense of the other 3 categories, yielding the lowest weights for RED (0.12), NED (0.12) and OSE (0.06).

4.3 Plan Rankings by Multi-attribute Utility (MAU) Score

In this analysis, an MAU score is calculated and plans are ranked by the MAU score. Plans with higher MAU scores are preferred, but these ranks assume a particular set of stakeholder preferences and planning assumptions.

4.3.1 Ranking of Measures

MAU scores were calculated for each of the measures and the no-action alternative using a full set of fifteen weights and metrics. The alternatives are then ranked by MAU score, with the alternative having the highest MAU score being most preferred given the preferences under consideration. However, these ranks should be interpreted with more caution than this because there are many uncertainties that have not been fully addressed in this analysis. Therefore, rather than focusing on identifying the top-ranked plan and choosing this as the "best" alternative, it may be more useful to consider other types of questions. For example:

- How much do the MAU scores vary across the alternatives?
- Is there a group of plans at the top that have MAU scores that are relatively close to one another? What are the similarities and differences of the plans that form this "top tier?"
- How sensitive are plan rankings to planning assumptions and stakeholder preferences?
- Do stakeholders with different preference patterns prefer one particular plan but for different reasons?

Results of the analysis are presented in the form of numerous tables and graphs that summarize the results for each planning unit so that they can be used to support these types of deliberations among decision makers and stakeholders.

4.3.2 Summary of Results

Results of the MCDA are summarized in Table 4-3 for each cluster group of preference pattern. An independent MCDA was completed in each of the nine subdivisions. Stakeholder preferences are assumed to be consistent across subdivisions and the preferred plan in one subdivision is assumed to be independent of choices in every other subdivision or project alternatives (see Chapter 5 of Main Report for discussion of alternatives). Therefore, when aggregated, the combination of preferred plans in Table 4-3 represents a comprehensive suite of projects for each preference pattern. For example, stakeholders with preferences consistent with those of preference pattern A are best-served by a plan that consists of a suite of projects including the Barrier Islands Comprehensive Plan, Option K in LOD2, Bayou Cumbest Acquisition, Forrest Heights Plan 2, the High-risk Homeowner's plan. These stakeholders prefer no action in Turkey Creek, Admiral Island, Dantzler, and Franklin Creek subdivisions. Although Table 4-3 suggests that, in some cases, some stakeholders would prefer the no action alternative in some subdivisions, each subdivision has at least one preference pattern for which an action plan is preferred by at least one preference pattern.

Table 4-3.
Summary of Decision Analysis Results by Preference Pattern and Subdivision

Subdivision	Preference Pattern			
	A	B	C	D
Barrier Islands	Comprehensive Plan	Comprehensive Plan	Option A	Option A
LOD2	Option K	Option K	Option K	Option K
Turkey Creek	No Action	No Action	No Action	Ecosystem Plan 1
Bayou Cumbest	Acquisition	Acquisition	Acquisition	Ecosystem Plan 1
Admiral Island	No Action	No Action	No Action	Ecosystem Plan 1
Dantzler	No Action	No Action	No Action	Ecosystem Plan 1
Franklin Creek	No Action	No Action	No Action	Ecosystem Plan 1
Forrest Heights	Plan 2	Plan 2	No Action	No Action
Non-Structural	High Risk HARP	Long-term HARP	High Risk HARP	Long-term HARP

HARP = Homeowner's Relocation and Assistance Plan

The calculation of the MAU score is summarized for each of the four preference patterns in Annex 3. In most subdivisions, at least one of the fifteen metrics did not vary across the decision alternatives. If a metric did not vary, it was dropped from the calculation of MAU and the weights for all preference patterns in that subdivision were re-scaled to sum to one. The consequence of this re-scaling is that MAU scores cannot be compared across subdivisions. For example, the Barrier Island Comprehensive Plan has an MAU score of 0.7393 for preference pattern A. This score should not be compared to an MAU score in Dantzler or any other subdivision. There are fifteen outcome metrics of performance associated with each decision outcome. If none of the decision alternatives being considered in a subdivision would have any impact on an outcome measure of performance, that outcome measure is irrelevant to the decision because it cannot affect the choice. Moreover, if the maximum value of an outcome metric for a set of alternatives is the same as the maximum value of that outcome metric (the case of non-varying metrics), it is impossible to calculate a value score using the equations on lines 6 and 8 on page 41 and a multi-attribute utility score cannot be calculated. Therefore, non-varying metrics are dropped. Dropping these metrics will have no effect on the decision (*i.e.*, which alternative is chosen) because there is a linear utility function.

Figures 4-3 through 4-11 illustrate project rankings and show the relative contribution of each metric to the overall multi-attribute utility (MAU) score. This is illustrated by the color banding of the vertical bar in each figure. A larger color band for a metric indicates that metric contributes more to multi-attribute utility than metrics with smaller bands. One of the results of this study is that in some subdivisions, stakeholders with different preference patterns may prefer similar measures for different reasons. For example, in Figure 4-4, LOD2 Option K is associated with the highest MAU for all preference patterns. It is sometimes the case that stakeholders with different preference patterns prefer the same plan, but they prefer the plan for different reasons. In these cases, MCDA can serve as a way to recognize these situations, help focus the debate and discussion on only the issues that matter, and promote consensus within a diverse group.

In the Barrier Islands (Figure 4-3), the Comprehensive Plan and Plan A are preferred by all preference patterns, but their ordering depends upon preferences. In LOD2 (Figure 4-4), Option K is preferred by all preference patterns. In Turkey Creek (Figure 4-5), the No Action plan is preferred by preference patterns A, B, and C. Preference pattern D prefers Plan 1. In Bayou Cumbest (Figure 4-6), Acquisition is the preferred alternative for preference patterns A, B, and C with the No Action plan coming in ahead of the other plans for preference patterns A and C. For preference pattern B, the No Action plan is least preferred. For preference pattern D, the preferred plan in Bayou Cumbest is Plan 1. For Admiral Island (Figure 4-7), Dantzler (Figure 4-8), and Franklin Creek (Figure 4-9), the No Action plan is preferred for preference patterns A, B, and C. Plan 1 is preferred for preference pattern D. In Forrest Heights (Figure 4-10), Plan 2 is preferred by preference patterns A and B. The No Action plan is preferred by preference patterns C and D. Among the Non-structural program alternatives (Figure 4-11), the High-risk Homeowner's Plan is preferred by preference patterns A and C and Long-term Homeowner's Plan is preferred by preference pattern B and D.

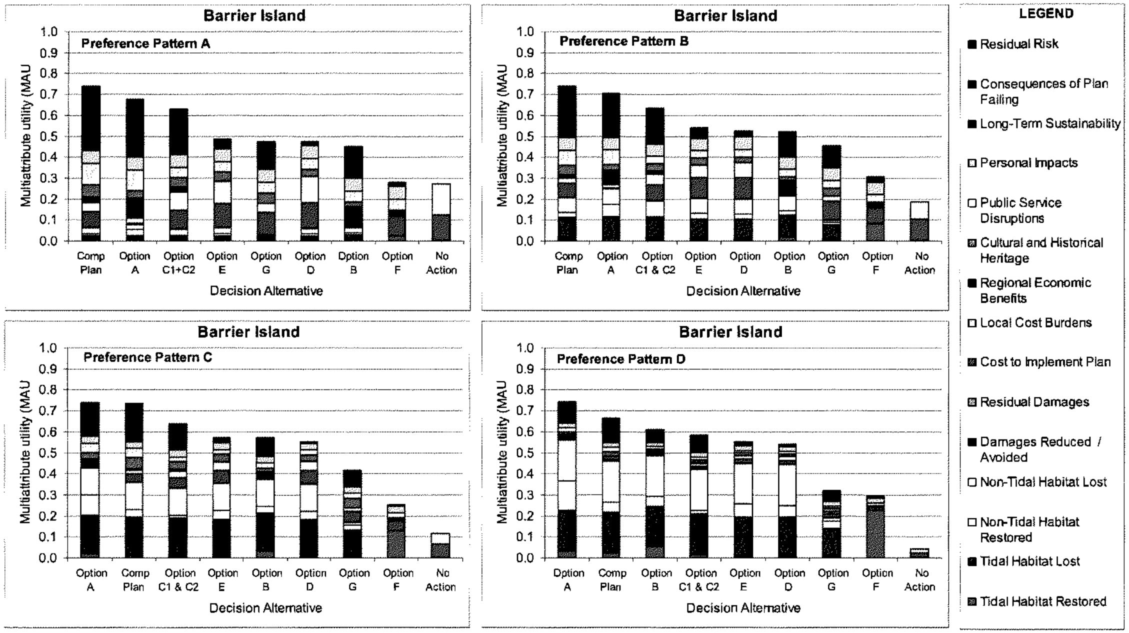


Figure 4-3: Contributions of the Metrics to Multi-attribute Utility Scores for Barrier Islands Ecosystem Restoration

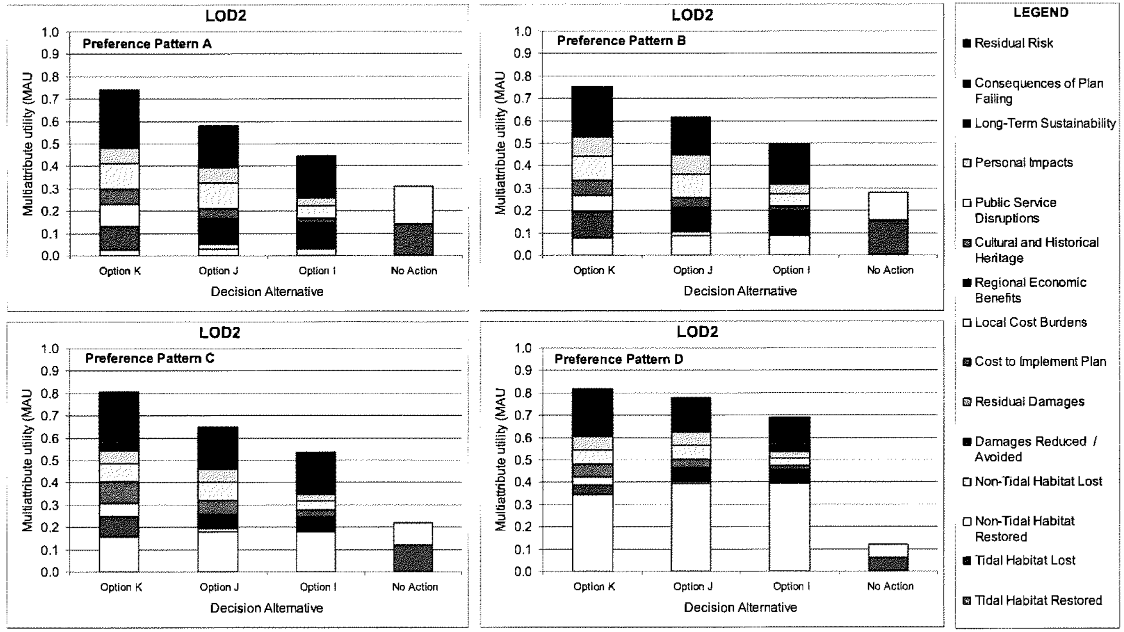


Figure 4-4: Contributions of the Metrics to Multi-attribute Utility Scores for LOD2, Beach and Dune Restoration

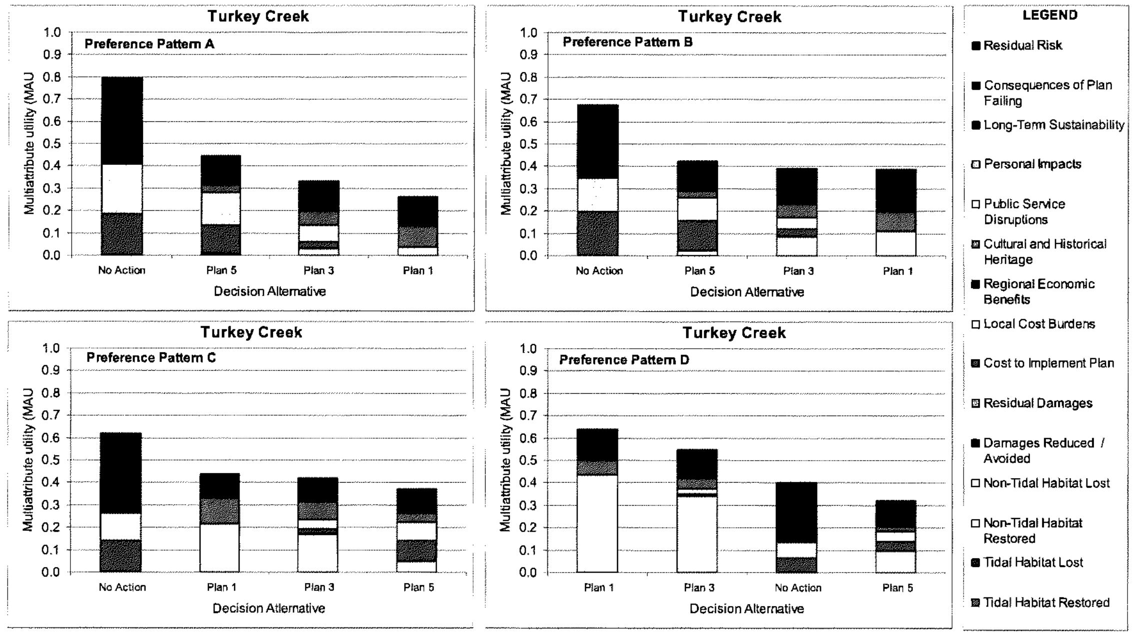


Figure 4-5: Contributions of the Metrics to Multi-attribute Utility Scores for Turkey Creek Ecosystem Restoration

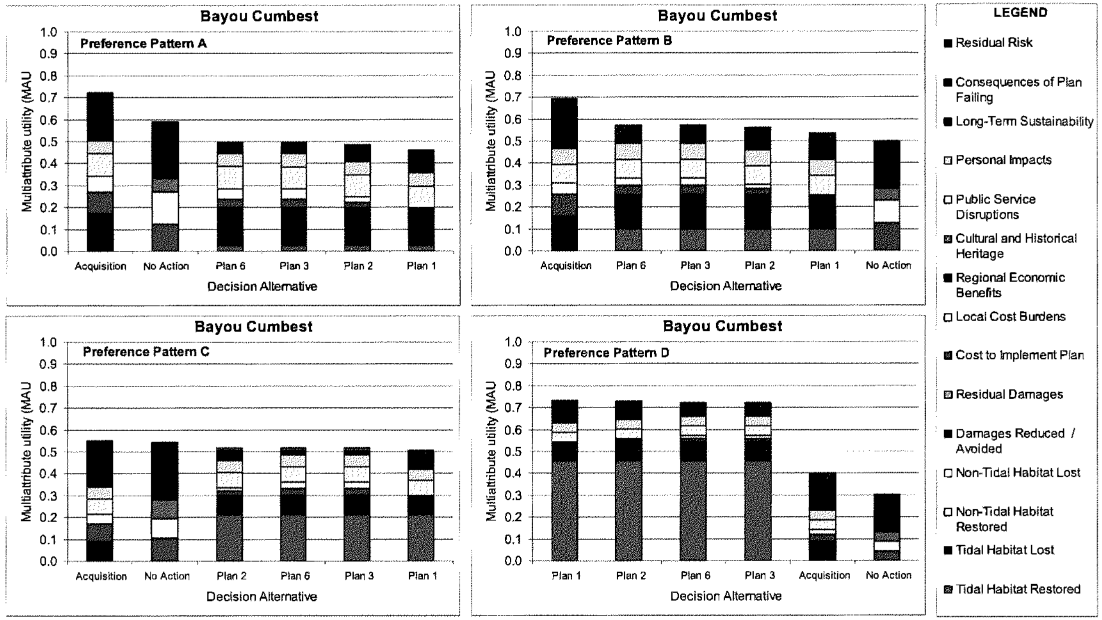


Figure 4-6: Contributions of the Metrics to Multi-attribute Utility Scores for Bayou Cumbest Ecosystem Restoration

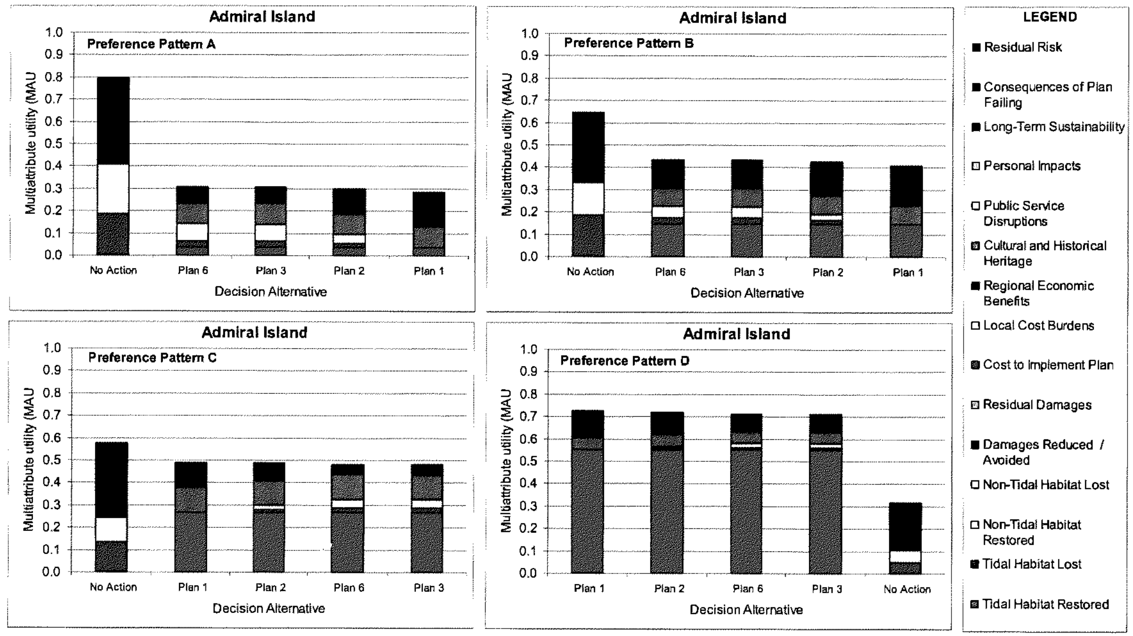


Figure 4-7: Contributions of the Metrics to Multi-attribute Utility Scores for Admiral Island Ecosystem Restoration

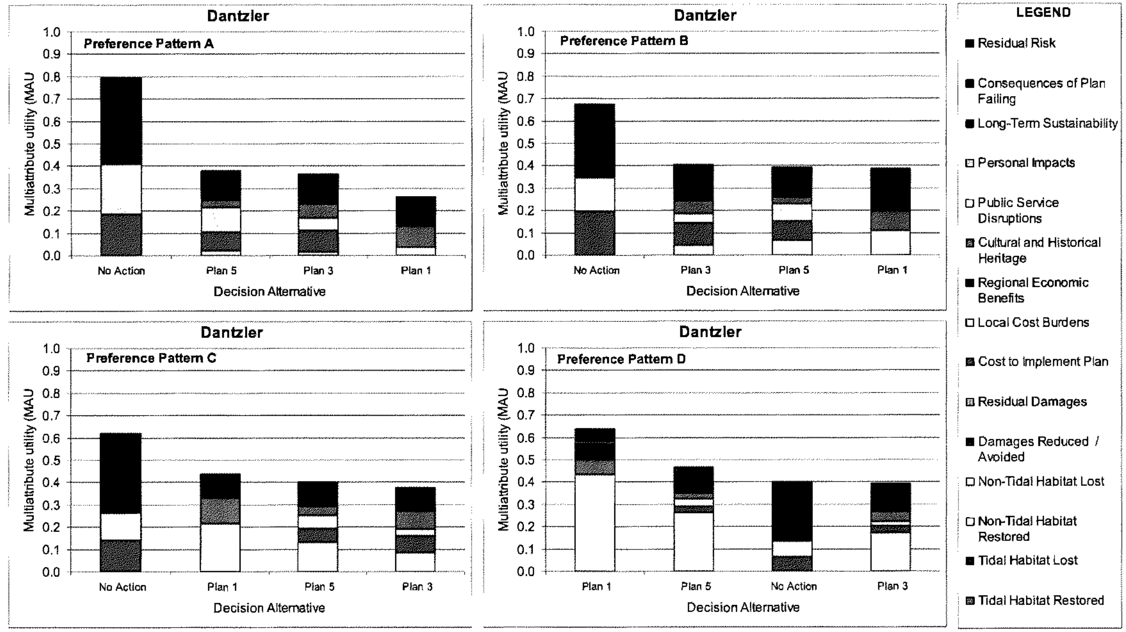


Figure 4-8: Contributions of the Metrics to Multi-attribute Utility Scores for Dantzler Ecosystem Restoration

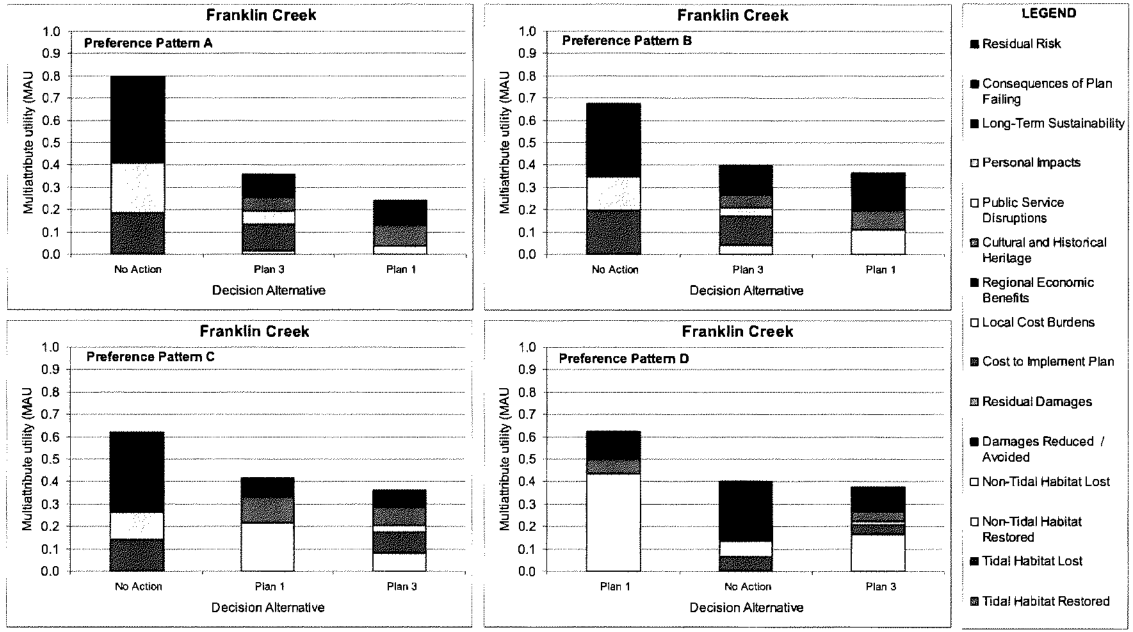


Figure 4-9: Contributions of the Metrics to Multi-attribute Utility Scores for Franklin Creek Ecosystem Restoration

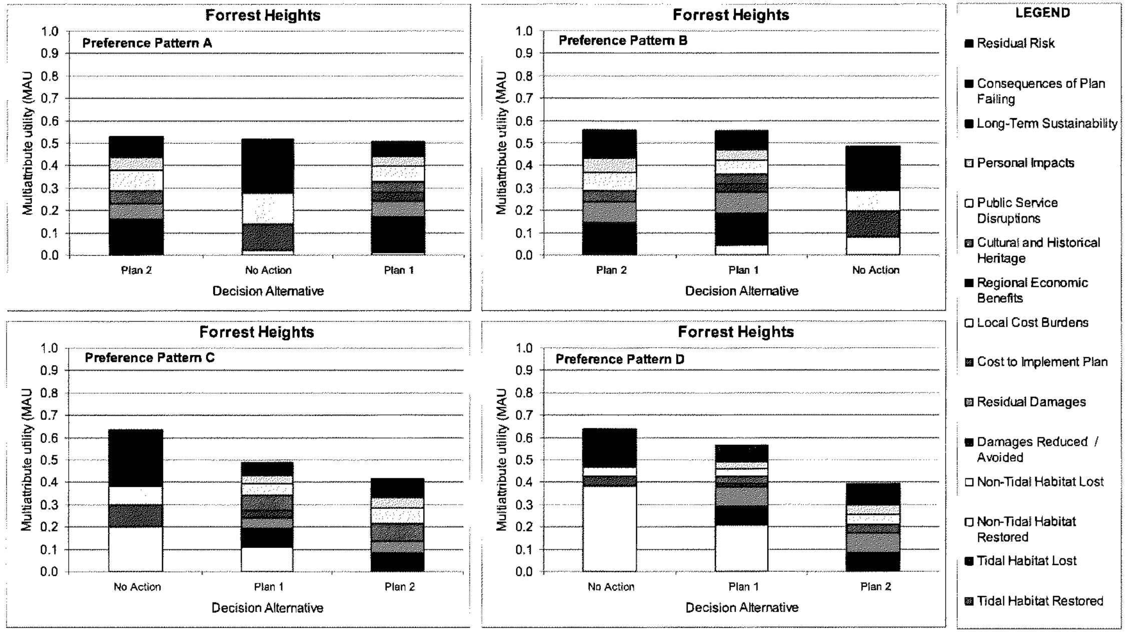


Figure 4-10: Contributions of the Metrics to Multi-attribute Utility Scores for Forrest Heights Hurricane and Storm Damage Reduction

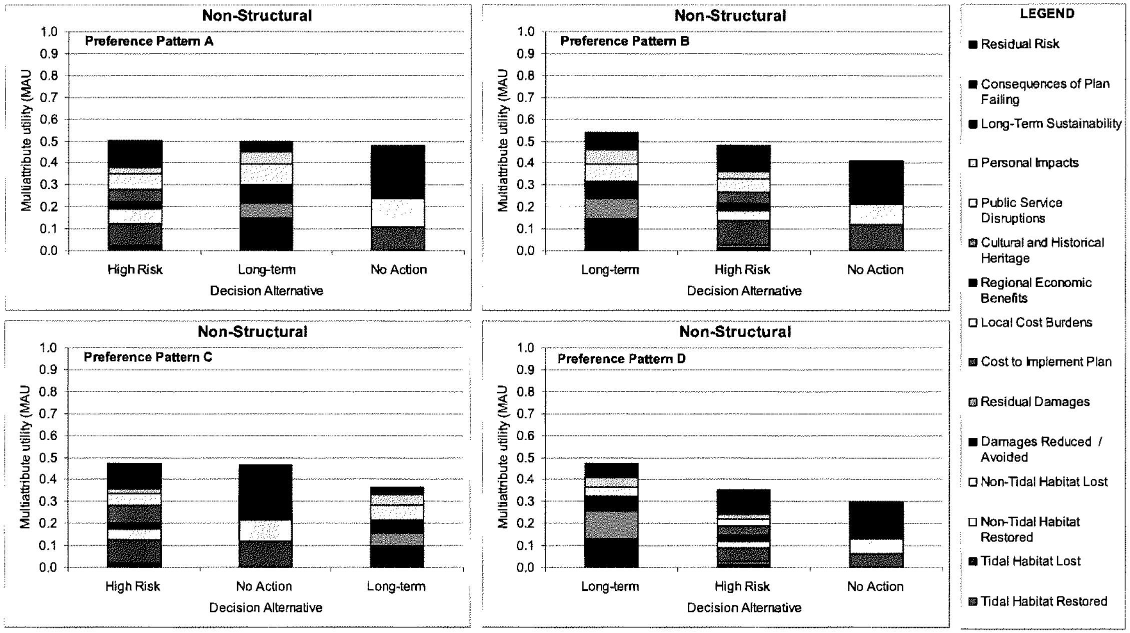


Figure 4-11: Contributions of the Metrics to Multi-attribute Utility Scores for Non-Structural Hurricane and Storm Damage Reduction

5. DISCUSSION

This application of RIDF has focused on developing an objectives hierarchy for MsCIP measures selection, identifying a set of metrics to model performance outcomes, and developing a multi-attribute utility function to rate the relative performance of project alternatives. In the analysis of results, MsCIP measures alternatives are ranked by MAU score using four different sets of attribute weights. Each set of weights characterizes a pattern of preference that is represented by a group of individuals, or cluster, within the stakeholder community. Plans are ranked by MAU score and, in the absence of uncertainty in the assumptions used to model plan outcomes, the preferred measure for each cluster is the measure with the highest MAU score. However, most decisions with long-range planning horizons involve a considerable amount of uncertainty and MsCIP is no exception.

In addition to enhancing the Corps' six-step P&G guidelines by providing a means to consider multiple objectives in the decision process, RIDF also offers a mechanism by which to engage stakeholders more actively in the Corps' planning process. For example, these MCDA procedures help decision makers and stakeholders: 1) systematically structure the decision process; 2) assess tradeoffs among decision objectives; 3) reflect upon, articulate, and apply explicit value judgments concerning conflicting decision criteria; 4) make more consistent and rational evaluations of risks and uncertainties; and 5) facilitate negotiation (Hobbs and Meier 2000). In addition to improving the quality of decisions, RIDF helps decision makers engage stakeholders. Stakeholders assist decision makers to develop an objectives hierarchy and to assess the relative importance of those decision objectives. An obvious benefit of engaging stakeholders during the planning process is that this is likely to engender greater trust and confidence on the part of stakeholders and may enhance the sense of legitimacy of the decision or final outcome. The objectives hierarchy is described in Section 3.1.3 and the stakeholder weight elicitation sessions are described in Section 4.1.

Results of the stakeholder weight elicitation sessions are analyzed using cluster analysis to identify characteristic patterns of preference in the stakeholder population. The rationale for this method is that it provides an objective approach to classifying stakeholders based on psychometric data obtained directly from them. Four characteristic patterns of preference emerged from the results of weight elicitation. These preference patterns can be differentiated by the aggregate weight on EQ objectives, which is the sum of relative weights on individual EQ sub-objectives. The aggregate weight on EQ objectives is negatively correlated with the aggregate weight on each of the remaining higher level objectives: NED, RED, and OSE. Preference pattern A places the greatest emphasis on NED and RED objectives while preference pattern D places the greatest emphasis on EQ objectives. OSE objectives are consistently rated low relative to the other objectives, but preference pattern A gives slightly more emphasis to OSE objectives than EQ objectives.

This study describes why the outcomes associated with some alternatives are preferred by various stakeholders to others. Utility provides a relative measure with which to compare decision outcomes given a set of objectives and the preferences of a subject. The contribution of an attribute to utility is determined by the relative importance placed on a performance objective and the relative performance of the alternative with respect to that decision objective. Plan rankings will tend to be more strongly influenced by those decision attributes that have both a high weight and a large amount of variability in performance outcomes across plans. If relative performance does not vary much across the alternatives, then these metrics should have little impact on the decision. Similarly, an objective that is unimportant (receives a low weight) should also have little impact on the decision, even if the corresponding metric varies a lot from one alternative to another. Metrics that do not vary much do not affect the plan rankings. For MsCIP, at least one metric in each subdivision was eliminated because it exhibited no variation across decision alternatives. Weights on decision objectives were scaled in each sub-division to accommodate the elimination of metrics.

Results of the MCDA are summarized in Table 4-3 and in the ensuing figures. A great deal can be learned by analyzing the MCDA for these four distinctly different patterns of preference. For the Barrier Islands Ecosystem Restoration, Option A and the Comprehensive Plan form a top tier of decision alternatives (Figure 4-3). These plans outrank the seven other plans for each preference pattern. Although preference patterns A and B prefer the Comprehensive Plan and preference patterns C and D prefer Option A, the differences in the MAU scores between these two plans appears relatively small for each preference pattern. This suggests that, while the different preference patterns express wildly different values and priorities, stakeholders could reach consensus around one of these two plans. Each preference pattern prefers the similar decision alternatives, but for different reasons. A similar result is observed in the LOD2 subdivision, where Option K is preferred to other alternatives for all preference patterns (Figure 4-4).

Results in other subdivisions are slightly more complicated. In Turkey Creek (Figure 4-5), Admiral Island (Figure 4-7), Dantzler (Figure 4-8), and Franklin Creek (Figure 4-9), preference patterns A, B, and C all prefer the No Action alternative while preference pattern D, which has a high weight on environmental objectives, prefers Ecosystem Plan 1. A similar pattern is observed in Bayou Cumbest (Figure 4-6) where preference patterns A, B, and C all prefer Acquisition while preference pattern D prefers Ecosystem Plan 1. It is worth pointing out that, in each case, the MAU score for the preferred alternative stands out as apparently higher than the MAU score for the other alternatives. In Forrest Heights (Figure 4-10), Plan 2 has the highest MAU score for preference patterns A and B while the No Action alternative ranks highest for preference patterns C and D. Among the Non-structural alternatives (Figure 4-11), the High Risk Homeowners Assistance Plan has the highest MAU score for preference patterns A and C while the Long-term Homeowners Assistance Plan has the highest MAU score for preference patterns B and D.

One of the benefits of subjecting policy decisions such as those being considered in MsCIP to a multi-attribute decision analysis and stakeholder involvement is that it helps decision makers to identify where common interests exist. It is possible to analyze the results to identify where and how bridges might be built to unite stakeholders who hold competing views, and where more work may be needed to evaluate decision alternatives. The results of this analysis suggest that, given the information that is available at this time, stakeholder consensus is a real possibility in the Barrier Islands and LOD2 subdivisions. For Turkey Creek, Bayou Cumbest, Admiral Island, Dantzler, and Franklin Creek, there is a modal preference for the No Action alternative among the preference patterns considered in this report. More work may be needed differentiate among the alternatives will be needed to develop recommendations for the Forrest Heights and Non-structural subdivisions.

Although a plan may have a high rank over a large number of preference patterns, the utility of that plan for one or more of those preference types may be substantially lower than for others. In this case, consideration should be given to how large these differences in utility are, whether or not these differences represent an inequity, and to what extent this outcome may be the product of having considered only a limited scope of decision alternatives.

6. LESSONS LEARNED FROM IMPLEMENTATION OF THE RIDF

Stakeholder input is being used by US Army Corps of Engineers to inform itself about the interests and values of the stakeholders who will be affected by the planning process. However, the ultimate responsibility for this project selection decision rests solely with the US Army Corps of Engineers. The agency is legally bound to act only within the mission and authority that it was given by Congress.

A number of lessons were learned in this application of RIDF that suggest recommendations for future planning studies that use this method. For example, it is important that sufficient attention be given to developing the objectives hierarchy and selecting the metrics. The time spent structuring an objectives hierarchy will assist in helping the decision maker to clarify his objectives and the use of poorly structured hierarchies can result in recommendations that lead to sub-optimal outcomes. All of the relevant interests of the decision maker should be included in the hierarchy and the lower level objectives should be associated with metrics that clearly represent the extent to which that objective is achieved by a decision outcome.

Ideally, metrics should be quantitative and measurable. Some of the metrics adopted for this study were qualitative because time and resource constraints limited the ability to evaluate the metrics quantitatively through modeling studies or other forms of analysis. Metrics should also be meaningful for the stakeholders who are participating in the weight elicitation session. For example, a decision objective to minimize project cost could be represented by a metric that is an estimate of an individual's additional tax burden rather than an estimate of the total project cost, which may hold less meaning for most stakeholders.

All objectives and metrics should be clearly defined. If definitions are long, complicated, or ambiguous, they will lack clarity. Clarity is needed to avoid confusion in the weight elicitation process and divergent views about what a particular metric represents. Such circumstances could undermine the ability to compare weights elicited from stakeholders.

Many different patterns of preference will commonly exist in populations affected by large planning projects. Therefore, it is important that the group of stakeholders who participate in the weight elicitation sessions provide a representative cross-section of the population. If participants are drawn from too narrow a subset of the population, the interests of the population will not be accurately represented.

Preference assessment is a difficult task and it is important that the level of effort needed to obtain valid results not be underestimated. While much effort went into obtaining information on stakeholder preferences for this project, some improvements in the approach are still possible. Stakeholder engagement sessions, such as those conducted for this project, should incorporate controls during the weight elicitation procedure to qualify the results using internal validity tests. For example, future weight elicitation sessions should include tests to help confirm that participants understand and are implementing the instructions properly. In addition, persons conducting the weight elicitation sessions should follow a script so that the procedures are consistently applied from one session to another and are well documented. It may also be useful to expand the scope of information collected from stakeholders. For example, a set of questions unrelated to the project at hand could assist in developing a more meaningful interpretation of the clusters. This will also provide the ground work for formalizing the MCDA technique and making it more generally applicable to other Corps decision processes.

Finally, there are many uncertainties that can influence a project selection decision. For example, the rate of change in sea-level rise over the life of the project is an obvious and relevant factor to consider in evaluating decision alternatives. Decision analysis assists decision makers in choosing among alternatives despite these uncertainties. Failure to account for uncertainty in the decision can lead to suboptimal outcomes. Therefore, future applications of the RIDF should assess the most important sources of uncertainty and fully analyze their impacts on the decision.

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ANNEX 1. – STAKEHOLDER WORKSHOP PARTICIPANTS

Table A1-1.
State Government Participants 10 September. 15 survey participants

Name	Organization
Margaret Bretz	Secretary of State
Mike Buchanan	MS Dept of Marine Resources
Sonia Carr	MEMA Long-Term Recovery
Kerwin Cuevas	MS Dept of Marine Resources
Dale Diaz	MS Dept of Marine Resources
Ashley Edwards	Governor's Office
Tom Mann	MS Museum Natural Science/MDWFP
David McNeel	MS State Port Authority
Jamie Miller	Governor's Office
Ken P'Pool	MS Dept of Archives and History
George Ramseur, Jr.	MS Dept of Marine Resources
David Seyfarth	MS Dept of Transportation
Kathy Shelton	MS Museum Natural Science/MDWFP
R. Chad Wallace	MDOT, Environmental Division
Nick Winstead	MS Museum Natural Science/MDWFP

Table A1-2.
Federal Government Participants 10 September. 11 survey participants

Name	Organization
Valerie Anderson	FEMA Biloxi
Sabrina Chandler	USFWS Jackson
Tyree Harrington	USDA-NRCS
Ntale Kajumba	USEPA Region 4
Rob Lowe	FEMA Region 4
C. Baxter Mann	FEMA-DELO
Bruce McCraney	National Park Service
Jim Murphy	MARAD
Mickey Plunkett	USGS (MS)
Chris Recceston	FEMA
Mark Thompson	National Marine Fisheries Service (Habitat)

Table A1-3.
Local Government Participants 10 September. 8 survey participants

Name	Organization
Patrick Bonck	Harrison County Zoning
Harrietta Eaton	City of Pascagoula
Les Fillingame	City of Bay St. Louis
Liz Ford	City of Pascagoula
Aneice Liddell	City of Moss Point
Gordon Quesenberry	City of Gautier
Jaclyn Turner	City of Pascagoula
Daphne Viverette	City of Moss Point

Table A1-4.
Business/Developer Participants 11 September. 5 survey participants

Name	Organization
Laura Brown	Gulf Coast Investment Dev (GCID)
Willie Davis	City of Pass Christian
Jim Kelly	Eco-Logic Restoration
Shelby Stevenson	CSX Transportation
Stuart Williamson	Association of Floodplain Managers of Mississippi

Table A1-5.
NGO/Scientist Participants 11 September. 5 survey participants

Name	Organization
Jeff Grimes	Gulf Restoration Network
Buck Lawrence	STEPs Coalition/North Gulfport Commission Land Trust
Mike Murphy	The Nature Conservancy
Stephanie Powell	STEPs Coalition Environmental Justice & Sustainability Piller
Judy Steckler	Land Trust

Table A1-6.
Corps MsCIP and ERDC Participants 11 September: 5 survey participants

Name	Organization
Cynthia Banks	ERDC
Todd Boatman	SAM
Barry Payne	ERDC
Susan Rees	SAM
Burton Suedel	ERDC

ANNEX 2. STAKEHOLDER RANKINGS

Table A2-1.
Allocation of 100 Points to 15 MsCIP Metrics (See Table 1-1 for Definitions of Metrics)

Cluster	Elicitation Session	Metrics														
		Tidal Habitat Restored	Tidal Habitat Lost	Non-Tidal Habitat Restored	Non-Tidal Habitat Lost	Damage Reduced/Avoided	Residual Damages	Cost to Implement Plan	Local Cost Burden	Regional Economic Benefits	Cultural and Historical Heritage	Public Service Disruptions	Personal Impacts	Long-Term Sustainability	Consequences of Plan Failure	Residual Risk
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
A	Business	1	1	1	1	35	3	5	5	5	4	2	2	15	16	4
A	Business	5	3	5	3	5	4	9	10	10	6	8	8	15	3	6
A	Federal	2	1	2	1	20	4	10	4	10	1	10	4	17	10	4
A	Local	2	2	2	2	7	7	12	24	10	5	10	5	5	2	5
A	Local	1	1	1	1	3	3	25	25	10	10	5	1	7	3	4
A	Local	1	2	1	2	13	8	1	12	13	1	8	5	12	12	9
A	Local	3	4	1	2	15	5	5	3	4	3	12	8	18	13	4
A	Local	1	1	1	1	20	8	12	9	10	6	7	2	15	5	2
A	Local	1	1	1	1	10	10	10	16	3	7	7	7	15	10	1
B	Business	8	6	6	2	15	6	10	8	8	8	5	7	4	3	4
B	Business	10	8	1	1	7	10	10	12	5	3	8	5	9	6	5
B	USACE	12	12	10	10	12	7	2	2	2	5	5	2	7	7	5
B	USACE	10	12	10	14	10	9	8	5	7	3	2	4	2	3	1
B	USACE	5	5	5	5	10	5	10	10	5	5	5	5	7	15	3
B	Federal	6	6	5	5	20	6	6	4	7	4	5	3	9	8	6
B	Federal	5	5	5	5	10	10	10	5	5	5	5	5	10	10	5
B	Federal	10	10	5	5	10	1	10	7	5	1	5	1	5	5	20
B	Local	1	10	1	10	10	12	18	1	8	4	8	3	1	12	1
B	Local	15	9	5	2	8	5	6	8	3	8	5	5	8	5	8
B	NGO	5	10	5	10	17	1	10	5	2	3	3	3	18	7	1
B	State	5	5	5	5	10	10	10	10	10	5	10	5	10	0	0
B	State	7	12	7	12	6	3	11	6	3	3	2	2	16	5	5
B	State	5	4	5	3	9	5	5	7	6	5	10	10	8	6	12
B	State	3	15	2	2	8	10	8	8	7	1	5	12	5	6	8
C	Business	8	30	1	1	5	1	10	10	9	5	5	3	10	1	1
C	USACE	11	12	11	12	5	7	6	6	4	2	3	2	9	8	2
C	Federal	12	12	12	12	5	5	3	3	2	5	5	5	10	5	4

Cluster	Elicitation Session	Metrics														
		Tidal Habitat Restored	Tidal Habitat Lost	Non-Tidal Habitat Restored	Non-Tidal Habitat Lost	Damage Reduced/Avoided	Residual Damages	Cost to Implement Plan	Local Cost Burden	Regional Economic Benefits	Cultural and Historical Heritage	Public Service Disruptions	Personal Impacts	Long-Term Sustainability	Consequences of Plan Failure	Residual Risk
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
C	Federal	10	10	12	15	4	4	1	1	1	15	1	1	5	15	5
C	NGO	16	16	11	11	4	3	3	1	1	2	1	1	18	8	4
C	NGO	10	20	5	20	6	3	5	3	5	2	5	2	5	8	1
C	State	12	14	11	13	9	1	10	9	2	2	1	2	10	2	1
C	State	8	15	8	16	5	5	5	10	2	5	4	4	8	3	2
C	State	15	20	10	10	5	0	10	0	3	2	3	2	10	10	0
C	State	15	15	5	5	5	5	5	5	5	5	10	10	4	4	2
D	Federal	15	20	15	15	10	5	1	2	3	4	2	4	1	1	2
D	Federal	30	25	12	8	1	1	1	1	1	1	1	1	77	5	5
D	Federal	50	1	20	2	6	5	2	2	1	2	2	2	2	1	2
D	NGO	14	20	14	20	1	1	1	3	7	2	1	1	5	88	2
D	NGO	14	25	15	24	2	1	3	2	1	2	2	3	2	3	1
D	State	5	15	2	40	1	10	5	1	1	2	1	1	10	1	5

ANNEX 3. - CALCULATION OF MULTI-ATTRIBUTE UTILITY SCORES BY PREFERENCE PATTERN.

Table A3-1.
Calculation of Multi-attribute Utility Scores for Preference Pattern A

CLUSTER A

Metric:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MAU
Overall Weights:	0.02	0.02	0.02	0.02	0.14	0.06	0.1	0.12	0.08	0.05	0.08	0.05	0.13	0.08	0.04	
Barrier Island Scaled Weights	**0.0247**	**0.0247**	**0.0247**	**0.0247**			**0.1235**	**0.1481**	**0.0988**	**0.0617**	**0.0988**	**0.0617**	**0.1605**	**0.0988**	**0.0494**	
Barrier Island Comp Plan	0.0026	0.0247	0.0084	0.0247			0.0811	0.0423	0.0247	0.0617	0.0988	0.0617	0.1605	0.0988	0.0494	0.7393
Barrier Island Option A	0.0036	0.0247	0.0247	0.0247			0.0087	0.0212	0.0988	0.0353	0.0988	0.0617	0.1605	0.0741	0.0395	0.6762
Barrier Island Option C1 & C2	0.0018	0.0247	0.0026	0.0247			0.0951	0.0847	0.0247	0.0441	0.0494	0.0617	0.1284	0.0494	0.0395	0.6308
Barrier Island Option E	0.0000	0.0247	0.0110	0.0247			0.1187	0.1058	0.0000	0.0441	0.0494	0.0617	0.0000	0.0247	0.0198	0.4845
Barrier Island Option G	0.0007	0.0172	0.0058	0.0023			0.1096	0.0423	0.0000	0.0529	0.0494	0.0617	0.0642	0.0494	0.0198	0.4753
Barrier Island Option D	0.0000	0.0247	0.0099	0.0247			0.1217	0.1270	0.0000	0.0353	0.0494	0.0617	0.0000	0.0000	0.0198	0.4742
Barrier Island Option B	0.0058	0.0247	0.0083	0.0247			0.0000	0.0000	0.0988	0.0265	0.0494	0.0617	0.0963	0.0247	0.0296	0.4504
Barrier Island Option F	0.0247	0.0000	0.0000	0.0000			0.0912	0.0000	0.0247	0.0088	0.0494	0.0617	0.0000	0.0000	0.0198	0.2803
Barrier Island No Action	0.0000	0.0000	0.0000	0.0000			0.1235	0.1481	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2716
LOD2 Scaled Weights			**0.0282**				**0.1408**	**0.1690**	**0.1127**	**0.0704**	**0.1127**	**0.0704**	**0.1831**	**0.1127**		
LOD2 Option K			0.0244				0.1077	0.0966	0.0000	0.0704	0.1127	0.0704	0.1831	0.0751		0.7404
LOD2 Option J			0.0282				0.0000	0.0241	0.1127	0.0469	0.1127	0.0704	0.1099	0.0751		0.5800
LOD2 Option I			0.0282				0.0034	0.0000	0.1127	0.0235	0.0563	0.0352	0.0732	0.1127		0.4452
LOD2 No Action			0.0000				0.1408	0.1690	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.3099
Turkey Creek Scaled Weights			**0.0370**				**0.1852**	**0.2222**		**0.0926**			**0.2407**	**0.1481**	**0.0741**	
Turkey Creek No Action			0.0000				0.1852	0.2222		0.0000			0.2407	0.1481	0.0000	0.7963
Turkey Creek Ecosystem Plan 5			0.0080				0.1260	0.1481		0.0309			0.0963	0.0000	0.0370	0.4464
Turkey Creek Ecosystem Plan 3			0.0290				0.0334	0.0741		0.0617			0.0481	0.0296	0.0556	0.3316
Turkey Creek Ecosystem Plan 1			0.0370				0.0000	0.0000		0.0926			0.0000	0.0593	0.0741	0.2630
Bayou Cumbest Scaled Weights	**0.0247**				**0.1728**		**0.1235**	**0.1481**		**0.0617**	**0.0988**	**0.0617**	**0.1605**	**0.0988**	**0.0494**	
Bayou Cumbest Acquisition	0.0000				0.1728		0.0978	0.0741		0.0000	0.0988	0.0617	0.0802	0.0988	0.0395	0.7237
Bayou Cumbest No Action	0.0000				0.0000		0.1235	0.1481		0.0617	0.0000	0.0000	0.1605	0.0988	0.0000	0.5926
Bayou Cumbest Ecosystem Plan 6	0.0247				0.1728		0.0394	0.0494		0.0000	0.0988	0.0617	0.0000	0.0000	0.0494	0.4962
Bayou Cumbest Ecosystem Plan 3	0.0247				0.1728		0.0393	0.0494		0.0000	0.0988	0.0617	0.0000	0.0000	0.0494	0.4961
Bayou Cumbest Ecosystem Plan 2	0.0247				0.1728		0.0263	0.0247		0.0000	0.0988	0.0617	0.0267	0.0000	0.0494	0.4851
Bayou Cumbest Ecosystem Plan 1	0.0247				0.1728		0.0000	0.0000		0.0000	0.0988	0.0617	0.0535	0.0000	0.0494	0.4609
Admiral Island Scaled Weights	**0.0370**						**0.1852**	**0.2222**		**0.0926**			**0.2407**	**0.1481**	**0.0741**	
Admiral Island No Action	0.0000						0.1852	0.2222		0.0000			0.2407	0.1481	0.0000	0.7963
Admiral Island Ecosystem Plan 6	0.0370						0.0298	0.0741		0.0926			0.0000	0.0000	0.0741	0.3076
Admiral Island Ecosystem Plan 3	0.0370						0.0294	0.0741		0.0926			0.0000	0.0000	0.0741	0.3071
Admiral Island Ecosystem Plan 2	0.0370						0.0194	0.0370		0.0926			0.0401	0.0000	0.0741	0.3003
Admiral Island Ecosystem Plan 1	0.0370						0.0000	0.0000		0.0926			0.0802	0.0000	0.0741	0.2840
Dantzler Scaled Weights			**0.0370**				**0.1852**	**0.2222**		**0.0926**			**0.2407**	**0.1481**	**0.0741**	
Dantzler No Action			0.0000				0.1852	0.2222		0.0000			0.2407	0.1481	0.0000	0.7963
Dantzler Ecosystem Plan 5			0.0225				0.0827	0.1111		0.0309			0.0963	0.0000	0.0370	0.3806
Dantzler Ecosystem Plan 3			0.0145				0.0995	0.0556		0.0617			0.0481	0.0296	0.0556	0.3646
Dantzler Ecosystem Plan 1			0.0370				0.0000	0.0000		0.0926			0.0000	0.0593	0.0741	0.2630
Franklin Creek Scaled Weights			**0.0370**				**0.1852**	**0.2222**		**0.0926**			**0.2407**	**0.1481**	**0.0741**	
Franklin Creek No Action			0.0000				0.1852	0.2222		0.0000			0.2407	0.1481	0.0000	0.7963
Franklin Creek Ecosystem Plan 3			0.0139				0.1227	0.0556		0.0617			0.0481	0.0000	0.0556	0.3576
Franklin Creek Ecosystem Plan 1			0.0370				0.0000	0.0000		0.0926			0.0000	0.0370	0.0741	0.2407
Forrest Heights Scaled Weights				**0.0230**	**0.1609**	**0.0690**	**0.1149**	**0.1379**		**0.0575**	**0.0920**	**0.0575**	**0.1494**	**0.0920**	**0.0460**	
Forrest Heights Plan 2				0.0000	0.1609	0.0690	0.0000	0.0000		0.0575	0.0920	0.0575	0.0000	0.0460	0.0460	0.5287
Forrest Heights No Action				0.0230	0.0000	0.0000	0.1149	0.1379		0.0000	0.0000	0.0000	0.1494	0.0920	0.0000	0.5172
Forrest Heights Plan 1				0.0125	0.1607	0.0689	0.0383	0.0000		0.0479	0.0690	0.0431	0.0299	0.0000	0.0368	0.5070
Nonstructural Scaled Weights					**0.1505**	**0.0645**	**0.1075**	**0.1290**	**0.0860**	**0.0538**	**0.0860**	**0.0538**	**0.1398**	**0.0860**	**0.0430**	
High Risk Homeowners Assistance Plan					0.0161	0.0069	0.1010	0.0645	0.0344	0.0575	0.0690	0.0287	0.0897	0.0000	0.0345	0.5022
Long-term Homeowners Assistance Plan					0.1505	0.0645	0.0000	0.0000	0.0860	0.0000	0.0920	0.0575	0.0000	0.0000	0.0460	0.4965
No Action Homeowners Assistance Plan					0.0000	0.0000	0.1075	0.1290	0.0000	0.0000	0.0000	0.0000	0.1494	0.0920	0.0000	0.4779

Table A3-2.
Calculation of Multi-attribute Utility Scores for Preference Pattern B

CLUSTER B

Metric:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MAU
Overall Weights:	0.07	0.09	0.05	0.06	0.11	0.07	0.09	0.07	0.06	0.04	0.06	0.05	0.08	0.07	0.06	
Barrier Island Scaled Weights	**0.0824**	**0.1059**	**0.0588**	**0.0706**			**0.1059**	**0.0824**	**0.0706**	**0.0471**	**0.0706**	**0.0588**	**0.0941**	**0.0824**	**0.0706**	
Barrier Island Comp Plan	0.0085	0.1059	0.0201	0.0706			0.0695	0.0235	0.0176	0.0471	0.0706	0.0588	0.0941	0.0824	0.0706	0.7393
Barrier Island Option A	0.0121	0.1059	0.0588	0.0706			0.0075	0.0118	0.0706	0.0269	0.0706	0.0588	0.0941	0.0618	0.0565	0.7058
Barrier Island Option C1 & C2	0.0061	0.1059	0.0063	0.0706			0.0816	0.0471	0.0176	0.0336	0.0353	0.0588	0.0753	0.0412	0.0565	0.6358
Barrier Island Option E	0.0000	0.1059	0.0262	0.0706			0.1018	0.0588	0.0000	0.0336	0.0353	0.0588	0.0000	0.0206	0.0282	0.5398
Barrier Island Option D	0.0000	0.1059	0.0237	0.0706			0.1044	0.0706	0.0000	0.0269	0.0353	0.0588	0.0000	0.0000	0.0282	0.5244
Barrier Island Option B	0.0193	0.1059	0.0198	0.0706			0.0000	0.0000	0.0706	0.0202	0.0353	0.0588	0.0565	0.0206	0.0424	0.5198
Barrier Island Option G	0.0024	0.0739	0.0138	0.0066			0.0940	0.0235	0.0000	0.0403	0.0353	0.0588	0.0376	0.0412	0.0282	0.4557
Barrier Island Option F	0.0824	0.0000	0.0000	0.0000			0.0783	0.0000	0.0176	0.0067	0.0353	0.0588	0.0000	0.0000	0.0282	0.3073
Barrier Island No Action	0.0000	0.0000	0.0000	0.0000			0.1059	0.0824	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1882
LOD2 Scaled Weights			**0.0877**				**0.1579**	**0.1228**	**0.1053**	**0.0702**	**0.1053**	**0.0877**	**0.1404**	**0.1228**		
LOD2 Option K			0.0761				0.1207	0.0702	0.0000	0.0702	0.1053	0.0877	0.1404	0.0819		0.7523
LOD2 Option J			0.0877				0.0000	0.0175	0.1053	0.0468	0.1053	0.0877	0.0842	0.0819		0.6164
LOD2 Option I			0.0877				0.0039	0.0000	0.1053	0.0234	0.0526	0.0439	0.0561	0.1228		0.4957
LOD2 No Action			0.0000				0.1579	0.1228	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.2807
Turkey Creek Scaled Weights			**0.1087**				**0.1957**	**0.1522**		**0.0870**			**0.1739**	**0.1522**	**0.1304**	
Turkey Creek No Action			0.0000				0.1957	0.1522		0.0000			0.1739	0.1522	0.0000	0.6739
Turkey Creek Ecosystem Plan 5			0.0235				0.1332	0.1014		0.0290			0.0696	0.0000	0.0652	0.4219
Turkey Creek Ecosystem Plan 3			0.0852				0.0353	0.0507		0.0580			0.0348	0.0304	0.0978	0.3923
Turkey Creek Ecosystem Plan 1			0.1087				0.0000	0.0000		0.0870			0.0000	0.0609	0.1304	0.3870
Bayou Cumbest Scaled Weights	**0.1000**				**0.1571**		**0.1286**	**0.1000**		**0.0571**	**0.0857**	**0.0714**	**0.1143**	**0.1000**	**0.0857**	
Bayou Cumbest Acquisition	0.0000				0.1571		0.1019	0.0500		0.0000	0.0857	0.0714	0.0571	0.1000	0.0686	0.6919
Bayou Cumbest Ecosystem Plan 6	0.1000				0.1571		0.0411	0.0333		0.0000	0.0857	0.0714	0.0000	0.0000	0.0857	0.5744
Bayou Cumbest Ecosystem Plan 3	0.1000				0.1571		0.0410	0.0333		0.0000	0.0857	0.0714	0.0000	0.0000	0.0857	0.5743
Bayou Cumbest Ecosystem Plan 2	0.1000				0.1571		0.0274	0.0167		0.0000	0.0857	0.0714	0.0190	0.0000	0.0857	0.5631
Bayou Cumbest Ecosystem Plan 1	0.1000				0.1571		0.0000	0.0000		0.0000	0.0857	0.0714	0.0381	0.0000	0.0857	0.5381
Bayou Cumbest No Action	0.0000				0.0000		0.1286	0.1000		0.0571	0.0000	0.0000	0.1143	0.1000	0.0000	0.5000
Admiral Island Scaled Weights	**0.1458**						**0.1875**	**0.1458**		**0.0833**			**0.1667**	**0.1458**	**0.1250**	
Admiral Island No Action	0.0000						0.1875	0.1458		0.0000			0.1667	0.1458	0.0000	0.6458
Admiral Island Ecosystem Plan 6	0.1458						0.0302	0.0486		0.0833			0.0000	0.0000	0.1250	0.4329
Admiral Island Ecosystem Plan 3	0.1458						0.0297	0.0486		0.0833			0.0000	0.0000	0.1250	0.4325
Admiral Island Ecosystem Plan 2	0.1458						0.0197	0.0243		0.0833			0.0278	0.0000	0.1250	0.4259
Admiral Island Ecosystem Plan 1	0.1458						0.0000	0.0000		0.0833			0.0556	0.0000	0.1250	0.4097
Dantzler Scaled Weights			**0.1087**				**0.1957**	**0.1522**		**0.0870**			**0.1739**	**0.1522**	**0.1304**	
Dantzler No Action			0.0000				0.1957	0.1522		0.0000			0.1739	0.1522	0.0000	0.6739
Dantzler Ecosystem Plan 3			0.0426				0.1051	0.0380		0.0580			0.0348	0.0304	0.0978	0.4068
Dantzler Ecosystem Plan 5			0.0661				0.0874	0.0761		0.0290			0.0696	0.0000	0.0652	0.3933
Dantzler Ecosystem Plan 1			0.1087				0.0000	0.0000		0.0870			0.0000	0.0609	0.1304	0.3870
Franklin Creek Scaled Weights			**0.1087**				**0.1957**	**0.1522**		**0.0870**			**0.1739**	**0.1522**	**0.1304**	
Franklin Creek No Action			0.0000				0.1957	0.1522		0.0000			0.1739	0.1522	0.0000	0.6739
Franklin Creek Ecosystem Plan 3			0.0409				0.1296	0.0380		0.0580			0.0348	0.0000	0.0978	0.3991
Franklin Creek Ecosystem Plan 1			0.1087				0.0000	0.0000		0.0870			0.0000	0.0380	0.1304	0.3641
Forrest Heights Scaled Weights				**0.0789**	**0.1447**	**0.0921**	**0.1184**	**0.0921**		**0.0526**	**0.0789**	**0.0658**	**0.1053**	**0.0921**	**0.0789**	
Forrest Heights Plan 2				0.0000	0.1447	0.0921	0.0000	0.0000		0.0526	0.0789	0.0658	0.0000	0.0461	0.0789	0.5592
Forrest Heights Plan 1				0.0429	0.1445	0.0920	0.0395	0.0000		0.0439	0.0592	0.0493	0.0211	0.0000	0.0632	0.5556
Forrest Heights No Action				0.0789	0.0000	0.0000	0.1184	0.0921		0.0000	0.0000	0.0000	0.1053	0.0921	0.0000	0.4868
Nonstructural Scaled Weights					**0.1447**	**0.0921**	**0.1184**	**0.0921**	**0.0789**	**0.0526**	**0.0789**	**0.0658**	**0.1053**	**0.0921**	**0.0789**	
Long-term Homeowners Assistance Plan					0.1447	0.0921	0.0000	0.0000	0.0789	0.0000	0.0789	0.0658	0.0000	0.0000	0.0789	0.5395
High Risk Homeowners Assistance Plan					0.0154	0.0098	0.1113	0.0461	0.0316	0.0526	0.0592	0.0329	0.0632	0.0000	0.0592	0.4813
No Action Homeowners Assistance Plan					0.0000	0.0000	0.1184	0.0921	0.0000	0.0000	0.0000	0.0000	0.1053	0.0921	0.0000	0.4079

Table A3-3.
Calculation of Multi-attribute Utility Scores for Preference Pattern C

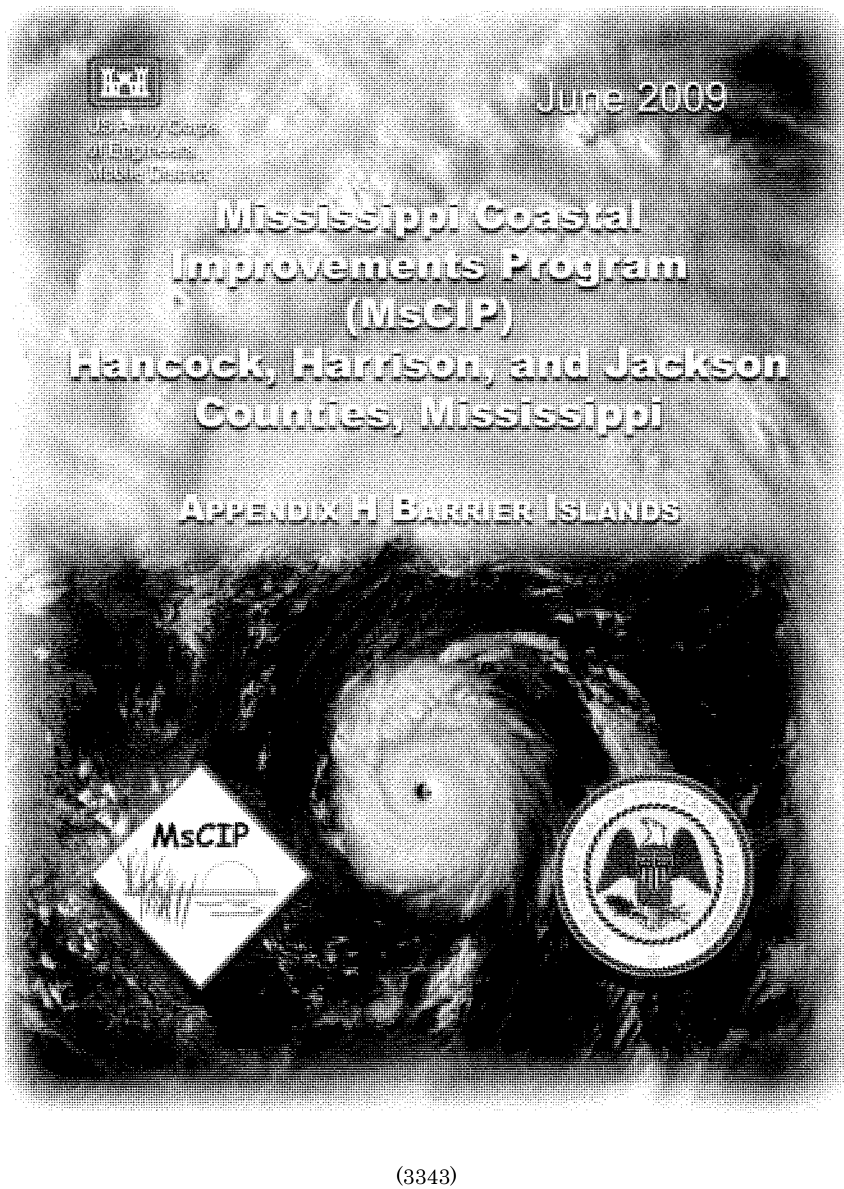
CLUSTER C

Metric:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MAU
Overall Weights:	0.12	0.17	0.09	0.12	0.05	0.03	0.06	0.05	0.03	0.05	0.04	0.03	0.09	0.06	0.02	
Barrier Island Scaled Weights	0.1290	0.1828	0.0968	0.1290			0.0645	0.0538	0.0323	0.0538	0.0430	0.0323	0.0968	0.0645	0.0215	
Barrier Island Option A	0.0189	0.1828	0.0968	0.1290			0.0046	0.0077	0.0323	0.0307	0.0430	0.0323	0.0968	0.0484	0.0172	0.7403
Barrier Island Comp Plan	0.0134	0.1828	0.0330	0.1290			0.0424	0.0154	0.0081	0.0538	0.0430	0.0323	0.0968	0.0645	0.0215	0.7358
Barrier Island Option C1 & C2	0.0096	0.1828	0.0103	0.1290			0.0497	0.0307	0.0081	0.0384	0.0215	0.0323	0.0774	0.0323	0.0172	0.6392
Barrier Island Option E	0.0000	0.1828	0.0431	0.1290			0.0620	0.0384	0.0000	0.0384	0.0215	0.0323	0.0000	0.0161	0.0086	0.5723
Barrier Island Option B	0.0302	0.1828	0.0326	0.1290			0.0000	0.0000	0.0323	0.0230	0.0215	0.0323	0.0581	0.0161	0.0129	0.5707
Barrier Island Option D	0.0000	0.1828	0.0390	0.1290			0.0636	0.0461	0.0000	0.0307	0.0215	0.0323	0.0000	0.0000	0.0086	0.5536
Barrier Island Option G	0.0038	0.1275	0.0227	0.0120			0.0573	0.0154	0.0000	0.0461	0.0215	0.0323	0.0387	0.0323	0.0086	0.4181
Barrier Island Option F	0.1290	0.0000	0.0000	0.0000			0.0477	0.0000	0.0081	0.0077	0.0215	0.0323	0.0000	0.0000	0.0086	0.2548
Barrier Island No Action	0.0000	0.0000	0.0000	0.0000			0.0645	0.0538	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1183
LOD2 Scaled Weights			0.1800				0.1200	0.1000	0.0600	0.1000	0.0800	0.0600	0.1800	0.1200		
LOD2 Option K			0.1561				0.0917	0.0571	0.0000	0.1000	0.0800	0.0600	0.1800	0.0800		0.8050
LOD2 Option J			0.1800				0.0000	0.0143	0.0600	0.0667	0.0800	0.0600	0.1080	0.0800		0.6490
LOD2 Option I			0.1800				0.0029	0.0000	0.0600	0.0333	0.0400	0.0300	0.0720	0.1200		0.5383
LOD2 No Action			0.0000				0.1200	0.1000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.2200
Turkey Creek Scaled Weights			0.2143				0.1429	0.1190		0.1190			0.2143	0.1429	0.0476	
Turkey Creek No Action			0.0000				0.1429	0.1190		0.0000			0.2143	0.1429	0.0000	0.6190
Turkey Creek Ecosystem Plan 1			0.2143				0.0000	0.0000		0.1190			0.0000	0.0571	0.0476	0.4381
Turkey Creek Ecosystem Plan 3			0.1680				0.0258	0.0397		0.0794			0.0429	0.0286	0.0357	0.4200
Turkey Creek Ecosystem Plan 5			0.0463				0.0972	0.0794		0.0397			0.0857	0.0000	0.0238	0.3721
Bayou Cumbest Scaled Weights	0.2105				0.0877		0.1053	0.0877		0.0877	0.0702	0.0526	0.1579	0.1053	0.0351	
Bayou Cumbest Acquisition	0.0000				0.0877		0.0834	0.0439		0.0000	0.0702	0.0526	0.0789	0.1053	0.0281	0.5501
Bayou Cumbest No Action	0.0000				0.0000		0.1053	0.0877		0.0877	0.0000	0.0000	0.1579	0.1053	0.0000	0.5439
Bayou Cumbest Ecosystem Plan 2	0.2105				0.0877		0.0224	0.0146		0.0000	0.0702	0.0526	0.0263	0.0000	0.0351	0.5195
Bayou Cumbest Ecosystem Plan 6	0.2105				0.0877		0.0336	0.0292		0.0000	0.0702	0.0526	0.0000	0.0000	0.0351	0.5190
Bayou Cumbest Ecosystem Plan 3	0.2105				0.0877		0.0335	0.0292		0.0000	0.0702	0.0526	0.0000	0.0000	0.0351	0.5189
Bayou Cumbest Ecosystem Plan 1	0.2105				0.0877		0.0000	0.0000		0.0000	0.0702	0.0526	0.0526	0.0000	0.0351	0.5088
Admiral Island Scaled Weights	0.2667						0.1333	0.1111		0.1111			0.2000	0.1333	0.0444	
Admiral Island No Action	0.0000						0.1333	0.1111		0.0000			0.2000	0.1333	0.0000	0.5778
Admiral Island Ecosystem Plan 1	0.2667						0.0000	0.0000		0.1111			0.0667	0.0000	0.0444	0.4889
Admiral Island Ecosystem Plan 2	0.2667						0.0140	0.0185		0.1111			0.0333	0.0000	0.0444	0.4881
Admiral Island Ecosystem Plan 6	0.2667						0.0214	0.0370		0.1111			0.0000	0.0000	0.0444	0.4807
Admiral Island Ecosystem Plan 3	0.2667						0.0211	0.0370		0.1111			0.0000	0.0000	0.0444	0.4804
Dantzler Scaled Weights			0.2143				0.1429	0.1190		0.1190			0.2143	0.1429	0.0476	
Dantzler No Action			0.0000				0.1429	0.1190		0.0000			0.2143	0.1429	0.0000	0.6190
Dantzler Ecosystem Plan 1			0.2143				0.0000	0.0000		0.1190			0.0000	0.0571	0.0476	0.4381
Dantzler Ecosystem Plan 5			0.1302				0.0638	0.0595		0.0397			0.0857	0.0000	0.0238	0.4028
Dantzler Ecosystem Plan 3			0.0840				0.0767	0.0298		0.0794			0.0429	0.0286	0.0357	0.3771
Franklin Creek Scaled Weights			0.2143				0.1429	0.1190		0.1190			0.2143	0.1429	0.0476	
Franklin Creek No Action			0.0000				0.1429	0.1190		0.0000			0.2143	0.1429	0.0000	0.6190
Franklin Creek Ecosystem Plan 1			0.2143				0.0000	0.0000		0.1190			0.0000	0.0357	0.0476	0.4167
Franklin Creek Ecosystem Plan 3			0.0805				0.0947	0.0298		0.0794			0.0429	0.0000	0.0357	0.3629
Forrest Heights Scaled Weights				0.2000	0.0833	0.0500	0.1000	0.0833		0.0833	0.0667	0.0500	0.1500	0.1000	0.0333	
Forrest Heights No Action				0.2000	0.0000	0.0000	0.1000	0.0833		0.0000	0.0000	0.0000	0.1500	0.1000	0.0000	0.6333
Forrest Heights Plan 1				0.1087	0.0832	0.0500	0.0333	0.0000		0.0694	0.0500	0.0375	0.0300	0.0000	0.0267	0.4888
Forrest Heights Plan 2				0.0000	0.0833	0.0500	0.0000	0.0000		0.0833	0.0667	0.0500	0.0000	0.0500	0.0333	0.4167
Nonstructural Scaled Weights					0.0980	0.0588	0.1176	0.0980	0.0588	0.0980	0.0784	0.0588	0.1765	0.1176	0.0392	
High Risk Homeowners Assistance Plan					0.0105	0.0063	0.1106	0.0490	0.0235	0.0833	0.0500	0.0250	0.0900	0.0000	0.0250	0.4732
No Action Homeowners Assistance Plan					0.0000	0.0000	0.1176	0.0980	0.0000	0.0000	0.0000	0.0000	0.1500	0.1000	0.0000	0.4657
Long-term Homeowners Assistance Plan					0.0980	0.0588	0.0000	0.0000	0.0588	0.0000	0.0667	0.0500	0.0000	0.0000	0.0333	0.3657

Table A3-4
Calculation of Multi-attribute Utility Scores for Preference Pattern D

CLUSTER D

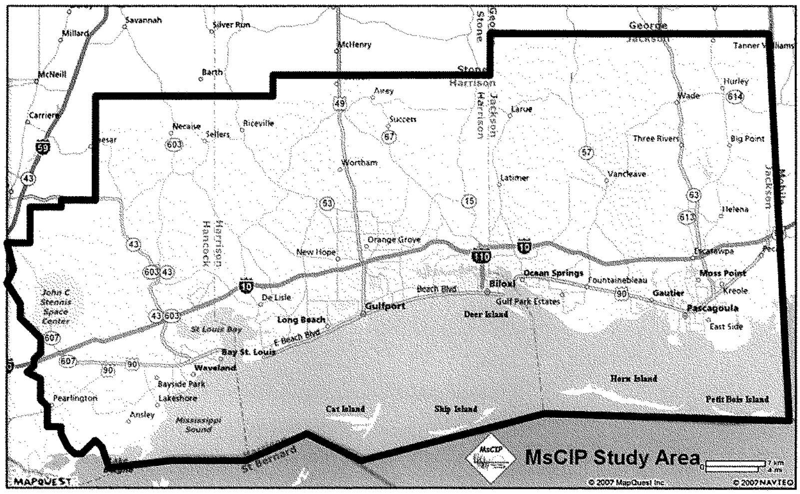
Metric:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MAU
Overall Weights:	0.21	0.18	0.13	0.18	0.04	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.05	0.03	0.03	
Barrier Island Scaled Weights	**0.2258**	**0.1935**	**0.1398**	**0.1935**			**0.0215**	**0.0215**	**0.0215**	**0.0215**	**0.0215**	**0.0215**	**0.0538**	**0.0323**	**0.0323**	
Barrier Island Option A	0.0330	0.1935	0.1398	0.1935			0.0015	0.0031	0.0215	0.0123	0.0215	0.0215	0.0538	0.0242	0.0258	0.7451
Barrier Island Comp Plan	0.0234	0.1935	0.0476	0.1935			0.0141	0.0061	0.0054	0.0215	0.0215	0.0215	0.0538	0.0323	0.0323	0.6666
Barrier Island Option B	0.0528	0.1935	0.0471	0.1935			0.0000	0.0000	0.0215	0.0092	0.0108	0.0215	0.0323	0.0081	0.0194	0.6096
Barrier Island Option C1 & C2	0.0167	0.1935	0.0149	0.1935			0.0166	0.0123	0.0054	0.0154	0.0108	0.0215	0.0430	0.0161	0.0258	0.5855
Barrier Island Option E	0.0000	0.1935	0.0623	0.1935			0.0207	0.0154	0.0000	0.0154	0.0108	0.0215	0.0000	0.0081	0.0129	0.5540
Barrier Island Option D	0.0000	0.1935	0.0563	0.1935			0.0212	0.0184	0.0000	0.0123	0.0108	0.0215	0.0000	0.0000	0.0129	0.5405
Barrier Island Option G	0.0067	0.1350	0.0327	0.0180			0.0191	0.0061	0.0000	0.0184	0.0108	0.0215	0.0215	0.0161	0.0129	0.3190
Barrier Island Option F	0.2258	0.0000	0.0000	0.0000			0.0159	0.0000	0.0054	0.0031	0.0108	0.0215	0.0000	0.0000	0.0129	0.2953
Barrier Island No Action	0.0000	0.0000	0.0000	0.0000			0.0215	0.0215	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0430
LOD2 Scaled Weights			**0.3939**				**0.0606**	**0.0606**	**0.0606**	**0.0606**	**0.0606**	**0.0606**	**0.1515**	**0.0909**		
LOD2 Option K			0.3417				0.0463	0.0346	0.0000	0.0606	0.0606	0.0606	0.1515	0.0606		0.8166
LOD2 Option J			0.3939				0.0000	0.0087	0.0606	0.0404	0.0606	0.0606	0.0909	0.0606		0.7763
LOD2 Option I			0.3939				0.0015	0.0000	0.0606	0.0202	0.0303	0.0303	0.0606	0.0909		0.6883
LOD2 No Action			0.0000				0.0606	0.0606	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.1212
Turkey Creek Scaled Weights			**0.4333**				**0.0667**	**0.0667**		**0.0667**			**0.1667**	**0.1000**	**0.1000**	
Turkey Creek Ecosystem Plan 1			0.4333				0.0000	0.0000		0.0667			0.0000	0.0400	0.1000	0.6400
Turkey Creek Ecosystem Plan 3			0.3397				0.0120	0.0222		0.0444			0.0333	0.0200	0.0750	0.5467
Turkey Creek No Action			0.0000				0.0667	0.0667		0.0000			0.1667	0.1000	0.0000	0.4000
Turkey Creek Ecosystem Plan 5			0.0937				0.0454	0.0444		0.0222			0.0667	0.0000	0.0500	0.3224
Bayou Cumbest Scaled Weights	**0.4565**				**0.0870**		**0.0435**	**0.0435**		**0.0435**	**0.0435**	**0.0435**	**0.1087**	**0.0652**	**0.0652**	
Bayou Cumbest Ecosystem Plan 1	0.4565				0.0870		0.0000	0.0000		0.0000	0.0435	0.0435	0.0362	0.0000	0.0652	0.7319
Bayou Cumbest Ecosystem Plan 2	0.4565				0.0870		0.0093	0.0072		0.0000	0.0435	0.0435	0.0181	0.0000	0.0652	0.7303
Bayou Cumbest Ecosystem Plan 6	0.4565				0.0870		0.0139	0.0145		0.0000	0.0435	0.0435	0.0000	0.0000	0.0652	0.7240
Bayou Cumbest Ecosystem Plan 3	0.4565				0.0870		0.0139	0.0145		0.0000	0.0435	0.0435	0.0000	0.0000	0.0652	0.7240
Bayou Cumbest Acquisition	0.0000				0.0870		0.0344	0.0217		0.0000	0.0435	0.0435	0.0543	0.0652	0.0522	0.4018
Bayou Cumbest No Action	0.0000				0.0000		0.0435	0.0435		0.0435	0.0000	0.0000	0.1087	0.0652	0.0000	0.3043
Admiral Island Scaled Weights	**0.5526**						**0.0526**	**0.0526**		**0.0526**			**0.1316**	**0.0789**	**0.0789**	
Admiral Island Ecosystem Plan 1	0.5526						0.0000	0.0000		0.0526			0.0439	0.0000	0.0789	0.7281
Admiral Island Ecosystem Plan 2	0.5526						0.0055	0.0088		0.0526			0.0219	0.0000	0.0789	0.7204
Admiral Island Ecosystem Plan 6	0.5526						0.0085	0.0175		0.0526			0.0000	0.0000	0.0789	0.7102
Admiral Island Ecosystem Plan 3	0.5526						0.0083	0.0175		0.0526			0.0000	0.0000	0.0789	0.7101
Admiral Island No Action	0.0000						0.0526	0.0526		0.0000			0.1316	0.0789	0.0000	0.3158
Dantzler Scaled Weights			**0.4333**				**0.0667**	**0.0667**		**0.0667**			**0.1667**	**0.1000**	**0.1000**	
Dantzler Ecosystem Plan 1			0.4333				0.0000	0.0000		0.0667			0.0000	0.0400	0.1000	0.6400
Dantzler Ecosystem Plan 5			0.2634				0.0298	0.0333		0.0222			0.0667	0.0000	0.0500	0.4654
Dantzler No Action			0.0000				0.0667	0.0667		0.0000			0.1667	0.1000	0.0000	0.4000
Dantzler Ecosystem Plan 3			0.1700				0.0358	0.0167		0.0444			0.0333	0.0200	0.0750	0.3952
Franklin Creek Scaled Weights			**0.4333**				**0.0667**	**0.0667**		**0.0667**			**0.1667**	**0.1000**	**0.1000**	
Franklin Creek Ecosystem Plan 1			0.4333				0.0000	0.0000		0.0667			0.0000	0.0250	0.1000	0.6250
Franklin Creek No Action			0.0000				0.0667	0.0667		0.0000			0.1667	0.1000	0.0000	0.4000
Franklin Creek Ecosystem Plan 3			0.1629				0.0442	0.0167		0.0444			0.0333	0.0000	0.0750	0.3765
Forrest Heights Scaled Weights				**0.3830**	**0.0851**	**0.0851**	**0.0426**	**0.0426**		**0.0426**	**0.0426**	**0.0426**	**0.1064**	**0.0638**	**0.0638**	
Forrest Heights No Action				0.3830	0.0000	0.0000	0.0426	0.0426		0.0000	0.0000	0.0000	0.1064	0.0638	0.0000	0.6383
Forrest Heights Plan 1				0.2082	0.0850	0.0850	0.0142	0.0000		0.0355	0.0319	0.0319	0.0213	0.0000	0.0511	0.5640
Forrest Heights Plan 2				0.0000	0.0851	0.0851	0.0000	0.0000		0.0426	0.0426	0.0426	0.0000	0.0319	0.0638	0.3936
Nonstructural Scaled Weights					**0.1290**	**0.1290**	**0.0645**	**0.0645**	**0.0645**	**0.0645**	**0.0645**	**0.0645**	**0.1613**	**0.0968**	**0.0968**	
Long-term Homeowners Assistance Plan					0.1290	0.1290	0.0000	0.0000	0.0645	0.0000	0.0426	0.0426	0.0000	0.0000	0.0638	0.4715
High Risk Homeowners Assistance Plan					0.0138	0.0138	0.0606	0.0323	0.0258	0.0426	0.0319	0.0213	0.0638	0.0000	0.0479	0.3537
No Action Homeowners Assistance Plan					0.0000	0.0000	0.0645	0.0645	0.0000	0.0000	0.0000	0.0000	0.1064	0.0638	0.0000	0.2992


June 2009
Mississippi Coastal
Improvements Program
(MsCIP)
Hancock, Harrison, and Jackson
Counties, Mississippi
APPENDIX H BARRIER ISLANDS
MsCIP

FOREWORD

This document is one of a number of technical appendices to the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan and Integrated Feasibility Report and Environmental Impact Statement.

The Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan Integrated Feasibility Report and Environmental Impact Statement provides systems-based solutions and recommendations that address: hurricane and storm damage reduction, ecosystem restoration and fish and wildlife preservation, reduction of damaging saltwater intrusion, and reduction of coastal erosion. The recommendations contained in the Main Report/EIS also provide measures that aid in: greater coastal environmental and societal resiliency, regional economic re-development, and measures to reduce long-term risk to the public and property, as a consequence of hurricanes and coastal storms. The recommendations cover a comprehensive package of projects and activities, that treat the environment, wildlife, and people, as an integrated system that requires a multi-tiered and phased approach to recovery and risk reduction, irrespective of implementation authority or agency.



The MsCIP Study Area

The purpose of the Comprehensive Plan Report is to present, to the Congress of the United States, the second of two packages of recommendations (i.e., the first being the "interim" recommendations funded in May 2007, and this "final" response, as directed by the Congress), directed at recovery of vital water and related land resources damaged by the hurricanes of 2005, and development of recommendations for long-term risk reduction and community and environmental resiliency, within the three-county, approximately 70 mile-long coastal zone, including Mississippi Sound and its barrier islands, of the State of Mississippi.

This appendix, the Main Report/EIS, and all other appendices and supporting documentation, were subject to Independent Technical Review (ITR) and an External Peer Review (EPR). Both review processes will have been conducted in accordance with the Corps "Peer Review of Decision Documents" process, has been reviewed by Corps staff outside the originating office, conducted by a Regional and national team of experts in the field, and coordinated by the National Center of Expertise in Hurricane and Storm Damage Protection, North Atlantic Division, U.S. Army Corps of Engineers.

The report presents background on the counties that comprise the Mississippi coastline most severely impacted by the Hurricanes of 2005, their pre-hurricane conditions, a summary of the effects of the 2005 hurricane season, problem areas identified by stakeholders and residents of the study area, a summary of the approach used in analyzing problems and developing recommendations directed at assisting the people of the State of Mississippi in recovery, recommended actions and projects that would assist in the recovery of the physical and human environments, and identification of further studies and immediate actions most needed in a comprehensive plan of improvements for developing a truly resilient future for coastal Mississippi.

This appendix contains detailed technical information used in the analysis of existing and future without-project conditions, in the development of problem-solving measures, and in the analysis, evaluation, comparison, screening, and selection of alternative plans, currently presented as tentatively-selected recommendations contained in the Main Report/EIS.

Each appendix functions as a complete technical document, but is meant to support one particular aspect of the feasibility study process. However, because of the complexity of the plan formulation process used in this planning study, the information contained herein should not be used without parallel consideration and integration of all other appendices, and the Main Report/EIS that summarizes all findings and recommendations.

This appendix, The Comprehensive Barrier Island Restoration Plan Appendix, contains detailed supporting data and technical information on the engineering and environmental options that were configured to meet the goals of the Comprehensive Plan. The goal of this plan will be to help restore the sediment transport and budget system for the Mississippi barrier islands. The Comprehensive Barrier Island Restoration Plan was developed through a joint effort of many Federal agencies including the National park Service who has jurisdiction over most of Mississippi's barrier islands as part of the Gulf Islands National Seashore.

EXECUTIVE SUMMARY

Soon after Hurricane Katrina, the notion became widely accepted by the public that if the Mississippi barrier islands had been in a "pre-Hurricane Camille" condition, there would have been much less storm damage during Katrina. During Hurricane Camille, there was extensive land loss on the islands and little natural recovery had occurred since then. Also during Camille, Ship Island was breached and this breach has remained open and is now known as Camille Cut. This massive restoration of the barrier islands was included in the State's Hurricane Recovery Program which was published soon after Katrina. During completion of the Mississippi Coastal Improvements Program Report, the Mississippi Barrier Islands were subject to several different design concepts for storm damage reduction including total restoration to the pre-Camille condition. These plans are fully described in the Engineering Appendix. Subsequent computer modeling of storm damage reduction benefits from any engineered changes reveal that storm surge reduction was not large, but other benefits would be obtained from simply maintaining the existence of the islands. These benefits include reduction of wave damage to the mainland coast and many important environmental benefits associated with maintaining Mississippi Sound as an estuary formed by the islands. Coordination with the National Park Service (NPS) who has ownership of most of the islands and other agencies has resulted in a plan that will provide continuing existence for the islands that have been badly eroded by storms. Ship Island received sufficient storm damage to endanger its survival in the future. This plan, the Comprehensive Barrier Island Restoration Plan, was coordinated with the NPS and includes direct sand placement in the breach of Ship Island with plantings of dune grasses, additional sand placed into the local littoral zone, changes in the Regional Sediment Management Practice, and additional studies of Cat Island where little data is available. The program also has the potential to make beneficial use of dredged material that has been deposited in both inland and offshore areas if quality objectives are clearly demonstrated. After implementation, a long term monitoring program will be established to monitor the project. This data will be extremely valuable in future programs such as this and can provide the NPS with information that they can use to better manage their coastal resources.

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CHAPTER 1 BACKGROUND AND GENERAL INFORMATION

The Barrier Island Restoration Plan consists of a comprehensive, all-inclusive plan to construct the best combination of the various options that have been developed for the Mississippi Barrier Islands. The State Plan to "restore the barrier islands to a pre-Camille footprint" offered many different ideas to accomplish this goal. An important factor that was not forgotten during this study was that the Mississippi Barrier Islands are owned within the National Park Service as the "Gulf Islands National Seashore". Coordination with many agencies has resulted in a plan that will provide many benefits including economic, environmental and storm damage reduction. The loss of land mass on the barrier islands has been documented and the continued loss will result in a change in the ecology of the Mississippi Sound that is formed by the island chain. The best method to accomplish any restoration requires that the different options be integrated to maximize benefits and prevent any adverse environmental impacts, modeled to predict the best benefits from any sand placement, and to bring consensus to the many agencies that would be involved in this type of plan. The options discussed in the Engineering Appendix have been based on three basic concepts for island restoration and identified to include:

- Adding additional land mass to the existing islands by using sand dredged and transported from an off-shore location. The new land mass would be shaped into dunes and marshes and planted with native marsh, maritime forest and dune vegetation or simply planted with these types of vegetation and allowing the effects of nature to create the land forms. The anticipated source of the sand is the St. Bernard Shoals, but this needs further investigation to verify the quantity and quality of the sand.

- Adding sand into the littoral zone at specific locations between the islands based on additional sediment transport modeling. This would allow the littoral currents to move the sand onto the islands where the natural process of island building could take place. This would not directly affect the present-day islands and would help mitigate any effects of dredging the ship channels that pass through the chain of islands where sand may have been lost from the system. This option would obtain the sand from the beneficial use of dredged material from an inland river source or from offshore borrow areas.

- Planting native vegetation to help provide environmental restoration of the existing islands where the vegetation was destroyed by Katrina. These options may also consist of shaping existing sand into low dunes on the beaches or adding sand from an offshore source to create dunes several feet above the existing beach. These dunes would be planted with sea oats to help in the re-establishment of the dunes on the beaches. This would be along with planting of maritime forests in the inland's interior where they were mostly destroyed by Hurricane Katrina. This plan was completed during the fall of 2007 and combined two of the engineering options described in the Engineering Appendix, incorporated some additional studies at Cat Island and recommended changes in the current practices under the Regional Sediment Management Plan. In compiling this plan, several documents were used. In the order included in this appendix is the "National Park Service Vision Statement for the Mississippi Barrier Islands", results of the "Sediment Transport Modeling and Sediment Budget", studies of "Inland River Sand Sources for Use at Barrier Islands", an "Overview of All Barrier Island Options (Line of Defense-1) from Engineering Appendix", and the "Multi-agency Mississippi Barrier Island Restoration Recommendation". The resulting plan is included in Chapter 7 as "The Comprehensive Barrier Island Restoration Plan". After completion of sand placement and planting vegetation, the project will be subject to an 11 year monitoring program described in Chapter 7.

CHAPTER 2 NATIONAL PARK SERVICE VISION STATEMENT

During the study phase for the Barrier Islands, the National Park Service (NPS) issued a Vision Statement for the Mississippi Barrier Islands. As a tool for the planners and engineers, this document set forth the details of any modifications that might be conceived for the barrier islands during this study that would carry the endorsement of the NPS. A copy of this document is included below.

United States Department of the Interior

NATIONAL PARK SERVICE
Southeast Regional Office
Atlanta Federal Center
1924 Building
100 Alabama St., SW.
Atlanta, Georgia 30303

IN REPLY REFER TO:
SER-SNRM

JUN 2 2 2007

Brigadier General Joseph Schrodel
Commander, South Atlantic Division
U. S. Army Corps of Engineers
60 Forsyth Street, Room 9M15
Atlanta, GA 30303-8801

Dear General Schroedel:

As requested by the Mississippi Coastal Improvements Program (MsCIP) Planning Team Program Manager, Dr. Susan Rees, in January 2007, the National Park Service has prepared and is enclosing its "Vision Statement for the Management of the Mississippi Barrier Islands, Gulf Islands National Seashore, National Park Service, June 22, 2007." This document is being copied to the MsCIP Project Delivery Team – Mobile, for incorporation into the draft Comprehensive Plan (MsCIP), which will be released in the fall of 2007 for agency and public reviews fall of 2007.

We appreciate the opportunity to participate in and provide feedback for this important planning process, and we look forward to a continued cooperative relationship with the U.S. Army Corps of Engineers Mississippi Coastal Improvements Program. Please let us know if we can provide additional information.

Sincerely,

Pat Frederick

for Patricia A. Hooks
Regional Director
Southeast Region

Enclosure

cc: Colonel Peter F. Taylor, Jr., COE w/ enclosure
cc: Dr. Susan Rees, COE w/ enclosure

TAKE PRIDE IN AMERICA

1

cc: Mississippi Coastal Improvements Program, COE w/ enclosure
cc: Jerry Eubanks, Superintendent, NPS – GUIS
cc: Sam D. Hamilton, Southeast Regional Director, USFWS
cc: Ray Aycock, USFWS - ES/MS
cc: Suzette Kimball, Eastern Regional Director, USGS
cc: Jack Kindinger, Deputy Director for Science / St. Petersburg, USGS
cc: S. Jeffress Williams, Coastal Marine Geologist / Woods Hole, USGS

Vision Statement for the Management of the Mississippi Barrier Islands Gulf Islands National Seashore National Park Service

June 2007

Executive Summary

The National Park Service (NPS) has a direct interest in the barrier island components of the Mississippi Coastal Improvements Program (MsCIP), since Horn, Petit Bois, East and West Ship Islands, and portions of Cat Island are within Gulf Islands National Seashore (Seashore). The Seashore's purpose is to preserve, protect, and interpret its Gulf Coast barrier island and bayou ecosystem and its system of coastal defense fortifications, while providing for public use and enjoyment. Undeveloped natural resource areas protected by the NPS provide habitat for several endangered species, stop-over habitat for migratory birds, and critical nursery habitat for marine flora and fauna, and serve as an enclave for complex terrestrial and aquatic plant and animal communities that characterize the northern Gulf Coast. The Seashore also contains one of the most complete collections of publicly accessible seacoast defense structures in the United States, from early French and Spanish exploration and colonization through World War II.

Barrier islands are dynamic coastal landforms that act as the interface between ocean and land, and bear the full impact of atmospheric and oceanic energy. Hurricanes, variations in sediment supply, and sea level rise anticipated from global warming will drive changes in island location and morphology. Effective barrier island management requires adaptation to their dynamics.

Based on federal statutes such as the National Park Service Organic Act and the park's enabling legislation, NPS Management Policies, and the Seashore's management plans, the NPS is mandated to preserve natural conditions and processes, and to preserve cultural resources. If peer-reviewed scientific studies indicate that human activities have altered or interfered with natural conditions or processes of the Mississippi barrier islands, such as the natural sediment supply and transport rate and direction, the NPS would consider actions that would attempt to restore those natural processes. Restoration of natural processes would help to re-establish a more natural biological and geological condition within park boundaries.

Restoration actions that NPS may consider acceptable and consistent within its legal mandates and authorities are:

Immediate measures (1 year or less)

- Sediment dredged from Ship Island Pass channel should be placed on the beach along the north (sound) shoreline near Fort Massachusetts on West Ship Island. The fort is a listed classified structure on the National Register of Historic Places. Renourishment would better protect the structural integrity of the fort, which currently is threatened by shoreline erosion, migration, and encroachment. Beach renourishment near the documented French Warehouse archaeological site on East Ship Island should also be undertaken, as this site is also currently exposed and threatened by erosion.
- Placement of sand fencing on the upper beach areas of East and West Ship Islands would assist natural dune formation and enhance wildlife habitat. Similar actions would not be appropriate on Horn and Petit Bois Islands given their designation as wilderness areas.
- Planting of sea oats and other native beach grasses and vegetation on East and West Ship Islands would aid the process of natural dune formation.

Long term measures

- Sand dredged from adjacent navigational/shipping channels should be re-deposited within the littoral system of the barrier islands. The additional sand supply would assist the island's natural recovery from recent storm events, and partially offset prior disruption to sediment transport and deposition from past human intervention. The sand must be free from contaminants and compatible in grain size, composition, and color with the existing beach and nearshore sediments.
- A Quality Assurance/Quality Control plan should be developed that includes adaptive management steps to halt, modify or mitigate the effects of activities with negative or adverse impacts to natural or cultural resources.

In order to make informed management decisions, and before beginning long-term measures, the NPS recommends additional scientific study to ensure that actions are effectively targeted and will not harm park resources.

1. Measure bathymetry to 40-ft depth from Dauphin Island to Cat Island, to help develop an improved sediment budget from 1917/20 (the most recent data set with complete bathymetric coverage) to the present.
2. Develop models to predict future location and geometry of the barrier islands at specific time intervals, perhaps 25, 50 and 100 years or longer into the future. Models should include forecasts of sea-level rise linked to global climate change.
3. Assess the quantity of sediment that has entered the Mississippi barrier island system through time from Mobile Pass and the Mobile ebb tidal delta, the primary source of sediment to the barrier islands.
4. Examine barrier island morphologic changes since the 2005 hurricane season to determine the extent of post-storm recovery.

I. Introduction

The National Park Service (NPS) has a direct interest in the barrier island components of the Mississippi Coastal Improvements Program (MsCIP). These barrier islands -- Horn, Petit Bois, East and West Ship Islands, and portions of Cat Island -- are all situated within Gulf Islands National Seashore, a unit of the National Park System. NPS also administers the 401-acre Davis Bayou area on the mainland near Ocean Springs, MS.

Gulf Islands National Seashore includes outstanding natural, cultural, and recreational resources along the Northern Gulf of Florida and Mississippi. These include several coastal defense forts spanning more than two centuries of military activity, archeological values, pristine examples of intact Mississippi coastal barrier islands, salt marshes, bayous and submerged seagrass beds, complex terrestrial communities, emerald green water, and white sand beaches.

The barrier islands within the Seashore are nationally significant for several reasons. Specifically, these islands:

1. Contain one of the most complete collections of publicly accessible seacoast defense structures in the United States, representing a continuum of development from early French and Spanish exploration and colonization through World War II.
2. Provide the public with recreational opportunities on natural and scenic island, beach, dune and water areas which possess the rare combination of remaining undeveloped and in a wilderness state, yet are located in close proximity to major population centers.
3. Provide habitat for several endangered species in diverse ecosystems, stop-over habitat for migratory birds, and critical nursery habitat for marine flora and fauna, and serve as an enclave for complex terrestrial and aquatic plant and animal communities that characterize the northern Gulf Coast and fully illustrate the natural processes which shape these unique areas.
4. Contain land and marine archeological resources which represent a continuum of human occupation in a coastal environment and are important in enhancing the knowledge of the past including interactions between the earliest settlers and original inhabitants of this area of the Gulf Coast.
5. Provide a benchmark to compare conditions in developed areas of the Gulf Coast to natural areas within the park.

The NPS manages the Gulf Coast barrier island system in accordance with the various federal laws which govern the National Park System and Gulf Islands National Seashore, NPS national management policies, and park-specific planning and management documents. The NPS management vision for the barrier islands, and several restoration actions potentially consistent with that vision, are explained in Section II. The legal, policy, and administrative authorities which form the foundation of the NPS's vision are explained in Section III. NPS management questions involving further scientific studies are presented in Section IV. The geomorphic origin and history of the island chain are explained in Appendix A.

II. NPS's Vision for the Mississippi Barrier Islands

The NPS's vision for management of the Mississippi barrier islands includes the preservation of natural biological and geological marine and terrestrial conditions and processes, and the preservation of cultural resources, consistent with peer-reviewed and documented scientific study.

Horn and Petit Bois Islands, which are designated wilderness areas, receive an even higher level of protection. In these areas, the NPS vision and management focuses on providing park visitors with an undisturbed environment, a pristine and unencumbered viewshed, an atmosphere of solitude, an opportunity for primitive, unconfined recreation, and negligible evidence of resource impairment. The NPS implements this vision by controlling nonconforming uses, preventing unnecessary or undue reduction of wilderness values, and applying the "minimum requirement" concept of the 1964 Wilderness Act to all proposed projects involving these islands.

The NPS's vision for the Mississippi barrier islands reflects an appreciation for the islands' geomorphic origin and history (see Appendix A). Studies indicate that hurricanes have historically segmented these barriers. A hurricane in 1740 split Isle Dauphin into Petit Bois and Dauphin Islands, while the July 1916 storm cut the Isle of Caprice in two. Furthermore, in 1969, Hurricane Camille split Ship Island into West Ship and East Ship Islands. Hurricanes, variations in sediment supply, and sea level rise anticipated from global warming will drive changes in island location and morphology. Effective barrier island management requires adaptation to their dynamics.

Nonetheless, if peer-reviewed studies provide evidence that human activities have altered or interfered with the natural condition or processes of the Mississippi barrier islands, such as the natural sediment supply and transport rate and direction, the NPS would consider actions that would attempt to restore these natural processes. Restoration of natural processes would, in turn, help to reestablish a more natural biological and geological marine and terrestrial condition within park boundaries, which NPS is charged to promote. Adaptive management principles would govern restoration actions, facilitated by continuing analysis of monitoring data to assess project effectiveness.

The following are restoration actions and associated specifications that NPS may consider acceptable and consistent with the legal mandates and other authorities listed above. NPS restoration actions identified below are contingent upon dedicated funding support for materials and staffing being provided as a component or line item cost incorporated into the MsCIP, as current NPS base funding is insufficient to cover these expenditures.

Immediate measures (1 year or less)

- Sediment dredged from Ship Island Pass channel should be placed on the beach along the north (sound) shoreline near Fort Massachusetts on West Ship Island. The fort is a listed classified structure on the National Register of Historic Places. Renourishment would better protect the structural integrity of the fort, which currently is threatened by active shoreline processes, including erosion, migration, and encroachment. Similarly, beach renourishment near the documented French Warehouse archeological site (GUIS-98, 22Hr-638) on East Ship Island would also be undertaken, as this site is also currently exposed and threatened by erosion due to active shoreline processes.

- Placement of sand fencing behind the upper beach area on both East Ship and West Ship Islands to assist in the process of natural dune formation and enhance wildlife habitat. Specific length and placement design of fencing will be determined in cooperation with park staff. Similar actions on Horn and Petit Bois islands are not feasible considering their designation as wilderness areas, and the coinciding higher conservation standards, and non-manipulative management objectives applying to these areas, as stipulated in Section III, C of this document.

- Planting of sea oats and other native beach grasses and vegetation on East and West Ship Islands as deemed appropriate by park science and natural resources management staff. The native vegetation could also aid in the process of natural dune formation.

Long term measures

- Sediment (sand) dredged from any of the adjacent navigational/shipping channels should be re-deposited within the littoral system of the barrier islands. Sand would be placed to mimic to the greatest extent possible natural sediment depositional processes, including within the surf zones, or as otherwise prescribed based on analysis of the longshore transport system. Sand placement would supplement the supply to the island where it has been significantly diminished or eliminated by dredging of shipping channels, with an estimated withdrawal of ~72 mcy of sand from the system over the last 100+ years. The additional sand supply would assist the island's natural recovery from recent storm events, and partially offset prior disruption to sediment transport and deposition from human-caused intervention.

- Any placement of dredged sediment within the park boundaries, whether on a barrier island beach or within the littoral system, would be contingent upon tests that show that the sediments are free from contaminants and are compatible in grain size, composition, and color with the existing beach and nearshore sediments. Dredging and sediment disposal, which have a significant potential to impact many of the animal communities on and around the islands, should be timed to avoid periods of high or seasonal animal activity. Limiting sediment dredging and disposal actions to certain months would reduce or minimize impacts to several threatened and endangered species that spend at least a portion of the year within the barrier island area, as well as non-listed species such as migratory shorebirds which may be particularly sensitive to on-island and nearshore disturbances.

- A Quality Assurance/Quality Control (QA/QC) plan should be developed, possibly as part of the NEPA or environmental compliance process, to monitor both adverse and beneficial impacts of any activities undertaken within the boundaries of GUIS as part of the MSCIP. The QA/QC plan should include monitoring during construction activities to measure immediate or short-term impacts, as well as for a specified time period after construction activities are completed to measure long-term or cumulative impacts. The plan should also include adaptive management steps to halt or modify activities, or to mitigate the effects of activities, should negative or adverse impacts to natural or cultural resources be noted during monitoring. The QA/QC plan would be developed through coordination between the US Army Corps of Engineers, National Park Service, the US Fish and Wildlife Service and the National Marine Fisheries Service.

III. Statutory, Policy, and Administrative Foundation of the NPS Vision for the Mississippi Barrier Islands

The NPS vision for managing the Mississippi barrier islands is derived directly from the federal laws which govern the National Park System and Gulf Islands National Seashore. Because Horn and Petit Bois Islands are also designated wilderness areas, the NPS's vision for these islands is additionally derived from the law which established the National Wilderness Preservation System.

A. Statutory Basis for NPS Management of the Mississippi Barrier Islands

In the **National Park Service Organic Act of 1916** (16 U.S.C. § 1), Congress stated that "There is hereby created in the Department of the Interior a service to be called the National Park Service, which shall be under the charge of a director....The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified, except such as are under the jurisdiction of the Secretary of the Army, as provided by law, by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Subsequently, in the **National Park System General Authorities Act of 1970**, Congress clarified that national park areas are to be "preserved and managed for the benefit and inspiration of all of the people of the United States, in light of the high public value and integrity of the National Park System" (16 U.S.C. § 1a-1). In the **National Parks Omnibus Management Act of 1998,** Congress instructed the NPS to integrate the results of scientific research into its management decisions (16 U.S.C. § 5936).

In the **enabling legislation which established Gulf Islands National Seashore**, Congress instructed the NPS to preserve for public use and enjoyment the outstanding natural, historic, and recreational values of the area, including wildlife natural resources and the military forts within the park (16 U.S.C.§ 459h). Congress further stipulated that "[t]he Secretary of the Interior and the Secretary of the Army may cooperate in the study and formulation of plans for beach erosion control and hurricane protection of the Seashore. Any such protective works or spoil deposit activities undertaken by the Chief of Engineers, Department of the Army, shall be carried out within the seashore in accordance with a plan that is acceptable to the Secretary of the Interior and that is consistent with the purposes of sections 459h to 459 h-10 of this title."

As required by the **Endangered Species Act of 1973** (16 U.S.C. § 1531 et seq.), the NPS also strives to conserve threatened and endangered species at Gulf Islands National Seashore, ensuring that its authorization, funding, or implementation of activities will not jeopardize the existence of any endangered or threatened species of plant or animal (including fish) or result in the destruction or deterioration of critical habitat of such species.

The Mississippi barrier islands also contain a number of sites of historic/archaeological value, including Fort Massachusetts on West Ship Island, which is a listed classified structure on the National Register of Historic Places. The NPS preserves these cultural resources and landscapes as required by the **National Historic Preservation Act** (16 U.S.C. § 470 et seq.).

Additionally, Horn and Petit Bois islands are designated wilderness areas and are therefore subject to the provisions of the **Wilderness Act of 1964** (16 U.S.C. §§ 1131, 1133), which directs federal land management agencies to preserve the wilderness character of the areas, including the preservation of natural conditions with the imprint of man's work substantially unnoticeable.

B. Policy Basis for NPS Management of the Mississippi Barrier Islands

The NPS's management vision for the Mississippi barrier islands is additionally derived from the Service-wide NPS Management Policies. Updated in 2006 after extensive review and comment from the general public, the scientific community, and agency employees, the NPS Management Policies are mandatory for all NPS employees unless specifically waived or modified in writing by the Secretary of the Interior, the Assistant Secretary of the Interior, or the Director of the National Park Service.

The sections of the NPS Management Policies most relevant to NPS management of the Mississippi barrier islands are quoted here. The policies are available in their entirety at www.nps.gov/policy/mp/policies.html or www.nps.gov/policy/MP2006.pdf.

(1) Section 4.4.2.4: Management of Natural Landscapes

"Natural landscapes disturbed by natural phenomena, such as landslides, earthquakes, floods, hurricanes, tornadoes, and fires, will be allowed to recover naturally unless manipulation is necessary to (1) mitigate for excessive disturbance caused by past human effects, (2) reserve cultural and historic resources as appropriate based on park planning documents, or (3) protect park developments or the safety of people. Landscape and vegetation conditions altered by human activity may be manipulated where the park management plan provides for restoring the lands to a natural condition."

(2) Section 4.8.1.1: Shorelines and Barrier Islands

"Natural shoreline processes (such as erosion, deposition, dune formation, overwash, inlet formation, and shoreline migration) will be allowed to continue without interference. Where human activities or structures have altered the nature or rate of natural shoreline processes, the Service will, in consultation with appropriate state and federal agencies, investigate alternatives for mitigating the effects of such activities or structures and for restoring natural conditions…Any shoreline manipulation measures proposed to protect cultural resources may be approved only after an analysis of the degree to which such measures would impact natural resources and processes, so that an informed decision can be made through an assessment of alternatives. Where erosion control is required by law, or where present developments must be protected in the short run to achieve park management objectives, including high-density visitor use, the Service will use the most effective method feasible to achieve the natural resource management objectives while minimizing impacts outside the target area."

(3) Section 4.1.5: Restoration of Natural Systems

"The Service will reestablish natural functions and processes in parks unless otherwise directed by Congress. Landscapes disturbed by natural phenomena, such as landslides, earthquakes, floods, hurricanes, tornadoes, and fires, will be allowed to recover naturally unless manipulation is necessary to protect other park resources, developments, or employee and public safety. Impacts on natural systems resulting from human disturbances include the introduction of exotic species: the contamination of air, water, and soil; changes to hydrologic patterns and sediment transport; the acceleration of erosion and sedimentation; and the disruption of natural processes. The Service will seek to return such disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated. The Service will use the best available technology, within available resources, to restore the biological and physical components of these systems, accelerating both their recovery and the recovery of landscape and biological community structure and function."

(4) Section 4.4.1: General Principles for Managing Biological Resources

"The National Park Service will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems….by

- preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur; .... and
- minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them."

(5) Section 4.4.2.3: Management of Threatened or Endangered Plants & Animals

"The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Service will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species."

(6) Section 4.6.4: Floodplains

"In managing floodplains on park lands, the National Park Service will (1) manage for the preservation of floodplain values; (2) minimize potentially hazardous conditions associated with flooding; and (3) comply with the NPS Organic Act and all other federal laws and executive orders related to the management of activities in flood-prone areas, including Executive Order 11988 (Floodplain Management), the National Environmental Policy Act, applicable provisions of the Clean Water Act, and the Rivers and Harbors Appropriation Act of 1899."

(7) Section 4.6.5: Wetlands

"The Service will manage wetlands in compliance with NPS mandates and the requirements of Executive Order 11990 (Protection of Wetlands), the Clean Water Act, the Rivers and Harbors Appropriation Act of 1899, and the procedures described in Director's Order 77-1 (Wetland Protection). The Service will (1) provide leadership and take action to prevent the destruction, loss, or degradation of wetlands; (2) preserve and enhance the natural and beneficial values of wetlands; and (3) avoid direct and indirect support of new construction in wetlands unless there are no practicable alternatives and the proposed action includes all practicable measures to minimize harm to wetlands."

(8) Sections 6.1, 6.3.3, 6.3.5, & 6.3.7: Wilderness Management

These sections direct the National Park Service to manage wilderness areas for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness. They further charge the NPS to (1) administer designated wilderness lands consistently among agencies but in no way diminish any established NPS wilderness standards and values.; (2) keep human-caused intrusions within wilderness to an absolute minimum; (3) ensure proposed actions are narrow in scope and the least required to effectively preserve wilderness character; and (4) apply science-based decision making in all NPS wilderness areas.

(9) Sections 5.3.5, 5.3.5.1, 5.3.5.1.1-4: Cultural Resources

Recognizing that the NPS is the steward of many of America's most important cultural resources, including archeological sites, as well as historic and prehistoric structures, the NPS Management Policies specify that park cultural resource management involves: (1)

research to identify, evaluate, document, register, and establish basic information about cultural resources and traditionally associated peoples; (2) planning to ensure that management processes for making decisions and setting priorities integrate information about cultural resources and provide for consultation and collaboration with outside entities; and, (3) stewardship to ensure that cultural resources are preserved and protected, receive appropriate treatments to achieve desired conditions, and are made available for public understanding and enjoyment.

C. Administrative Planning Basis for NPS Management of the Mississippi Barrier Islands

In 1978, Gulf Islands National Seashore produced a General Management Plan (GMP) which provides long-term direction for administering the Seashore. Congress requires each park unit to have a GMP to guide park decisions about resource preservation, visitor use, and park management. GMPs are developed and adopted with much public review and input. Gulf Islands National Seashore is developing a new General Management Plan, which is anticipated to be completed in 2009-2010. Until then, the existing 1978 GMP, its 1983 amendment, and a 1995 updated Statement for Management will remain in effect.

As directed by the 1978 GMP, the NPS must manage the Mississippi barrier islands in the following ways:

- Keep development to a minimum, and manage Petit Bois and Horn Islands as wilderness areas emphasizing their primitive character and limited development.
- Promote diverse marine biota in Mississippi Sound, and the surrounding Gulf of Mexico waters and diverse estuarine biota at Davis Bayou, and assure that activities within the Seashore have the least possible effect on the population of fish, shellfish, and other marine and estuarine organisms.
- Minimize disturbance of natural landforms, vegetation, and wildlife by human-caused activities and restoring ecological conditions on lands adversely affected by such uses and activities in the past.
- Protect and perpetuate the Seashore's natural resources and managing them in ways that enhance natural, ecological, and geological processes and mitigate the adverse effects of human activities.
- Perpetuate suitable habitat conditions to support the Seashore's rich flora and fauna, with particular emphasis on Federally or State endangered or threatened species or, other species of management concern.
- Allow for the natural processes of storms and hurricanes related to barrier island development, by minimizing construction and development of facilities in areas prone to natural channelization and overwash, or otherwise dynamically active.

NPS management of Horn and Petit Bois Islands is also based on the Congressionally-mandated Wilderness Management Plan, completed in 2004. In accordance with this plan, the NPS objectives for these island wilderness areas are to (1) provide for solitude and primitive, unconfined recreation; (2) preserve the character of the wilderness, including a pristine, unencumbered viewshed; and (3) control nonconforming use and prevent unnecessary or undue reduction of wilderness values. The plan further establishes that the NPS's desired future condition for Horn and Petit Bois Islands is a wilderness area unaffected by the works and acts of humankind, where minimum tools or techniques are used in the completion of any project.

IV. Information Needs for NPS Management

The questions listed below were developed by NPS to highlight perceived scientific data needs and research gaps with respect to geomorphology issues to be addressed for NPS to make informed management decisions as to potential restoration alternatives for the barrier islands as part of the MsCIP. The study needs following the questions identify studies and research likely to yield data that could be used to address NPS management needs framed in the questions. The study needs should be regarded as only an initial list, and NPS would welcome the opportunity to work with the Army Corps of Engineers and the U.S. Geological Survey, as well as other agencies, to further refine these study needs.

A. NPS Scientific Data/Research Questions

1. To what extent have human-caused actions, principally from dredging of shipping channels in proximity to the MS barrier islands, altered the sediment transport and depositional processes of the islands?
2. Taking a modeling approach, what would the configuration/make-up of the MS barrier islands be today had sediment transport processes not been disrupted through human intervention, including reoccurring dredging to maintain adjacent shipping channels?
3. Taking a modeling approach, what is the projected future (25, 50, & 100-year intervals) configuration/make-up of the barrier islands given existing conditions vs. what the islands may otherwise look like if natural processes, including hurricane effects, were the only contributing factor to island migration historically and over time?
4. Factoring in the unpredictability of climate change and sea level rise, as well as hurricane frequency, what is the projected future location and configuration of the barrier islands (25, 50, & 100-year intervals)? The modeling studies should use both the long-term relative sea-level rise for the area, as well as one or more increased rates of sea-level rise as predicted with global climate warming data.
5. Given the present sediment transportation and depositional processes, where might additional sand be introduced into the active coastal system to most effectively maintain the MS barrier islands?

B. Further Study Needs

1. Measurement of the present-day bathymetry to a 40-ft depth for the Mississippi barrier island area from Dauphin Island to Cat Island. The most recent bathymetric data from 1960/1971 included only limited

coverage offshore of the barrier islands. More extensive coverage of the present-day bathymetry could be used to formulate an improved historical sediment budget from 1917/20 (the most recent data set with complete bathymetric coverage) to the present. Measurement of the present-day bathymetry would allow the ongoing dredging and placement activities around Ship Island Pass and Horn Island Pass to be incorporated into the sediment budget.

2. Modeling studies to predict future location and geometry of the barrier islands at various scenarios of sea level rise. Existing information on historical shoreline change, bathymetric change, and dredging records, as well as any additional present-day bathymetric data that could be collected, may also be utilized in the studies that would predict future change in the barrier islands at specific time intervals (perhaps 25, 50, 100 years or longer) in the future. The modeling studies should use both the long-term relative sea-level rise for the area, as well as one or more increased rates of sea-level rise as predicted with global climate warming data.
3. Better understanding of the quantity of sediment that has entered the Mississippi barrier island system from Mobile Pass and the Mobile ebb tidal delta, the origin of the sediment supply to the barrier islands. A sediment budget should be developed for the Dauphin Island area that would quantify sediment transport from Mobile Pass and the Mobile Pass ebb tidal delta to Dauphin Island, and from Dauphin Island westward towards Petit Bois Island. A historical sediment budget could be developed based on existing bathymetric change, shoreline position change and dredging records. A hypothetical present-day sediment budget could also be developed based upon present-day bathymetric data and shoreline positions, incorporating dredging activities in and around Mobile Pass.
4. Studies to examine barrier island morphologic changes since the 2005 hurricane season to help determine the extent of storm recovery. Studies may use a combination of data sets, and include for example, the present-day bathymetry and hypothetical sediment budget. Full LiDAR (scanning airborne laser altimetry) and aerial video and photography coverage of the islands could be collected and compared with post-Katrina data collected in 2005 to quantify changes in elevation and shoreline position. Precise shoreline position and elevation data may also be collected in the field using high resolution GPS ground surveys to verify the laser altimetry data. These data sets may help identify the most effective locations and quantities of additional sediment to be introduced into the barrier island littoral system.

Appendix A

Geomorphology of the Mississippi Barrier Islands

Barrier islands are extremely dynamic coastal landforms. They act as the interface between ocean and land, and bear the full impact of atmospheric and oceanographic energy. Composed primarily of sand and water, the features and habitats of the islands are constantly changing and evolving through time. The following excerpt from the Geologic Resource Evaluation Scoping Summary for Gulf Islands National Seashore (KellerLynn, 2007) briefly describes the origin and history of the Mississippi barrier islands located within the seashore.

The six barrier islands along the Mississippi Sound are parallel to the Pleistocene mainland coast (fig. 1). Dauphin Island, the only island not part of the national seashore, is at the mouth of Mobile Bay; westward are Petit Bois, Horn, East Ship, West Ship, and Cat islands. The sound behind the islands is very wide, more than 7 miles (11 km) on average, and deepens gradually from the mainland shore to the islands, with depths exceeding 20 feet (6.1 m) locally (Kwon, 1969).

As in Florida, the barrier islands in Mississippi formed from shoals (Otvos, 1979). Natural interactions between relative sea level, sediment supply, and meteorological-oceanographic conditions, and human-induced changes from dredging, sediment diversion, and habitat modifications resulted in the present configuration (Schmid, 2003). According to Otvos and Giardino (2004), the earliest barrier islands emerged between 5,700 and 5,000 years ago, when sea level was lower than present by 3.2 to 4.9 feet (1.0–1.5 m).

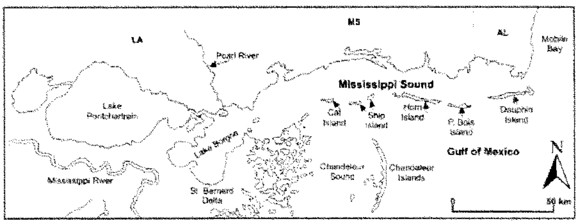


Figure 1. Index map of major landforms in the Mississippi Sound barrier island chain. *Source:* Otvos and Giardino (2004).

The islands formed against a background of decelerating late Holocene sea-level rise. At this time, eastern Dauphin Island represented a higher Pleistocene ground that was veneered by Holocene beach and dune deposits. Dauphin Island became the transmission site for large volumes of littoral sand. From this small island, the rest of Dauphin Island aggraded and extended westward as a narrow, shore-parallel sandy shoal platform (Otvos and Giardino, 2004). By "capturing" the sand that arrived from the Alabama mainland shore through current and drift processes via the Mobile Bay ebb-tidal delta and steering it westward along its south shore, eastern Dauphin Island probably played an important role in originally determining the general offshore position of the whole barrier island chain, which extended well into southeastern Louisiana (Otvos and Giardino, 2004). Many new barrier sectors formed downdrift by gradual extension over adjacent shoal platform areas.

Historic trends indicate that island reduction by storm and fair-weather erosion to subtidal levels alternated with periods of platform aggradation above low-tide level. For instance, the earliest islands and beach ridges of still existing islands east of Cat Island were replaced by shoal areas or more recent islands (Otvos, 1981). Square Handkerchief Shoal west of and aligned with Cat Island probably represents the platform of an extinct barrier (Otvos and Giardino, 2004). Between 3,500 and 4,000 years ago, the St. Bernard delta of the Mississippi River (see fig. 1) prograded into the area west of the Mississippi barrier islands. Mainland extension and marsh development as a result of this progradation stranded the barrier islands and halted their westward migration. Sediments from the delta created shoals in present-day Mississippi Sound, which interrupted westward-directed littoral drift, diminished the impact of the Gulf wave regime, and deactivated Cat Island and the Square Handkerchief Shoal by approximately 2,400 years ago. Cat Island, its sand supply from the other islands cut off by surrounding shoal waters, kept eroding on its eastern end. Shore erosion, combined with subsidence, eliminated the oldest ridge sets off northern Cat Island long ago (Otovs, 1979). Another example of periodic erosion and aggradation is "Isle of Caprice," which existed between Horn and "Ship" islands between the early 1900s and 1940. This island and its neighboring group of islands ("Dog Keys") had a history of emergence, punctuated by episodes of these islets becoming shoals (Otvos, 1979; 1981).

The erosive history of the island chain suggests a relatively short life expectancy (Otvos and Giardino, 2004). French and British charts from the 18th century indicate that Dauphin and Petit Bois islands once formed a single entity ("Isle Dauphin") (Otvos, 1979). The oldest (eastern) part of Petit Bois Island formed the western sector of this ancient island that also incorporated present-day Dauphin Island. After Petit Bois and Dauphin were separated, Petit Bois gradually lost its narrow eastern sector. Widening to a record 5.3 miles (8.5 km) by 1957, Petit Bois Pass now overlaps with the former island area. Since the 1850s, Petit Bois has prograded westward, in downdrift direction (Otvos, 1979). While Petit Bois advanced approximately 3.1 miles (5.0 km) westward between 1850 and 1974, its 9.6-mile- (15.5 km) long eastern sector reverted to a shoal platform. Chart and survey data document a 26% area reduction in Ship, Horn, and Petit Bois islands, declining from a combined surface area of 15.5 square miles (40.2 km^2) in 1850 to 11.5 square miles (29.7 km^2) in 2000 (Otvos and Giardino, 2004).

Although episodic, hurricane destruction and segmentation have played an essential role in the evolution of all the Mississippi Sound barriers (Otvos, 1979) (see "Hurricane-generated Features" section). For instance, during the 1740 hurricane, Isle Dauphin was separated into Petit Bois and Dauphin islands (Otvos, 1979); Isle of Caprice was cut in two by the July 1916 hurricane (Otvos, 1979); and Ship Island was split into West Ship and East Ship islands during Hurricane Camille in 1969 (Falls, 2001). In 2005, Hurricane Katrina completely submerged the entire barrier island chain, segmenting several of the islands and causing significant erosion.

CHAPTER 3 SEDIMENT TRANSPORT MODELING AND SEDIMENT BUDGET

3.1 Introduction and Purpose

In order to conceive any realistic plan for island restoration, it is necessary to understand the physical processes that move sand along the littoral drift zone off the coast of Mississippi. This littoral zone influences the character of the Mississippi barrier islands as they exist in an ever-changing cycle. To help in this understanding, a sediment transport model was conducted to establish a sediment budget for the islands. This study evaluated the existing regional sediment transport magnitudes and directions for the Mississippi and Alabama barrier islands fronting Mississippi Sound and the mainland coast, including an analysis of historical long-term barrier island migration. Based on analysis of previous studies, historical bathymetric and shoreline change, and numerical modeling, a suite of sediment budgets was developed. First, a conceptual sediment budget was developed through a review of existing studies; this budget formed the framework for the historical and calculated sediment budgets. Next, a historical sediment budget was developed through analysis of bathymetric and shoreline position change through time. Engineering activities and significant storm events were also documented. A calculated sediment budget was developed based on numerical modeling of regional waves and sediment transport, for the Gulf and Bay shorelines of the barrier islands as well as the mainland coast. The final sediment budget was formulated from all these intermediate budgets, and is presented herein along with a summary of information pertinent to the final budget. Details about the conceptual, historical, and calculated sediment budgets and further discussion of the entire study can be found in the draft Regional Sediment Budget for Mississippi Mainland and Barrier Island Coasts, (Rosati et al. 2007). Volume change and sediment budget calculations in the 2007 draft MsCIP sediment budget report will be updated during the advanced engineering and design phase using the Jan 2008 upgrade to ESRI's ArcGIS. This recent software upgrade allows more accurate procedures for quantifying volumetric change than were applied when the report was originally written in the spring of 2007. These changes are not likely to impact overall trends in the regional sediment transport system, but may change the magnitude of volumetric differences.

3.2 Mississippi Coast Physical Setting and Processes

The barrier islands in the project area, Cat, West and East Ship, Horn, Petit Bois, and Dauphin Islands, provide the offshore boundary for Mississippi Sound (Figure 3.2-1). These islands are the first line of defense for the mainland as tropical storms, hurricanes, and cold fronts pass the region. Table 3.2-1 summarizes the tropical storm and hurricane history for locations in and around the study area from 1871 (or 1872) through 2006. Because data were not provided for a city in Hancock County, New Orleans, Louisiana is shown in Table 3.2-1 to provide a western boundary to the study area. Locations in Hancock County are assumed to have storm occurrences similar to those presented for New Orleans and Gulfport.

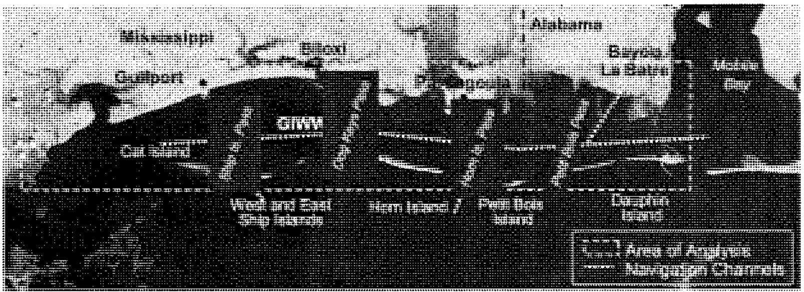


Figure 3.2-1. Mississippi Gulf Coast, showing barrier island system, navigation channels, and the area of study for the regional sediment budget (image courtesy NASA's Earth Observatory, dated 15 Sep 05)

Table 3.2-1.
Storms within 60 miles of selected Mississippi, Alabama, and Louisiana Cities west of Mobile Bay, 1871/2 through 2006[1]

Location (from west to east)	Year of Storm Occurrence t=tropical storm; b=brush; h=hurricane	Frequency of Occurrence (yr)	
		Brush or Hit	Direct Hit
New Orleans, LA	1879h, 1879t, 1887h, 1888b, 1897b, 1892t, 1893h, 1900tb, 1901h, 1905t, 1907t, 1909h, 1914t, 1915h, 1916b, 1932t, 1934tb, 1936t, 1944tb, 1947h, 1948h, 1949t, 1955t, 1964t, 1965h, 1969b, 1979h, 1985b, 1988t, 1992b, 1998t, 2002t(2), 2004tb, 2005t, 2005h	3.8	12.4
Gulfport, MS	1872t, 1879b, 1881b, 1885t, 1885tb, 1887t, 1892t, 1893h, 1895t, 1900t, 1901b, 1904tb, 1905tb, 1906h, 1907tb, 1912b, 1914tb, 1916h, 1923t, 1926t, 1932b, 1934tb, 1944t, 1947h, 1947t, 1955tb, 1960t, 1965b, 1969h, 1979b, 1985h, 1988b, 1998h, 2002tb, 2002t(2), 2004b, 2005t, 2005h	3.5	15.1
Biloxi, MS	1879b, 1880b, 1881t, 1885t, 1885tb, 1887t, 1892tb, 1893h, 1895h, 1900t, 1901h, 1906h, 1907tb, 1912h, 1916h, 1923t, 1926h, 1932h, 1934tb, 1947h, 1955tb, 1960t, 1969h, 1985h, 1997b, 1998h, 2002t, 2002tb, 2004b, 2005t, 2005h	4.4	11.3
Pascagoula, MS	1872b, 1881t, 1885t, 1885tb, 1887t, 1893h, 1893b, 1895t, 1900t, 1901h, 1902tb, 1904tb, 1906h, 1912h, 1914tb, 1916h, 1923tb, 1926h, 1932h, 1934tb, 1944tb, 1947b, 1950b, 1960b, 1969h, 1979h, 1985h, 1998h, 2002t, 2004h, 2005t, 2005h	3.8	9.7
Dauphin Island, AL	1880b, 1881t, 1882b, 1885, 1887t, 1893h, 1895tb, 1900t, 1901t, 1902t, 1904t, 1906h, 1910h, 1911b, 1912b, 1914tb, 1916b, 1919tb, 1922tb, 1923tb, 1926h, 1932h, 1934t, 1939t, 1944tb, 1947t, 1950h, 1956b, 1959t, 1960tb, 1979h, 1985h, 1985tb, 1995b, 1997h, 1998b, 2002t, 2004h, 2005(2)tb, 2005h	3.3	11.3

[1] http://www.hurricanecity.com/. This database does not have any locations in Hancock County, Mississippi; thus, data for New Orleans, Louisiana are included to provide a western boundary for the study area. Locations in Hancock County are assumed to have storm occurrences similar to those provided for New Orleans and Gulfport.

The frequency of direct landfall is approximately equal for Biloxi, Pascagoula, and Dauphin Island, with a direct hit every 10-11 years. The likelihood for a direct hit decreases to approximately once every 15 and 12 years for Gulfport and New Orleans, respectively. However, all locations listed in Table 3.2-1 have historically been brushed or hit with a tropical storm or hurricane approximately once every 3-4 years. Cold fronts, although less intense than tropical storms and hurricanes, occur more frequently at approximately 30 to 40 times per year (Stone et al. 1999).

The barrier islands protecting Mississippi Sound experience a low energy wave climate, with average significant wave height at National Data Buoy Center (NDBC) Buoy 42007 (22 nautical miles south-southeast of Biloxi, in 46 ft depth) averaging 2 ft and 1.3 ft in the winter and summer months, with associated average peak wave periods of 4 to 3.5 sec, respectively. Wave transformation modeling by Cipriani and Stone (2001) indicated that breaking wave heights on the barrier islands range from 1 to 2 ft. Waves in Mississippi Sound are fetch- and depth-limited. The Coastal Studies Institute's Wave-Current Surge Information System (WAVCIS[1]) gage CSI-13 located at Ship Island Pass (23 ft depth) from June 1998 through July 2005 measured an average significant wave height of 0.3 ft and associated average wave period of 2.5 sec.

Tides in Mississippi Sound are diurnal, with a tidal range of 1.5 ft and 1.8 ft for the mean and spring tides at Biloxi, Mississippi[2], respectively. However, the relatively shallow and large area of the Sound create strong currents in the tidal passes between the barrier islands, ranging from 1.63 to 3.3 ft/sec and 5.9 to 11.5 ft/sec on flood and ebb tides, respectively (Foxworth et al. 1962). In the winter months, winds from the same direction and of a sufficient magnitude are capable of lowering water surface elevations in the bays and nearshore from 1-2 ft (U.S. Army Corps of Engineers Mobile District 1984).

For the Gulf barrier island beaches, net longshore sediment transport is from east to west, although local reversals in the net transport occur adjacent to the tidal passes. The primary sources of sediment are longshore sediment transport from east to west, and, potentially, the offshore shelf (Otvos 1979, Cipriani and Stone 2001). Cipriani and Stone (2001) discussed that a well-defined cellular structure exists for each barrier island in which, over historic times, little sand transfer exists between islands. However, dredging records at Horn Island and Ship Island Passes (also called Pascagoula Bar Channel and Gulfport Bar Channel, respectively) suggest that infilling of sand from adjacent barrier islands occurs, indicating the potential for transport of sand between islands. Eastern Dauphin Island, with a Pleistocene core, is more stable than the other barriers although eastern Dauphin Island has been eroding in response to the dominant westerly-directed transport. Based on grain size analysis, Cipriani and Stone (2001) inferred that offshore sources may provide some sediment to central Petit Bois Island. The Mississippi Sound barrier islands range from very well vegetated, with maritime forests on east Dauphin Island, to low elevation barriers that are overwashed and breached during hurricanes. Long-term relative sea level rise for Dauphin Island, Alabama from 1966 to 1997 was 0.12 +/- 0.023 in/year[3].

On the mainland coast, beach change in Harrison County has been dominated by harbor construction, beach restoration and replenishment since 1951 (Byrnes et al. 1993a, 1993b). Cross-shore sediment transport processes dominate beach change, with wave-induced sediment transport processes of secondary importance, typically from east-to-west (Byrnes et al. 1993a, 1993b). Hancock County had beach nourishment in 1993-1994 between Waveland and Bay St Louis and again in 1996 for the Bay St Louis Downtown beach (Schmid 2002). Net longshore transport in Hancock County is generally from northeast to southwest. The bays, distributaries, and bayous of

[1] http://www.wavcis.lsu.edu/, dated 11 December 2006, accessed 11 December 2006.
[2] http://tidesandcurrents.noaa.gov/tides05/tab2ec4.html#107, dated 25 March 2005, accessed 11 December 2006.
[3] http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8735180, dated 10 February 2006, accessed 29 July 2006.

the remaining coast are typically bordered with marsh populated by *Spartina-Juncus* succession (Christmas 1973).

3.3 Review of Existing Studies and Dredging Database

Existing studies were reviewed for the project area to provide information about sediment transport processes of the barrier island and mainland coast. This knowledge gained was incorporated into the sediment budget as appropriate. For a full summary of each study that was reviewed, please see Rosati et al. (2007).

Dredging rates for navigation channels within Mississippi Sound were also evaluated in the study. As was shown in Figure 3.2-1, the study area is traversed by many navigation channels: two "bar" channels that extend through Horn Island Pass (also called Pascagoula Bar Channel) and Ship Island Pass (also called Gulfport Bar Channel); the Gulf Intercoastal Waterway (GIWW) that runs east-west through Mississippi Sound; and five Sound navigation channels that extend from Gulfport, Biloxi, Pascagoula, Bayou Cassotte, and Bayou La Batre. The SAM dredges these channels on a regular basis. The U.S. Army Corps of Engineers' Navigation Data Center[4] (NDC) has documented all Corps contract and non-contract dredging for all Districts for Fiscal Year (FY) 1990 through 2005. NDC's database for SAM's entire District dredging program is provided in Rosati et al. (2007).

Byrnes and Griffee (2007) culled historical dredging and placement information from published Corps reports and databases to develop annual dredging and placement rates for each of the bar channels. Sediment dredged from the GIWW and other channels extending through Mississippi Sound was side-cast or placed in disposal areas to either side of the channels, and is assumed to shoal primarily from fine sediment that is mobilized in the bay. Thus, these dredging and placement activities in the Sound do not change the sediment budget for the mainland and barrier islands. However, dredging and placement adjacent to the barrier islands (Ship Island Pass/Gulfport Bar Channel and Horn Island Pass/Pascagoula Bar Channel) must be considered in the sediment budget.

Dredging data provided by Byrnes and Griffee (2007) have been analyzed to provide estimated maintenance shoaling rates for each of the Bar Channels as a function of channel depth, width, and length (Table 3.3-1). Of particular interest is the maintenance dredging rate as a function of channel depth, as shown in Figure 3.3-1.

Table 3.3-1.
Summary of Dredging Rates for Navigation Channels Adjacent to Barrier Islands (modified from Byrnes and Griffee 2007)

Date	Description	New Work (cy)	Maintenance (cy)
	Ship Island Pass/Gulfport Bar Channel (Data from 1881-2003)		
Mar 1899–Mar 1948	26-ft deep, 300-ft width, 0.76-mile long channel (1.9-mile length dredged in 1922)	163,401	2,115,576 (43,175 cy/yr) (33,028 cu m/yr)
Mar 1948–Jul 1992	32-ft deep, 300-ft wide, 8 miles long	3,679,044	21,111,495 (476,200 cy/yr) (364,292 cu m/yr)
Nov 1993–Apr 2003	38-ft, 300-ft wide, 8 miles long	9,695,988	5,456,817 (579,485 cy/yr) (443,306 cu m/yr)

[4] http://www.iwr.usace.army.mil/NDC/data/datadrg.htm , updated 25 July 2006, accessed 13 December 2006.

Table 3.3-1.
Summary of Dredging Rates for Navigation Channels Adjacent to Barrier Islands (modified from Byrnes and Griffee 2007)

Date	Description	New Work (cy)	Maintenance (cy)
1899 to 2003	**Total Dredging**	**13,538,433**	**28,683,888 (275,807 cy/yr) (210,992 cu m/yr)**
Horn Island Pass/Pascagoula Bar Channel (Data from 1881-2005)			
Feb 1897–Mar1948	25-ft deep, 300-ft wide channel	896,748	1,735,817 (34,000 cy/yr) (26,010 cu m/yr)
Mar 1948–Jan 1965	38-ft deep, 325-ft wide, 2.8 mile length	2,910,835	2,711,925 (161,104 cy/yr (123,245 cu m/yr)
Jan 1965–Sep 1993	40-ft deep, 350-ft wide; Impoundment area along the western end of Petit Bois Island	1,305,589	14,772,517 (515,320 cy/yr) (394,220 cu m/yr)
Sep 1993–Nov 2005	44-ft deep, 550-ft wide; Impoundment area along the western end of Petit Bois Island	3,117,658	2,986,712 (245,483 cy/yr) (187,690 cu m/yr)
1897 to 2005	**Total Dredging**	**8,230,830**	**22,206,971 (205,600 cy/yr) (157,284 cu m/yr)**

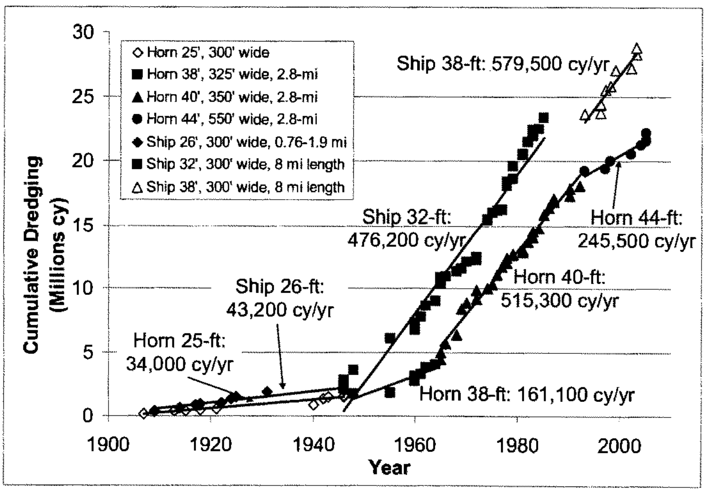


Figure 3.3-1. Cumulative maintenance dredging volumes and associated dredging rates for Horn Island Pass (Pascagoula Bar Channel) and Ship Island Pass (Gulfport Bar Channel)

These data indicate that deepening Ship Island Pass in 1948 by 23% (from 26 to 32 ft depth) and lengthening the channel (from 0.76 and 1.9 miles to 8 miles) increased the maintenance dredging rate by more than an order of magnitude (from 43,200 to 476,200 cy/yr). Dredging rates also increased more than an order of magnitude at Horn Island Pass through several depth increases from 25 to 40 ft, an increase in width from 325 to 350 ft, and length to 2.8 miles (dredging increased from 34,000 to 515,300 cy/yr). However, the dredging rate at Horn Island Pass decreased most recently when the channel was deepened to 44 ft and widened to 550 ft. This decrease in shoaling is opposite to what would be expected and possibly indicates a change in dredging or placement practices at Horn Island Pass. As these channels were deepened, they were also lengthened to provide safe navigation from a similar depth contour offshore. Thus, the deeper channels not only provided a better trap for sand moving alongshore but also resulted in longer channels which captured more of sand that is being transported in the offshore zone.

As mentioned previously, dredging for channels in the Sound do not modify the sediment budget for the barrier islands and mainland coast. The NDC's dredging database has been evaluated to provide a complete regional sediment budget as shown in Table 3.3-2.

Table 3.3-2.
Dredging Rates for Navigation Channels in Mississippi Sound (from SAM and NDC Database)

Location	Dates	Duration (years)	Shoaling Rate (cu yd/yr)	Notes
Gulfport Harbor Channel[1]	Jul 1991 – Sep 2004	8.3	1,151,000	Assume includes GIWW dredging
Biloxi Harbor Channel	Dec 1991 – Aug 2003	12.5	43,600	
Pascagoula Harbor Channel	Aug 1992 – Jan 2005	13.5	3,074,600	Assume includes GIWW dredging in vicinity of Pascagoula
Bayou Cassotte	Sep 1992 – Sep 2000	8	248,500	
Bayou La Batre	May 1996 – Sep 2004	8.3	732,400	Assume includes GIWW dredging

[1] Omitted Gulfport deepening in 1992.

3.4 Historical Data Analysis

A second phase of this study developed a historical sediment budget for the barrier islands and adjacent passes based on bathymetric change, shoreline position change, and dredging and placement data. The historical sediment budget is utilized to develop the present-day sediment budget. In this chapter, historical volumetric change, shoreline position change, and dredging data are reviewed. This portion of the study was conducted by Byrnes and Griffee (2007).

Shoreline and bathymetric data were compiled within a Geographic Information System (GIS) for the Mississippi Sound region. This database has associated metadata specifying the coordinate system, vertical datum, measurement units, and timing of data collection for each data set. Data are available for 1846/57, 1916/21, and 1960/71 periods, with coverage of the eastern portion of the study area available for 1984/89.

The primary goal of bathymetric change analysis is to identify regional sediment transport pathways and quantify net sediment volume changes associated with the historical evolution of nearshore morphology and adjacent beaches. Table 3.4-1 provides a summary of bathymetric data available for the Mississippi Sound area. Initial bathymetric surveys of the area were completed for the period 1847/56. All data have been compiled within a GIS framework, so metadata regarding coordinate system, vertical datum, measurement units, and timing of data collection are provided in the attribute table for each data set. These data, in addition to recorded shoreline changes, have been used to quantify regional sediment dynamics throughout the study area and evaluate the historical sediment budget for the period 1917/21 to 1960/71. Limited coverage offshore of Horn, Petit Bois, and Dauphin Islands for the 1960/71 period limits volumetric change calculations and, ultimately, the historical sediment budget.

Table 3.4-1.
Bathymetry Source Data Characteristics (from Byrnes and Griffee 2007)

Date	Data Source	Comments and Map Numbers
1847/56	USC&GS Hydrographic Sheets 1:20,000	First regional bathymetric survey within the study area. 1847 - H-00191; 1847/48 – H-00192; 1848 – H-00193, H-00194; 1851 – H-00256, H-00261; 1852 – H-00329; 1853 – H-00328, H-00365; 1854 – H-00430; 1855 – H-00485, H-00488, H-00489; 1856 – H-00546.
1916/20	USC&GS Hydrographic Sheets 1:40,000 (all others) 1:80,000 (H-4171)	Second regional bathymetric survey in the study area. 1916/17 – H-03960; 1917 – H-04000; 1917/18 – H-04020, H-04021, H-04023; 1920 - H-04171.
1960/71	USC&GS Hydrographic Sheets 1:10,000 (H-08524, H-08525, H-08560, H-08561, H-08562, H-08642, H-08643, H-08644, H-08645, H-08646, H-08649 to 08652, H-08922, H-08923, H-08925, H-08970, H-09156, H-09177) 1:20,000 (all others)	Third regional bathymetric survey in the study area. 1960 – H-08524, H-08525, H-08562, H-08563); 1960/61 - H-08560, H-08561; 1961 – H-08642; 1961/62 - H-8643 to 08648; 1962 – H-08649 to 08652; 1966/68 – H-08922, H08923; 1967/68 – H-08924, H-08925; 1968 – 08970, H-08971; 1968/69 – H-09004; 1970 – 09103, H-09109; H-09028, H-09156, H-09177; 1971 – H-09200.
1984/89	USC&GS Hydrographic Sheets 1:20,000 (D-00079, F-00324, H-10179, H-10208, H-10226, H-10247, H-10261) 1:40,000 (D-00078, H-10206) 1:80,000 (D-00065)	Survey covering eastern portion of the study area; 1984/87 - D-00065, D-00078; 1985/87 - H-10179; 1985 - H-10206, H-10208; 1986/88 – H-10226; 1987 - H-10247, H-10261; 1988 - D-00079; 1989 - F-00324.

Several insights into forcing processes and engineering activities were observed from the bathymetric change data.

(1) Overall, the barrier islands have eroded on the eastern regions and accreted to the west, indicating the dominant direction of longshore sand transport from east-to-west. Similarly, the Passes between barrier islands have also migrated to the west, as noted by the ebb shoal that erodes to the east and reforms to the west. Thus, the migrating barrier islands naturally "push" the Passes to the west.

(2) Dredging of the ship channels in Mississippi Sound is readily observed in the bathymetric change maps that include the 1960/71 surface, with side-casting and placement of the dredged material shown on either side of the channels. This side-cast sediment does not appear to move within Mississippi Sound.

(3) As the barrier islands have eroded, portions of the barriers have rolled over towards the Sound. For example, East Ship Island and western Dauphin Island have eroded on the Gulf side and reformed in a more northerly location further into the Sound. The processes transporting sand into the Sound is a combination of overwash during storms and inlet formation and possible subsequent closure.

(4) Portions of the barrier islands are relatively stable and maintain position through time (this is observed in Byrnes and Griffee's (2007) shoreline position data). Examples of these locations are

the widest portions of Horn, Petit Bois, and Dauphin Islands. These areas are likely more stable ancient Pleistocene formations along which the sand spits which comprise the rest of the barrier island morphology form.

(5) Initial studies on the barrier island sediment budget indicate Cat Island is not part of the sand-sharing system that comprises Dauphin, Petit Bois, Horn, and Ship Islands and the Passes that separate these barrier islands. Cat Island appears to be a separate entity and the bathymetric change maps do not indicate that sand from Ship Island naturally bypasses or transports to Cat Island. If there were connectivity between Ship and Cat Island, it would be evidenced by erosion or accretion of morphologic features between the islands.

(6) From the historical shoreline position data (Byrnes and Griffee 2007), it is evident that the barrier islands have experienced cycles of breaching and mending throughout history. For example, Dauphin Island breached in 1917 in response to the 1915 hurricane, and reformed by 1957 slightly further northward (into the Sound) at the location of the washover deposit. Dauphin Island again shows a breach in the 2006 shoreline position data. Similarly, Ship Island breached in response to the 1947 hurricane and the barrier had reformed by 1950. Ship Island has been divided into East and West Ship Islands since another breach formed in the 1960s. These cycles of breaching and reformation indicate that breaches will naturally mend through the dominant longshore sand transport direction to the west, if a sufficient source of sediment is available. The historical data analysis is further discussed in Byrnes and Griffee (2007) and Rosati et al. (2007).

3.4.1 Numerical Modeling

Two numerical models were applied to develop estimates of sediment transport magnitudes and pathways. First, GENESIS shoreline change modeling that was conducted as a part of a larger regional study was incorporated to provide potential longshore sand transport rates for the Gulfside of the barrier islands for representative yearly waves. This model used pre-Katrina shoreline positions. Next, regional wave transformation modeling was conducted with STWAVE to estimate breaking wave height and direction magnitudes for the Gulfside and mainland coast beaches. These wave parameters and the shoreline orientation for sections of the Gulf barrier beaches and mainland coast were used to calculate potential longshore sand transport rates. Potential longshore sand transport rates are those estimated to occur if a sufficient quantity of sand were available for transport. Thus, these calculations do not apply to muddy coastlines or wetland regions of the study area. Finally, STWAVE was also applied to estimate wind-induced wave parameters for the Sound side of the barrier islands and subsequent sand transport on the Sound barrier coast. The methodology and results for this numerical modeling are discussed in Rosati et al. (2007).

3.4.2 Sediment Budget

Using the calculated and historical sediment budgets, and dredging and placement practices from 1993-2005 as presented by Rosati et al. (2007), a present-day (post-Katrina shoreline position) sediment budget has been hypothesized. In formulating this budget, several assumptions were made as follows:

(1) The historical sediment budget (1917/20-1960/71) was weighted more heavily than the calculated sediment budget, because the historical budget is based on actual measured changes in the region. However, for portions of the barrier islands that have changed morphology since the 1917/20 to 1960/71 period, or would be modified by a change in dredging or placement practices, the calculated sediment budget was given preference. The calculated sediment budget was adopted for eastern Dauphin Island because volume change data have not yet been released, pending acceptance of the Dauphin Island mitigation study.

(2) In the absence of historical data, the calculated sediment budget and observed morphologic response were adopted for the mainland coast.

(3) Dredging and placement practices from 1993 to 2003/2005 were adopted for Ship Island Pass and Horn Island Pass, and the barrier island response to these activities was hypothesized. Dredging rates for Gulfport, Biloxi, and Pascagoula Harbor Channels, and Bayou Cassotte and Bayou La Batre were adopted as shown in Table 3.3-2. The source of sediment for these channels in Mississippi Sound was assumed to be fine-grained sediment that is mobilized during storms and wind events.

The hypothetical present-day sediment budget is shown in Figures 3.4-1 through 3.4-10, in which P=placement of dredged material, R=dredging or removal of sand, and sand fluxes are shown in thousands of cubic yards per year. It is emphasized that this sediment budget is only one of many possible solutions that could represent typical present-day conditions.

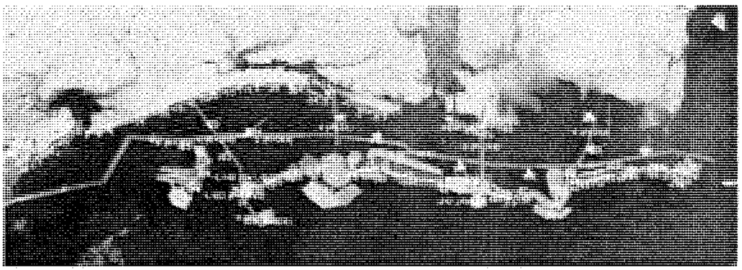


Figure 3.4-1. Overview of hypothetical present-day sediment budget (thousands of cy/yr)

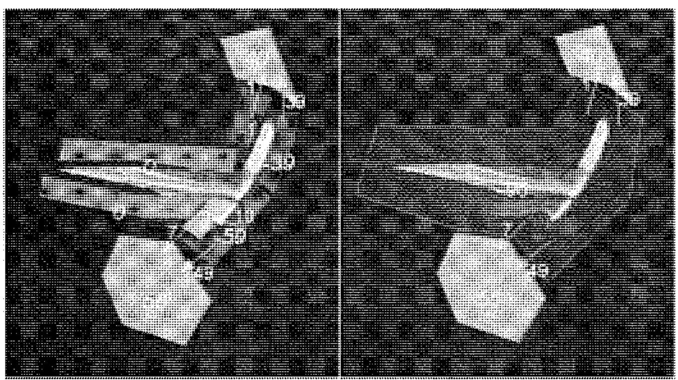


Figure 3.4-2. Hypothetical present-day sediment budget and macrobudget: Cat Island thousands of cy/yr).

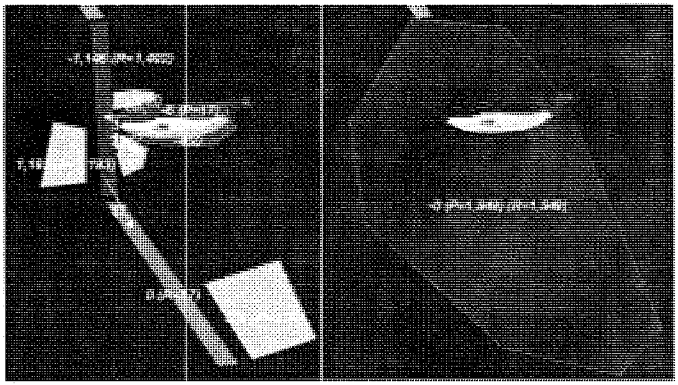


Figure 3.4-3. Hypothetical present-day sediment budget and macrobudget: West Ship Island and Ship Island Pass (thousands of cy/yr).

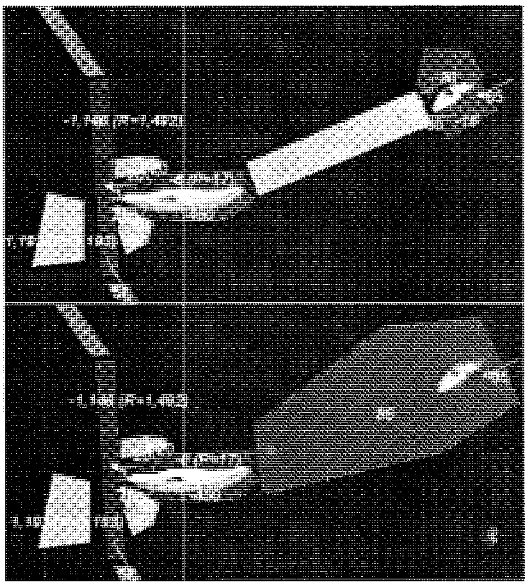


Figure 3.4-4. Hypothetical present-day sediment budget and macrobudget: East Ship Island and Camille Cut (thousands of cy/yr).

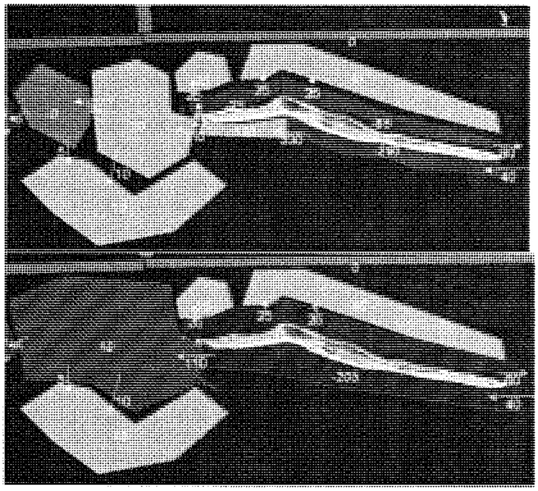


Figure 3.4-5. Hypothetical present-day sediment budget and macrobudget: Horn Island and Dog Keys Pass (thousands of cy/yr).

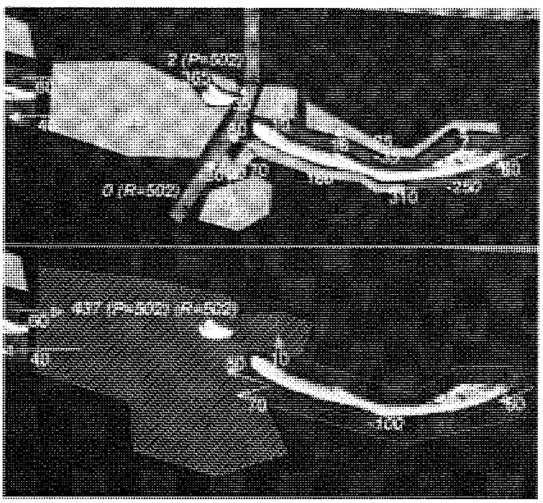


Figure 3.4-6. Hypothetical present-day sediment budget and acrobudget: Petit Bois Island and Horn Island Pass (thousands of cy/yr).

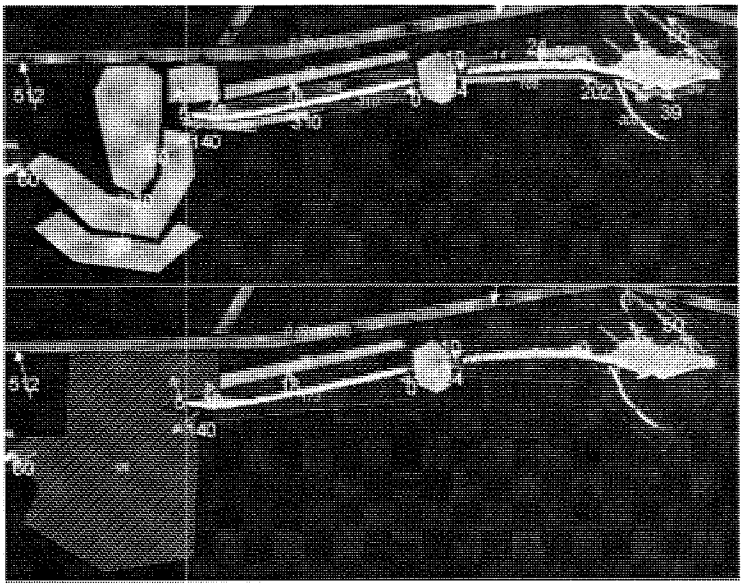


Figure 3.4-7. Hypothetical present-day sediment budget and macrobudget: Dauphin Island and Petit Bois Pass (thousands of cy/yr).

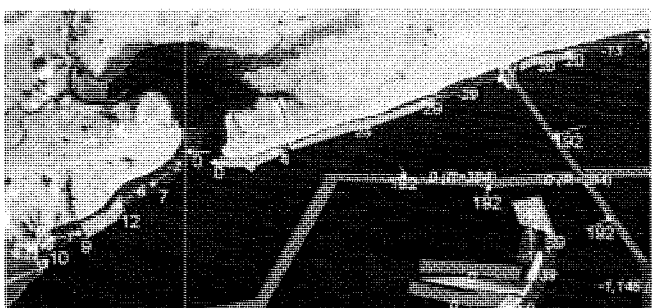


Figure 3.4-8. Hypothetical present-day sediment budget: Hancock County, Gulfport Harbor Channel, and a portion of the Gulf Intercoastal Waterway (thousands of cy/yr).

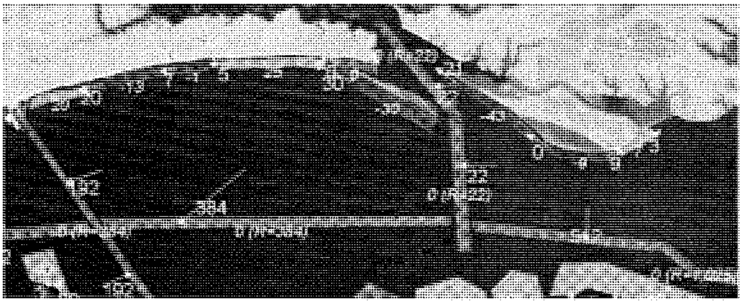


Figure 3.4-9. Hypothetical present-day sediment budget: Harrison County, Pascagoula Harbor Channel, and a portion of the Gulf Intercoastal Waterway (thousands of cy/yr).

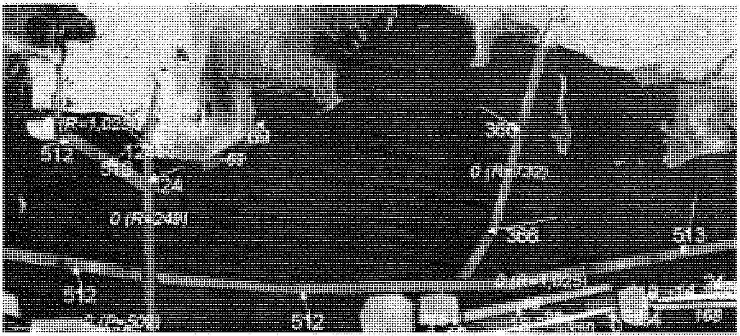


Figure 3.4-10. Hypothetical present-day sediment budget: Jackson County, Bayou La Batre, and a portion of the Gulf Intercoastal Waterway (thousands of cy/yr).

Knowledge gained through this study and recommendations that follow include the following:

(1) Cat Island is not a part of the barrier island littoral system represented by Dauphin, Petit Bois, Horn, and East and West Ship Islands. Cat Island is a separate morphologic feature that is naturally eroding due to waves, storm surge, and relative sea level rise in the region. Dredged sand that is placed in the littoral zone to the west of Ship Island Pass most likely will not be transported to Cat Island. Even in the absence of any engineering activities in Mississippi Sound, there is no evidence that sand from Ship Island would ever reach Cat Island.

(2) The net longshore sand transport rate for the barrier islands is from east-to-west. The barrier islands are migrating towards the west and, as they move west, also move the Passes between islands in a westerly direction. The source of sand for this region is the Mobile Pass ebb tidal shoal and the sandy shelf and shoreline to the east of Mobile Pass. This study has shown Ship Island is the terminus of the longshore sand transport system in this region. Thus, the regional shortage of littoral sand will be most profoundly observed at Ship Island. Disintegration of this barrier island, especially since Hurricane Katrina in 2005 has been observed. It is also recommended that

restoration of any barrier islands in Mississippi Sound begin with Ship Island. Also recommended is utilizing sand dredged from Ship Island Pass, placing this sand either in Camille Cut, near East Ship Island, or in Dog Keys Pass or other littoral zones based on additional sediment transport modeling. Sand can be placed in the surf zone (3 to 6-ft depths) and the natural longshore sand transport process will rebuild the island and begin to mend breaches.

(3) The historical sediment budget from 1917/20 to 1960/71 includes bathymetry change, shoreline position change, and dredging and placement practices representative of this period. However, data for the 1960/71 period are very sparse offshore of the barrier islands. This lends some uncertainty to the historical budget. In addition, Ship Island Pass and Horn Island Pass were deepened (and Horn Island was widened) in 1992/1993. Since that time, dredging rates have increased from those that occurred during the 1917/20 to 1960/71 period. Thus, the historical sediment budget is not representative of present-day dredging and placement activities, and has uncertainty with respect to bathymetric change offshore of the barrier islands. We recommend measurement of modern bathymetry (to 30 or 40-ft depths) and formulation of a sediment budget characterizing the period from 1917/20 (which has sufficient bathymetric coverage) to present-day.

(4) The historical analysis indicated that Horn Island has not experienced wash-over deposition across the entire island and has only been breached on a part of terminal spit during Hurricane Katrina (personal communication, Ms. Linda Lillycrop, May 2005). This cross-shore stability implies that the elevation and width of this barrier island might be a good template to evaluate for possible future restoration of the Mississippi Sound barrier islands.

(5) Wave modeling indicated that the mainland coast experiences a greatly reduced wave climate due to sheltering by the barrier islands fronting Mississippi Sound, as well as the Chandeleur Islands, and the Mississippi River's Bird's Foot delta. Restoration of the barrier islands could also consider lengthening the islands to recreate a previous historical footprint to provide additional wave protection for the mainland coast.

CHAPTER 4 INLAND RIVER SAND SOURCES FOR USE AT BARRIER ISLANDS

4.1 General Information

While off-shore sources of good quality sand exist, other inland sources of sand exist that will be used for barrier island littoral zone restoration will be subject to additional study. After the construction of inland waterways in Alabama and Mississippi, maintenance dredging is required to maintain the channel depths and alignments. This material is typically moved to disposal areas along the banks of the river where it accumulates in diked areas. Dredging of some of the areas along the river produces large quantities of sand that have potential use for beach nourishment. An inventory of current disposal sites indicates that approximately 30,000,000 cubic yards of sand may be available. Only disposal sites that contain a minimum of 100,000 cubic yards of sand were included in the inventory. Of interest to this study are disposal sites that are located along the Black Warrior–Tombigbee River system and the Tennessee-Tombigbee Waterway. Figure 4-1 shows the relationship of these disposal areas to the project sites along the Mississippi coast. Material from these sites could easily be transported by barge down the river system for use along the beaches or added to littoral zones.

4.2 Prior "Beneficial Use of Sand" Studies

Because of the shortage of additional disposal areas, the Corps of Engineers' Operations Division has contracted for several studies on the beneficial use of the sand. Some of these studies have been targeted at using the sand for beach nourishment, (Thompson Engineering, 2001). Using sand samples from some of the inland disposal areas along the Black Warrior – Tombigbee River, a series of analyses were conducted on the samples. For comparison purposes, several samples of actual beach sand and from the littoral drift zone from coastal Alabama were taken and subjected to the same tests. These tests included grain size distribution (gradation), color and roundness. The results of the tests indicated that some of the samples may be suitable for beach nourishment. The sand samples from the river were typically a finer grain size that the beach sand with the predominant river size being a fine sand while the beach sand was mostly medium sand. It was also noted that the beach sand was slightly more rounded than the river sand.

The one factor that warranted further analysis was the color difference of the river sand as compared to the beach sand. All of the river sand had a brown tint described as "very pale brown" or "light yellow brown". This compared to the beach sand samples which were described as "pale olive, white or light grey". These colors were assigned along with evaluations for hue, value and chroma from a Munsell Soil Color chart which provides a standard method of assigning color to soils. These reports also indicated that the color may be due to staining on the sand grains and not included in the mineral structure of the sand itself. The report also noted that beach sand came from a higher energy environment where any staining due the depositional environment may have been removed by abrasion due to wave action. It also noted that the sand might undergo bleaching from the ultraviolet radiation from the sun if the color was caused by a mineral staining. To test these conditions that may change the color of the sand, a series of tests were conducted on samples from the same areas that were used during the initial analyses, (Thompson, 2002). The samples were subjected to two tests. The first involved actual bleaching of the samples using a chemical oxidizer, hydrogen peroxide, for different periods of time. These tests did indicate that the bleaching process was detectable after 72 hours. Other tests were conducted to simulate the process of wave action causing an agitation of the particles which may remove any mineral coating or staining along with exposure to ultraviolet light. This process was conducted for 144 hours without a notable difference in color.

Other studies on the dredge disposal areas by the Bureau of Mines, U.S. Department of the Interior were conducted to characterize the sand for use as an aggregate in making concrete (Smith, 1995). While these tests were not directed at use of the sand for beach nourishment, they did supply information on chemical and physical characteristics of the materials from several locations. These tests provided data that shows the sand to be clean, mostly fine grained, quartz sand with little of no fines, to be non-toxic based on Toxic Characteristic Leachate Procedure (TCLP) and to contain very little heavy minerals. All of these tests would indicate the material would be safe to place on a beach.

Review of the documents referenced above indicated that the color issue was not resolved and this would be an important factor in the use of the sand on the barrier island beaches. The methods employed, bleaching and agitation with exposure to ultraviolet light, were not considered to be effective in removal of what is suspected to be the basis of the color on the sand grains, amorphous iron oxide more commonly referred to as rust. Hydrogen peroxide is a common household bleaching agent that is effective in oxidation of organic matter, but would no effect iron oxide through chemical removal. The same is true for the effects of ultraviolet light on iron oxide. The idea of using agitation would be the most effective of the methods attempted if the color was a coating on the mineral grains, but the test, as conducted, was not conclusive.

4.3 Additional Studies

With the renewed interest in the possibility of using the sand as a source of material for the littoral zone associated with the Mississippi barrier islands, the disposal areas warranted further study. Again the color of the sand is a concern that has been raised by the National Park Service who has control of the Mississippi Barrier Islands. This concern has both aesthetic and environmental aspects. Aesthetically, the beaches on the barrier islands are composed of relatively white sand. Numerous studies have indicated that the primary source of this sand is an Appalachian origin probably associated with river systems discharging onto the Continental Shelf of present-day Florida (Stone and Others, 2004). This sand is transported westward from the discharge of the river into the Gulf of Mexico. Transport of this sand along the prevailing littoral current has created the white beaches and barrier islands that extend from Florida westward across Alabama to Mississippi as shown in Figure 4-2.

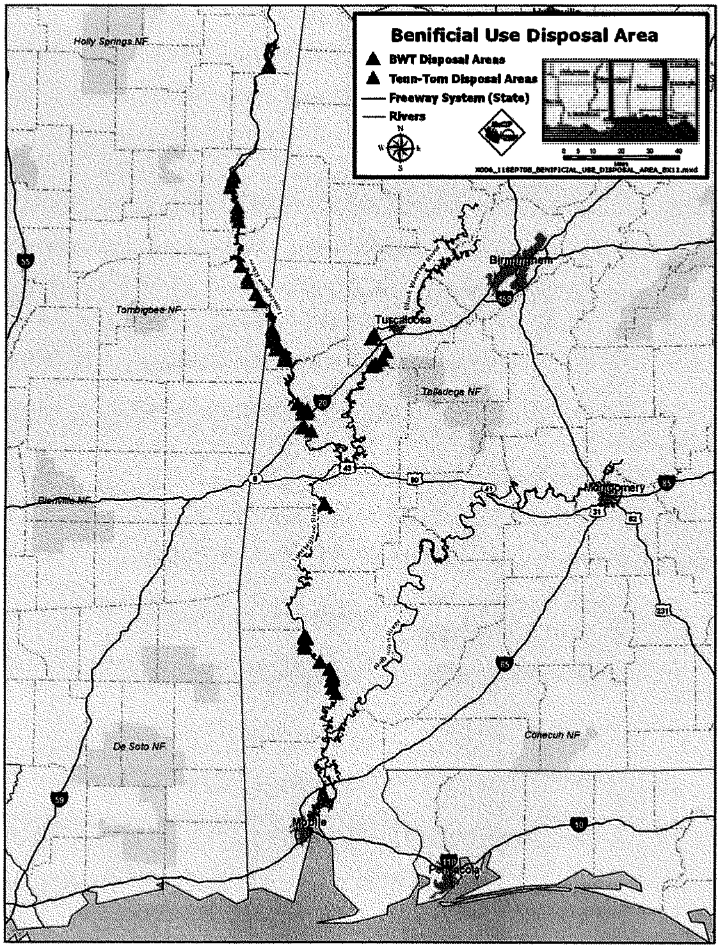


Figure 4-1. Location of Disposal Areas Along the Black Warrior–Tombigbee River System and the Tennessee-Tombigbee Waterway

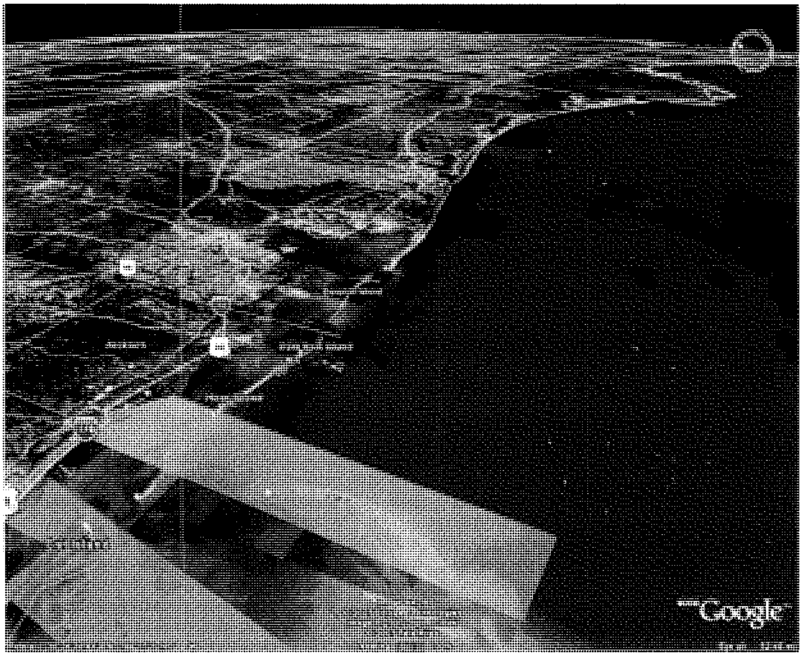


Figure 4-2. Littoral zone (white beaches and islands) along Central Gulf Coast extending from Bay County, Florida (top of picture) to Mississippi Barrier Islands (lower left), looking east.

Looking at the color differences of the sand along this system reveals a definite change as shown in Figure 4-3. The sample on the left was taken from sand dredged from the Chattahoochee River which is a major tributary of the Apalachicola River. This sampling location is approximately 150 river miles above the Gulf. The middle sample was taken from Disposal Area 39 on the Apalachicola River approximately 37 river miles above the Gulf. The sample on the right was taken from the south beach of Petit Bois Island in Mississippi. Note the progressive change in color from brown to tan to white.

Geochemical processes could account for the consistent staining of the sand grains while in the river system. As the sand entered the Gulf's littoral system, changes in the geochemical process would not allow additional staining of the sand and any removal of the coating would allow the underlying sand grain to display its true color. The mechanical process of abrasion would occur both in the river system and the littoral system, but if the iron oxide staining was continuously reoccurring in the river system, the resulting color would remain. As the sand grains entered a different geochemical environment where re-staining did not occur, it would account for the difference where the color was a coating. Review of selected sand samples taken from the Black Warrior– Tombigbee River system disposal areas the reveal the same general color that is characteristic of the Chattahoochee-Apalachicola River system. Figure 4-4 is a photograph of five samples that include the same samples used in Figure 4-3 plus two additional samples, one from the Black Warrior River and another from the Tombigbee River. Note the similarities in color of the Apalachicola River (second from left), the Black Warrior (third from left and marked BWT North Star), and the Lower Princess (forth from left, Lower Tombigbee River).

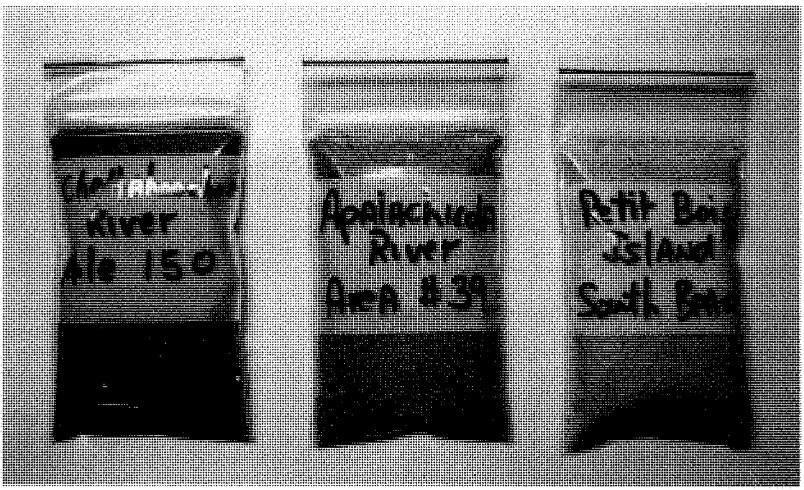


Figure 4-3. Samples of Sand taken from (left to right) Chattahoochee River Mile 150, Disposal Area #39 on the Apalachicola River, and Petit Bois Island

Figure 4-4. Samples of Sand taken from (left to right) Chattahoochee River Mile 150, Disposal Area #39 on the Apalachicola River, North Star Disposal Area on the Black Warrior River, Lower Princess Disposal Area on the Tombigbee River, and Petit Bois Island in Mississippi

Assuming that the previous testing was not effective at removing the iron oxide staining on the sand grains, a different bench-top test was performed. If iron oxide is only a coating on the sand grains and occurs as a stain, abrasion would be effective in the removal. The addition of a week acid would also aid in keeping the iron oxide from re-coating the sand grains as it is being removed. For the experiment, I used a small "rock tumbler" of the type used to polish small stones. Into the chamber of the rock tumbler was added a small quantity of sand obtained from the Lower Princess disposal area on the Tombigbee River, enough water to just cover the sand and a tablespoon of "Zud". Zud is a household cleaning product that is composed of oxalic acid and abrasives. Oxalic acid is a weak acid commonly used to remove rust stains. Zud contains about 10% oxalic acid and 90% fine abrasives. The tumbling chamber was closed and placed the tumbler. An electric motor spins the chamber which allows the contents to tumble. This process would mimic the process of sand grains being transported along the littoral zone with the sand grains being abraded as they strike each other. In the almost infinite volume of water in the Gulf, any iron stain that was removed would not re-coat the sand, but be diluted away. This process started on 4 October 2007 and concluded 10 October 2007. The tumbler did not run over the included long weekend, but did operate for about 4 days. At the completion of the tumbling process, rinse water was added and decanted several times until the turbidity levels dropped and the fines were removed. The remaining sand was air dried and placed in a clear plastic bag for comparison with sand from the same parent sample. As shown in Figure 4-5, the results of the experiment are quite dramatic. The tumbled sand lost most of the tan color and is approaching white. This supports the process that occurs with the tan sand from the Apalachicola River system becoming the white sand so familiar to beach-goers along the central Gulf Coast.

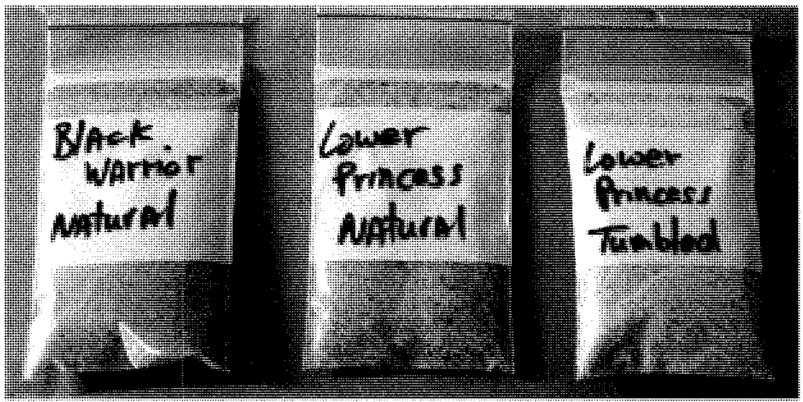


Figure 4-5. Samples of Sand taken from (left to right) North Star Disposal Area on the Black Warrior River, Lower Princess Disposal Area, and "Tumbled Lower Princess Disposal Area"

Adding the sand into the littoral system along the gulf coast could provide the proper geochemical and mechanical processes to remove the iron staining and provide the quality of sand that is desired as it is transported along the littoral drift zone which contain the Mississippi Barrier Islands. Littoral zone placement will also allow additional sorting by the currents and rounding of the sand grains through continued abrasion during transport. Additional research and testing will be performed to support this process prior to any use of any sand from disposal areas.

4.4 References

Smith, C. W., 1995, Characterization of Dredged River Sediments in 10 Upland Disposal Sites in Alabama, Report of Investigations 9549, U.S. Department of the Interior, Bureau of Mines.

Stone, Gregory W.; Liu, Baozhu; Pepper, David A.; Wang, Ping; 2004, The Importance of Extratropical and Tropical Cyclones on the Short-term Evolution of Barrier Islands along the Northern Gulf of Mexico, USA, Marine Geology 210, pages 63-78

Thompson Engineering, 2001, Dredged Material Suitability Analysis - BWT River Sediments, Project 01-2116-0102.

Thompson Engineering, 2002, Sediment Bleaching Analysis from Disposal Sites Along the Alabama, Black Warrior and Tombigbee River Systems in Alabama, Project 02-2116-0030.

CHAPTER 5 OVERVIEW OF ALL BARRIER ISLAND OPTIONS (LINE OF DEFENSE-1) FROM ENGINEERING APPENDIX

5.1 Line of Defense 1 – Offshore Barrier Islands

5.1.1 General

The coastline of mainland Mississippi is bordered on the south by the Mississippi Sound, a shallow body of water that separates the coast from four barrier islands that lie several miles to the south as shown in Figure 5.1.1-1. These barrier islands are located along a littoral drift zone that moves sand westward creating three elongated islands and then westward toward Cat Island, where littoral currents are not as well defined. The birds-foot delta system from the Mississippi River has extended through the historic littoral system, cutting off the sediment transport. Cat Island had the same origin than the other islands, but now being re-shaped by wave action and lack of new sediments moving into the system. Wave action has created a beach on the eastern side of the island forming a distinctive T-shape. From west to east, the islands are Cat, Ship (now actually two islands, West and East Ship Island), Horn and Petit Bois. As noted above, Ship Island has been breached by prior hurricanes and now is actually two small islands, West Ship Island and East Ship Island, with a shallow sand bar between the two. Since Hurricane Camille in 1969, this breach has existed with varying amounts of natural rebuilding between later storms and is now known as Camille Cut. The western ends of both Petit Bois and West Ship Islands have migrated westward and are now against maintained deep-water navigation channels and the continuing littoral drift of the sand into the channels is causing an artificial termination of the migration. A small, new island has emerged on the west side of the channel from Petit Bois Island, created from the dredged sand that is disposed of on the west side of the channel. This small island can be seen in Figure 5.1.1-1 as the small island just west of and across the channel from Petit Bois Island.

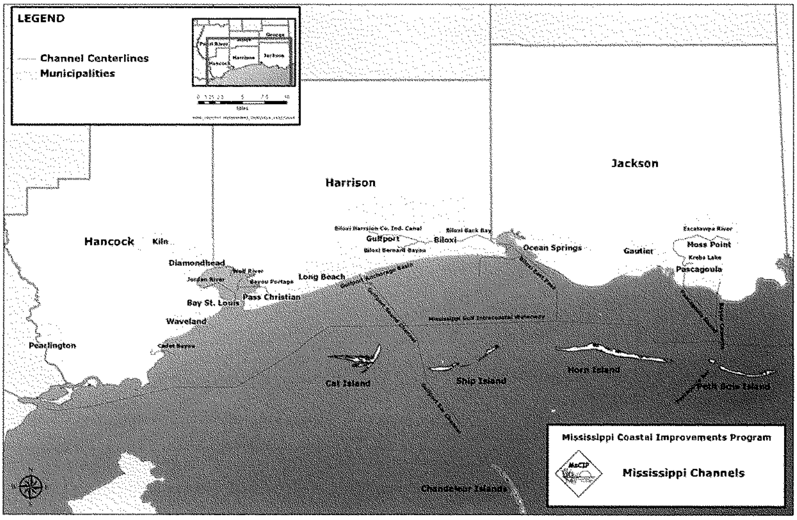


Figure 5.1.1-1. The Mississippi Barrier Islands shown in relationship to the numerous navigation channels near the islands

Immediately following Hurricane Katrina, most of the effort was spent protecting human life and securing structures throughout the impacted areas on the mainland; therefore, few assessments of the vegetation impacts exist, especially on the barrier islands. For the barrier island system, most all of the marsh vegetation recovered several months following Hurricane Katrina. The predominant vegetation that has long-term impacts consists of those pines found in the maritime forests. It is estimated that about 75% of these pine species were killed following the hurricane season of 2005, with most that attributable to Hurricane Katrina. Figure 5.1.1-2 is a photograph taken on Horn Island after Hurricane Katrina that shows the loss to the pine trees. The emergent marsh habitat is thriving so well it actually looks as though hurricanes never past through the barrier island system. The sea oats are still found in small patches due to the reduced dune system. Any option that includes the planting of marsh vegetation will have to consider the current population of nutria that inhabits the islands. These exotic animals from South America can destroy attempts to establish marsh planting and any program should include the control of these rodents.

In 1998, Hurricane George played a role in destroying many of the sand dunes on the islands. Although a relatively small storm, the constant pounding of the waves along the beaches eroded most of the dunes on the southern shores which were the higher elevations on the islands. Along with the destruction of the dunes was the loss of the associated vegetation and habitat. Figure 5.1.1-3 is a photo of the south beach of Horn Island where hurricanes have destroyed the dunes system.

Figure 5.1.1-2. Photo of interior of Horn Island. Note the mature pine trees that were killed from the effects of salt water that covered the island during Hurricane Katrina.

Figure 5.1.1-3. Photo of the south beach at Horn Island. Pre-existing dunes have been destroyed by numerous hurricanes over the last several years.

Prior to Hurricane Katrina, the State of Mississippi was working on a coastal storm protection plan that included restoring the barrier islands to the condition that existed prior to Hurricane Camille. The general assumption was that there would have been less damage along the coast from Hurricane Katrina if the islands had been in this improved condition. This was also included in the Mississippi Governor's Hurricane Katrina Recovery Plan which called for restoring the islands to a pre-Camille footprint. This concept was included in the hurricane protection study as LOD-1.

To determine the effects of the islands in reducing the surge damage to the mainland, a number of storms were selected to model against the chain of islands in a pre-Camille and a post-Katrina configuration. The post-Katrina condition can be considered a baseline condition for the modeling and the pre-Camille condition would be an improved condition. The pre-Camille footprint of the islands was obtained from historical records and an assumption was made as to a top of dune elevation and a typical island width. During the modeling process, the island sizes were held constant and not allowed to be destroyed. It should be noted that some of the islands have migrated and any reconstruction would be to increase their footprint at their present location and not move them back to historical locations. In general, the islands were modeled with a 2000-foot width and with an elevation 20.0 dunes, but may be in a slightly different position. Modeling efforts have concluded that over a wide range of storms, there would be some protection provided to the eastern coast of Mississippi along the Jackson County shoreline if the islands are in the pre-Camille condition. This area is the most protected from the restored islands and this protection may result in only up to a 10% reduction in storm surge. The effect of this protection diminishes rapidly to the west from Jackson County. An important aspect of the islands shown by the modeling is the reduction of the large sea waves as they advance towards the mainland. Reduction in wave height up to several feet is realized by the presence of the islands. Loss of Ship Island would leave a portion of the heavily developed Harrison County shoreline subject to these larger waves.

All of Petit Bois, Horn, and Ship Islands and part of Cat Island are within the boundaries of the Gulf Islands National Seashore under the jurisdiction of the National Park Service. The park boundaries are shown in Figure 5.1.1-4. In most cases, the boundary extends one mile from the shore of the island. Petit Bois and Horn Islands have also been designated as Wilderness Areas by the U.S. Department of the Interior and have a higher degree of protection than the other islands.

The formation of Camille Cut has created problems for the National Park Service due to the location of two historically important sites. Fort Massachusetts is located on the northern shore of West Ship and the French Warehouse is located on the northern shore of East Ship Island. Both of these sites are endangered by on-going erosion of the shoreline with Mississippi Sound. Another site known as the Quarantine Station has already been lost to erosion. These sites are shown in Figure 5.1.1-5. This photo was taken after Hurricane Katrina, but would be similar to conditions after Hurricane Camille.

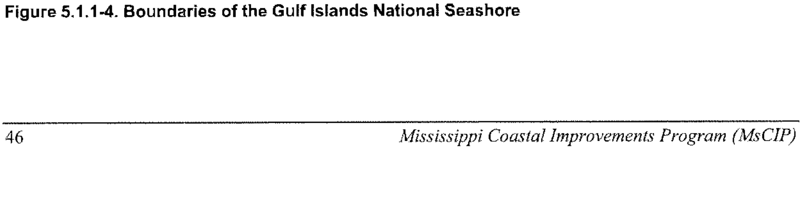


Figure 5.1.1-4. Boundaries of the Gulf Islands National Seashore

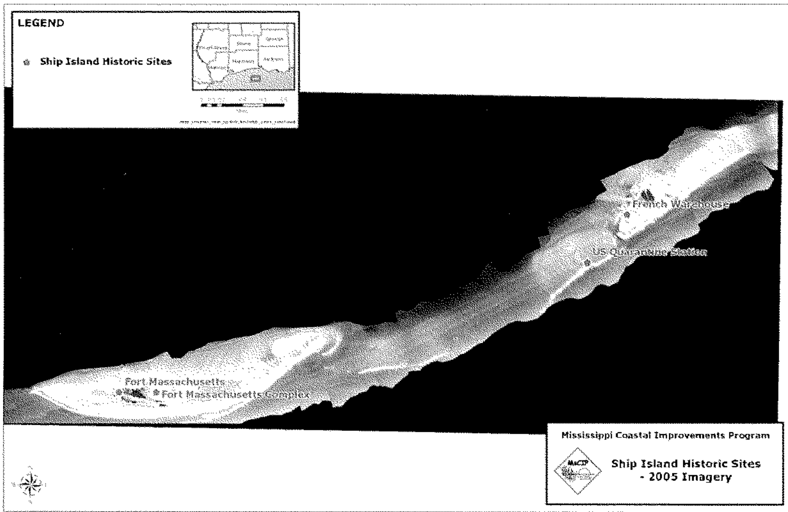


Figure 5.1.1-5. Aerial photo of West and East Ship Island taken in 2005 after Hurricane Katrina showing the locations of listed historical sites separated by Camille Cut

Fort Massachusetts was originally built on the western tip of Ship Island. The westward migration of sand along the southern shore and erosion of the northern shore now has put the fort almost a mile from the western tip of the island, but dangerously close to being in the Sound. Several emergency beach re-nourishments have taken place over the last 35 years to protect the fort from wave action during winter storms. At present, the NPS is again requesting that the Corps place sand along the shore near the fort in conjunction with dredging operations at the Gulfport navigation channel. This emergency placement of sand is being repeated about every five to six years.

The French Warehouse site has not had any sand placement on its shoreline in the past. The erosive process is slower at that location, but now there are concerns from the NPS about the integrity of the site. Unlike the location of the fort, the warehouse site is covered by maritime forest which may be added in slowing the erosion of the shore.

The Corps was asked to visit Fort Massachusetts with the NPS during July, 2007 to look at the present erosion problem and to discuss any possible long-term solutions to the loss of sand along the shoreline. The immediate erosion problem will require re-nourishment of the beach adjacent to the fort similar to the past protection projects. Any type of hardened structural feature as protection for the fort was not desired by the NPS nor was this recommended by the Corps. There was a breakwater placed north of the fort in the past (prior to the barrier islands becoming a National Seashore under the NPS) and seems to be compounding the erosion problems. The problem of a long-term fix may be tied to closing the three mile wide breach known as Camille Pass between West and East Ship Island. Review of historical footprints of the islands indicates that after the breach caused by Hurricane Camille, the westward migration of sand was continuing, but that the sand supply was being depleted before it reached West Ship Island. Aerial photos show the formation of a sand spit that extends westward from East Ship Island. The volume of sand that is creating this spit is being depleted before it reaches West Ship Island. The photos also show that a deeper channel has formed a pass between the eastern end of West Ship Island and the western end of the spit. It appears that an ebb tidal delta at this pass moves the sand southward where it is removed from any migration along the northern shore of West Ship Island. The sand continues to supply the south beach and extends the western tip of the island in its migration. The loss of the sand from the littoral drift along the northern shore of West ship Island has resulted in erosion of that shoreline. Figure 5.1.1-6 shows an excellent aerial view of this process. Note the boat on the northern side of the pass.

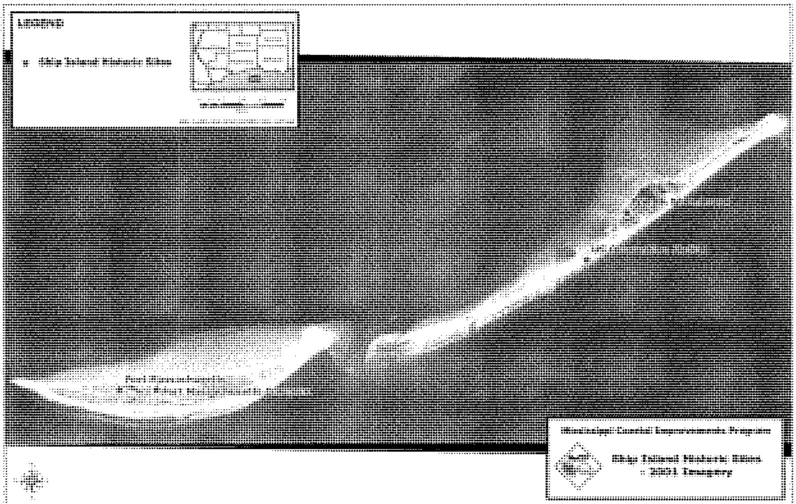


Figure 5.1.1-6. Aerial photo of West and East Ship Island taken in 2001. Note the sand spit extending westward from East Ship Island and the pass between the two islands.

A positive by-product of filling of the Camille Pass would be to provide a longer term solution to the erosion on the northern shores of West Ship Island. This will require modeling to better understand the benefits that are believed to be associated with this plan. The costs will be substantial due to the large quantities of sand high quality sand that will be required to fill the breach. Initial estimates for sand requirements are approximately 13 million cubic yards. The fill would be expected to prevent the continuing loss of sand to West Ship Island, but it is also understood that the islands are a dynamic system, ever changing to nature's forces. Different types of dune vegetation planting would also be included to restore habitat on the newly created land.

5.1.2 Restoration of the Offshore Barrier Islands

5.1.2.1 General

Soon after Hurricane Katrina, it was reported that many residents in Mississippi were of the opinion that if the islands had been in the condition that existed prior to Hurricane Camille, there would have been less damage along the coast from Hurricane Katrina. This initial concept was also included in the Mississippi Governor's Restoration Plan which called for restoring the islands to a pre-Camille footprint. Changes in the footprints are shown in Figures 5.1.2.1-1 through 5.1.2.1-4.

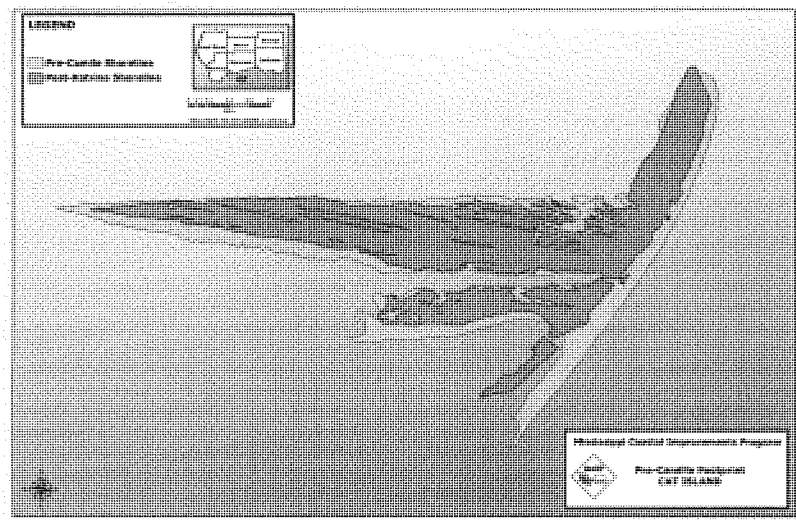


Figure 5.1.2.1-1. Changes in footprint of Cat Island from pre-Camille to post-Katrina

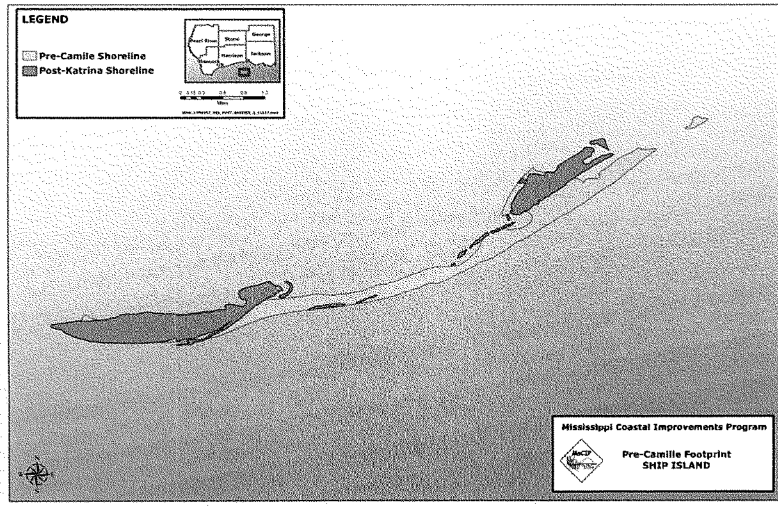


Figure 5.1.2.1-2. Changes in footprint of Ship Island from pre-Camille to post-Katrina

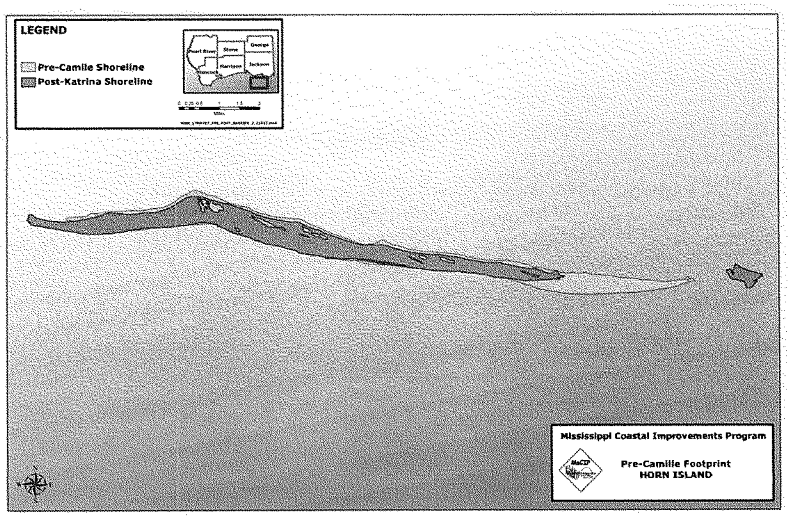


Figure 5.1.2.1-3. Changes in footprint of Horn Island from pre-Camille to post-Katrina

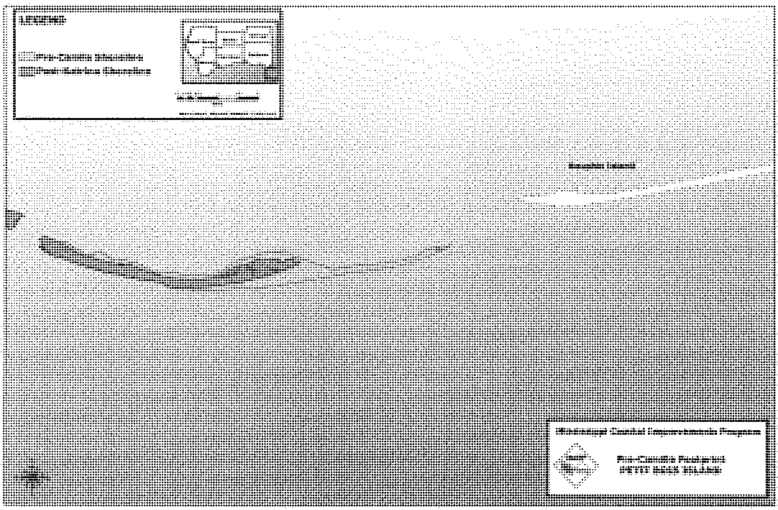


Figure 5.1.2.1-4. Changes in footprint of Petit Bois Island from pre-Camille to post-Katrina

As discussed in the Engineering Appendix, Part 2, a number of storms were selected to model against the chain of islands in a pre-Camille and a post-Katrina configuration. The post-Katrina condition can be considered a baseline condition for the modeling and the pre-Camille condition would be an improved condition. The pre-Camille footprint of the islands (USGS, 2007) was obtained from historical records and an assumption was made as to a top of dune elevation of 20 feet. It should be noted that some of the islands have migrated and any reconstruction would be to increase their footprint at their present location and not move them back to historical locations. This increase in size generally increased their length and maintained their typical width.

Modeling efforts have concluded that over a wide range of storms, there would be some protection provided to the eastern coast of Mississippi along the Jackson County shoreline if the islands are in the pre-Camille condition. This area is the most protected from the restored islands and this protection may result in only up to a 10% reduction in storm surge. As was shown in Figure 5.1.2.1-5, the effect of this protection diminishes rapidly to the west from Jackson County. With the consideration that these islands are within the National Park Service and that Petit Bois and Horn Islands are designated Wilderness Areas, any extensive restorations to these islands may not be feasible based on the limited reduction in storm surge.

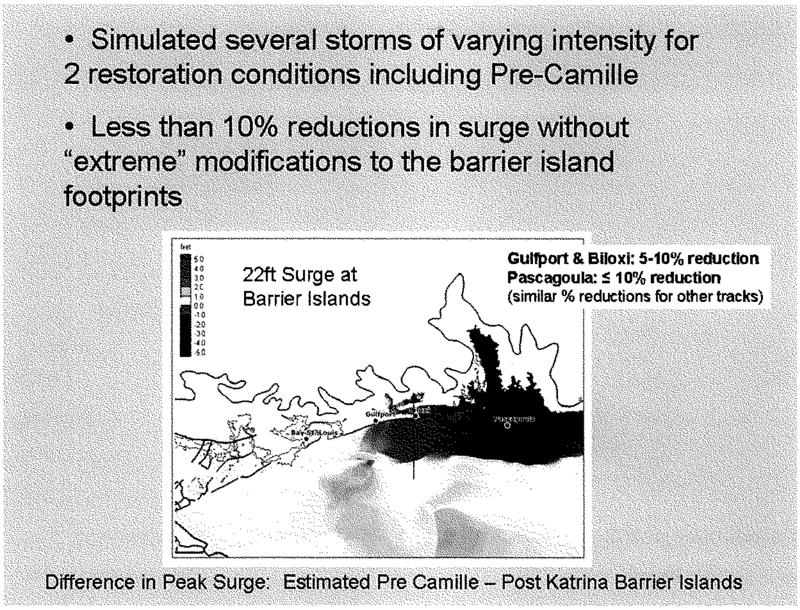


Figure 5.1.2.1-5 Difference in Peak Surge between pre-Camille and post-Katrina barrier islands

Another consideration to help restore the islands is to supplement the sand into the littoral system. This could be accomplished by adding sand in specific locations based on sediment transport modeling. This sand would not be put on the islands, but in areas between the islands where the currents that make up the littoral drift zone could transport the sand to the islands where the natural process of island building could take place. There, waves and wind could cause accretion on the islands. This may mitigate the loss of land mass at the islands that has been occurring since Hurricane Camille. The source of these sands may be from inland sources or from offshore borrow areas. This would not directly affect the present-day islands and would help mitigate any effects of dredging the ship channels that pass through the chain of islands where sand may have been lost from the system.

A positive affect that the islands have is to provide a natural off-shore breakwater for the large sea waves that are generated from hurricanes. For this to occur, the islands only need to be a low stretch of sand or even a shallow sandbar. The presence of the islands and the relatively shallow water of the Mississippi Sound between the islands and the mainland prevent the sea waves from maintaining their considerable size as they move towards the mainland. Sea waves, often reported at heights of 40 feet and higher in large storms, would break as they approach the chain of islands. The open water between the islands and the mainland, generally ten miles or more, would have enough fetch for waves to regenerate, but at a much lower height do to the shallower water. The generally accepted relationship between water depth and wave height is that the wave can sustain itself at a height that is one half the depth of the water.

An environmental impact of the islands continuing to diminish in size is to allow salinity increases in the Mississippi Sound. Under current conditions, the islands provide a boundary condition between the sea water salinity of the open Gulf of Mexico and the brackish water found in the Sound. Loss of the islands would allow the salinity in the Sound to increase and result in a change of the ecological habitats that exist now. This would impact shellfish and other forms of marine life. This occurred at the Chandeleur Islands near the Mississippi barrier islands when almost the entire island structure was eroded away by Hurricane Katrina (see Figure 5.1.2.1-6). Mississippi Sound is classified as a 'bar-built' estuary as opposed to 'drowned river valley' (like Mobile Bay). The physics of bar-built estuaries is very different from others and you would expect to see broad zones of 'salinities' with the estuary which respond greatly to both river flow and wind conditions. Should the 'bars' go away then the estuary is totally lost because in general an estuary is considered part of the coast as opposed to forming the coast.

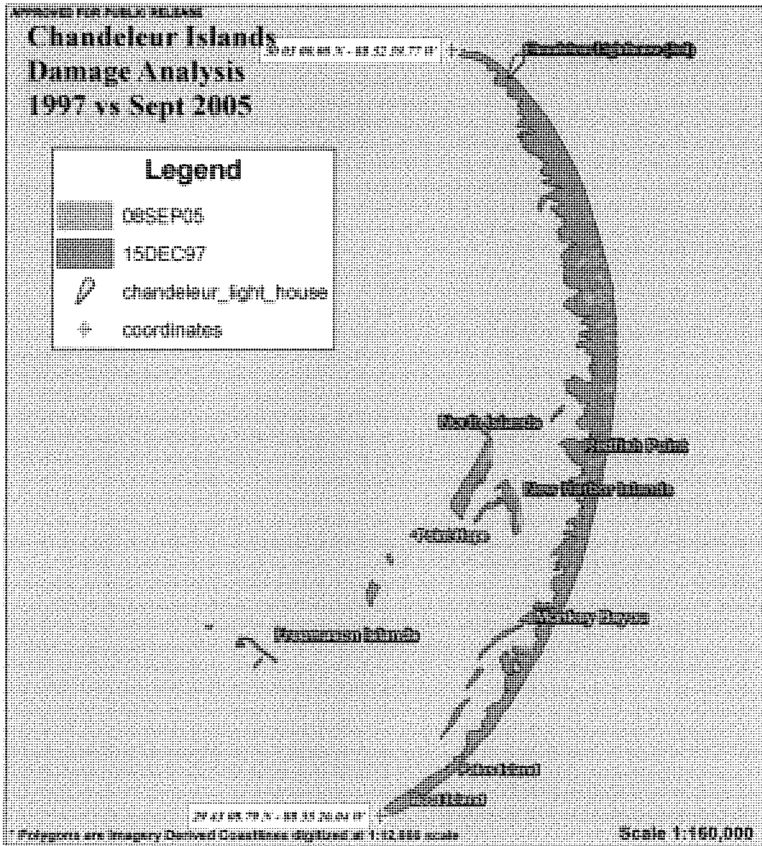


Figure 5.1.2.1-6. Loss of land mass from storm erosion at the Chandeleur Islands, 1997 to 2005. (US Navy)

One restoration option for the barrier islands would be to re-establish the vegetation that was destroyed by Hurricane Katrina. This option could involve environmental restoration of the existing islands through adding sand dunes on the beaches along with planted vegetation, planting of marshes and maritime forests, and planting sea grasses in the near-shore areas of the islands. This plan would not involve adding any land mass to the islands other than the possibility of adding to the dune system. The addition of vegetation from sea oats up to trees would aid in reducing erosion of the sand from wind thus helping in maintaining the stability of the islands. The vegetation would also aid in preventing erosion by water in the event that the islands gets overtopped by storm surge in a large hurricane. Sources of this sand could be from the beach area behind the dunes or from sources off the island. Historically, large areas of sea grass existed north of the islands. Much of this sea grass is now gone and the loss of these areas have been mapped. Replanting the grasses and other vegetation will aid in establishing valuable habitat that was lost from the ecological system. Figure 5.1.2.1-7 shows the extent of vegetation on Horn Island prior to Hurricane Katrina.

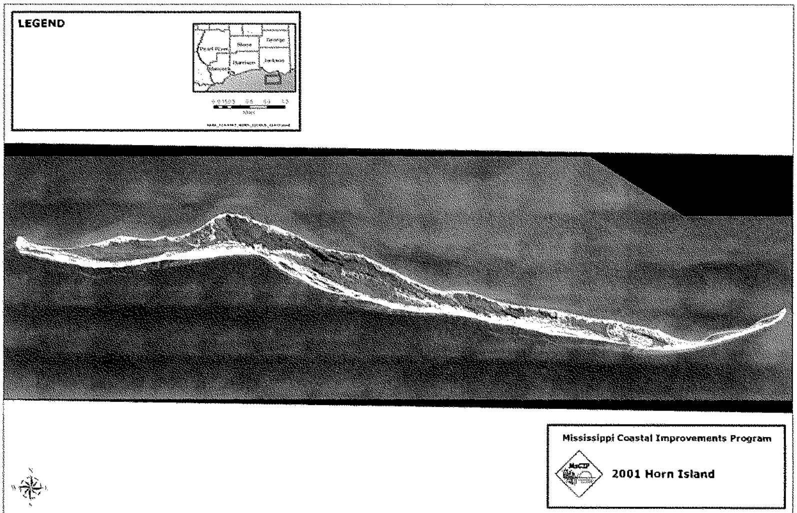


Figure 5.1.2.1-7. Aerial photo of Horn Island. The darker areas are vegetation consisting of maritime forest and marsh grasses.

As was mentioned at the end of Section 5.1.1 and will be discussed in more detail in Chapter 7 of this Appendix, an additional restoration option was added that will fill and close Camille Cut between West and East Ship Island. In addition to providing some storm damage reduction, this option will provide some protection to two historical sites on West and East Ship Island, respectively. This degree of protection is desired by the NPS and meets the goal of storm damage reduction and helping maintain the integrity of the Mississippi Sound estuary. This option will require additional study to model the desired results of slowing erosion near the two sites. These proposals have been incorporated into LOD-1 under Options C and G by adding sand into the littoral zone and closing the breach between West and East Ship island. A working paper that documents the NPS position on the barrier islands (NPS, Sept. 2007) along with other cooperating agencies is included in Chapter 6 of this Appendix. An important result of the NPS agreement was that any work that involved direct placement of sand into Camille Cut would be a one-time event without additional O&M sand placement. In accordance with 2006 NPS Management Policies (see Chapter 2, the NPS Vision Statement Section III), the NPS has concluded that this one-time placement of sand would mostly directly counteract the long-term reduction in sand supply which has resulted in Ship Island being diminished to the point where it may have lost the ability to restore and maintain itself as in the historical past. Natural re-building and maintenance of the barrier islands in the long-term would then be supported by the continuing placement of sand back into the littoral zone during future maintenance dredging of navigation channels under revised Regional Sediment Management

Practices. Two important areas where this will be employed is the Pascagoula Navigation Channel and the Gulfport Navigation Channel.

5.1.3 Location

The barrier islands of Mississippi are located 10 to 15 miles south of the mainland as shown in Figure 5.1.1-1. Currently, there are five islands in the chain that extends for 45 miles west from a point south of the Alabama – Mississippi state line along the coast. Currently, Ship Island exists as two islands separated by Camille Cut. It was breached during Hurricane Camille in 1969 and remains today as West and East Ship Island. Two maintained navigation channels pass through the chain of islands. The Gulfport channel passes near the west end of West Ship Island and the Pascagoula channel passes near the end of Petit Bois Island. The present day location of the channels prevents any further westward migration of either island.

5.1.4 Existing Conditions

As is typical of most barrier island systems, the Mississippi islands are an ever-changing and dynamic landscape. Data shows that the islands have lost approximately 20 to 25 percent of their land mass since pre-Camille times. The islands have been heavily influenced by the various hurricanes including even the lower intensity ones. Hurricane George, in 1998, even though a small hurricane, proved to be devastating to the islands due heavy erosion from waves. Many of the higher dunes systems on the islands were destroyed and much of the elevation the islands once had is gone. Most of the islands are now very susceptible to over-wash during storms. Another result of being submerged during Hurricane Katrina was the loss of much of the maritime pine forest that existed on the islands. The trees, mostly now dead from the salt water submergence, played a major role in preventing erosion both from wind and any surges against the islands.

The westernmost island, Cat Island, has a similar origin from the other islands in the chain, but isolated from the littoral current by a historical birds-foot delta from the Mississippi River that cut off the path of the historical littoral zone. A change in wave climate has formed a T-shaped configuration. Sorting of the sediments has created a beach on the east facing portion of the island. Results of the sediment budget completed as part of this study indicates that little or no sand is being added to Cat Island from the littoral drift system that supplies sand to the other islands in the chain. The remainder of the islands have a westward drift that is more pronounced from the eastern-most Petit Bois Island and decreasing respectively to the west to West Ship Island.

5.1.5 Coastal and Hydraulic Data

The barrier islands protecting the Mississippi Sound experience a low energy wave climate, with average significant wave height at National Data Buoy Center (NDBC) Buoy 42007 (22 nautical miles south-southeast of Biloxi, in 45 ft depth) averaging 2.0 and 1.3 feet in the winter and summer months, with associated average peak wave periods of 4.0 to 3.5 s, respectively. Wave transformation modeling by Cipriani and Stone (2001) indicated that breaking wave heights on the barrier islands range from 1.0 to 2.0 feet. Waves in the Mississippi Sound are fetch and depth-limited. The Coastal Studies Institute's Wave-Current Surge Information System (WAVCIS) gage CSI-13 located at Ship Island Pass (23 foot depth) from June 1998 through July 2005 measured an average significant wave height of 0.3 feet and associated average wave period of 2.5 sec.

Tides in the Mississippi Sound are diurnal, with a tidal range of 1.5 and 2.8 feet for the mean and spring tides at Biloxi, Mississippi, respectively. However, the relatively shallow and large area of the Mississippi Sound create strong currents in the tidal passes between the barrier islands, ranging from 1.6 to 3.3 feet/sec and 6.0 to 11.5 feet/sec on flood and ebb tides, respectively (Foxworth et al.

1962). In the winter months, winds from the same direction and of a sufficient magnitude are capable of lowering water surface elevations in the bays and nearshore from 3.6 to 2.0 feet (U.S. Army Corps of Engineers Mobile District 1984).

For the Gulf barrier island beaches, net longshore sediment transport is from east to west, although local reversals in the net transport occur adjacent to the tidal passes. The primary sources of sediment are longshore sediment transport from east to west, and, potentially, the offshore shelf (Otvos 1979, Cipriani and Stone 2001). Cipriani and Stone (2001) discussed that a well-defined cellular structure exists for each barrier island in which, over historic times, little sand transfer exists between islands. However, dredging records at Horn Island and Ship Island Passes (called Pascagoula Bar Channel and Gulfport Bar Channel, respectively) suggest that infilling of sand from adjacent barrier islands occurs, indicating the potential for transport of sand between islands. Eastern Dauphin Island, with a Pleistocene core, is more stable than the other barriers although eastern Dauphin Island has been eroding in response to the dominant westerly-directed transport. Based on grain size analysis, Cipriani and Stone (2001) inferred that offshore sources may provide some sediment to central Petit Bois Island. The Mississippi Sound barrier islands range from very well vegetated, with maritime forests on east Dauphin Island, to low elevation barriers that are overwashed and breached during hurricanes. Long-term relative sea level rise for Dauphin Island, Alabama from 1966 to 1997 was 0.12 inch/year +/- 0.02 inch/year.

5.1.6 Engineering Options

5.1.6.1 General

Seven separate options were included in the Engineering Appendix. All were based on some variation of direct sand placement and shaping, establishing vegetation and littoral zone sand additions. Each of the LOD-1 Options, A through G, are briefly described below. Full descriptions of each option can be found in the Engineering Appendix.

5.1.6.2 LOD-1, Option A

This option will only include new land mass that is being added to the islands by using sand dredged and transported from an off-shore location. The shaping of the sand into beaches, dunes and marsh areas will not affect the existing islands other than that narrow strip of land that will form the boundary between the existing island and the new land mass. This option can be used in combination with other options under this line of defense should it be desired to restore habitat on the existing islands.

5.1.6.3 LOD-1, Option B

Another consideration to help restore the islands is to supplement the sand in the littoral system. This could be accomplished by adding sand in specific locations based on sediment transport modeling. This would allow the littoral currents to move the sand onto the islands where the natural process of island building could take place. This would not directly affect the present-day islands and would help mitigate any effects of dredging the ship channels that pass through the chain of islands where sand may have been lost from the system. This option would obtain the sand from the beneficial use of dredged material from an inland river source.

5.1.6.4 LOD-1, Option C

Another consideration similar to Option B is to help restore the islands is to supplement the sand in the littoral system. Initial studies indicate areas east of Petit Bois and Ship Island are the best locations, but additional modeling will be completed that could add other areas within the barrier islands chain. Sand will be obtained from offshore sources (same as Option A) for Ship Island and from inland river sources (same as Option B) for Petit Bois Island based on sand quality and compatibility requirements. Like Option B, this could be accomplished by adding sand in specific locations based on sediment transport modeling.

5.1.6.5 LOD-1, Option D

This option would involve environmental restoration of the existing islands. This would consist of shaping existing beach sand into low, 2-foot high dunes on the beaches. This would be along with planted vegetation on the dunes and planting of maritime forests in the inland's interior where they were mostly destroyed by Hurricane Katrina.

5.1.6.6 LOD-1, Option E

This option would involve environmental restoration of the islands consisting of placing and shaping sand into 6-foot dunes on the beaches with planted vegetation and planting of maritime forests on the existing islands where they were mostly destroyed by Hurricane Katrina. The sand required to construct a dune of this size would be more than could be removed from the existing beach berm and would come from the same offshore borrow area as the sand used in Option A. Placement of the sand would require moving the sand from a hopper dredge to a staging area on the beach, then moving the sand to the area of placement along the beach.

5.1.6.7 LOD-1, Option F

This option would involve environmental restoration of the sea grass beds that have historically existed on the north side of the islands in the Mississippi Sound. Despite continual changes that occur, the barrier islands remain to buffer the mainland from storms and provide habitat for the rich, diverse wildlife residing within the area.

5.1.6.8 LOD-1, Option G

The pre-Camille footprint of Ship Island was obtained from historical records. This data showed the area that was breached during Hurricane Camille forming two separate islands. West and East Ship Island has two major historic sites that are in danger from the continuing erosion of the barrier islands. Current studies by the Corps indicate that restoring the two islands to a single island, pre-Camille condition may prevent the rapid erosion of the beaches that is now occurring. Estimates indicated that the restoration of Ship Island to a single land mass off the Mississippi coast will involve approximately 13 million cubic yards of sand. As happened during Hurricane Camille, the breach was opened during Hurricane Katrina leaving two islands with approximately three miles of open water between the remaining portions. To mitigate this problem, the breach could be filled as single operation up to an elevation that would help withstand over-wash until planted vegetation could be come established and promote stable dunes.

CHAPTER 6 MULTI-AGENCY MISSISSIPPI BARRIER ISLAND RESTORATION RECOMMENDATION

6.1 General

To complete its recommendation for the barrier islands the National Park Service met and coordinated with many different agencies including the Corps of Engineers, United States Geological Survey, National Marine Fisheries Service, Environmental Protection Agency, National Oceanic and Atmospheric Administration, US Fish and Wildlife Service, and Mississippi Department of Marine Resources.

6.2 Introduction

The Mississippi barrier islands consisting of Petit Bois, Horn, East and West Ship Islands, and portions of Cat Island are located within Gulf Islands National Seashore (Seashore), a park unit managed by the National Park Service (NPS). The NPS also administers the 401-acre Davis Bayou area on the mainland near Ocean Springs, Mississippi. The Seashore's purpose is to preserve, protect, and interpret its Gulf Coast barrier island and bayou ecosystem and its system of historic coastal defense fortifications, while providing for public use and enjoyment.

The Mississippi barrier islands are dynamic coastal landforms that act as the first line of defense between the ocean and mainland coast, and bear the full impact of atmospheric and oceanic energy (Figure 6.5-1). In addition, the barrier islands contribute to the maintenance of the highly productive Mississippi Sound ecosystem. Hurricanes, variations in sediment supply, and relative sea level rise drive changes in island location and morphology, and effective barrier island management requires adaptation to their dynamics.

The Mississippi barrier islands have experienced substantial changes in shoreline position and island landmass since the mid-1800s. Lateral island migration (erosion along the eastern end of the islands and sand deposition to the west) has occurred, driven by dominant east-to-west longshore sand transport. The long-term and accelerating erosion and land loss experienced by the barrier islands is of major concern to the NPS.

Factors contributing to erosion of the barrier islands include storms, relative sea level rise, and anthropogenic activities, including dredging of sand from the Horn Island Pass Outer Bar Channel (Figure 6.5-1). Such activities have likely resulted in a progressive reduction in sand supply downdrift to Horn Island and Ship Island (now East and West Ship Island). Significant storm events and a reduction in sand supply has contributed to substantial upland land area losses between 1847 and 2005 ranging from 24% at Horn Island to 64% at the Ship Islands. In addition, Petit Bois Island, which is located east (updrift) of Horn Island Pass, has experienced a 56% reduction in upland land area between 1847 and 2005 (Morton, 2007).

The regional shortage of littoral sand for barrier island maintenance is most profound at the Ship Islands, located at the terminus of the sediment transport system along the Mississippi barrier islands. Cat Island, located west of the Ship Islands, is not part of the sand-sharing system that comprises the other barrier islands, and is considered to be a separate entity (Rosati et al., 2007). Consequently, the Ship Islands' vulnerability to breaching has progressively increased with time.

Because of the island's diminished state, it may now have lost the ability to restore and maintain itself as in the historical past (Morton, 2007), placing the island's cultural resources, historic Fort Massachusetts and the French Warehouse archeological site, at great risk (Figure 6.5-2).

Given the altered state of natural resource processes due in part to human-caused intervention, as well as the resulting threats to cultural resources, the NPS in collaboration with other agencies (USACE, USGS, NMFS, EPA, NOAA, USFWS, and MDMR) has concluded that specific emergency actions and long-term restoration of the sediment transport system and budget are crucial and necessary for preserving and protecting the Mississippi barrier islands' natural and cultural resources. This Mississippi barrier island restoration recommendation represents the results of extensive interagency consultation and collaboration.

6.3 Background

6.3.1 NPS Management of Mississippi Barrier Islands

Gulf Islands National Seashore includes outstanding natural, cultural, and recreational resources along the northern Gulf of Mexico coasts of Florida and Mississippi. These resources include several coastal defense forts spanning more than two centuries of military activity, archeological values, pristine examples of intact coastal barrier islands, salt marshes, bayous and submerged seagrass beds, complex terrestrial communities, emerald green water, and white sand beaches. The barrier islands within the Seashore are nationally significant for several reasons. Specifically, these islands:

- contain one of the most complete collections of publicly accessible seacoast defense structures in the United States, representing a continuum of development from early French and Spanish exploration and colonization through World War II;
- provide the public with recreational opportunities on natural and scenic island, beach, dune and water areas which possess the rare combination of remaining undeveloped and in a wilderness state, yet are located in close proximity to major population centers;
- provide habitat for several endangered species in diverse ecosystems, stop-over habitat for migratory birds, and critical nursery habitat for marine flora and fauna, and serve as an enclave for complex terrestrial and aquatic plant and animal communities that characterize the northern Gulf Coast, and fully illustrate the natural processes which shape these unique areas;
- contain land and marine archeological resources which represent a continuum of human occupation in a coastal environment and are important in enhancing the knowledge of the past including interactions between the earliest settlers and original inhabitants of this area of the Gulf Coast; and
- provide a benchmark to compare conditions in developed areas of the Gulf Coast to natural areas within the park.

The NPS's vision for management of the Mississippi barrier islands (Chapter 2) includes the preservation of natural biological and geological marine and terrestrial conditions and processes, and the preservation of cultural resources, consistent with peer-reviewed and documented scientific study. Horn and Petit Bois Islands, which are designated wilderness areas, receive an even higher level of protection. In these areas, the NPS vision and management focuses on providing park visitors with an undisturbed environment, a pristine and unencumbered viewshed, an atmosphere of solitude, an opportunity for primitive, unconfined recreation, and negligible evidence of resource impairment. The NPS implements this vision by controlling nonconforming uses, preventing unnecessary or undue reduction of wilderness values, and applying the "minimum requirement" concept of the 1964 Wilderness Act to all proposed projects involving these islands.

Based on federal statutes such as the National Park Service Organic Act and the Seashore's enabling legislation, NPS Management Policies, and management plans, the NPS is mandated to preserve and protect the natural conditions and processes affecting the barrier islands, and to preserve the significant cultural resources existing on the islands. In addition, the Seashore's enabling statute directs that beach erosion control measures and spoil deposition activities in the park undertaken by the U.S. Army Corps of Engineers must be carried out in a manner that is acceptable to the NPS and consistent with the park's purposes (16 U.S.C. § 459h-5). NPS decision-making must also integrate the results of scientific study (16 U.S.C. § 5936).

6.3.2 Impacts to Mississippi Barrier Islands and Processes

Net longshore sand transport is from east to west along the Mississippi barrier islands, although local reversals in the net transport occur adjacent to the tidal passes. Based on analysis of historical shoreline and bathymetry data, Ship Island is the terminus to the longshore sand transport system in this region. Modern Cat Island beaches, located west of Ship Island, appear to be affected by littoral processes not directly related to those of the islands to the east. Thus, the regional shortage of littoral sand for barrier island maintenance is best observed at Ship Island (Rosati et al., 2007).

Between the late 1840s and 2005, all of the Mississippi barrier islands managed by the NPS have eroded and migrated appreciably. Petit Bois Island lost about 56% of its surface area, Horn Island lost approximately 24%, East and West Ship Islands have cumulatively lost about 64%, and Cat Island lost approximately 26% (Morton, 2007). Furthermore, island erosion rates have increased more than three fold between 1847 and 2000/2002. For example, Ship Island lost about 0.9 hectares/year between 1848 and 1917, increasing to approximately 2.5 hectares/year between 1917 and 2000 (Rosati, et al., 2007). Additionally, between 2000 and 2005, a period of significant storm events, the Ship Islands lost about 22 hectares/year (Morton, 2007). In 1847, Ship Island had a surface area of approximately 603 hectares (Rosati, et al., 2007), but by 2005 the total surface area for East and West Ship Islands had decreased to about 216 hectares (Morton, 2007).

The principal causes of Mississippi barrier island erosion and land loss are frequent intense storms, a relative rise in sea level, and a deficit in the sediment budget. Of these causes, the one that experienced the greatest change over the last 100+ years is the reduction in sand supply related to dredging of navigation channels through the outer bars of the tidal inlets near the islands (Morton 2007). According to Rosati et al. (2007), maintenance dredging operations conducted between 1897 and 1948 in the Horn Island Pass Outer Bar Channel removed sediment at a rate of approximately 34000 cubic yards per year (cy/yr). After the channel was modified to 38-feet deep by local interests in 1949 at their expense, maintenance dredging quantities continued to increase as authorized channel depths increased. Maintenance dredging rates increased to161,104 cy/yr in 1949-1965, increased again to 515,320 cy/yr in 1965-1993, and decreased to a rate of 245,483 cy/yr in 1993-2005.

Therefore, between 1909 and 2005, a total of approximately 22 million cubic yards of sand were removed from the Horn Island Pass Outer Bar Channel by maintenance dredging (Rosati et al., 2007). Much of the sand dredged from the outer bar channel during maintenance dredging operations likely originated from littoral zone transport east of the channel. Offshore disposal of sand dredged during channel maintenance operations conducted in the past may have removed such sand from the barrier island sediment budget downdrift of the channel. However, a detailed analysis of the dredging/placement records and the resulting impact on the barrier island sediment budget has yet to be determined. Additional investigations into past dredged material placement quantities and locations relative to the regional barrier island sediment budget need to be conducted.

Ship Island experienced breaching by hurricanes in 1852, 1916, 1947, and 1969 (Hurricane Camille). However, pre-Camille breaches eventually shoaled and the narrow, low-profile barrier beach reformed through natural processes. Since 1969, Ship Island has been separated into two islands (East and West Ship) by "Camille Cut." Between 1969 and 2002, the average width of Camille Cut between the Ship Islands was approximately one mile. However, the breach widened to about three miles following the passage of Hurricane Georges in 1998, creating a shallow subaqueous shoal across the eastern one-mile of the breach area. Although precise depth measurements are not yet available, water depth across most of the breach area is estimated at 1 to 5 feet, and the channel that has formed adjacent to the east end of West Ship Island is about nine-feet deep (Figure 6.5-2).

Recent scientific reports present concerns regarding the existing condition of the Ship Islands and their ability to restore themselves to a single island once again based on current trends (i.e., accrete enough sand to shoal, closing the Camille Cut breach and channel, and redeveloping the narrow, low-profile barrier beach). Morton (2007) states "the historical record for Ship Island indicates that its vulnerability to breaching progressively increased with time and that because of its diminished state, the Camille Cut inlet will not shoal and East and West segments will not become reattached as in the past." Rosati et al. (2007) also notes "disintegration of this barrier island (Ship Island), especially since Hurricane Katrina in 2005."

Beach erosion along the Mississippi Sound (Sound) shoreline of East and West Ship Islands currently threatens the French Warehouse archeological site and historic Fort Massachusetts (constructed between 1859 and 1866), respectively. Relatively small-scale beach renourishment projects with sand volumes ranging from 44,346 to 160,566 cubic meters were authorized in 1974, 1980, 1984, 1991 and 2002 to advance the north shoreline on West Ship Island to protect Fort Massachusetts. Observations indicate that Camille Cut may be exacerbating erosion along the northeast shoreline of West Ship Island, and it may be interrupting sediment transport downdrift toward Fort Massachusetts.

The consequences of continued erosion of the Mississippi barrier islands affect not just the islands themselves, but the physical, chemical and biological integrity of the Sound and the Mississippi mainland coast. In the broader regional sense, the physical integrity of these barrier islands may provide the Sound and coastal counties some degree of protection from the energy generated by tropical storms and hurricanes. Ocean surge generated by hurricanes has been modeled with and without these islands for a variety of storm tracts, intensities and forward speed. As modeled, ocean surge protection provided by these islands is estimated between two (2) and four (4) feet, with a general tendency of greater protection toward the eastern area of the Mississippi mainland coast (Ty Wamsley, personal communication, Sept. 18, 2007).

Wave height modeling for a variety of storm tracts, intensities and forward speed also shows that the physical presence of the barrier islands may reduce expected wave height at the Mississippi mainland shoreline by four (4) to six (6) feet. Again, the barrier islands afford a greater degree of protection relative to wave height reduction toward the eastern area of the Mississippi mainland coast (Ty Wamsley, personal communication, Sept. 18, 2007). Furthermore, combining predicted surge and wave height modeling results shows that total loss of the Mississippi barrier islands may increase the elevation of adverse impacts on mainland coastal areas on the order of an additional six (6) to ten (10) feet.

The loss of any one barrier island would result in a more localized coastal impact. Localized increases in surge, wave height and current speeds would likely occur due north and west of a barrier island lost from the system. Additional modeling is necessary to determine the potential impacts to the mainland coastal area if the Ship Islands continued to erode to a shallow sand shoal.

Water chemistry within the Sound would be expected to change as well with the physical loss of any one or more of the barrier islands. Specifically, salinity gradients may increase in the Sound north of any area of greater exposure to Gulf of Mexico waters resulting from continued erosion and loss of the barrier islands, or the creation of additional water exchange pathways (passes, cuts, etc.). Baseline salinity modeling completed by USACE Engineer Research and Development Center demonstrates this potential gradient increase. Salinity gradient increases resulting from new or expanded passes or cuts would result in greater penetration of oyster drills into the Sound. The expansion of salinity gradients and related penetration of oyster drills increases potential adverse affects on Sound oyster beds.

Other biological communities, such as submergent and emergent grass beds, marshes, scrub/shrub and forest vegetation communities could be adversely affected by the continued erosion and land loss of the barrier islands. Predicted higher storm surge, waves and energy would likely shift these vegetation communities landward over time. Disruptions of these existing vegetation communities exposes highly erodeable soils, and when subjected to high energy, may increase water turbidity and decrease light penetration, reducing submergent vegetation and depositing sediment on existing oyster beds. Emergent vegetation in the Sound and along the coastline provides protection from storm surge and wave action. These components also provide significant benefits for aquatic and aquatic-dependent faunal species of this area. Food, cover, spawning and nursery sites for estuarine and marine organisms require some or all of these submergent and emergent vegetative communities during their life cycles. Coastal areas that have significant emergent marshes, scrub/shrub and forested vegetative communities in the tidal zone have significantly less wind and storm surge damage than coastal areas adjacent to open water.

Continued erosion and loss of the Mississippi barrier islands within Gulf Islands National Seashore could result in significant adverse consequences not only to the natural and cultural resources managed by the NPS, but also to the overall health of the Mississippi Sound ecosystem and mainland coastal communities. Under a no action scenario, barrier island land loss will continue to increase. At the current rate of erosion and land loss on East and West Ship Islands, these islands may be eliminated within a decade. If so, significant natural and cultural resources managed by the NPS, including Fort Massachusetts, will be in peril.

6.4 Barrier Island Restoration Strategy

Given the value of these barrier islands as natural habitat, recreation sites, and possible protection for the mainland to some degree, the following recommendations are designed to address chronic losses in surface area along the islands to restore the natural transport system and island habitat that existed historically. Priority is assigned to East and West Ship Island because these islands have recorded the greatest losses throughout the system and significant cultural resources on both islands are at risk.

6.4.1 Restoration Goals

The overarching goal is to restore the crucial sediment transport system and budget, including littoral zone geologic processes around the Mississippi barrier islands, to a natural state as much as possible given the realities of navigation channel dredging, climate change (sea level rise, increased frequency of storms, etc.) and other anthropogenic activities. Restoring the sediment transport processes of the Mississippi barrier islands to a condition similar to the natural system that functioned before human intervention offers the best opportunity to ensure the long-term viability of these islands.

The preferred restoration approach includes (1) littoral zone deposition of compatible sand, consistent with the quality, especially color, grain size, absence of contaminants, and angularity of sand that would be present in the barrier island system under natural conditions, in appropriate volumes and locations near Petit Bois, Horn and East Ship Islands; (2) up to two small-scale beach nourishment projects on the Mississippi Sound shoreline of West and East Ship Islands to protect historic Fort Massachusetts and the French Warehouse archeological site; and (3) the direct deposition of acceptable beach-quality sand in the area of chronic breaching and inlet formation at Camille Cut to reconstruct the narrow, low sand spit that historically connected East and West Ship Island. The primary objectives of this alternative are to restore the Mississippi barrier island sediment transport system and budget disrupted by anthropogenic activities conducted near these islands, facilitate the restoration of Ship Island to a natural condition, and reduce erosion threats to significant cultural resources.

This preferred restoration strategy would also provide for (1) additional scientific investigations and modeling on which project planning, restoration benchmarks, goals, monitoring protocols and adaptive management prescriptions will be based; and (2) restoration of the regional sediment transport processes, including at a minimum the bypassing of all beach-quality sediment dredged from the navigation channels near the Mississippi barrier islands, and the proper placement of such sediment in the littoral system to replicate natural coastal geologic processes and provide for the protection and preservation of these nationally significant islands.

The sand placement strategy considered for restoration of Ship Island is based on the general geomorphic characteristics of the circa 1916-1917 shoreline and island land mass. The 1916-1917 baseline condition represents the most recent shoreline data available which documents a continuous Ship Island (Rosati et al., 2007; Morton, 2007). Applying data presented in Rosati et al. (2007), this baseline condition also represents a time frame prior to significant increases in maintenance dredging rates and thus volumes of sand removed in the Horn Island Pass Outer Bar Channel which began to occur in 1949. The land mass that connected East and West Ship Islands in 1916-1917 was a narrow, low sand spit measuring approximately 1000-feet wide (north-south width) with a likely elevation of approximately five (5) feet.

The volume of sand necessary to achieve the prescribed "emergency actions" and "advanced engineering and design actions" described below is based on the premise that the 22 million cubic yards of sand removed from the Horn Island Pass Outer Bar Channel during the period of 1909-2005 should be properly placed back into the sediment transport system to restore the barrier islands. In addition, sand removed from the Horn Island Pass Outer Bar Channel during future maintenance dredging operations should be properly placed west of the channel to mimic the natural sediment transport system.

6.4.2 Emergency Actions

Emergency actions would include direct placement of compatible sand on the Sound shoreline of West Ship and East Ship Islands to protect the integrity of historic Fort Massachusetts and the French Warehouse archeological site, direct placement of compatible sand in Camille Cut to suture (fill-in) the existing gap between East and West Ship Islands to a circa 1916-1917 geomorphic condition, and concurrently placing compatible sand in the littoral zone near East Ship Island.

Beach renourishment to protect the integrity of Fort Massachusetts and the French Warehouse archeological sites would include the direct placement of approximately 100,000 cubic yards of beach-quality sand along the Sound shoreline of West Ship Island to protect Fort Massachusetts, and direct placement of about 100,000 cubic yards of beach-quality sand on the Sound shoreline of East Ship Island to protect the French Warehouse archeological site. Sand source locations, compatibility requirements, precise depositional locations, depths of sand deposition, etc., would be determined by the NPS and USACE. A second round of direct sand placement at the same volumes and locations is contemplated within five years following initial emergency beach renourishment to protect these significant cultural resources until such time as restoration of the barrier island sediment transport system and budget is achieved through additional planned actions described below.

In order to restore the 1916-1917 geomorphic condition of Ship Island, approximately 13 million cubic yards of compatible sand would be directly placed in the Camille Cut breach and inlet area to reconnect East and West Ship Islands (Figure 3). The proposed dimensions of the Ship Island breach restoration project are three (3) miles in length, 1000 feet wide (north-south width), with a proposed sand thickness of approximately six (6) to 14 feet to achieve the desired five (5) feet subaerial elevation across the restored spit reconnecting East and West Ship Islands. However, the anticipated volume of sand required to achieve these restoration dimensions could be slightly modified based upon the results of a planned bathymetric survey of the breach area by the USGS. The sand placement approach would be adaptively managed based on monitoring of project performance measures. The restored sand spit would be planted with native vegetation species (e.g., seaoats, bitter panicum, etc.) to hold the sand in place and to foster future entrapment of wind-blown sand and long-term island stabilization. Native vegetation species would be planted in 60 feet swaths and no closer than approximately 100 feet from both the Gulf and Sound shorelines.

Sand placement in the littoral zone near East Ship Island is essential for continued nourishment to the restored spit at the Camille Cut breach and inlet. Approximately 5 million cubic yards of beach-quality sand would be placed within water depths affected by normal to moderate wave action and no deeper than 15 feet, the USACE definition of maximum littoral zone depth for this area (Hallermeier, 1981 (USACE Coastal Engineering Tech. Aid No. 81-2)) over a large area on the south-southeast side of East Ship Island. This phase of restoration is essential for supplying sand to the beaches west along Ship Island, including those occupying the reconstructed connecting spit. Westward sand transport from the reconstructed spit will also nourish the shoreline near Fort Massachusetts through natural alongshore currents in the Sound. Detailed planning for such deposition in the littoral zone near East Ship Island would be subject to the results of additional research and modeling efforts, including near-shore bathymetry and numerical modeling of waves, currents, and sediment transport.

During and following the placement of sand in all the aforementioned restoration locations, the effectiveness of such placement should be evaluated for success as part of an adaptive management strategy. If metrics indicate successful performance for island restoration and littoral zone placement, projects will continue as planned. Otherwise, at the end of year one, a reassessment and potential change in location for littoral zone placement may be implemented. Successful performance should be based on several factors, including, but not limited to, proper sand placement to nourish the islands and to protect Fort Massachusetts and the French Warehouse archeological site for the next 20 years without a need for annual or repetitive maintenance. Additional sand placement and native vegetation replanting may be required, depending upon success rate, to achieve the desired percent cover.

6.4.3 Advanced Engineering and Design Actions

This restoration strategy will also include the proper placement of approximately 4 million cubic yards of beach-quality sand in the littoral zone updrift of Petit Bois Island in water depths affected by normal to moderate wave action and no deeper than 15 feet. In addition, this strategy proposes to place all sand removed during maintenance dredging operations from the Horn Island Pass Outer Bar Channel to the west of the channel and east of Horn Island so that the dredged sand remains within the littoral zone. The bypassed sand will also be placed in water no deeper than 15 feet. Such bypassing of sand transported to Horn Island is essential to the long-term health and maintenance of downdrift islands (Horn, East and West Ship Islands). It is estimated that approximately 1 million cubic yards of sand will be bypassed every 2.5 years.

Detailed planning for such deposition in the littoral zone near Petit Bois and Horn Islands would be subject to the results of additional research and modeling efforts, including near-shore bathymetry and numerical modeling of waves, currents, and sediment transport. During and following the placement of sand in the littoral zone near Petit Bois and Horn Islands, the effectiveness of such placement should be evaluated for success as part of an adaptive management strategy. If metrics indicate successful performance for littoral zone placement, projects will continue as planned. Otherwise, at the end of year one, a reassessment and potential change in location for littoral zone placement may be implemented.

6.4.4 Long-term Restoration Actions

Restoring and replicating the sediment transport processes and budget of the Mississippi barrier islands to a condition similar to the natural system that functioned before human intervention offers the best opportunity to ensure the long-term viability of these islands. Therefore, the best long-term restoration solution is to plan for the addition of compatible sand routinely dredged from navigation channels in the area that are located east of Petit Bois, Cat, and Horn Islands back into down-drift littoral zones including the Sand Island Beneficial Use Area. Appropriate volumes of sediment would then be available in the littoral zone transport system to replenish sand lost from all of the Mississippi barrier islands (including Dauphin Island) due to natural geologic processes. Any long-term planning to achieve this objective must be based on sound scientific information and understanding of the barrier island sediment budget and transport system, and must be consistent with NPS mandates.

6.4.5 Data Collection, Analysis and Modeling

Prior to implementing the recommended barrier island restoration actions presented above, additional data collection, analysis and numerical modeling must be completed to ensure that project design is based upon the most current scientific information and understanding of the sediment transport system and budget. Recommended data collection and analysis needs include:

- conduct bathymetric survey throughout the island chain and inlets to document water depth in Camille Cut between East and West Ship Islands, identify sand resource targets, and update the existing sediment budget related to island restoration (Figure 6.5-4);
- analyze U.S. Coast Survey topographic maps of Ship Island prepared in 1848, 1853, and 1917 to confirm the subaerial elevation of the narrow sand spit in the central part of the island during that period;
- obtain current orthophotography to document island geomorphology and vegetation characteristics as part of CHARTS data acquisition, and to derive high-water shoreline position for each barrier island;
- acquire seismic and vibracore data at dredged material disposal site locations identified by comparing the modern bathymetric survey to the 1917/18 survey;
- determine sedimentologic characteristics of existing dredged material disposal sites to verify the quantity of sand available for barrier island restoration;
- review past dredged material placement quantities and locations relative to the regional sediment budget; and

- review historical breaching and breach closure data for all islands, and assess available geologic and morphologic data for Ship Island relative to the other barrier islands, to determine why Ship Island has breached several times, whereas Horn Island and Petit Bois Island have not.

To adequately design sand placement throughout the system and to evaluate potential impacts of the no action and preferred alternative scenarios, numerical modeling of waves, currents, and sediment transport should be conducted. Modeling analysis will validate the regional beach response to evaluate dredging and placement alternatives, and restoration of East and West Ship Islands. All historical data since the mid-1800s will be utilized in developing and calibrating the model so that future evolution (decades to a century) can be estimated with and without anthropogenic activities. Recommended modeling tasks include:

- develop input data for the Cascade Model, including shoreline position, topographic cross sections, sediment sources and sinks, vegetation composition and density through time, aerial photographs, storm and typical wave, wind, and water level data, and incorporate spatial data into the existing MsCIP sediment budget GIS;
- calibrate and validate Cascade (including sub-modules: breaching, wind-blown sand and dune building);
- demonstrate application of Cascade for proper dredged material placement, interim beach fills, and large-scale renourishment;
- evaluate placement locations for dredged material disposal at Horn Island Pass and Ship Island Pass for effective bypassing of littoral sand to mimic the barrier island natural sediment transport processes;
- conduct wave climate and surge modeling with and without the Ship Islands to assess potential impact on the mainland; and
- conduct salinity modeling to predict change in the salinity regime under present conditions, without the islands, and with a restored Ship Island (continuous island across the present location of Camille Cut).

6.5 Adaptive Management Strategies for Mississippi Barrier Island Restoration

Adaptive management strategies employed during the restoration project will provide the means to monitor the progress of the project, to assess whether immediate or short-term impacts are those intended or unintended, and a means to halt or modify project activities, or to mitigate the effects of activities, should negative or adverse impacts to natural or cultural resources be noted during monitoring. Monitoring activities should be continued for a specified time period after project activities are completed to measure long-term or cumulative impacts, and whether the goals of the project have been met.

6.5.1 Monitoring Protocols

Monitoring during and following the implementation of the barrier island restoration actions described above is needed to assess the progress of the restoration and short- and long-term impacts to the barrier island system and cultural resources. Monitoring recommendations include:

- obtain orthophotography of each barrier island on an annual basis to determine shoreline position change;

- map bathymetry in the barrier islands area pre- and post-project, 1 year after project completion, 5 yrs after project completion, and immediately following passage of a tropical storm or hurricane to document movement of sand placed in Camille Cut and in the littoral system;
- use topographic, bathymetric and hyperspectral sensors on the Compact Hydrographic Airborne Rapid Total Survey (CHARTS) system to document land elevation and vegetation density change annually, and process and analyze acquired data in an efficient and timely manner to make adjustments in sand placement strategies if desired results are not being achieved; and
- obtain daily real-time water quality data adjacent to all beach renourishment, direct placement and littoral zone placement areas in coordination with EPA Gulf of Mexico, MS Department of Marine Resources and MS Department of Environmental Quality.

During the barrier island restoration process, information obtained through the adaptive management monitoring protocols outlined above will be reviewed by a committee consisting of representatives from NPS, USGS, USACE, NOAA and the State of Mississippi. This committee would determine whether the restoration objectives were being met, and if not, whether sediment placement strategies should be modified or terminated.

6.5.2 Barrier Island Restoration Success Benchmarks

Suggested benchmarks to use to measure the degree of success of the restoration project include:

- 80% vegetation survival in the Camille Cut fill area two (2) years following completion of replanting efforts;
- absent a storm of record, Ship Island should remain continuous for 20 years, and expected minor breaches that occur should heal within 10 years;
- rate of accretion along the western edge of Ship Island should respond as it did in the historical record based upon the best available scientific information; and
- sand placed in the littoral system east of Horn and Petit Bois Islands should result in restoration of the east ends of these islands as measured by an increase in the surface area or a significant decrease in the rate of surface area loss documented during the past two decades.

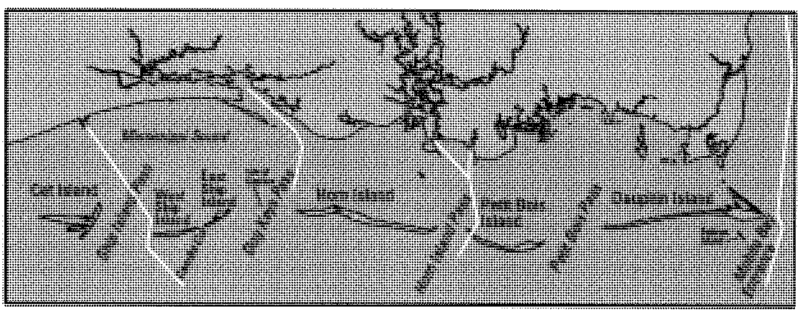


Figure 6.5-1. Locations of the Mississippi-Alabama barrier islands and associated tidal inlets. Deep draft shipping channels maintained by periodic dredging are show as white lines. (from Morton, 2007)

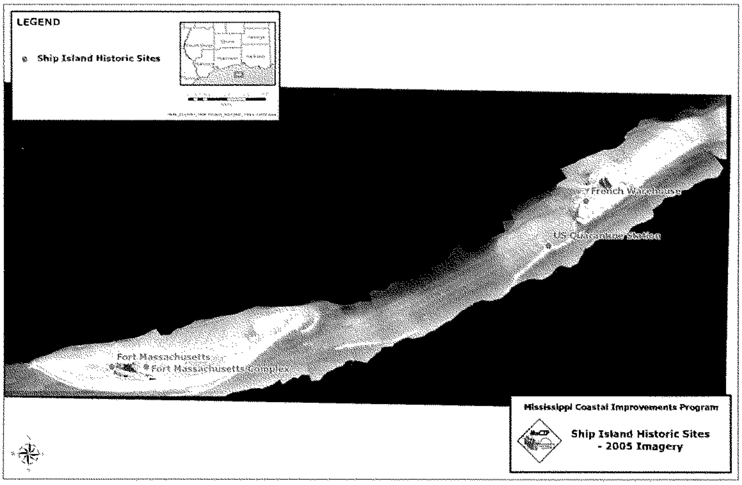


Figure 6.5-2. Aerial photo of West and East Ship Island taken in 2005 after Hurricane Katrina showing the locations of listed cultural resource sites. Note the presence of Camille Cut tidal inlet adjacent to the east end of West Ship Island.

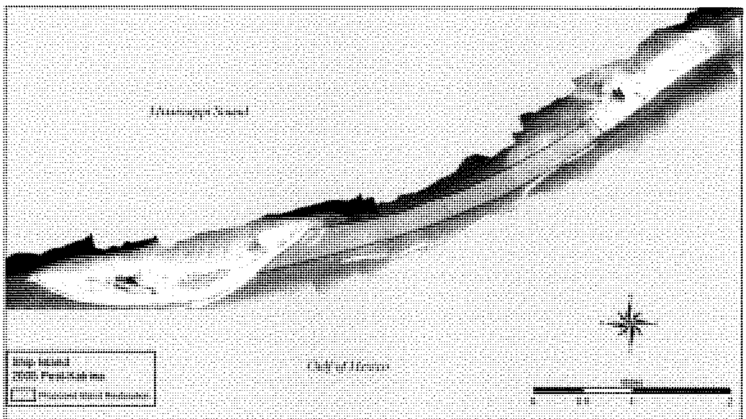


Figure 6.5-3. Approximate conceptual dimensions of the proposed island restoration project connecting East and West Ship Island and filling Camille Cut.

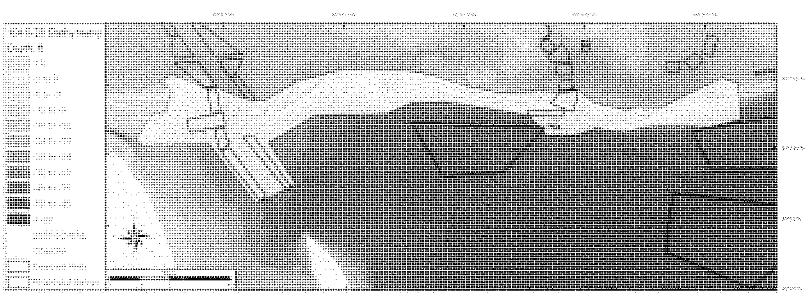


Figure 6.5-4. Proposed location (outlined in the light blue area surrounding the barrier islands) for modern bathymetry survey for identifying potential sand resource targets and updating the existing sediment budget related to island restoration.

CHAPTER 7 THE COMPREHENSIVE BARRIER ISLAND PLAN

7.1 General

The Comprehensive Barrier Island Plan is recommended for construction and will consist of the combination of two engineering options for the barrier islands combined with recommended changes in the local Regional Sediment Management practices. This alternative is recommended to help prevent the accelerated erosion of the barrier islands, especially what is now West and East Ship Island (a single island prior to Hurricane Camille) as well as Petit Bois Island to the east. The National Park Service has endorsed a restoration of islands as described below based on the anthropogenic activities that have compartmentalized the Gulf Islands National Seashore based on national interests including shipping, cultural resources, federally listed species and Essential Fish Habitat components. Stabilizing the outermost barrier islands appears to be the best way to ensure the Mississippi Sound and coastal shoreline ecosystems remain intact. These islands also are the first natural features that protect the coastal counties of the State Mississippi.

To provide needed data on some aspects of completing this plan, additional studies will be conducted during the Engineering and Design (E&D) phase of this project. It is generally understood that the loss of these islands will change the entire ecosystem of the Mississippi Sound as well as having affects on the amount of storm damage incurred along the mainland coast. Since the islands form the Mississippi Sound estuary, continued loss of the islands will allow a different salinity interface as fresh water from the mainland river systems and the salt water from the Gulf of Mexico adjust to new tidal and littoral currents. Under E&D, additional storm surge, wave, water quality, and sediment transport modeling will be conducted to predict the affects of not having West and East Ship Island in place during future hurricanes. Initial modeling indicate that taking Ship Island(s) out of the system will not have a great effect on surge, but will have a major impact on waves that affect the mainland. The additional sediment transport modeling will also be used to optimize the placement of sand in the littoral zone under this plan. Water quality models will also be conducted to predict the changes to salinity levels in the Sound without Ship Island.

Immediately following Hurricane Katrina, the State of Mississippi proposed restoring the barrier islands back to a pre-Hurricane Camille condition with the concept that this would reduce storm surge on the mainland. Analysis of the land loss among the four islands indicated that from 1917 to 2006 (post-Katrina) over 1600 acres of the islands had been lost. To return the islands back to a 1917 footprint (when there was good data available), a supply of beach quality sand would be required that was estimated at 66,000,000 cubic yards. The quality of the sand source would need to be similar in color, grain size, and roundness to the sand that currently comprises the barrier islands. The NPS had concerns over the State's proposal in that it directly contradicted their policy of letting nature take its course unless it was to restore the activities of man or to protect historical sites within Park boundaries. As modeling efforts to evaluate storm surge were being conducted, a sensitivity analysis was performed on different restoration changes to the barrier islands. These results indicated that reductions in surge would not be large, but that the increase in wave heights would be significant if the barrier islands eroded away. Other studies by the USGS and ERDC showed a continuing trend in erosional loss of the islands and that West and East Ship Island would probably be totally lost in the future. Loss of the islands would also be expected to drastically change the ecology of the estuary formed between the islands and the mainland. With all these considerations, the NPS and the Corps formulated a plan (referred to as the NPS Plan) for the barrier islands that would help mitigate some of the loss at the islands and prolong the existence of the islands. This plan includes direct placement of sand to fill a breach in Ship Island, commonly called Camille Cut, that has existed since Hurricane Camille, add sand to the littoral zone in selected areas, and to propose changes in the disposal practices of littoral zone sediment removed from local navigation channels.

7.2 Additional Studies - Littoral Zone Placement and Cat Island Coastal and Ecological Processes and Confirmation of Borrow Areas

Prior to any placement of sand, additional modeling is required to confirm the quantity and quality of sand in borrow areas, better define the optimal locations for the littoral zone placement and obtain additional data needed to understand the ecology and geomorphic fate of Cat Island.

7.2.1 Confirmation of Offshore Sand Borrow Areas

After funding is obtained, an acoustic survey will be conducted in some areas near the barrier islands to identify areas that may contain sufficient sand to use in both direct island and littoral zone placement at Ship Island. These areas will be both disposal areas where disposal from maintenance dredging may have concentrated usable material and sediments that have been pushed out and deposited with the ebb tide currents at the pass west of Ship Island. Any deposits that have useful quantities will be sampled to test for quality requirements. If these surveys fail to located suitable material, the program will then concentrate on the submerged islands that make up St. Bernard Shoals that lie south of the barrier islands. To verify the quantity of sand available for borrow at St. Bernard Shoals and to obtain physical samples for quality characteristics, a geophysical survey and sampling program will be conducted.

7.2.2 Optimal Littoral Zone Placement

The model that was completed and described in Section 3.0 will be used as a basis to further study the optimal locations to place littoral zone additions of sand and the locations for disposal of material from future maintenance dredging.

7.2.3 Cat Island Coastal and Ecological Processes

Cat Island has a different coastal process that has been identified, but not thoroughly investigated. Initial studies have indicated the littoral zone currents that help replenish the other Mississippi barrier islands do not cross the pass between West Ship Island and Cat Island to the west. The formation of the Mississippi River delta cut off the path of the historic littoral current and may have left Cat Island without the natural nourishment of sand moving from the east. Little information is available on Cat Island, but the additional study will include not only coastal processes, but also ecological processes that will provide valuable information on the little known habitat on Cat Island.

7.3 Camille Cut and Barrier Island Restoration

West Ship has migrated westward along the littoral drift zone with the western end of the island now terminating against the deep-water, Gulfport navigation channel that prevents further drift. Studies (Rosati, 2007) have confirmed that West Ship Island is the last active island system in the littoral zone that originates in northwest Florida. The same type of land loss exists for Petit Bois Island where the east end is migrating westward and the western end is now terminated against the Pascagoula navigation channel. Records indicate that over 22 million cubic yards of sediment have been removed for maintenance from the Pascagoula Channel since it was created. This quantity of sand was used as the basis of adding sand back into the littoral system since, theoretically, this sand would have continued its transport along the littoral system. Three measures were adopted to return this sand into the system. The first would be to fill the three mile breach in Ship Island, Camille Cut, to a 1000-foot width and a height that would require approximately 13-million cubic yards of sand including loss during placement and the re-nourishment of some erosion along the northern shore. Based on current studies, the other two measures would be to add sand into the littoral system with about 5-million cubic yards going into the area east of East Ship Island and the rest (4-million cubic yards) going to the area east of Petit Bois Island. Placing more sand at Ship Island is assumed because of the accelerated erosion that has taken place there. Additional studies will be undertaken during advanced engineering and design to determine if other locations such as Cat Island could benefit from some fraction of this sand placement, therefore the quantities of material assumed for the littoral placements would be subject to change after additional sediment transport modeling if this modeling indicates this adjustment.

Loss of these islands from the barrier islands chain will have severe impacts to both cultural and ecological resources in Mississippi. The islands play a major role in maintaining the ecosystem of the Mississippi Sound. The various types of vegetation found on the islands provide habitat to many species including endangered birds such as Least Tern and Piping Plovers. Oysters, shrimp and many species of fish depend on the role the islands play in maintaining lower salinity levels found within the Sound and the presence of these species are tremendously important to the local economy and provide a way of life for the thousands of local residents employed by the seafood industry. The many miles of beaches associated with the islands also provide recreation for tens of thousands of visitors annually.

The pre-Camille footprint of Ship Island was obtained from historical records and this data showed that the island was breached during Hurricane Camille in 1969 forming two separate islands as mentioned above. This breach had been partially filled with a sand spit extending westward from East Ship Island when Hurricane Katrina again opened the breach in 2005. As happened during Hurricane Camille, the new breach was formed leaving two islands with approximately three miles of open water between the remaining portions. West Ship Island has been experiencing severe erosion in some areas because of the loss of sand in the system from the ebb tidal flows through the breach. East Ship Island is also losing land mass as the sand in its system migrates into the breach area. Currents studies (USGS, 2007 and Rosati, 2007) indicate that West and East Ship will probably not recover from their current severely eroded state.

West and East Ship Island also have two major historic sites that are in danger from the continuing erosion of the barrier islands. The presence of these historic sites, in addition to the nationally significant natural resources, led to the inclusion of the barrier islands off the coast of Mississippi as a National Seashore. Current studies by the Corps indicate that restoring the two islands to a single island, pre-Camille condition may prevent the rapid erosion of the beaches that is now occurring at these sites and aid in the reduction of erosion that is endangering Historic Fort Massachusetts on West Ship Island.

The addition of sand into the littoral system on the eastern ends of East Ship and Petit Bois Islands and possibly Cat Island will provide a sediment source for the islands and help mitigate any affects from the maintenance of the navigation channels. Figure 7-3 provides potential locations where littoral zones placements may occur, The additional sediment transport modeling will include modeling to predict the optimal location for the placement of sand into the littoral zone near the islands to provide a source of sand for the natural healing on the breach.

The quantity of sand required for these options are considerably less than the total restoration of the islands, but still substantial. To fill the breach, the sand would have strict requirements on color, grain size, and roundness. In discussions with the USGS, a potential source of sand was identified at St. Bernard Shoals which is a submerged chain of barrier islands approximately 45 miles south of the Mississippi barrier islands. Both quality and quantity are assumed to be available, but further investigations are required to verify the source. Activity from oil and gas production in the local area must also be considered. As described above approximately 13,000,000 cubic yards of the high quality sand are needed to fill the breach. For costing purposes, an additional 5,000,000 cubic yards of sand is being proposed for placement into the littoral zone east of East Ship Island and to add approximately 4,000,000 cubic yards of compatible sand into the littoral zone east of Petit Bois Island. This sand would still have physical compatibility characteristics to the sand in the littoral system that must be considered.

PROPOSED LITTORAL ZONE SAND PLACEMENT
MISSISSIPPI BARRIER ISLAND

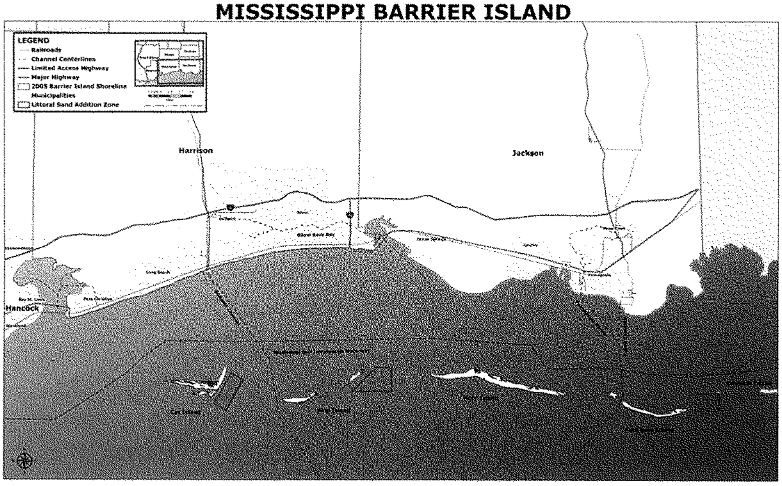


Figure 7.1 Potential Littoral Zone Placements

Also during the E&D phase, another potential source of sand would be investigated that would be much closer to the project site and would also allow the beneficial reuse of dredged material. This further study would look at historical disposal areas for the Gulfport navigation channel that crosses through the littoral zone. The sediments that are removed from the channel during routine maintenance dredging have been placed in approved disposal areas that have been used for an extended period of time. While the material placed in these areas was not segregated by grain size, there may be substantial quantities of beach quality material that has potential use at Ship Island, either for filling Camille Cut, adding to the littoral zone, or both. Reuse of the sediments from the disposal areas would follow Regional Sediment Management practices that promote keeping sediments in the littoral system and/or beneficial use of material that is removed during both new and maintenance dredging.

In this same local area, recent sediment transport studies have shown that westward sediment migration has been affected by the southward extension of the Mississippi River delta. This extension has cut off the littoral current and terminated the westward migration of sediments in the pass in the vicinity between Cat and West Ship Island. The fate of these sediments has not been determined, but there may be a large deposit of sand that could be used at Camille Cut or replaced in the littoral system.

The placement of sand in Camille Cut and the littoral zone are planned as one-time events to restore some of the islands land surface that may have been lost to erosion from past human activities or from mass erosion during storm events. NPS Management Policies (2006) allows restoration of lands disturbed by human activities, and protection of significant cultural resources in NPS units. Addition of sediment into the littoral system will help restore its function , which modeling indicates is necessary for the long-term preservation of the three barrier islands. This will extend the life of the islands and the closure of Camille Cut will help maintain the boundaries of the Mississippi Sound estuary. It is understandably difficult to quantify either of these sand loss causes because the barrier islands themselves are dynamic systems that are undergoing constant change

7.4 Regional Sediment Management Issues

The presence of two deepwater navigation channels that pass through the littoral zone have created artificial boundaries to the westward migration of the islands. The continued maintenance of these channels will require that sand and other sediments be removed, but under the guidelines of the Regional Sediment Management Practices, the sand removed from the channels will be returned to the littoral system. The placement of this sand in the future will be supported and guided by the results of additional focused sediment transport modeling that will be conducted prior to any placement.

This continuing study would evaluate future placement of maintenance material dredged from the Pascagoula Harbor Navigation Channel. It has been recommended that sand from the channel be placed down-drift in a newly designated disposal area located in the littoral zone near Sand Island. Much of the sand dredged in the past was placed down-drift, but was formed into a small island commonly called Sand Island. Sand Island has become a prime environmental resource vegetated with dune grasses that provide habitat to many types of shore birds. With no further sand additions, the sand within this islands will probably return to the littoral system as wind and currents erode the land mass.

Material removed from the Gulfport Channel has historically been placed in disposal areas south of the littoral zone. In keeping with the guidelines of the Regional Sediment Management Practices, revised recommendations will be made to more properly dispose of the material removed from the littoral zone segment of the channel so it will have improved beneficial use. The existing channel alignment is at the western tip of West Ship Island and is a trap for the migrating sand. It has been recommended to study and model placement zones that will maximize the benefits of disposing of this sand. This practice will allow the sand to continue to nourish the barrier islands and slow the erosional processes of the land masses. How to best achieve this will be considered in the continuing study of the islands. Initial ideas include immediate reuse by littoral zone placement or stockpiling high quality sand in selected disposal areas so the material would be readily available in the future for relocating the sand into the littoral zone as needed. The disposal areas that are currently designated may be used or additional areas could be defined.

7.5 Long Term Monitoring Program

Monitoring during and following the implementation of the barrier island restoration actions described in this plan is needed to assess the progress of the restoration and short- and long-term impacts to the barrier island system and cultural resources. Monitoring recommendations include:

- Task 1 - Obtain orthophotography of each barrier island on an annual basis to determine shoreline position change annually for five (5) years and for an additional three (3) events every two (2) years;
- Task 2 - Map bathymetry in the barrier islands area pre- and post-project, 1 year after project completion, 5 yrs after project completion, and immediately following passage of a tropical storm or hurricane to document movement of sand placed in Camille Cut and in the littoral system;
- Task 3 - Use topographic, bathymetric and hyperspectral sensors on the Compact Hydrographic Airborne Rapid Total Survey (CHARTS) system to document land elevation and vegetation density change annually, and process and analyze acquired data in an efficient and timely manner to make adjustments in sand placement strategies if desired results are not being achieved; and
- Task 4 - Obtain daily real-time water quality data adjacent to all beach renourishment, direct placement and littoral zone placement areas in coordination with EPA Gulf of Mexico, MS Department of Marine Resources and MS Department of Environmental Quality. Water quality sampling will be conducted quarterly for 5 years, then quarterly every other year for the remaining 6 years.

7.6 Emergency Sand Placement for Fort Massachusetts and French Warehouse

An emergency project to place sand in two areas is being included in the Comprehensive Barrier Island Restoration Plan. These sand placements are to protect Fort Massachusetts on West Ship Island and the French Warehouse site on East Ship Island from damage or destruction from erosion of the northern beaches at their respective locations. This project has been requested by the National Park Service to mitigate the recent storm damage to these two historic sites. This project was included in the Main Report Section 5.3.14 - Public Input and Review of Planning Options, Round One, but was not selected in the initial group of Interim Projects because of extensive coordination that was required by multiple agencies. This effort made it impossible to meet the short time frames required for the Interim Projects.

CHAPTER 8 COST ESTIMATES

8.1 General

The Comprehensive Barrier Island Restoration Plan has many study components will be included within the "Engineering and Design" cost based on the estimated contract cost. These studies were requested as part of the overall plan, but will be covered under the required studies for design. They include the Optimal Littoral Zone Placement and Cat Island Coastal and Ecological Processes. Studies that will have an additional cost are associated with a recommended monitoring plan to document from the pre-construction conditions at the barrier islands, then for about ten years post-construction. The summary costs for the Comprehensive Barrier Island Restoration Plan is shown in Table 8-1. The local Regional Sediment Management Practice team has been heavily involved in the Mississippi barrier island study and will make revisions to their operating practices at the Mississippi Barrier Islands. These changes will not have a direct cost to the Comprehensive Barrier Island Restoration Plan.

Table 8-1.
Summary of Costs for the Comprehensive Barrier Island Restoration Plan

Project Sub-item	Costs
Sand Placement, Ship Island Breach and Littoral Zones	$516,000,000
Long Term Monitoring	$4,950,000
Cat Island Cat Coastal and Ecological Processes and Optimal Littoral Zone Placement	$1,000,000 (see note)
Regional Sediment Management Practice Revision	(see note)
Emergency Sand Placement, Fort Mass and French Warehouse	$3,000,000

Note 1: As described in Section 8.1 and shown in Table 8-2, this cost are included in the Engineering and Design costs ($17 million) for the "Sand Placement, Ship Island Breach and Littoral Zones"

8.2 Construction (Sand Placement) Costs

The Total Project Costs for the construction associated with the barrier island restoration will include all costs that were described in Options C1, C2 and G under the LOD-1 estimates in the Cost Appendix. These detailed costs were combined into a single estimate and is included in Table 8-2.

8.3 Monitoring Program

The total costs for the long term monitoring program (over a period of 11 years) as described in Section 7.5 are included in Table 8-3. The tasks are fully described in Section 7.5.

8.4 Emergency Sand Placement, Fort Massachusetts and French Warehouse

An emergency project to protect Fort Massachusetts on West Ship Island and the French Warehouse on East Ship Island has been requested by the National Park Service to mitigate storm damage to these two historic sites. This project was included in the Main Report Section 5.3.14 - Public Input and Review of Planning Options, Round One, but was not selected in the initial group of Interim Projects because of extensive coordination that was required by multiple agencies. This effort made it impossible to meet the short time frames required for the Interim Projects. The cost for this project is included in Table 8-4.

Table 8-2.
Sand Placement, Ship Island Breach and Littoral Zones

TOTAL PROJECT **** TOTAL PROJECT COST SUMMARY **** PAGE 1 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Barier Islands DISTRICT: MOBILE

LOCATION: Mississippi Coastal Barrier Islands P.O.C.: Joseph H. Ellsworth

ACCOUNT NUM	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ COST ($K)	CNTG ($K)	FULL ($K)
17	BEACH REPLENISHMENT (Barrier Islands) *(Barrier Islands)*	326,279,000	107,543,280	33%	433,822,280	326,279,000	107,543,280	433,822,280	353,465,241	116,490,463	469,955,704
30	PLANNING, ENGINEERING & DESIGN	13,051,160	4,301,731	33%	17,352,891	13,051,160	4,301,731	17,352,891	13,490,461	4,448,199	17,938,660
31	CONSTRUCTION MANAGEMENT	19,576,740	6,452,597	33%	26,029,337	19,576,740	6,452,597	26,029,337	21,207,914	6,989,428	28,197,342
	TOTAL PROJECT COST ======>	**358,906,900**	**118,297,608**		**477,204,508**	**358,906,900**	**118,297,608**	**477,204,508**	**388,163,616**	**127,928,090**	**516,091,706**

rounded

100% TOTAL FEDERAL COSTS ======> **$516,000,000**

0% TOTAL NON-FEDERAL COSTS ======>

DISTRICT APPROVED:

________ CHIEF, COST ENGINEERING

________ CHIEF, REAL ESTATE

________ CHIEF, PLANNING

________ CHIEF, ENGINEERING

________ CHIEF, OPERATIONS

________ CHIEF, CONSTRUCTION

________ CHIEF, PROGRAMS MANAGEMENT

________ PROJECT MANAGER

________ DDE (PM)

Table 8-2.
Sand Placement, Ship Island Breach and Littoral Zones (continued)

FEDERAL COSTS — **** TOTAL CONTRACT COST SUMMARY **** — PAGE 2 OF 2

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE Feasibility, DATED: Aug 08

PROJECT: Mississippi Coastal Improvemnets Program, Barier Islands — DISTRICT: MOBILE

LOCATION: Mississippi Coastal Barrier Islands — P.O.C.: Joseph H. Ellsworth

ACCOUNT No.	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: Aug 08 EFFECTIVE PRICING LEVEL: Aug 08 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: FY-09 EFFECTIVE PRICING LEVEL: Aug 08 OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED ESTIMATE FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
	Contract 1													
17---	DREDGING (Hopper)	183,829,000	58,825,280	32%	242,654,280	0.0%	183,829,000	58,825,280	242,654,280	Apr 12	7.9%	198,351,491	63,472,477	261,823,968
30---	PLANNING, ENGINEERING & DESIGN, 4%	7,353,160	2,353,011	32%	9,706,171	0.0%	7,353,160	2,353,011	9,706,171	Apr 09	1.6%	7,470,811	2,390,659	9,861,470
31---	CONSTRUCTION MANAGEMENT, 6% +-	11,029,740	3,529,517	32%	14,559,257	0.0%	11,029,740	3,529,517	14,559,257	Apr 12	7.9%	11,901,089	3,808,349	15,709,438
	Contract # 1 Subtotal	202,211,900	64,707,808		266,919,708		202,211,900	64,707,808	266,919,708			217,723,391	69,671,485	287,394,876
	Contract 2													
17---	DREDGING (Hopper)	78,350,000	28,206,000	36%	106,556,000	0.0%	78,350,000	28,206,000	106,556,000	Apr 12	7.9%	84,539,650	30,434,274	114,973,924
30---	PLANNING, ENGINEERING & DESIGN, 4%	3,134,000	1,128,240	36%	4,262,240	0.0%	3,134,000	1,128,240	4,262,240	Oct 10	4.7%	3,281,298	1,181,267	4,462,565
31---	CONSTRUCTION MANAGEMENT, 6% +-	4,701,000	1,692,360	36%	6,393,360	0.0%	4,701,000	1,692,360	6,393,360	Apr 12	7.9%	5,072,379	1,826,056	6,898,435
	Contract # 2 Subtotal	86,185,000	31,026,600		117,211,600		86,185,000	31,026,600	117,211,600			92,893,327	33,441,597	126,334,924
	Contract 3													
17---	DREDGING (Hopper)	64,100,000	20,512,000	32%	84,612,000	0.0%	64,100,000	20,512,000	84,612,000	Apr13	10.1%	70,574,100	22,583,712	93,157,812
30---	PLANNING, ENGINEERING & DESIGN, 4%	2,564,000	820,480	32%	3,384,480	0.0%	2,564,000	820,480	3,384,480	Apr 11	6.8%	2,738,352	876,273	3,614,625
31---	CONSTRUCTION MANAGEMENT, 6% +-	3,846,000	1,230,720	32%	5,076,720	0.0%	3,846,000	1,230,720	5,076,720	Apr 13	10.1%	4,234,446	1,355,023	5,589,469
	Contract # 3 Subtotal	70,510,000	22,563,200		93,073,200		70,510,000	22,563,200	93,073,200			77,546,896	24,815,008	102,361,906

Table 8-3.
Long Term Monitoring Program

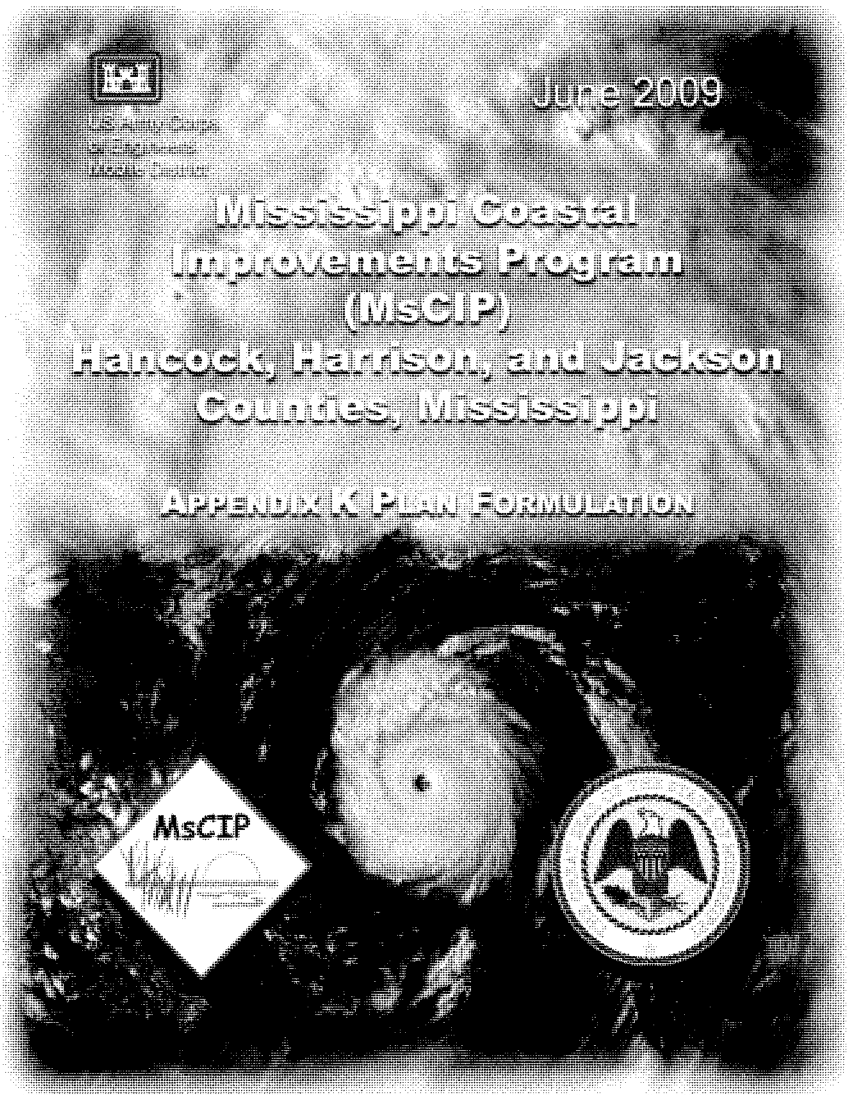
Task	Program Costs
1 - Orthophotography	Included in Task 3
2 - Bathymetry	$1,400,000
3 - CHARTS	$3,300,000
4 – Water Quality	$250,000

Table 8-4.
Emergency Sand Placement, Fort Massachusetts and French Warehouse

COMPREHENSIVE PLAN "STRUCTURAL" COST ESTIMATE

PROJECT: **Mississippi Coastal Improvements Program "MsCIP"** ITEM NO. DATE 7-Jan-09
LOCATION: **Mississippi** SHEET NO. 1 OF 1
PREPARED: Joseph H. Ellsworth CHECKED: Gary A. Payton
WORK ITEM: ***Line of Defense 1*** BASIS of ESTIMATE: info furnished per Project Delivery Team
Beach / Dune Construction FILE NAME:

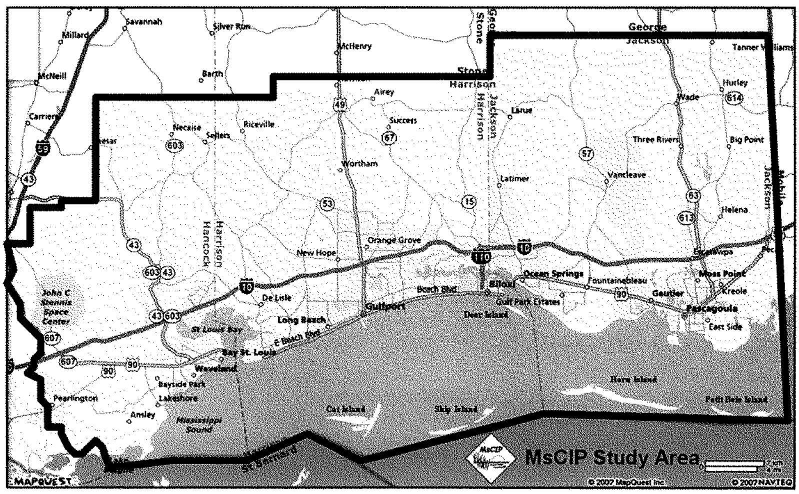
DESCRIPTION	Quantity	Unit	Unit Price	ESTIMATED AMOUNT
Ship Island Fort Mass & French Warehouse ***Emergency Beach Nourishment***				
Mobilization, Preparatory Work, Demobilization (Dredge Plant)	1	job	allow	$900,000
Mobilization, Preparatory Work, Demobilization (Land Base Equipment	1	job	allow	45,000
Construct Sand (dune), Dredged from near Shore Borrow Site	125,000	cy	9.00	1,125,000
Misc Site Items	1	ls	allow	2,800
Current Contract Cost, Jan 09				$2,072,800
CONTINGENCY		@	**25.0%**	518,200
				$2,591,000
01 Account, Lands & Damage		PCA	**LS**	25,000
				$2,616,000
30 Account, Plan, Engr.& Design		@	**8.0%**	209,280
				$2,825,280
31 Account, Constr. Management		@	**6.0%**	169,517
				$2,994,797
ESCALATION		@	**1.0%**	29,948
				$3,024,745
				rounded
TOTAL PROJECT COST, Oct 09				$3,000,000


June 2009
U.S. Army Corps
of Engineers
Mobile District
Mississippi Coastal
Improvements Program
(MsCIP)
Hancock, Harrison, and Jackson
Counties, Mississippi
APPENDIX K PLAN FORMULATION
MsCIP

FOREWORD

This document is one of a number of technical appendices to the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan and Integrated Feasibility Report and Environmental Impact Statement.

The *Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan Integrated Feasibility Report and Environmental Impact Statement* provides systems-based solutions and recommendations that address: hurricane and storm damage reduction, ecosystem restoration and fish and wildlife preservation, reduction of damaging saltwater intrusion, and reduction of coastal erosion. The recommendations contained in the Main Report/EIS also provide measures that aid in: greater coastal environmental and societal resiliency, regional economic re-development, and measures to reduce long-term risk to the public and property, as a consequence of hurricanes and coastal storms. The recommendations cover a comprehensive package of projects and activities, which treat the environment, wildlife, and people, as an integrated system that requires a multi-tiered and phased approach to recovery and risk reduction, irrespective of implementation authority or agency.



The MsCIP Study Area

The purpose of the Comprehensive Plan Report is to present, to the Congress of the United States, the second of two packages of recommendations (i.e., the first being the "interim" recommendations funded in May 2007, and this "final" response, as directed by the Congress), directed at recovery of vital water and related land resources damaged by the hurricanes of 2005, and development of recommendations for long-term risk reduction and community and environmental resiliency, within the three-county, approximately 70 mile-long coastal zone, including Mississippi Sound and its barrier islands, of the State of Mississippi.

The USACE has taken a system wide approach in formulating the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan to ensure that both the MsCIP and the Louisiana Coastal Protection and Restoration (LaCPR) efforts are fully coordinated and develop complementary plans for the restoration of the U.S. Gulf coastal region as an integrated system.

In addition, the planning effort has taken a "top down" comprehensive planning approach, beginning with development of a Comprehensive Plan to address the overall water resources problems and opportunities of the region. Building off of the comprehensive identification of problems and opportunities, the planning effort then proceeded to develop site specific problems, opportunities and solutions that contribute to accomplishing the Comprehensive Vision for the restoration and protection of the Mississippi Gulf Coast. The results of this effort are a comprehensive regional plan that addresses hurricane and storm damage reduction and environmental restoration needs, as well as recommending a variety of site specific projects for either immediate implementation or for further investigation and subsequent implementation.

The analyses presented in this Plan Formulation Appendix support recommendations for approval of the Comprehensive Plan and for immediate implementation for a variety of water resource development projects that were developed through the comprehensive planning process. The Plan Formulation Appendix also supports recommendations for additional study for those components of the Comprehensive Plan which require additional investigations prior to identifying a specific recommendation for construction.

This appendix, the Main Report/EIS, and all other appendices and supporting documentation, were subject to Independent Technical Review (ITR) and will be presented for an External Peer Review (EPR). Both review processes will have been conducted in accordance with the Corps "Peer Review of Decision Documents" process, has been reviewed by Corps staff outside the originating office, conducted by a Regional and national team of experts in the field, and coordinated by the National Center of Expertise in Hurricane and Storm Damage Protection, North Atlantic Division, U.S. Army Corps of Engineers.

This Plan Formulation Appendix presents problem areas identified by stakeholders and residents of the study area, a summary of the approach used in analyzing problems and developing recommendations directed at assisting the people of the State of Mississippi in recovery, recommended actions and projects that would assist in the recovery of the physical and human environments, and identification of further studies and immediate actions most needed in a comprehensive plan of improvements for developing a truly resilient future for coastal Mississippi.

The MsCIP also developed and employed risk-based concepts which engaged stakeholders and allowed for informed decision making. The MsCIP planning process made extensive use of public and agency involvement, which introduced ideas, provided feedback, and gave first-hand accounts of the damages suffered as a result of the disaster. In an effort to demonstrate reliable public service professionalism, the public, state and local government input received at public workshops was also used to identify the degree of importance placed on environmental issues and to give indication of the likely Locally-Preferred Plans, should those be pursued as options to more cost-effective recommendations, consistent with Federal guidelines.

The results of the planning process (as expressed in the Systems of Accounts tables):

- identify cost-effective solutions,
- provide the best choices based on an extensive set of criteria, and
- identify the trade-offs made during the evaluation of alternatives.

The System of Accounts tables present the culmination of technical analyses, public input, and systematic evaluation. The selected alternatives stand out in their ability to fulfill the Congressional authorization and the needs of the nation.

This appendix contains detailed technical information used in the analysis of existing and future without-project conditions, in the development of problem-solving measures, and in the analysis, evaluation, comparison, screening, and selection of alternative plans. Each appendix functions as a complete technical document, but is meant to support one particular aspect of the feasibility study process. However, because of the complexity of the plan formulation process used in this planning study, the information contained herein should not be used without parallel consideration and integration of all other appendices, and the Main Report/EIS that summarizes all findings and recommendations.

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1 THE MSCIP PLANNING PROCESS – REACHING BEYOND THE TRADITIONAL PROCESS

The process of developing technically sound, environmentally sensible, cost-effective, publicly acceptable, and comprehensive solutions to the problems caused by the hurricanes of 2005, and with the potential to be caused by future events, required a thorough, and highly iterative process. This process had to incorporate both traditional planning requirements (which have served the nation well), as well as a more direct process of identifying and fully discussing potential risks and consequences of any given action, in a way that all might participate in, and understand the full meaning of.

This Appendix follows the plan formulation process in its applied sequence, and each step of this process must be fully laid out, to understand how the study team formulated plans, screened measures and alternatives, and arrived at a cost-effective, environmentally beneficial, and technically sound package of recommendations.

Plan formulation for the Comprehensive Plan utilized the highly-successful process discussed in Corps of Engineers' Engineering Regulation 1105-2-100 (also known as the "Planning Guidance Notebook"), with the addition of a number of new tools required in this specific study effort, including an extensive set of tools and evaluative and screening processes involving the potential risks and consequences of any action.

The directive language for the Mississippi Coastal Improvements Program included the requirement to address not only hurricane and flood (storm) damage, but also coastal erosion, fish and wildlife preservation and recovery, and salt water intrusion. Additionally, the study language also specified a different approach toward identification of a plan, in that it specifically directed that the report "shall recommend a cost-effective project", and furthermore, that the report "shall not perform an incremental benefit-cost analysis...and shall not make project recommendations based on maximizing net national economic development [NED] benefits..". This guidance demanded that the study team both develop an approach that met those mandates, while not deviating significantly from the traditional Federal planning process.

The MsCIP planning process uses the familiar Corps and NEPA study processes, which compare and contrast measures and alternatives for a full range of anticipated impacts and effects, with the former also requiring a "System of Accounts" analysis. Because the study area is so large and diverse, the mandates so broad, and the consequences of exceedance or failure so potentially catastrophic, the study effort also required that the Plan Formulation process be more iterative and risk-aware than is usually the case. The process had to be capable of re-visiting each and every assumption and piece of data, and modifying the measures developed as solutions, so as to create the most cost-effective package of potential options for review by decision-makers. This is also reflected in the study recommendations. Cost-effectiveness was determined by comparison of implementation costs to that of the damage reduction benefits each measure would provide.

The MsCIP study utilized an additional evaluative tool to address risks and consequences of potential alternatives, by use of a Risk-Informed Decision Framework (RIDF), to allow comparison of highly disparate factors affected by plan implementation, particularly those factors that were not dealt with well under the traditional Corps planning process. A key component of this process was the "weighing-in" of the public and other decision-makers, which reflect the factors most important to them, in deciding what might be done to address identified problems. Most notable among these factors were the potential risks (including residual risks), to population, environmental recovery and preservation, cultural, aesthetic and historic resources, and other factors that remain very difficult to compare and contrast. The Risk-Informed Decision Framework process is discussed in great detail in the RIDF Appendix.

The MsCIP process integrated a highly inclusive public and agency involvement process. This process was critical in the conduct of plan formulation activities, in that it introduced ideas, provided feedback, and gave first-hand accounts of the damages suffered as a result of the disaster. Public input (which included local and State governmental input) received at these public workshops was also used to define the "weight" of factors discussed above (such as the degree of importance they placed on environmental issues) examined in the Risk and Consequences analysis of potential plans, and to give indication of the likely direction of Locally-Preferred Plans, should those be pursued as options to more cost-effective recommendations.

Finally, the tentative recommendations derived by this process and presented in the Comprehensive Plan may be used as guidelines concerning the most cost-effective solutions, the best choices for a given set of criteria, and the trade-offs required. These are the tools required by local government and residents in the selection of plans that best meet their needs, and the needs of the nation.

1.1 The Traditional Federal Planning Process

The traditional Federal planning process has served this nation well. It has allowed the development of thousands of water resource projects that have prevented billions of dollars in damages, and saved countless lives. Unfortunately, it has also not always addressed the difficult-to-evaluate elements of risk and consequences, both of failure, and also of residual risk not addressed by projects, in situations both where the design event is exceeded, and also where different choices are made that may affect future conditions. It has also not necessarily accommodated the values of residents and decision makers in the analysis and selection process, in particular in weighting factors, which are of particular importance to concerned interests other than economic factors. Recent guidance has reinforced the need to utilize methods capable of evaluating factors that resist quantification by traditional means, as part of the plan formulation and selection process. This includes means by which a study team might evaluate the trade-offs inherent in any design, those of residual risks inherent in each design, and also those of factors that are difficult to evaluate and prioritize under the traditional process.

The six traditional Planning Steps include:

1) Identifying Problems and Opportunities
2) Inventorying and Forecasting Resources
3) Formulating Alternative Plans
4) Evaluating Effects of Plans
5) Comparing Alternatives
6) Selecting the Recommended Plan

1.1.1 The MsCIP Comprehensive Plan – The Planning Process

The planning process utilized in the MsCIP study was a highly iterative process, which actually went beyond that done in the traditional six-step Corps feasibility study planning process. This was required, due to the fact that new problems or data were constantly being identified, but also because analysis of comprehensive plans, such as a "Lines of Defense" (LOD), constantly brought new problems and opportunities to light, requiring modification of, or development of, new measures; and the analysis, evaluation, and comparison that this requires.

A key element of the modified planning process utilized for the MsCIP study also included an additional sub-step of forecasting and analyzing not only one future "without-project" scenario, but a series of potential future scenarios, including highly speculative future re-development, and relative sea level rise scenarios.

In addition, and as discussed above, the addition of a RIDF, which evaluates the risks and consequences of a certain action, required additional sub-steps to be inserted in this process.

The sequence of steps developed for the MsCIP effort (*with additional sub-steps or iterative steps italicized*) can be shown in figure 1 and included:

1) Identifying Problems and Opportunities (*or Further Refined)*
1a) Constraints Identified (*or Further Refined)*
2) Inventory and Forecast Resources *(and Define Multiple Future Without-Project Scenarios)*
3) Preliminary Measures Developed for Each Problem Area (*followed in later iterations by formulation of true alternative plans*)
4) Evaluation of Effects of Measures (*followed later by Alternative Plans*)
5) Comparing Measures (*followed in later iterations by comparison of Alternatives*)
5a) Measure Screening by Traditional Initial Screening Criteria - Technical, Environmental and Economic Feasibility (*followed in successive iterations by screening by progressively more rigorous criteria)*
5b) Refinement of Measures - Development of Data at Higher Level of Detail, on Remaining Plans, in concert with development of data on other impact areas such as cultural, environmental, etc. effects.
5c) Development of metrics, units of measure, etc., for Risk Evaluation
5d) "Weighting" of Risk metrics by residents of coastal Mississippi
5e) Risk-Informed Decision-Making with Refined Data
5f) Final presentation of measure and/or alternative outcomes, including benefits, costs, risks, and consequences, to decision-making population
6) Selection and Presentation of Recommendations.

It must be pointed out that addition of these sub-steps, additional iterations, and inclusion of risk-based analysis is not an exclusive process, but a complementary process, that ensures a more rigorous identification of risks and consequences, and also greater inclusion of the public in a decision-making process.

The plan formulation process actually began during the Interim Phase of study, with development of a comprehensive list of problem areas, consisting of single or multiple problems associated with a given site or resource, and identified as having been caused or exacerbated by the hurricane events of 2005. Each of the problems identified were related to one of the four key areas of: a) hurricane storm damage, b) coastal zone erosion, c) damage to fish and wildlife resources, and d) saltwater intrusion.

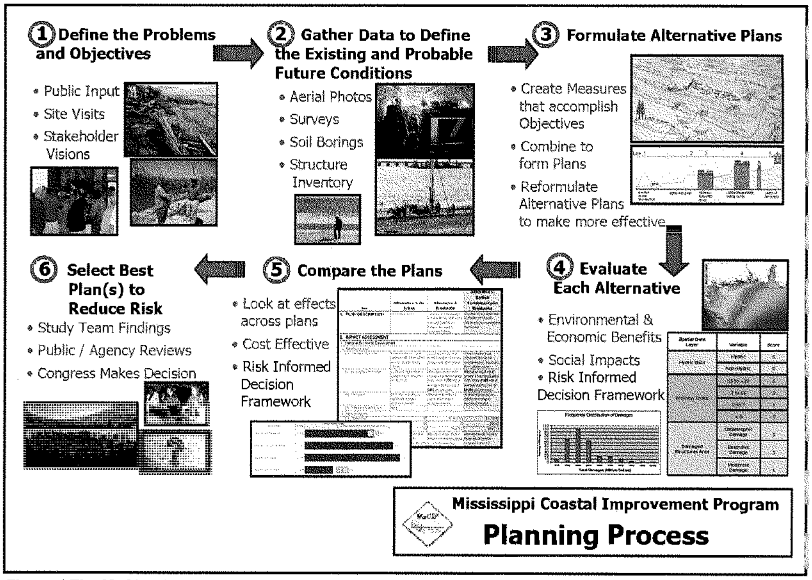


Figure 1 The MsCIP Planning Process

1.1.2 Internal Technical Review and External Peer Review

Internal Technical Review (ITR) was lead and coordinated by the Corps' National Center of Coastal Storm Damage Reduction Expertise, at the North Atlantic Division. ITR involved the use of experts in many fields, from multiple disciplines, and located in numerous parts of the country. ITR was conducted as a completely separate enterprise from internal technical review quality control, and quality assurance. No member of the ITR team was involved in any aspect of the study effort but that of independent technical review of products.

ITR consisted of multiple levels of review, at several points in the process. Details on the timing, sequencing, and disciplines engaged, are contained in the ITR / External Peer Review (EPR) Appendix.

The EPR was coordinated by the Corps' Baltimore District. No member of the District was involved in this wholly-external review process. The EPR process was lead by the Battelle Corporation, a private company with expertise in this particular requirement. Battelle staff chose the members of the EPR team from the ranks of academia, private concerns, and other sources of particular expertise. At no time were the names of credentials of any member of the EPR team shared with any member of the study team, but all EPR team members represent highly qualified individuals in those specific fields of endeavor. EPR was also conducted as a completely separate enterprise from internal technical review quality control, quality assurance, or independent technical review. No member of the EPR team was involved in any aspect of the study effort but that of external peer review of products.

EPR consisted of a single level of review. Details on the timing, sequencing, and disciplines engaged, can be found in ITR / EPR Appendix.

1.1.3 Introduction to Addressing Risks and Consequences

The approach chosen by the study team on the MsCIP Comprehensive Plan effort was a multi-layered assessment, evaluation, and presentation of risk, uncertainties, and consequences.

Risks and uncertainties were evaluated and incorporated into numerous technical analyses, such as the degree of uncertainty the coastal engineer felt about wave heights, surge heights, or storm behavior. Risks and uncertainties were also accounted for in the technical analysis of ecosystem functions values, and long-term project performance. Risks and uncertainties were also evaluated for a variety of economic indicators, and for multiple future without-project scenarios, including those of relative sea level rise, and of multiple future re-development scenarios.

The MsCIP Comprehensive Plan phase of study utilized an additional evaluative tool to address risks and consequences of potential alternatives, by use of a "RIDF", which allowed comparison of highly disparate factors affected by plan implementation, particularly those factors that were not dealt with well under the traditional Corps planning process. A key component of the RIDF process was the "weighing-in" of the public and other decision-makers, which reflected the factors most important to them, in deciding what might be done to address identified problems. Most notable among these factors were the potential risks (including residual risks), to population, environmental recovery and preservation, cultural, aesthetic and historic resources, and other factors that remain very difficult to compare and contrast. The Risk-Informed Decision Framework process is discussed in great detail in the RIDF Appendix.

In addition, the team also spent a great deal of effort evaluating the risks, uncertainties, and consequences of any given action, outside that framework, so that complete and unbiased information on those factors could be presented and evaluated, by the broadest possible group. Information on risks, uncertainties, and consequences (including that of residual risk), is presented in both the table of factors used in the RIDF process, but also as a separate System of Accounts category, for full disclosure in that process, also. Key in this recognition of risks, uncertainties, and consequences, was also the recognition of multiple future without-project scenarios, most importantly those addressing uncertainties in the behavior of human beings and political realities within the study area, and those of uncertainties regarding sea level changes and subsidence.

1.1.3.1 Accommodating Uncertainty in Future Re-Development Through Scenario Testing

Field surveys were conducted to observe structure and content characteristics, where damages occurred, and the magnitude of damages incurred by Hurricane Katrina. The magnitude of structures that sustained significant damage, 50% or more structural damage and would have to completely rebuilt, was significant. It was estimated from the field surveying of structures that 32,446 structures within the study area sustained this level of damage; 9,555 in Hancock County, 16,528 in Harrison County, and 6,363 in Jackson County.

Given the magnitude of the long-term rebuilding effort, two re-development scenarios were identified. The first scenario is the full redevelopment of structures as existed pre-Hurricane Katrina to exactly what they were before the storm (i.e. if a structure was a residence before it will rebuild as a residence, a condominium will rebuild as a condominium, etc.). The second scenario includes the full re-development of the study area to its pre-Katrina levels but differs slightly from the first re-development scenario with respect to the coast line, which would see commercial re-develop. This scenario is based on observations of re-building efforts in other counties and states along the Gulf Coast and Florida Panhandle following Hurricane Ivan in 2004. Those re-development efforts suggest that a large portion of the beach front and back bay areas may re-develop to condominium structures. In addition to condominiums, current Mississippi law allows casinos to be built in these counties on land within 100-feet of the Mississippi Sound.

These re-development scenarios are intended to determine the level of risk of future surge events depending on the types of development that might be seen in the future. They were coupled with various levels of relative sea level rise and evaluated to determine the extent of plan performance, expected annual damages, and residual damages of flood damage reduction measures using the Hydrologic Engineering Center - Flood Damage Analysis (HEC-FDA) Monte Carlo Simulation program. More detail on these scenarios can be found in the Economic Appendix to this report.

1.1.3.2 Accommodating Uncertainty in Future Sea Level Rise Through Scenario Testing

Systematic long-term tide elevation observations suggest that the elevation of oceanic water bodies is gradually rising and this phenomenon is termed 'sea level rise.' The rate of rise is neither constant with time nor uniform over the globe. Present estimates of recent (over about the last 100 years) global average, or eustatic, sea level rise are varied but the average value is about 2 millimeters per year. Sea level is rising due to global warming, and there is uncertainty as to the future rate of sea level rise, how much sea level will rise at any particular location, what the primary drivers of global warming really are, and whether the rate of rise will be relatively constant or accelerate. Regardless of these uncertainties, more than half of the world's population lives near the sea, and sea level rise is a phenomenon which requires society's sustained attention and requires planning with consideration to the needs and protection of future generations.

Preliminary analysis of available data suggests a 20th century relative sea level rise of nine inches along the Mississippi coast. Relative sea level rise is what an observer standing on the shoreline over a long period would observe and includes the combined effects of land subsidence (or uplift) and the rise of sea level in and of itself. For the last twenty five years, the climate change community has also been arguing that sea level rise will accelerate in the 21st century, though to date, there is no clear confirmation that acceleration is actually taking place, and the rates at which sea level rise is predicted to accelerate have been somewhat inconsistent. There is therefore some uncertainty as to the future prevailing natural environment which a proposed project must function within. Society relies on project performance. Therefore, it is important to recognize that sea level has been rising, and it's prudent (and required by USACE regulations) to recognize inherent uncertainties by exploring the ramifications of varying levels of possible relative sea level rise scenarios on project performance. This present study employs sensitivity analysis to do so. Sensitivity analysis is nothing more than an exercise where one changes an assumption and examines how outputs change accordingly. There are two primary assumptions that are modified in this program. The first is the magnitude of the relative sea level rise over the evaluation period. This program examines the implications to project performance for existing sea level; expected (i.e. moderate, or 'central value') relative sea level rise of about 2 feet; and high relative sea level rise of about 3.4 feet. Changes to these inputs provide a sense of project robustness (i.e. how well does the project perform over a range of uncertain futures?) and vulnerability (i.e. if a future materializes whereby the project would fail, how bad would the failure be?). Additionally, project performance is evaluated at a lifetime of 50 years; changes to the project lifetime provides insight as to the value over time of the initial investment, and whether an investment might be better delayed into the future, or whether more significant investments might be required in the future than might be expected, amongst other considerations. Numerous outputs are examined according to these alternative scenarios, including expected annual damages, damages reduced, and the annual probability of a surge level being exceeded.

2 IDENTIFYING PROBLEMS AND OPPORTUNITIES

Problem areas and sites, and opportunities associated with those sites, were solicited from, and then discussed, with members of the public, state, local, and other Federal agencies, representatives of industry and commerce, and resource agencies concerned with study area resources, at the series of open meetings, at individual meetings, and through other open forums. The meetings also included web-casts intended on reaching those that could not physically attend one of the in-field meetings.

2.1 Problems

Hurricane-caused problems were also investigated in a series of on-going site investigations conducted in partnership with local representatives, to ensure a complete grasp on the nature of all identified problems, and to ensure development of a full range of suitable measures and plans to deal with the identified problems. The general nature of ***problems*** identified by the study team, State, County, and City officials, residents, and agency staff, included:

- Hurricane-induced storm surge and wave damage to structures and infrastructure within a specific site/problem area;
- Hurricane-induced storm surge and wave damage to structures and infrastructure within the entire three-county study area (analyzed as both specific areas, depending on the siting of the measure, but also as an entirety as a specific problem area);
- Hurricane-induced storm surge and wave damage to specific ecosystems/sites/problem areas within the identified three-county area;
- Hurricane-induced storm surge and wave damage to the entirety of all ecosystems within the entire three-county study area (analyzed as both specific areas, depending on the siting of the measure, but also as an entirety as a specific problem area);
- Hurricane-induced saltwater intrusion within the Mississippi Sound ecosystem and associated coastal environments;
- Hurricane-induced erosion of specific coastal wetlands and coastal infrastructure.

To facilitate the gathering of information, several workshops and public meetings were held in each county. Lists of the identified problems from each meeting are provided in Tables 1 through 15.

Table 1.

Coastal-wide Stakeholder Input: Coordination with Local Communities

Item#	Name
1	Coastal Mississippi Hurricane Evacuation Plan
2	Coastal Mississippi Artificial Reef Project for Remediation of 2005 Hurricane Damage

Table 2.

Coastal-wide Stakeholder Input: Regional Coordination Workshops

Item#	Name
3	Wetland area buy-outs
4	Barrier Islands - Restoration
5	USE selected levels of rip-rap instead of bulkheads for erosion control
6	Replace structures with marshes.
7	Provide 100 acres of oyster reef restoration
8	Work with State to authorize transfer of development rights in state statut
9	Include repair standards in building codes
10	Dredge access channels to existing public marine industry and recreatio
11	Review main drainage systems to determine where improvements are most necessary and will decrease future erosion and/or failure issues
12	Improve comprehensive retention/detention systems in each entity to reduce rainfall-related flooding.
13	Form a monitroing network network that will survive and function throughout a major storm to provide data that is critical to emergency managers
14	Provide an incentive for replacing failing septic systems in rural areas to improve water quality along bayous and bays.
15	Implement a barrier or check valve system to isolate freshwater detention from saltwater inundation during surge events.
16	Add wetlands along main drainage systems in each location to increase capacity of the systems during rainfall and surge flooding events.
17	Complete snagging/clearing, etc. to restore the capacity of existing drainage.
18	Repair existing bulkheads or other structural drainage components that were damaged during the storm to reduce future failures during similar events.
19	Maximize Beneficial Use of Dredge Materials
20	Consider brown water system to minimize demand on ground and surface waters and limit saltwater intrusion.
21	Re-establish Benchmark Information Coastal-wide
22	Relocate wastewater treatment facilities out of the surge-prone areas
23	Inspect and Rehabilitate Wastewater and Piping Systems
24	Develop additional Offshore Breakwaters or Sand Dunes where determined most Beneficial through Modeling
25	Barrier Islands - Combat invasive species
26	Consider all archaeological sites in planning process Many significant coastal sites are eroding and need to be preserved.
27	Barrier Islands - Sensitivity towards barrier islands
28	Barrier Isalands - Remove hazardous materials
29	Barrier Islands - Develop Baseline Flora-Fauna Studies
30	Barrier Islands - Protect From Spills
31	Barrier Islands - Evaluate Sediment Transport - Ensure sand minimg does not Impact Islands
32	Barrier Island - Indicate NPS boundaries on project maps
33	Marsh Restoration where Feasible This can be done in conjunction with private and government dredging projects
34	Partnership Efforts with Louisiana to Marsh Island Areas

Table 3.

Coastal-wide Stakeholder Input: Public Workshops

Item#	Name
35	Barrier Islands - Restoration (to a natural setting)
36	Allow nature to dictate wetlands vs. beach to a greater degree.
37	Provide protection for public facility (i.e., WW treatment plants).

Table 4.

Hancock County Stakeholder Input: Study Team Coordination

38	Bay St. Louis Downtown HSDR
39	Cowand Point Seawall Erosion Control
40	Hancock County Beach Ecosystem Restoration and HSDR
41	Clermont Harbor Seawall HSDR and Erosion Control
42	Hancock County Comprehensive HSD - Ecosystem Restoration
43	Jackson Wetland Restoration
44	Bayou Caddy Shore Protection and Ecosystem Restoration
45	St. Louis Bay Comprehensive Ecosystem Restoration
46	Lakeshore Beach Ecosystem Restoration
47	Clermont Lake Ecosystem Restoration
48	Hancock County Communities Flood Damage Reduction
49	White/Æs Road Evacuation Route Protection

Table 5.

Hancock County Stakeholder Input: Regional Coordination Workshops

50	Biloxi Marshes Comprehensive Ecosystem Restoration
51	Magnolia Branch Ecosystem Restoration
52	Jordan River Shores Ecosystem Restoration. . Buy out landowners, return hydrology, begin mitigation, prohibit new/more development
53	Pearlington Ecoystem Restoration - Buy-out homeowners and return hydrology
54	Shoreline Park buyout

Table 6.

Hancock County Stakeholder Input: Public Workshops

55	Restore more natural freshwater flows by closing the MRGO
56	Remove storm debris (i.e., demolition debris carried in by surge retreat) from aquatic environments. Restore traditional shrimping and fishing areas rendered un-trawlable by storm debris.
57	Ferries to Temporarily Replace Bridges.
58	Restore all Hancock (all cosatal MS) marshes damaged by storm
59	Restore Hancock County Beaches to Pre-Katrina conditions
60	Widen Hancock County Beaches, jump-start dunes
61	Preserve Bayou Caddy Area
62	Protect Hancock County wetlands from filling for development
63	Construct a N/S rail link connecting Port Beinville Industrial Park to the Norfolk and Southern Railroad through Stennis Buffer. Hurricanes cause CSXT rail outages which cost > $20,000/day

Table 7.

Hancock County Stakeholder Input – Additional Input from Regional Coordination Workshops

Item#	Name
64	Open the east Pearl River channel so it can be used by commercial marine traffic from Port Bienville
65	Pursue the development of additional breakwater structures in low-use areas.

Table 8.

Harrison County Stakeholder Input: Study Team Coordination

66	Mississippi Coastal Pump Station Inundation Protection
67	Mississippi Coastal Urban Communities HSDR
68	Mississippi Coastal Barrier Island Restoration
69	Mississippi Coastal Improvement and Hurricane Storm Damage Reduction Program
70	WhiteÆs Road Evacuation Route Protection
71	WhiteÆs Road Evacuation Route Protection
72	Harrison County Beach Ecosystem Restoration and Erosion Control
73	Long Beach Harbor HSDR
74	Highway 90 û Rodeburg to St. Charles St. HSDR and Flood Control
75	Pass Christian Harbor HSDR
76	Biloxi Point Flood Damage Reduction
77	Cedar Lake Road Flood Damage Reduction
78	Gulfport Commercial Harbor
79	Turkey Creek Watershed Improvements
80	Turkey Creek Flood Damage Reduction
81	North Gulfport Interior Drainage
82	Long Beach Interior Drainage HSDR (includes Canals 2 - 3)
83	Harrison County Industrial Seaway Harbor of Refuge
84	Tchoutacabuffa River Flood Damage and Watershed Improvement
85	Courthouse Road Wetlands Ecosystem Restoration and Preservation
86	Deer Island Ecosystem Restoration
87	DÆIberville Wetlands Ecosystem Restoration
88	Biloxi Back Bay Watershed Management and Ecosystem Restoration

Table 9.

Harrison County Stakeholder Input: Regional Coordination Workshops

Item#	Name
89	West Ship Island. Continue to re-nourish the north shore of the island east and in front of Fort Massachusetts, a national historic site.
90	Evaluate Dredging and Channelization when preparing flood controls from rain events to consider impact for storm surge in costal zone.
91	Extend South Side of Deer Island. Extend 200 yards to repair breach in island and restore original footprint of island.
92	Deer Island enhancements. Cap shell middens on western side of the island and restore top soil in maritime live oak forest
93	New Sewage Treatment Plant in Woolmarket Lagoon Area - Move the Woolmarket Lagoon to north of I10 north of the area. would protect the citizens by moving the sewage from the flood prone areas:
94	Flood-Proof Existing Infrastructure
95	Enhance Lee and Bayview Docks for commercial shrimpers.
96	Enhance Maine Street Docks for commercial shrimpers.
97	Acquire wildlife corridors in lands that repeatedly flood
98	Develop Concrete Staging Center in Industrial Canal. Develop Harrison county industrial canal artificial reef staging area to stockpile concrete debris for oyster reef and other useful projects.
99	Restore or enhance Mississippi oyster reefs.
100	Open hw 90 Bridges quickly
101	Utilize HW 90 bridge as artificial reef material
102	Provide Compensation for Persons in Flood-prone Areas to Relocate. Areas prone to flooding, such as Eagle Point, should be offered buy-outs.
103	Economic Development of Downtowns. Orderly expansion of municipal harbors along with revitalization of downtowns would provide green space; non-water dependent retail, and a manageable beach blvd. (NOT HW 90).
104	Turkey Creek: Mt. Pleasant UME Audubon site 41, Tidal Creek restoration of flood plain.
105	Complete the purchase of "optional" Cat Island for inclusion into Gulf Islands Nationals Seashore
106	Rebuild the Harrison County boardwalk with concrete to accommodate pedestrians, BICYCLES, and possibly street vendors.
107	Provide inland marine vessel storm shelter location with adequate moorings.

Table 10.

Harrison County Stakeholder Input: Public Workshops

108	Restore grassbeds in MS Sound
109	Retention/Detention basin to hold runoff while waiting for surge to go down from Brickyard Bayou.
110	Surge gates along Biloxi Bay to help ease drainage areas during storm events
111	Wiers (low level dams) within estuaries to control water flow
112	Purchase riparian buffers, wetland areas.
113	Reconsider dioxin cleanup on navy base post Katrina.
114	Long Beach Interior Drainage HSDR (includes ôCanals 2 - 3)
115	Reduce toxic exposure which exacerbates storm damage – Dioxin, Creosote, Titanium Dioxide, Gypsum.
116	Turkey Creek watershed Greenway
117	Forrest Height Levee :- Restore; Vegetate with native species; Footbridges; Nature trail atop
118	Dredge shoaled channels hinfering storm evacuation
119	Dredge shoaled marinas

Table 11.

Harrison County Stakeholder Input: Additional Input from Regional Workshops

Item#	Name
120	Deer Island re-nourishment of south side.
121	Provide protection of public infrastructure from flooding, surges and sedimentation.
122	Possibly add height to the existing beach elevation and redevelop lost dune vegetation.
123	Flood-proof low-lying sewer treatment plants. Lift stations and wells and their electrical and electronic controls.
124	Construct reservoir or detention system to provide storage for rain events to reduce or prevent flooding along coastal rivers.

Table 12.

Jackson County Stakeholder Input: Study Team Coordination

125	West End Landing Coastal Erosion
126	Front Beach Blvd. Ecosystem Restoration and Erosion Control
127	Front Beach Road Wetlands
128	Shearwater Bridge Erosion Control
129	East Beach Road Ecosystem Restoration
130	Belle Fontaine Marsh
131	Pascagoula Beach Blvd. Restoration
132	Beach Park Storm Damage Reduction
133	Beach Boulevard Erosion Control
134	Pascagoula Breakwater HSDR
135	Chicot Road Flood Damage Reduction
136	Monster Ditch/Ocean Springs Flood Damage Reduction
137	West Bayou/Rhodes Bayou Flood Damage Reduction
138	Upper Bayou Cassotte Flood Damage Reduction
139	Biloxi Back Bay
140	Davis Bayou Ecosystem Restoration
141	Grand Batture Island Ecosystem Restoration
142	Greenwood Island Ecosystem Restoration
143	West Pascagoula Delta Flood Damage Reduction and Ecosystem Restoration/Study
144	Jackson County Marsh Outlet Ecosystem Restoration
145	Upper Old Fort Bayou Comprehensive Flood Damage Reduction
146	Old Spanish Trail Comprehensive Flood Damage Reduction/Drainage
147	Old Spanish Trail Comprehensive Flood Damage Reduction
148	Old Spanish Trail Comprehensive Flood Damage Reduction
149	Gautier Hurricane Storm Damage Reduction and Ecosystem Restoration
150	Franklin Creek Floodplain Restoration/Franklin Creek and Pecan Hydrology Project
151	Gautier Hurricane Storm Damage Reduction and Ecosystem Restoration
152	Gautier Hurricane Storm Damage Reduction and Ecosystem Restoration/Ladnir Rd

Table 13.

Jackson County Stakeholder Input: Regional Coordination Workshops

Item#	Name
153	Bayou Chico Beach HSDR/Bayou Chico Bulkhead Rehabilitation
154	Round Island Ecosystem Restoration/Round Island Lighthouse Relocation
155	Upper Old Fort Bayou Comprehensive Flood Damage Reduction/C. Byrd Road Drainage
156	Upper Old Fort Bayou Comprehensive Flood Damage Reduction/C. Byrd Road Drainage
157	Pascagoula beaches, offshore breakwater/dunes/reefs/marshes to dissipate wave energy
158	Restore natural drainage ways upper Bayou Castelle (vic Fishhawk Rd, Meadow Dale Dr., Longwod Dr, and Bayou Castelle Dr)
159	Restore natural drainage ways upper Sioux Bayou (vic Laville Subdivision and Westgate Subdivision)
160	Restore natural drainage ways upper Mary Walker Bayou (vic Northwood Hills, Rolling Meadows, and Bayou Oaks subdivisions)
161	Robert Hiram Bridge (Gautier) Hurricane evacuation route. Wetlands restoration, drainage
162	Graveline Rd Bridge at Shepard St Park (County)
163	W River Delta restoration. Bulkhead western channel. Beneficial use. Wave protection for subdivisions.
164	Bennett Bayou tidal marsh restoration
165	Pascagoula Beach Restoration. Dunes, grasses, trees, with intermittent pockets of sand beach
166	W Land Lake Pascagoula. Dredge to recover retention qualities and install new drainage pipes to north.
167	New Drainage Channel West Side of Martin Rd Bridge
168	Study same as 58
169	11th St Bridge and Drainage Canal. Bridge is failing and canal walls are caving in.
170	Drainage improvements - same as 166
171	Old Mobile Hwy Bridge Failing
172	Bridge at Old Mobile Highway and Hospital Road is damaged
173	Restore Bates St Drainage to Open Water
174	Inspection & Rehabilitation of Sewer and Storm Piping for Pascagoula
175	Relocate Pascagoula WWTP out of surge area
176	Re-establish benchmarks Pascagoula city-wide
177	Pascagoula brown water system study
178	Pascagoula Beach Blvd. Restoration (Boardwalk, beach, and marsh addition along Pascagoula front beach)
179	11th St Bulkhead Rehab
180	Pascagoula main drainage system restoration including additional wetland side storage. City-wide retention/detention system. Drain barrier valve system.
181	C. Byrd Road Drainage

Table 14.

Jackson County Stakeholder Input: Public Workshops

Item#	Name
182	Ebb and flow of Intracoastal veins from the MS Sound to rebuild property with the erosion in the bayous near potential project #66.
183	Use jetties to prevent sediment flow clogging channels
184	Cedar Point/West River-Restore beaches, sand, work, sediment management in this area
185	Ecosystem restoration along Hwy 90, Jackson County
186	Dredge/clear area in front of beachfront outfalls.
187	Hydraulic lifting boardwalk/sidewalk as component of seawall/boardwalk improvements.

Table 15.

Jackson County Stakeholder Input: Additional Input from Regional Workshops

188	Improve the Jackson-county seawall. Provide additional county-wide seawall construction, boardwalks, beach construction, marsh construction, or a combination of these elements
189	Gautier improvements to drainage. Same as B.
190	Gautier, drainage improvements. Same as C
191	Bayou Outlets on the Mississippi Sound that require actions to remove deposited siltation
192	Gautier improvements to drainage. Same as D.
193	Dredge Davis & Simmons Bayous to include all connecting bayous to help prevent flooding.
194	Rebuild and enlarge Marsh Island
195	Divert water from Escatawpa River into Bayou Cumbest to restore freshwater flow to the bayou and improve water quality.

Table 16 presents a synopsis of system-wide and county problems and related needs identified by stakeholders during the workshops and public meetings. These problems and related needs are the basis for the plan formulation process.

Table 16
Examples of Stakeholder Input: Coordination with Local Communities

Stakeholder Identified Problems	Stakeholder Identified Needs
• Loss of life and human injury due to ineffective communication • Insufficient capacity at storm shelters	• Coastal Mississippi Hurricane Evacuation Plan
• Storm surge damages and environmental degradation due to development in low lying areas	• Wetland Area Buyouts
• Erosion and intrusion of salt water	• Barrier Island Restoration • Restore or enhance Mississippi Oyster Reefs • Freshwater Diversion
• Erosion and storm damage	• Widen beaches, jump start dunes (Hancock, Harrison, and Jackson Counties)
• Storm surge flooding caused damage to structures and infrastructure	• Provide protection for public facilities • Surge gates along Biloxi and St Louis Bays • Seawalls, levees and ring levees (Forrest Heights Levee, etc.) • Hurricane and Storm Damage Reduction at population centers (Gautier, Ocean Springs, etc.) • Flood proof Existing Infrastructure
• Storm surge caused sedimentation in wetland areas	• Restore wetland functions (Grand Bay Swamp, Hancock County Marsh, etc.) • Restoration of Pine Savannah • Complete snagging and clearing to increase flood water conveyance

Additional details on specific problems are provided within the appropriate appendices. For storm damage reduction and erosion control formulation and screening processes, these discussions are contained in the Engineering Appendix. For ecosystem restoration and saltwater intrusion reduction formulation and screening processes, these discussions are contained in the Environmental Appendix. The results of each evaluation and screening process are summarized in the following chapters, and are presented as a Comprehensive Plan of "tentative recommendations" in the Main Report.

2.2 Opportunities

Comprehensive, ***system-wide opportunities*** were identified during the MsCIP planning process to guide the development and evaluation of solutions to the region's water resource problems. An overall theme of Comprehensive Plan opportunities is not merely to reverse the harm done by the hurricanes of 2005, but as importantly to promote the long-term future sustainability of physical, human, and environmental resources within the study area. Comprehensive, system-wide opportunities include:

- Assist in sustainable redevelopment of hurricane damaged physical, environmental, and human resources within the MsCIP study area;
- Reduce the susceptibility of residential, commercial, and public structures and infrastructure to hurricane induced storm damages within the three-county (Hancock, Harrison, and Jackson) MsCIP study area;
- Assist in the recovery and long-term sustainability of coastal wetlands that support important fish and wildlife resources within the study area;
- Accelerate the recovery and assist in the long-term sustainability of maritime forest environments that suffered hurricane induced damages;
- Restore barrier island environments that suffered hurricane induced storm damages in a manner that promotes long-term sustainability of their fish and wildlife resources;
- Reduce saltwater intrusion within the Mississippi Sound coastal environment;
- Assist in the recovery of coastal ecosystems and infrastructure damaged by erosion during the hurricane events of 2005 and support programs that promote long-term erosion reduction and limit erosion potential during future hurricane events.

2.3 Planning Goals and Objectives

In response to the Federal Goal, as established by Congress, the following goals were established for the MsCIP by the Corps of Engineers Project Development Team (PDT), cooperating agencies and affected public. The system-wide goals established for this study were developed in clear recognition of the linkages between structural and nonstructural storm damage reduction and ecosystem restoration opportunities. System-wide goals are intended to address the coastal landscape of the entire Gulf Region, including the area specifically evaluated in the LaCPR program. MsCIP system-wide goals identified in the Comprehensive Plan effort include the following:

- Identify measures to minimize risk to loss of life and safety caused by hurricane and storm surge;
- Recommend cost-effective measures for restoration of nationally and regionally significant environmental resources within a context of long-term sustainability;
- Recommend cost-effective measures to reduce damages from hurricanes and storms without encouraging re-development in high-risk areas;
- Recommend cost-effective measures to mitigate damages caused by saltwater intrusion into nationally significant ecosystems;
- Recommend cost-effective measures to restore eroded coastal resources as part of a system-wide approach to develop a resilient coastline;
- Identify other water resource related programs and activities integral to the development of a comprehensive system-wide plan.

The system-wide objectives established for this study provide specific targets to measure progress towards achieving the comprehensive goals outlined above. Projects formulated as part of the Comprehensive Plan were evaluated based on their ability to contribute to achieving the targets established in these objectives. System-wide objectives include the following:

- Reduce loss of life caused by hurricane and storm surge by 100%;
- Reduce damages caused by hurricane and storm surge by \$150M-\$200M annually;
- Restore 10,000 acres of fish and wildlife habitat including coastal forests, coastal wetlands, wet pine savannah, submerged aquatic sea grasses, oyster reefs, and beaches and dunes by the year 2040;
- Manage seasonal salinities within the western Mississippi Sound such that optimal conditions for oyster growth (surrogate for other aquatic resources, 15 ppt during summer months) are achieved on an annual basis by 2015;
- Reduce erosion to barrier islands, mainland, and interior bay shorelines by 50%;
- Create opportunities for collaboration with local, state, and Federal agencies to facilitate implementation of programs and activities that maximize the use of resources in achieving the comprehensive goal.

2.3.1 Planning Considerations: Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.* The EO is designed to focus attention of Federal agencies on the human health and environmental conditions in minority communities and low-income communities. Environmental Justice Analyses are performed to identify potential disproportionately high and adverse impacts from proposed actions and to identify alternatives that might mitigate these impacts.

2.3.1.1 Historic and Existing Conditions

Data from the U.S Department of Commerce, Census of Population and Housing were used for this Environmental Justice analysis. The population in 1990 for Mississippi was 2,573,216. Minority populations included in the census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, Hispanic, of two or more races, and other. Mississippi is only second to the District of Columbia as having the largest Black or African American population. Poverty status, used in this coastal Mississippi report to define low-income status, is reported as the number of persons with income below poverty level. The 2005 Census defines the poverty level as \$9,973 of annual income, or less, for an individual, and \$19,971 of annual income, or less, for a family of four. In 2005, Mississippi ranked number one out of the 50 states for individuals living below the poverty level in the past 12 months. Unfortunately, Mississippi had 21.3% of its population living in poverty in 2005.

Coastal Mississippi has a lower percentage of minority residents than the State of Mississippi and the U.S. In 2000 (the most up-to-date data available), 79.6 percent of the population was white and 16.3 percent was black. All other racial groups combined totaled approximately 4.1 percent of the population, while 2.2 percent were of Hispanic origin. In Mississippi, 61.4 percent of the population was white, 36.3 percent was black, 2.3 percent was of another minority racial group, and 1.4 percent was of Hispanic origin. For the U.S., 75.1 percent of the population was white, 12.3 percent was black, and 12.6 percent was of other minority racial groups. Approximately 12.5 percent of the U.S. population was Hispanic.

The Census Bureau bases the poverty status of families and individuals on 48 threshold variables, including income, family size, number of family members under the age of 18 and over the age of 65, and amount spent on food. In 1997, approximately 14.6 percent of the residents were classified as living in poverty, lower than the State of Mississippi but slightly higher than the poverty rate for the U.S. as a whole.

2.3.1.2 *Post-Hurricane Conditions*

As of 2006, the population in Mississippi was 2,910,540 – of this 135,940 individuals live in Jackson County, 193,810 live in Harrison County, and at this time a population count for Hancock County was not available. Hurricane Katrina drew focus on the number of residents unable to flee the Gulf coast due to lack of funds. There is a longstanding legacy of unfair and disproportionate harmful exposures to low income, predominantly African American communities in much of Mississippi. Predominantly in the Biloxi area but also in other coastal Mississippi communities, there was a large population of Asian Americans that depended upon fishing for their livelihood. Adverse impacts from Hurricane Katrina have resulted in a large number of these individuals leaving the area.

Environmental Justices have resulted from years of industrial activity and waste disposal practices that hit these communities harder than higher income, predominantly white communities. Impacted areas, such as superfund facilities, are located more often in low-income areas and therefore are at greater risk to post-Katrina exposure. As clean-up proceeds and rebuilding begins, every effort must be made to remedy these environmental injustices through full clean-up, fair rebuilding practices and full partnership with affected communities. Over 30,000 families are being helped through Administration on Children and Families Temporary Assistance for Needy Families (TANF) program by the provision of short-term, non-recurrent cash benefits to families who traveled to another State from the disaster designated States. The hurricane-damaged States of Mississippi, Louisiana, and Alabama also received additional funding for the TANF program to provide assistance and work opportunities to needy families ($69 million for loan forgiveness and $25 million in contingency funds for State Welfare Programs.)

Counties along the Mississippi Gulf coast lost a sizeable share of their white residents and homeowners immediately following Hurricane Katrina, while other Gulf Coast metropolitan areas, especially those that gained residents, experienced little overall shifts in their demographic profiles. Coastal counties of Mississippi, which include Gulfport-Biloxi and Pascagoula metropolitan areas, in contrast to New Orleans, were left with a population that had a larger share of minority residents, a lower level of homeownership, and no significant decline in poverty. In essence, while the poor and less well-off residents of New Orleans bore the greatest brunt of Katrina, the storm had a more egalitarian effect on the population of coastal Mississippi. Our examination of the data for other hurricane impacted areas in the Gulf Coast region reveals that while a great deal of population shifting had occurred, only minor changes have taken place in the race and ethnic, economic and socio-demographic profiles for most of these areas.

Each and every measure or alternative examined in the MsCIP study was evaluated for its potential for adverse impacts to minority and/or low-income populations, in adherence with EO 12898. In no case was there any identified negative impact to any of these communities in regards to human health and environmental conditions, from any proposed actions or projects.

Because no plans for structural or non-structural protection of residences or businesses, either in-place or as acquisition and relocation have been vetted by community leaders or the public at more than a concept level, it is impossible to say whether or not any of these measures, as ultimately acted on over the long-term, would genuinely have a significant effect, either positive or negative, on low-income or minority populations.

In fact, the realities of living in a high hazard area, which grows more hazardous as one approaches the shoreline, will supersede the effect of any plans or projects pursued under any outside authority. The reality is that most low-income populations, some of whom are also minorities, will have a hard time rebuilding in high hazard areas simply due to the cost of homeowners or business insurance, which will be a requirement of the vast majority of lending institutions. In the more than two years since the hurricanes of 2005, the majority of rebuilding has been undertaken by those that can self-insure their homes or businesses, and also afford to rebuild with their own resources, something the vast majority of low income families cannot do. Therefore, the economic nature of communities along the coast of Mississippi is being changed largely by the economics of those that can afford to rebuild and insure their properties, versus those that cannot.

And, while some structural measures might protect areas in which low-income residents might rebuild, those measures would only provide damage reduction for surge events, and not wind. The cost of insurance against wind damage, which would continue to be a requirement of lending institutions, may continue to drive the economics of whether one can or cannot afford to rebuild traditional residences or businesses, within the highest hazard zones.

Non-structural measures intended for acquisition and removal of the most risky structures would tend to affect all residents or businesses located in those zones, low-income and high-income alike. However, well-armored structures, such as high-rise concrete complexes, would advisedly be the most survivable of those that might exist in the most high hazard zones. But, the choice of income level of those that would be able to afford to live in those complexes will also likely be driven by the economics of those that can or cannot afford to do so. Whether or not some of those complexes can afford to contain apartments that have low rental rates, will be a choice of local government, which controls zoning ordnances and land-use and development decisions. Ultimately, the plan adopted for the Mississippi coast will not be a plan forced on them by the Corps or other Federal agencies, but a plan coordinated, discussed, and finally adopted by the numerous entities and individuals that will live with that plan, the residents and local government of coastal Mississippi.

3 DISCUSSION ON TECHNICAL ANALYSES: PLANNING AND ENGINEERING METHODOLOGIES AND APPROACHES

The technical analyses undertaken by the MsCIP study team involved the development of methodologies and application of models, over a broad spectrum of disciplines. These include economics, environmental resources, plan risk evaluation and decision-making, coastal engineering, design and cost estimating, real estate, geotechnical investigations, Geographic Information Systems (GIS) application, saltwater/freshwater interface and saltwater intrusion remediation analysis, erosion and sediment transport analysis, sediment source analysis, hydrology and hydraulics, public involvement, and plan formulation.

Details on each of these technical functions and evaluative efforts are given in each of their respective appendices; however, a general discussion of the process each engaged in, in the development of measures and alternatives, is provided in following sections of this report.

3.1 Planning Models

Planning models used in the development, evaluations, and screening of measures, are provided in Table 17, below. A more complete discussion on all the models used throughout this study, as well as quality control and quality assurance procedures can be found in the Modeling Appendix.

Table 17.

MsCIP Planning Models

Model	Description/Purpose	Use in MsCIP
Spatial Decision Support System (SDSS)	GIS based decision system to identify & evaluate potential sites	Selection of potential Wetland restoration sites
AL/MS Gulf Coast Tidal Fringe Hydrogeomorphic Model (HGM)	Perform functional assessment of tidal fringe wetlands	Evaluate positive/negative impacts to tidal fringe wetlands
MS Wet Pine Savannah HGM Model	Perform functional assessment of wet pine savannah habitats	Evaluate positive/negative impacts to wet pine savannah habitats
Functional Habitat Unit (FHI) Spreadsheet	Assess the environmental Values of beach and dune habitat	Evaluate positive/negative impacts to beach and dune habitats

3.2 Environmental Resources Analysis and Evaluation

The analysis of existing and future "without-project" resources, and the development, evaluation, and screening of measures and alternatives dealing with ecosystem degradation and restoration, are discussed in general terms below, and in more detail in the Environmental Appendix.

The environmental team initially defined the overall comprehensive natural system and its condition after the hurricane season of 2005. This detailed discussion is found in Chapter 1 of the Environmental Appendix. A comprehensive list of ecosystem-related problem areas consisting of single or multiple problems associated within a given site was compiled with assistance from members of the public, state, local, and other Federal agencies, representatives of industry and commerce, and resource agencies concerned with study area resources, at a series of open meetings and on-site meetings. These areas were first identified as having been caused or exacerbated by the 2005 hurricane events identified with: a) coastal erosion; b) damage to fish and wildlife resources; and c) saltwater intrusion. The vast areas initially identified for study of ecosystem damage are shown in Figures 2 - 4. The areas are color designated based on their ability to be restorable. The red designation shows areas that are highly likely to be able to be restored to their historical habitats and in contrast the blue designation shows areas that are possible but very difficult to be able to be restored.

After an initial screening of problem areas to determine their link to the hurricanes of 2005, a list of potential problem-solving measures was developed for each problem area. This list of problem areas and sites damaged by the hurricanes of 2005 was then screened based on the input of the inter-disciplinary study team's understanding of each site's ability to either heal on its own, unaided by human intervention, or:

- by its national and/or regional significance in regards to the type of ecosystem it represents;
- the need for assistance to restore vital hydrologic links;
- the need to manually remove blockages created by hurricane-deposited debris that was impacting function;
- the need to remove excess sediment deposited by the hurricanes that had changed the nature of the land's surface and resulted in degraded function and value;
- the need to remove invasive species that had entered the area since the hurricanes and caused displacement of native plant species (and potentially wildlife depending on native species), degrading function of the ecosystem; or

- the need to plant native species vital to restoration of a significant ecosystem and restoration of its functions and values.

The following four models were utilized by the MsCIP environmental PDT to evaluate existing and future without-project conditions within the three-county study area:

- Mississippi and Alabama Gulf Coast Tidal Fringe Hydrogeomorphic (HGM) model;
- Wet Pine Savannah HGM model,
- SDSS; and
- Functional Habitat Index (FHI) Model.

The methodology used for riparian and coastal wetlands is the HGM, developed by the USEPA, NOAA, Corps, and USFWS, calibrated for wetlands ecosystems found in coastal Mississippi, as used in many prior studies (Schaffer 2007). HGM is a science-based quantitative and replicable methodology that establishes functions ands values at a variety of sites and reference points that are then used to establish functional values for sites within the area be analyzed. HGM was applied at a landscape-level, using numerous reference sites in the area in the establishment of without-project conditions. The HGM model was used for the functional assessment of tidal fringe wetlands and wet pine savannahs within the study area.

Because HGM has not been calibrated for use in coastal maritime forest analysis in this area, an alternative methodology was used for the small number of beach, dune, and/or coastal maritime forest sites evaluated. The methodology chosen for this application was FHI. Functional production was quantified as an output that the fauna could potentially use. Functions evaluated in the matrix included substrates, habitat types, stabilization, and vegetation. In order to reduce subjectivity, the output was identified as an indirect or direct benefit. The "No Action" effort for a given project still has a FHI score even though there is no work proposed for the area. The FHI tables quantify expected biological output by linking biophysical benefits (termed functions) to specific restoration activities. The term biophysical, in this case, refers to the living and non-living components and processes of the ecosphere. Adding all of these outputs together from the table, and then multiplying by the acreage, provides an FHI score. A FHI model was used in the assessment of existing and future without-project conditions for coastal dune environments. This model is based on collaboration between resource agencies involved in past restoration projects.

The SDSS tool allowed the Corps, Mobile District, working in cooperation with the USFWS and MDMR, to identify and prioritize potential wetland restoration areas throughout coastal Mississippi. A subset of potential restoration sites were identified by the SDSS tool and then ground-truthed by the MsCIP environmental team, including ERDC, Corps, MDMR, and USFWS. This interagency team allowed us to both confirm the accuracy of the SDSS results and to collect additional on-site information pertinent to restoration efforts. There are some major benefits in using the SDSS approach to wetland restoration. First, it allows for the relatively rapid assessment of the large number of restoration sites across the wide study area. Second, potential sites can be evaluated and restored in a watershed or landscape context, which allows us to comprehensively evaluate the overall natural system. This approach can maximize the benefits of wetland restoration, as opposed to simply restoring wetlands where convenient or where property is available. Essentially use of this SDSS tool allowed the MsCIP environmental PDT to assess the entire coastline as a holistic natural system; thus, the team was more effectively able to analyze needs in coastal Mississippi.

The SDSS effort resulted in the following products:

1. A Model Builder based SDSS tool, which can be subsequently edited and applied to other areas along coastal Mississippi in the future as funding becomes available;

2. Maps, such as aerial photography, topographic, soil layers, etc., depicting areas in the study region that have a high probability of being successfully restored into wetland functions that buffer and/or store stormwater, and provide suitable habitat for fish and wildlife; and
3. Photograph documentation and data sheets containing information on ground-truthed potential restoration sites.

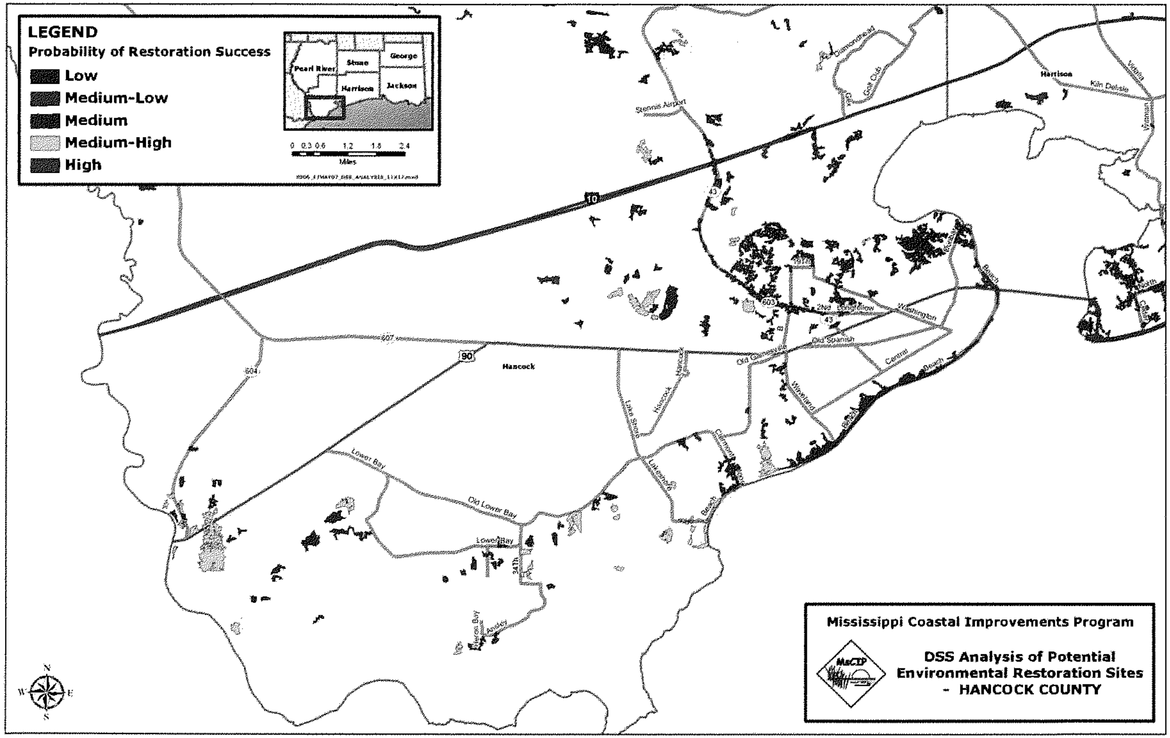


Figure 2. Hancock County Ecosystem Resources

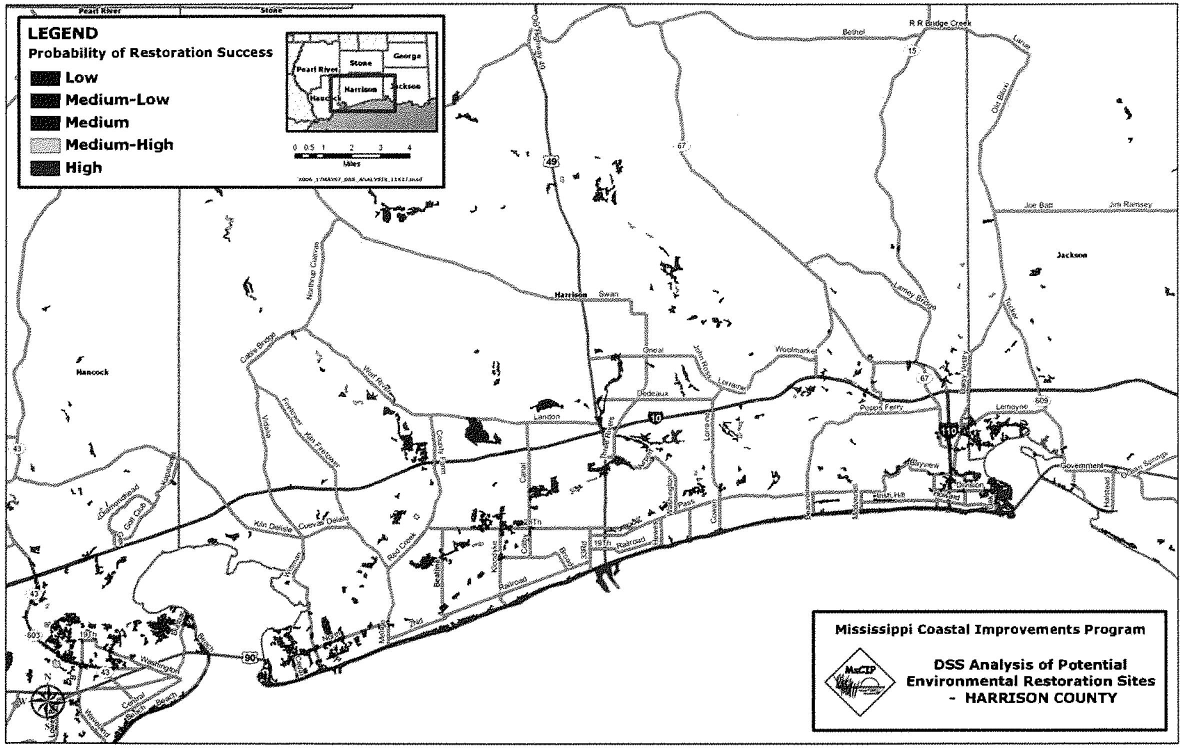


Figure 3. Harrison County Ecosystem Resources

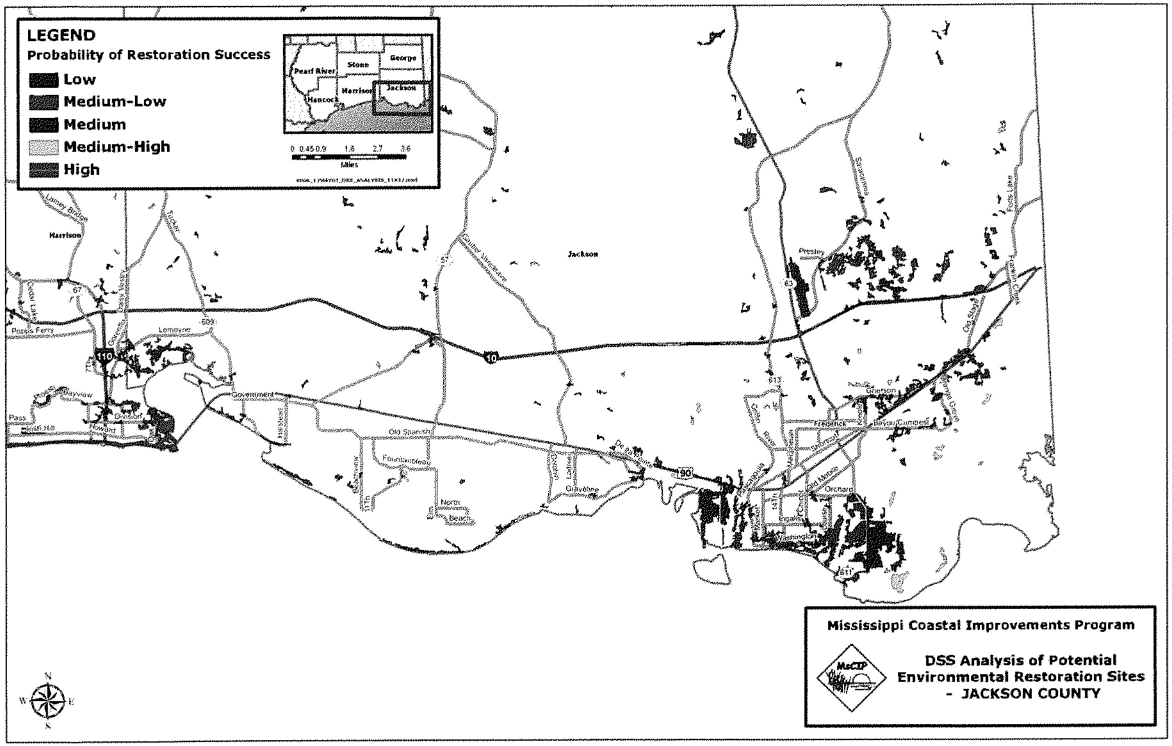


Figure 4. Jackson County Ecosystem Resources

A FHI model was used in the assessment of existing and future without-project conditions for coastal maritime/beach-dune environments. This model is based on its use in the Corps' 2003 Section 204: Beneficial Use of Dredged Material at Deer Island, Harrison County, Mississippi Combined Planning and Design Report. The end product of the without-project conditions analysis was a set of functional scores for each problem area or site, which are presented in the Environmental Appendix.

A cost-effectiveness analysis was conducted for each of the measures and alternatives that were formulated for ecosystem restoration. The analyses followed the methodologies established in the Corps Institute for Water Resources (IWR) publications, Evaluation of Environmental Investment Procedures Manual, Interim: Cost-Effectiveness and Incremental Analyses, May 1995, IWR Report #95-R-1 and Cost Effectiveness Analysis for Environmental Measuring: Nine Easy Steps, October 1994, IWR Report 94-PS-2. The nine steps outlined in the cited IWR report have become the standard practice for identifying what are known as "Best Buy" ecosystem restoration measures, or those measures that yield the greatest 'bang for the buck' at various levels of output.

The IWR Measure model was developed based on these nine steps and is the preferred Corps model for the evaluation for ecosystem restoration measures. For the MsCIP Comprehensive Report and Integrated Programmatic EIS, Congressional Authority stated, "...but shall not perform an incremental benefit-cost analysis to identify the recommended project...." Following this authorization, only the first five steps of the nine easy steps, which are bolded below, were used in the IWR Plan evaluation, resulting in the identification of cost-effective plans for restoration purposes. The nine steps are:

- Formulation of combinations:
  Step 1 - Display Outputs and Costs
  Step 2 – Identify Combinable Management Measures
  Step 3 – Calculate Outputs and Costs
- Cost-Effective Analysis:
  Step 4 – Eliminate Economically Inefficient Solutions
  Step 5 – Eliminate Economically Ineffective Solutions
- Development of Incremental Cost Curve
  Step 6 – Calculate average costs
  Step 7 – Recalculate average costs for additional output
- Incremental Cost Analysis:
  Step 8 – Calculate incremental costs
  Step 9 – Compare successive outputs and incremental costs

3.3 Engineering Analyses

This section describes in very general terms the methods used to evaluate various elements and attributes of a "lines of defense concept". This concept involves multiple lines that include structural, environmental, and nonstructural features to accomplish the planning objectives. The lines are arranged in increasing levels of risk reduction from off-shore to in-shore up to the maximum possible intensity storm event that the team evaluated as possible for coastal Mississippi. This concept would utilize existing barriers such as the barrier islands, roadways, and railroad embankments as shown in Figure 5. Detailed descriptions of objectives, methods, and results are described in the Engineering Appendix.

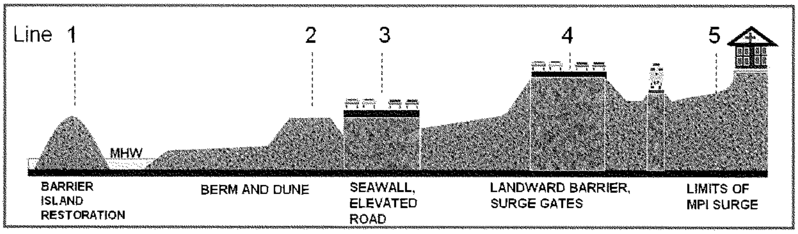


Figure 5 Lines of Defense Concept

3.3.1 Coastal Process Modeling

The purpose of this analysis is to evaluate the physical performance of the beach and dune system for anticipated future without-project and alternative with project conditions and to estimate the economic costs and benefits of each. The coastal processes modeling analysis employed the engineering-economic model Beach-fx (Gravens et al. 2007). Beach-fx relies on a shore response database to evaluate the beach and dune line of defense (line of defense two). The beach and dune analysis was evaluated considering the environmental forcing as characterized by plausible variants of the 71 historical tropical storm events that impacted the study area between 1886 and 2001.

The models applied to evaluate beach profile response to storms and project induced shoreline change are SBEACH (Larson and Kraus 1989) and GENESIS (Hanson and Kraus 1989). SBEACH is a numerical model for simulating storm-induced beach change that has been applied at numerous projects. SBEACH takes as input the storm time series (wave heights, wave periods, and total water elevations) and the initial profile definition, as well as other descriptors of the beach (e.g., grain size) and model parameters, and produces as output, the estimated beach profile at the end of the storm, as well as cross-shore profiles of erosion, maximum wave height, and total water elevation including wave setup. This information is extracted from the SBEACH output by post-processing routines and stored in the shore response database (SRD). The storm time series input is derived from a pre-computed surge response database developed by the Dredging Research Program (DRP) and the Wave Information Studies (WIS) database.

3.3.1.1 Hurricane Surge Modeling

A team of Corps of Engineers, FEMA, NOAA, private sector and academic researchers have been working toward the definition of a new system for estimating hurricane inundation probabilities. The findings and recommendations of this Risk Assessment Group are documented in a White Paper on Estimating Hurricane Inundation Probabilities (Resio 2007). The approach recommended by the group was a modified Joint Probability Method (JPM) referred to as the JPM with Optimal Sampling (JPM-OS). Generally, the approach involves wind and pressure field analysis and modeling; offshore and nearshore wave modeling, and storm surge modeling. For a full description, see Resio (2007). The general modeling approach is illustrated in Figure 6.

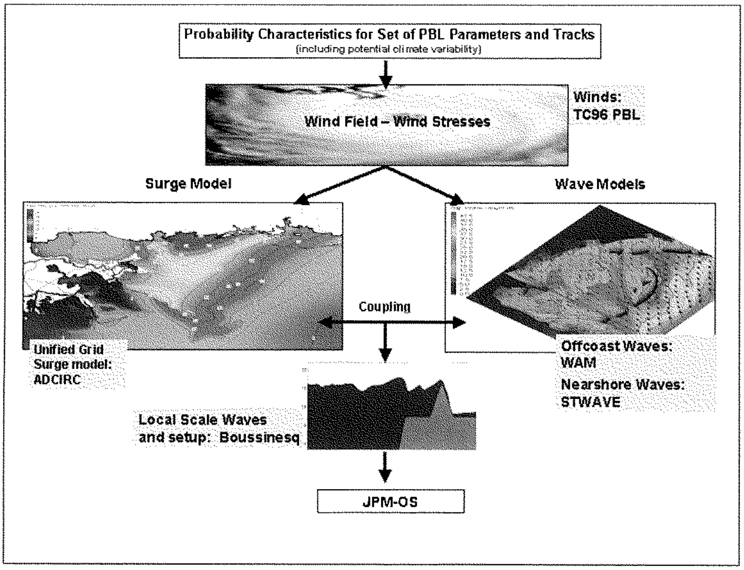


Figure 6. Diagram of modeling system for coastal inundation applications

Tropical cyclone surface wind and pressure fields were computed using the Planetary Boundary Layer Model, a.k.a. the TC-96 model. The wind and atmospheric wave fields were applied in (a) STWAVE to generate offshore and nearshore wave spectra and (b) ADCIRC generate bulk sea surge identities. These models were used iteratively to account for nearshore radiation stress transformation, and the resulting surge stage signature was modified for local shore feature effects based on limited application of the Boussinesq model COULWAVE.

Resulting storm surge surface envelopes were statistically sampled to derive surge stage-frequency relationships at a number of locations along the Mississippi Coastline. These relationships describe the stage for events with an annual chance of occurrence between 1 in 25 (or 4%) and 1 in 1000 (0.1%).

3.3.1.2 Stage-Frequency Curves

Stage-frequency curves are a foundational product for the present storm damage reduction design and analyses. The stage-frequency curves are the primary engineering inputs to economic flood damage analyses, and represent the static water surface elevation for non-structural flood damage reduction measures and levee crest height determination.

Stage-frequency curves describe the annual chance of occurrence of the surge still water elevation. The curves are composite curves, composed of both observed information (USACE tide gage observations at Gulfport, Biloxi, and Pascagoula) for more common events, and synthetic information (surge envelopes derived from statistical analysis of historic storm properties and imposition of those properties on the coastal environment through hydrodynamic wave and surge models) for more rare events. The composite and synthetic portions of the curves were joined graphically. Given the focus on hurricane surge damage Curves were developed for 62 locations in the vicinity of the coastline, and another 18 locations in Mississippi Sound in the vicinity of the Barrier Islands. Stage frequency curves with uncertainty were developed for the without project condition; for the Line of Defense 3 condition; and for the Line of Defense 4 condition.

Uncertainty to plus and minus one standard deviation about the observed portion of the stage-frequency curves were developed using the method of order statistics. Uncertainty to one standard deviation about the synthetic portion of the stage frequency curve was based on a Gumbel distribution. Uncertainty limits were also joined graphically.

3.3.1.3 Flood Damage Reduction Analyses

The Hydrologic Engineering Center's Flood Damage Analysis (HEC-FDA) program uses risk and uncertainty analysis methods for evaluating flood damage and flood damage reduction alternatives. The program relies on hydrologic, hydraulic, and economic data input. Uncertainties in these data are input and used by the model for computing expected annual damages. Version 1.2.3b dated August 2007 was used. This is a customized version of the modeling platform which provides for input of user-specified stage-frequency uncertainty. The Engineering Appendix describes the model and its application.

FDA models were developed for each coastal Mississippi County: Hancock, Harrison, and Jackson counties). Each county represents a planning unit, and each was further delineated into planning sub-units (PSU). There are ten PSU's in Hancock County, 19 in Harrison County, and 26 in Jackson County.

3.3.1.4 Levee Crest Elevation Determination

Levee heights were initially established based on interpretation of early hydrodynamic model output. A range of heights were conceptually designed and cost-height function was developed. The adequacy of a given levee height is related to social acceptability, cost-effectiveness, the desired level of protection, and local hydraulic and geotechnical performance requirements.

Hydraulic performance for purposes herein is predicated on limiting the average overtopping flow rate to a given threshold. The adopted threshold, based on application of limited mean estimates of coincident frequency significant wave height, peak period, and still water elevations, is 0.01 cubic feet per second per foot of levee. Wave heights, periods, and still water surface elevation frequency functions were provided by ERDC based on the hydrodynamic modeling program output. Such estimates are based on consultation with New Orleans District and are considered preliminary in accordance with draft levee certification regulations. Where required, wave properties are translated to the levee toe using the CEDAS program, which is also used to determine the required crest freeboard above the still water elevation for overtopping. Hydraulic performance evaluations are ongoing and are contained in Section 2.14 of the Engineering Appendix.

3.3.1.5 Regional Sediment Budget

This study evaluated the existing regional sediment transport magnitudes and directions for the Mississippi and Alabama barrier islands fronting Mississippi Sound and the mainland coast, including an analysis of historical long-term barrier island migration. A conceptual sediment budget was developed through a review of existing studies and is included in Section 2.12 of the Engineering Appendix. This budget formed the framework for the historical and calculated sediment budgets. Next, a historical sediment budget was developed through analysis of bathymetric and shoreline position change through time in consideration of engineering activities (navigation channel construction, etc.) and significant storm events were also documented. A calculated sediment budget was developed based on STWAVE and GENESIS modeling for the Gulf and Bay shorelines of the barrier islands as well as the mainland coast. The final sediment budget was formulated from all these intermediate budgets.

3.3.1.6 Wetlands, Landscape Features, and Storm Surge

A literature review that documents studies that have measured and modeled storm surge elevations with the goal of understanding how landscape features and vegetation modify the surge elevation was conducted. A sensitivity study of a degraded and restored Biloxi marsh utilizing STWAVE was also performed.

3.3.1.7 Interior Drainage

Drainage on the interior of the ring levee would be collected at the levee and channeled to culverts placed in the levee at the locations shown above. The culverts would have flap gates on the seaward ends to prevent backflow when the water in Mississippi Sound is high. An additional closure gate would also be provided at every culvert in the levee for control in the event the flap gate malfunctions. A typical section is shown below in Figure 7.

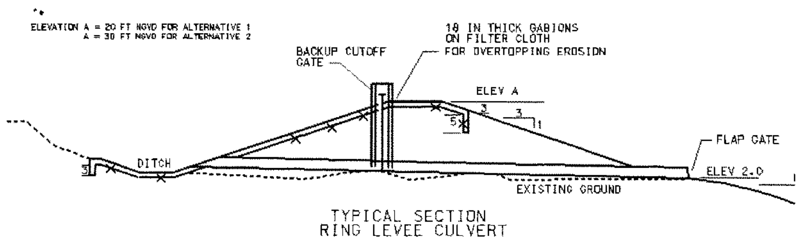


Figure 7. Typical Section at Culvert

In addition, pumps would be constructed near the outflow points to remove water from the interior during storm events occurring when the culverts were closed because of high water in the sound.

Flow within the levee interior was determined by subdividing the interior of the leveed areas into major sub-basins and computing flow for each sub-basin by USGS computer application WinTR55. The method incorporates soil type and land use to determine a run-off curve number. The variation in soil types, hydrologic soil groups, and major sub-basins was accounted for.

Peak flows for the 1-yr to 100-yr storms were computed. Levee culverts were then sized to evacuate the peak flow from a 25-year rain in accordance with practice for new construction in the area using Bentley CulvertMaster application. During periods of high water in Mississippi Sound, pumps would be required to evacuate rainfall. Pump sizes were determined for the peak flow resulting from a 10-yr rainfall based on an evaluation of rainfall observed during hurricane and tropical storm events as presented in two sources. The first is "Frequency and Areal Distributions of Tropical Storm Rainfall in the US Coastal Region on the Gulf of Mexico" US Dept of Commerce, Environmental Science Services Administration, ESSA Technical Report WB-7, Hugo V Goodyear, Office Hydrology, July 1968. The second is "National Hurricane Research Project Report No. 3, Rainfall Associated with Hurricanes (And Other Tropical Disturbances)", R.W. Schoner and S.

Molansky, 1956, Weather Bureau and Corps of Engineers. This decision was also based on coordination with the New Orleans District.

During some hurricane events, when the gates are shut, and rainfall exceeds the average 10-yr intensity over the basin, some ponding from rainfall will occur. Detailed modeling of all the interior sub-basins for all the areas was not possible for this report; therefore the exact extent of the ponding for extreme events is not precisely defined. The design rationale is based on the minimum facility concept, and economic tradeoffs between induced flooding and pumping provisions were not examined. Further studies will detail the requirement for the appropriate ponding areas, pump sizes, or buyouts in the affected areas.

3.3.1.8 Structural Damage Reduction - Engineering

Hurricanes are commonly recurring hazards for coastal Mississippi. The central Gulf coast region has one of the highest rates of occurrence in the U.S. Development along the Mississippi coastline at relatively low elevations in many areas has created a landscape that is highly susceptible to storm damage. The two bays that divide the coastline of the three counties also aggravate the potential for inland flooding due to storm surge. The influence that landfall location for hurricanes may impart on storm surge is based on physical reasons and dictates why western Mississippi might register higher stages for a given hurricane than elsewhere along the Mississippi Coast. While the central coast of Mississippi has the highest topography, major hurricanes such as Camille in 1969 and Katrina in 2005 still produced surges that devastated this highly developed area. Approximately half of the coast of Mississippi including all of Harrison County has man-made beaches with high-value real estate immediately landward of the beaches. Essentially all of the structures facing the Sound were completely destroyed in Katrina.

Sea level rise and land surface subsidence have been taken into account as part of this study and the two together are reported as "relative sea level rise", which accounts for both as a single value. Both factors play into the gradual rise in sea level compared to the land surface, over the period of analysis, or planning horizon.

The MSCIP Study incorporated many geotechnical considerations into the structural and environmental appendices of the report. All embankments in support of the various lines of defense were modeled for alignment footprint and quantities using Microstation CADD 3D and INROADS software. The basic design templates assumed side slopes of 1 vertical to 3 horizontal with a 15 foot crest for normal embankments and some greater than 75 feet in support of major roads. Access through the levees was provided by earthen ramps where the embankment heights were small relative to the existing ground and a small elevation gradient could be accommodated. Areas where the levee height differentials were too great or site conflicts prevented access ramps, then tunnels with closure gates were provided. All utility removals and reinstallations excavations were incorporated into the cost estimate for the individual feature. Materials to be used in the embankment and levee structures were assumed to be obtained from commercial sources with 10 miles of any given project. No formal geotechnical investigations were performed for this study. Geotechnical investigations will be performed for any project carried forward for feasibility design.

3.4 Non-structural Analysis

The nonstructural analysis for this study was performed as directed by Section 73 of the WRDA of 1974, and as prescribed in ER1105-2-100 and the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (March 1983). Section 73 specifically requires consideration of nonstructural alternatives in all flood damage reduction studies. These alternatives can be considered independently or in combination with other measures.

All nonstructural measures reduce flood damages without significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the use made of the floodplains, or by accommodating existing uses to the flood hazard. Examples are flood proofing, relocation of structures, flood warning and preparedness systems (including associated emergency measures), and regulation of floodplain uses.

The foundation of the technical analyses for nonstructural formulation was based upon five primary sources of data and associated models:

1) Tax assessor's databases from the three counties (Jackson, Harrison, and Hancock) that were further refined by the Mobile PDT,

2) FEMA databases for the National Flood Insurance Program that included Flood Insurance Rate Mapping, post Katrina damage assessments and GIS mapping, FEMA's model of the Advisory Base Flood Elevation mapping and associated topographic GIS layers,

3) The FEMA HAZUS model and databases for damageable structures in the project area,

4) Information and data gleaned from NOAA post-Katrina reports, and

5) Information on historic districts and buildings located in the project area from the National Park Service. Other databases from local communities and the US Census were used to describe local conditions, public buildings, housing resources, and current land use regulations (i.e. zoning, NFIP and building codes).

The nonstructural analysis was based in part upon research of proven nonstructural methods applied within coastal areas of the USA and determination of the relative surge inundation and wave hazards of the various coastal areas. Field observations of the damages to elevated and non-elevated structures and community facilities supported several aspects of the formulation process. FEMA data and flood zone mapping for the National Flood Insurance Program and post-Katrina damage reports supplied information on the location and extent of high-hazard flood zones that defined the division between areas suitable (safe) for floodproofing by elevation and those areas only suitable for permanent acquisition.

Several established computer programs were used to collect and analyze the parcel data and GIS mapping from the above sources including Microsoft Excel, Microsoft Access, and ESRI ArcMap Versions 9.1 and 9.2. These computer programs were used to create the database spreadsheets that supported the formulation of the various nonstructural measures and plans as well as the basis for the nonstructural cost models. The ArcMap programs were used to create the nonstructural graphic plans for the various measures and combinations of measures displayed in the Nonstructural Appendix.

The formulation and analysis of applicable nonstructural measures was based upon the Corps' Engineering Regulation 1105-2-100, The Corps Planning Manual (IWR Report 96-R-21), applicable sections of Corps regulations regarding real estate acquisitions (ER 405-1-12 and CFR, Title 49, Part 24) and public buildings and facilities relocations (EFARS Appendix Q - Relocations, Alterations, Vacations and Abandonments October 1984), provisions of the Uniform Act (PL 91-646) and various floodproofing regulations from the FEMA National Flood Insurance Program as well as applicable sections of the Mississippi State Code (Title 17-1-17) regarding local land use, zoning and regulation capabilities.

3.5 Economic Analysis

This section describes the methodology for the evaluation of economic impacts of potential solutions for the Mississippi Gulf Coast under the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Report. It is intended to be an outline of the process used to determine the economic impacts that are fully detailed throughout this report and in the Economic Appendix. The methodology was developed to seamlessly fit into the six step planning process and current Corps guidance. The six step planning process, as defined by the Engineering Regulation (ER) 1105-2-100; Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council 1983), referred to as the P&G, is:

1. Identify Problems and Opportunities
2. Inventory and Forecast Conditions
3. Develop Alternatives
4. Evaluate Alternatives
5. Compare Alternatives
6. Select the Recommended Plan

The Mississippi Gulf Coast is a complex system that is made up of a diverse blend of ecological and human habitats. Given those complexities, a fluid and flexible process was needed to evaluate and aggregate the benefits of potential measures and measures. The process incorporates data collection, forecasting techniques, scenario planning, cost effective evaluation using state of the art modeling techniques, and the communication of both benefits and risks associated with potential measures and measures. Figure 8 outlines the process used for this analysis.

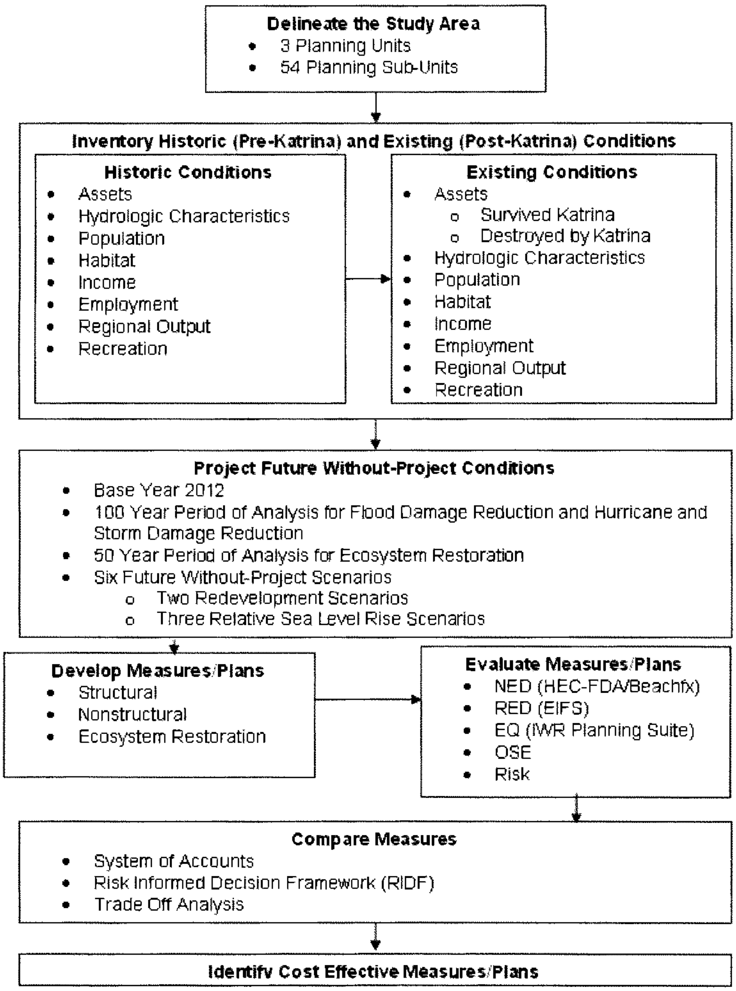


Figure 8. Overview of Economic Methodology

The first step in the process was to delineate the study area. The overarching study area, as defined by Congress, is the three coastal counties in Mississippi; Hancock, Harrison and Jackson from west to east respectively. For purposes of system wide evaluation and aggregating benefits, the study area was divided into four planning zones, three planning units, and fifty-four sub-planning units. These are described in more detail in the following section.

Once the planning zones, planning units, and planning sub-units were identified, the next step was inventorying the economic, social, and environmental characteristics of the area. Data from Local, State, and Federal government agencies was utilized to determine the Historic (Pre-Hurricane Katrina) Condition, including data from the U.S. Census Bureau, the Federal Emergency Management Agency (FEMA), U.S. Fish and Wildlife, the Mississippi Emergency Management Agency (MEMA), the Mississippi Governor's Recovery Office, County Tax Assessors, previously conducted Corps of Engineers studies conducted in the area, and other valuable data sources. Historic data included economic structures (structures, content, and critical infrastructure), social and regional indicators (population, income, and employment), topographic and hydrologic characteristics, acreage of habitat, and etc.

With the historic data serving as a foundation, the next step was to determine the impacts of surge inundation from Hurricane Katrina. The team developed an inventorying methodology that was a combination of sampling and field verification. PDT members drove every street within the fifty-four planning sub-units over the course of four months from June to October, 2006, for purposes of determining the existing (Post-Hurricane Katrina) conditions and characteristics of structures. The findings of this work were put into a structure database that included over 200,000 tax parcels, 138,000 of which contained structures. Hydrologic programming was used to evaluate the surge inundation of each planning sub-unit and a combination of ESRI's ArcMap 9.1 Geographical Information System (GIS) data and ground truthing was used for habitat evaluation.

Six future with-out project scenarios were developed, based on the existing condition characteristics, for the evaluation of future without-project conditions. The six scenarios were evaluated over a 100-year period of analysis from the base year 2012 (2012-2111) and using the FY07 federal discount rate of four-and-seven-eighths (4.875) percent. The six future scenarios include two redevelopment scenarios (residential and mixed-residential and commercial) and three relative sea level rise scenarios (existing sea level, moderate relative sea level rise, and high relative sea level rise) for a total of six different future scenarios. Scenario one is a residential redevelopment with no relative sea level rise over the period of analysis, scenario two is a mixed residential and commercial redevelopment with no relative sea level rise, scenario three is a residential redevelopment with a maximum relative sea level rise depending on location of 2.0-feet over the period of analysis, scenario four is a mixed residential and commercial redevelopment and a maximum relative sea level rise of a 2.0-foot, scenario five is a residential redevelopment with a relative sea level rise depending on location of 3.4-feet, and scenario six is a mixed residential and commercial redevelopment with a maximum relative sea level rise depending on location of 3.4-feet. The detailed evaluation of these scenarios is outlined in the Economics Appendix, and a technical description of the calculation of relative sea level can be found in the Engineering Appendix.

The next step, identified as step three in the planning process, was to develop measures that relate to the planning objectives for this study. A measure is something that can be implemented to directly address a problem within the study area. Some examples of measures include levees and acquisitions for flood damage reduction, beach and dune construction for flood damage reduction and ecosystem restoration, excavation and planting of native species for ecosystem restoration. These measures can be stand alone or may be able to be combined like a system.

For the Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan Report, multiple measures were developed under structural, nonstructural, and ecosystem restoration categories. The project delivery team applied a screening process based on engineering, environmental, and economic feasibility to narrow the list of viable measures.

The result of the screening was a list of measures that were fully evaluated as compared to the future without-project conditions. These measures were evaluated using the four systems of accounts, outlined in ER 1105-2-100, which include National Economic Development (NED) benefits, Regional Economic Development (RED) benefits, Environmental Quality benefits, and Other Social Effects (OSE). Evaluations of the various metrics that make up these four accounts were conducted using multiple economic programs, expert opinion, and other sources where available. The main economic programs used for the evaluation of measures include the Corps of Engineers Flood Inventory Tool (CEFIT), the Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA) program, the Beach-fx program, the Institute for Water Resources (IWR) Planning Suite, and the Economic Impact Forecasting System (EIFS). Outputs from these programs were carried forward for the comparison of the measures.

The final two steps of the process include a comparison of measures/plans and the identification of cost effective plans. A comparison of the evaluated measures was conducted using the System of Accounts (SOA) table and the RIDF process developed specifically for the MsCIP and LaCPR studies.

3.6 Geographic Information Systems (GIS) Approach and Analyses

During the MsCIP Comprehensive Study, several Geographic Information System (GIS) software components were used. The GIS software used was created by ESRI and includes: ArcGIS, ArcIMS, ArcReader, ArcGlobe, and ArcSDE. ArcGIS is used for analysis of geospatial data; this software allows the user to overlay data and perform analysis on the data. ArcIMS is used in displaying GIS data on the internet; this software allows users to view and query data without having to purchase software or need training to run the software. ArcReader is a GIS component that allows users to look at data on their local computers without having to purchase software and requires very little training. ArcGlobe is the GIS component that allows users to view data in 3D and is great to use when dealing with depths and heights. ArcSDE is the GIS component that is used to store and organize geospatial data.

3.7 Real Estate Analyses

Real estate costs are an important part of evaluating and comparing different measures to solve a problem. The real estate analysis includes descriptions of the minimum real estate requirements for different measures, estates to be acquired for the alternatives, Land costs to include Easements, Rights-of-way, Relocations and Disposal or borrow areas (LERRD's), and schedules for real estate activities. The real estate analysis was conducted in accordance with Corps' Guidance from Engineer Regulations 405-1-12, and from the Code of Federal Regulations, Title 49, Part 24. Other supporting guidance can be found in the attached Real Estate Appendix.

The real estate analysis for this study required a search of the local public records at local tax and county clerk's offices, to obtain data about owners and the types of properties that would be impacted by potential measures. The analysis includes the proposed acquisition of any land rights in privately owned lands that would be required for the building of a structure like a levee, and any other real estate requirements appropriate for the project construction. The acquisition of land rights may be either a partial or complete purchase of a parcel or tract of land, and in an easement or fee simple interest. Relocation assistance for landowners or tenants when structures are impacted is also included in the analysis. For the nonstructural buyout measures, fee simple purchase of lands and structures along with relocation assistance to displaced persons is recommended. Any such acquisitions of real estate interests and/or relocation assistance for displaced persons are governed by Public Law 91-646.

An assessment was also made of which public facilities would need to be relocated for each measure, including roads, pipelines, utilities, and bridges. The Real Estate Appendix includes information as to the costs and land requirements whether the Government or the local Sponsor would be responsible for the relocation. More detailed investigations of items such as land for borrow areas, pipeline routes, staging areas, etc. will be conducted in a future feasibility study, or studies, if authorized by Congress.

Structural measures, as well as potential Nonstructural buy-out and Ecosystem Restoration sites, all have real estate requirements. Although some measures overlap, each could be constructed as a stand-alone project, and requires a separate real estate cost estimate. The total estimated cost includes land and any associated improvements, relocation payments, and administrative costs to acquire lands and provide relocation assistance services.

The Project Delivery Team (PDT) obtained tax databases for 2005 from the tax assessors' offices in Jackson, Harrison, and Hancock Counties. The team linked this information with GIS "footprints" of the measures to aid in sorting and querying of large amounts of data. These queries were imported into spreadsheets for use by economics, cost engineering, and environmental team members.

Due to the magnitude of the study involving evaluation of approximately 75,000 parcels, a number of assumptions were made in compiling the Real Estate costs. The average number of potentially impacted parcels for the individual interior barrier measures varied anywhere from 320 to over 1,700 parcels. The process originally began by looking at what percentage of each individual parcel might be impacted by the construction of a measure. As changes occurred and more measures were added, it became necessary to discontinue the parcel by parcel analysis and instead make determinations to estimate subsequent real estate requirements based on a percentage factor. Assumptions were also made for when an entire parcel needed to be acquired, and what percentage of structures on a parcel would potentially be impacted by a given measure.

While costs are based on assessed values from the 2005 tax year, an appraiser completed a market study using approximately 135 comparable sales from the three coastal counties. All of the sales used occurred in the first quarter of 2007. From these sales an "adjustment factor" for each county was established. It was found that post Katrina real estate values were approximately double the pre-Katrina values, and the adjustment factors for each county ranged from 1.75 - 2.50 percent. For planning purposes, this adjustment factor was used to bring the assessed values more in line with 2007 "market values".

A Real Estate Supplement (RES) will be prepared for each authorized component once the real estate requirements have been sufficiently identified during a Pre-construction, Engineering, and Design phase (PED). The RES will provide updated information as to final real estate requirements for a particular component and will include updated real estate values and costs. A Real Estate Relocation Plan for displaced individuals and businesses would also be prepared during PED. The Relocation Plan will investigate the availability of replacement housing within a specified radius and any unique or unusual problems that should be considered.

3.8 Costs Estimating Analysis

Rough order magnitude cost estimates have been developed for each of the recommended plan components and comparative alternatives. All cost estimates for a specific plan component/alternative concept have been developed to the same level of detail and include the same level of uncertainty with regard to the precision of the estimate. As discussed below some estimates are considered to be more advanced in that a selected design may have been available to use in developing the estimate.

In general the cost estimates for structural options are based on conceptual designs. To proceed with initial cost estimates, the structural options were conceptually designed to the selected elevations (i.e. 20 feet, 30 feet, or 40 feet) as described in previous paragraphs. These initial elevations selected for each component of the lines of defense are assumed to bracket a wide range of potential storms with corresponding surge elevations. Using these preliminary designs, rough order of magnitude cost estimates were completed for each of the structural options. These cost estimates can used to develop cost curves for future use to estimate costs after final design elevations are selected. Also, these cost curves, can be used in future studies to select varied levels of risk reduction based on risk assessments as well as taking into account future estimates of sea level rise. Cost estimates include not only the construction costs, but also any real estate and/or environmental costs as appropriate. In some cases the costs of environmental mitigation have been assumed to equal the cost of purchase of lands in mitigation banks. Additional detail is necessary before fully developed costs estimates can be developed. As discussed below, the team has included in the estimate a factor for uncertainty with regards to a number of factors (contingency percentages). Costs for plans and specifications have been included where applicable.

Costs for all the environmental restoration options are also estimated at the same rough order of magnitude type estimate, however unlike the structural options, each option had a selected design and no cost curves are developed. Costs for environmental restoration features are based to the maximum extent on prior efforts by the Mobile District in the Mississippi area (i.e. dredging costs for sand placement on barrier islands; costs for acquiring and installing specific vegetation species). Costs for plans and specifications, monitoring and any additional studies have been included where applicable.

Non-structural costs were generated from spreadsheet summaries of the tens of thousands of real estate parcels assigned to the 54 economic reaches based on available data from county tax data bases. All non-real estate contract costs (demolition or flood proofing) for inclusion into these spreadsheets were completed by cost estimators familiar with these activities and acquisition costs were provided by real estate specialists.

A specific analysis of the uncertainties of the cost estimates is being performed to best define the risks associated with the level of cost estimating used for this effort.

3.8.1 Uncertainty as Related to Construction Costs

Even though a Cost Risk Analysis was not developed for the total project cost estimate, some uncertainties were identified and addressed in developing the Construction Contingency. Such uncertainties identified included (a) lack of geotechnical information, (b) physical size and complexity of project, (c) a number of features of the project not being of conventional design, (d) contract requirements, (e) economy shifts, market forecast, (f) quantities not available; assumptions made based on historical information, (g) exclusion of hazardous, toxic, and radiological waste assessments and escalation cost, and (h) no detailed project scheduling.

Contingency in the construction cost estimates represents an allowance for elements within the project scope that are not included in the detailed estimate. This contingency allowance provides a level of confidence that the cost estimate will not overrun due to unpredicted events. Contingency is not intended to cover such factors as estimating allowances, change in scope, inaccurate projections of inflations, unanticipated regulatory standards, and other external factors (bad weather, strikes, labor disputes).

Based on review of identified uncertainties and the project delivery team's (PDT) judgment, the assumed **risk level** is considered higher than normal. Therefore, a Contingency of 25% was used throughout the cost estimate. Even though ER 110-2-1302 identifies Contingencies at 20% for projects greater than $10,000,000 for recon/feasibility phase, it was determined and agreed upon by the PDT that a higher rate should be used primarily due to higher risk than normal, degree of confidence lower than normal, and many features of the project not being of conventional design.

3.8.2 Uncertainty Relating to the Delineation of the High-hazard Areas for Real Estate Acquisitions

Numerous factors contribute to the uncertainty in Real Estate cost estimates. Estimates were made based on proposed project footprints for which plans and specifications are not finalized. Consequently there may be some variance, either higher or lower, in the total number of parcels impacted for a particular option. It is likely that a parcel which may be considered to be partially impacted by project construction could in fact be avoided when plans and specifications are completed. In addition, the real estate land cost is based on tax values with an adjustment factor for 2007 applied to bring the valuations of parcels in line with market values. Additional adjustments may be required to remain current with market conditions and values as project construction is scheduled.

There may also be a variance in the number of structures projected as being impacted since the footprint of actual structures was not available during the data analysis. Assumptions were made based on the "percentage of impact" to the parcel where a structure was shown in the tax data base. The county data bases, appeared to have a mix of pre-storm and post-storm data which mostly affected structure values. If the tax data included a structure value, an assumption was made that a structure is in existence. However, a site inspection is necessary to confirm the actual existence of a structure. Similarly, a parcel assumed to be vacant as per tax information could have a structure at the actual time of acquisition.

The number of relocations under P.L. 91-646 that are projected relates directly to the number impacted structures, and will increase or decrease proportionately with any increase or reduction in the number of structures impacted. An average cost was used across the project for a "relocation" payment with no distinction being made between relocation of an individual or business. Before implementation of acquisition, a relocation plan will need to be completed to gather more specific information and to prepare a more refined cost estimate.

Administrative costs used in the estimate are based on historical costs per tract for other projects. Although none have been as large as the MsCIP, they are thought to be a sound basis for this project. A contingency of 25% was used throughout for each cost estimate prepared.

3.8.3 Uncertainty as Related to Non-structural Costs

The uncertainties related to the delineation of the high-hazard zones would affect the number of tax parcels selected for permanent acquisition versus floodproofing by elevation. In all cases, parcels lying along that line of demarcation between the two measures would be either permanent acquisition or floodproofing by elevation; therefore any differences in cost could be expressed as the average cost difference between the two measures. In the formulation of the accelerated High Hazard Area Risk Reduction Plan the average homeowner payment for acquisition was calculated to be $143,000. The average cost estimate to raise an existing structure up to 6 feet was $140,000 – a difference of $3,000 between the two measures for any structure along the demarcation line.

The differences in the number of parcels allocated to one or the other of the two measures would affect the relative amounts of cost allocated between the project accounts. Since the lines delineating the various zones may have not exactly matched the parcel boundaries, there is some inherent inaccuracy in the accumulation of the affected parcels by the GIS database in one or the other of the two categories of measures included in the plan.

The uncertainty surrounding the delineation of the high-hazard areas along the Mississippi coast is based upon three primary components: 1) the accuracy of the FEMA geographic information system (GIS) layer that delineated the VE Zone (Velocity Elevation Zone) on the Flood Insurance Rate Maps for the three counties and municipal areas along the coast, 2) the accuracy of the GIS layer delineated by FEMA in their post-Katrina report regarding the catastrophic damage zone where damages to insured structures exceeded 50%, and 3) the accuracy of a GIS-generated polygon depicting a 800-foot wide buffer zone in Jackson County that mimicked the damage areas observed in Hancock and Harrison counties.

The GIS layers used in the Nonstructural Appendix to delineate the VE and catastrophic zones were taken from FEMA published data. Considering the scales used on FEMA National Flood Insurance Program mapping and the dates of the flood insurance rate maps from which the GIS layers are taken (1970's) it's likely that there are inherent inaccuracies in the GIS layers. Any inaccuracies that may have been inherent in that data have been carried into the Corps document. The construction of the 800-foot wide buffer area was generated and whatever inaccuracies are imbedded in that layer are also within the report database.

3.9 Communication and Collaboration

Collaborative planning requires that the Corps move beyond the Corps interest and embrace solutions that reflect the full range of the national Federal interest. In an effort to fully embrace this, concept steps have been taken to involve all applicable state and Federal agencies in the development of the various measures being considered. The USFWS and NPS have assigned specific individuals to be on staff at the District as they participate on the PDT. Other agencies have identified specific individuals to represent their agencies on all team efforts. Further, the environmental PDT has been communicating on-going effort to the resource agencies. Measures that have been developed relate to activities that cross all boundaries of the Federal government. In particular, plans for the systematic restoration of the Mississippi barrier islands have been developed jointly by the NPS, USGS, NOAA, EPA and the Corps. Collaboration with the State of Mississippi is a critical building block of the MsCIP as we move forward with the long-term restoration of the coast. Elements of this collaboration including sharing personnel and data have resulted in the development of a comprehensive restoration strategy.

Communication among all the stakeholders has been a critical element of the MsCIP. From the inception, the importance of communication is evident with the hiring of a specialty firm to assist in the development of the stakeholder base and the dissemination of information. Group Solutions Inc. has employed a number of innovative techniques to assist in obtaining participation from the largest number of stakeholders possible. The MsCIP communication plan includes the use of public workshops and meetings, meetings with special interest groups including NGOs, web based meetings, and extensive use of the internet to facilitate communication. As a result of the extent of the damage from the hurricanes, a large number of stakeholders have been displaced and every effort has been undertaken to reach these individuals as well as those currently residing along the coast. Although a large amount of effort has been taken to reach the stakeholders (over 30 meetings since April 2006), we are still not satisfied with the participation and will continue to take additional steps as the comprehensive plan develops.

3.9.1 Regional Sediment Management (RSM)

Regional Sediment Management uses the understanding of sediment dynamics (inputs, outputs, movement) to manage sediment resources towards implementing environmental restoration, conservation, and preservation while reducing coastal erosion, storm damages, and associated costs of sediment management. The MsCIP study team is building on RSM relationships, technology, data, and tools; likewise, the RSM program is benefiting from the extension of these relationships, technology, data and tools as well as lessons learned through MSCIP. Prior to the MsCIP project, data and information were lacking along coastal Mississippi. The MsCIP project is providing valuable information and data, and is improving our understanding of the coastal processes, which occur along the Mississippi mainland shoreline as well as the barrier islands. Additionally, MsCIP project's coordination and relationships developed with other Federal agencies, sponsors, and stakeholders will enhance the RSM programs ability to coordinate and implement future RSM strategies in coastal Mississippi.

Formulation of measures and alternatives fully considered the opportunities of applying RSM. Measures formulated consistently considered the beneficial uses of sediment in the larger ecosystem, as well as ways by which sediment delivery or re-allocation could be enhanced to areas of greatest need. This objective was carried through the formulation, evaluation, screening, and selection process.

The State of Mississippi as part of Gulf of Mexico Alliance has acknowledged that sediment resources are integral to accomplishing many restoration initiatives. It is also recognized that there is a need for a better understanding of regional sediment systems and processes to inform decisions about projects and actions that use or affect sediment resources. Mississippi is actively involved in the development of a Gulf Regional Sediment Management Master Plan as an implementation action for the Gulf Alliance Conservation and Restoration Workgroup. The regional sediment management plan will also help link sources of sediment with sediment needs, provide a basis for assessing competing needs for sediment, and foster more cost effective sediment management.

3.9.2 Public and Agency Involvement in the Planning Process

The Corps' 6-step planning process is a structured approach to problem solving that provides a rational framework for sound decision making. The 6 steps consists of: identifying problems and opportunities; inventorying and forecasting conditions; formulating alternative plans; evaluating alternative plans; comparing alternative plans; and selecting a plan. The MsCIP team has made every effort to involve the public and agencies throughout the entire Interim and Comprehensive Plan development. Immediately following Hurricane Katrina, members of the MsCIP team were openly communicating with state, federal, and local agencies regarding their concerns, obstacles, hurricane-related problems, needs, and opportunities. Agencies, educational institutions, and interested individuals have been contacted via phone, e-mail, or public notice, to solicit input, ideas, and constraints to the plan formulation process. A website was developed and maintained as a way of disseminating information and receiving public comments regarding potential issues and their concerns. Over 60 Federal, State and local government agency representatives and other community leaders from business and industry gathered in Biloxi on April 7, 2006 to identify early needs, opportunities and recommendations for the MsCIP process. Many other public and agency meetings have been held in Harrison, Jackson and Hancock Counties to examine a broad range of potential coastal protection options and solicit input on designing comprehensive improvements. Comments received from these meetings have led the team to revise some of the initial proposed measures. Existing and future conditions were identified and projected in coastal Mississippi by Corps, MDMR, USFWS, and the NPS members. On May 7, 2007, the MsCIP team held a public workshop to present additional environmental, structural and non-structural measures. Input provided from these meetings was used during further formulation of the comprehensive plan.

3.9.2.1 Initial Coordination by Mobile District Team

The hurricanes of 2005 caused numerous deaths and untold injuries to local residents and visitors to the area, extensive damage to environmental resources, homes, businesses and industries. Soon after Hurricane Katrina struck coastal Mississippi, the Mobile District made and received contact with local government officials, agencies, and the public regarding the impacts of the storm and conditions on the coast. This interaction was encouraged by the existing working relationships established during the normal water resource activities conducted by the Mobile District and the state and local governments. After the MsCIP authorization, Mobile District multi-disciplined project teams went to each coastal Mississippi county and municipal area to assess damages and needs first hand identifying needs and formulating ideas and opportunities.

3.9.3 Public and Agency Involvement Process

The MsCIP team places a high value on public and agency involvement during development of the Interim and Comprehensive Plans. Participation from Federal and state agencies, local governments, and stakeholders was obtained through an on-going and engaging series of public scoping meetings, public input meetings, agency and stakeholder meetings, web-casts, on-line auditoriums, Federal principals group, vertical teams, regional coordination meetings, in-house USFWS and NPS personnel, MDMR personnel, non-structural road shows, on-site meetings and multi-participant plan formulation.

3.9.4 Public Input and Review of Planning Options: Round One

Planning solutions to water resource problems is not an activity just for engineers and scientists. It also involves homeowners, businesses, environmental advocates, interest groups, and other members of the public as well as people from Federal, State, regional and local agencies. Citizens have the right to participate meaningfully in public decision making processes, and to be informed about the bases for those decisions. In addition, public participation will undoubtedly lead to better decisions. The wisdom needed to solve complex problems is not limited to the technical experts in public agencies. Early and continuing participation by a diversity of interests, including project sponsors, customers, partners and other stakeholders, can provide essential information and insights. Public participation also increases confidence in the planning process and acceptance of its resulting decisions. The following sections show how the public was involved early and often during the MsCIP planning process.

3.9.4.1 Regional Coordination Workshop

A highly interactive Regional Coordination Workshop was held in Biloxi, MS, on April 7, 2006 for a group of state, municipal, county, NGOs, and agency officials. Approximately 200 participants were invited to attend the workshop through letters, e-mails and phone contacts. Approximately 75 individuals participated representing a spectrum of participant groups invited. Participants were asked to provide the Corps guiding principles for MsCIP direction and specific projects that should be included within the two plans (i.e. Interim and Comprehensive) for Congress. Over a hundred ideas were generated at the workshop. The ideas ranged from small local projects to coastal-wide submissions. The MsCIP Team reviewed these ideas or potential projects for consideration as near-term projects in the Interim Report or actions to be considered in the Final Report.

3.9.4.2 Public Workshops

Following the Regional Coordination Workshop, the Corps held 3 Public Workshops; April 10, 12, and 13, 2006. One workshop was held in each of the 3 coastal Mississippi counties, Jackson, Harrison, and Hancock. Invitations to participate in Public Workshops were made through a Mobile District Public Notice sent to standard environmental coordination mailing list, Mobile District press releases sent to the media, and by Mobile staff contacts. We asked state, county and local officials to help get word of the workshops out to the public.

The purpose of the workshops was to review the ideas already gathered from previous involvement activities and gather additional ideas for inclusion in the MsCIP reports and plans. The workshops

were interactive and non-confrontational. Public participants were polled on project direction and the important principles of recovery that should be used in the plans. The public was invited to review the ideas already submitted and to add additional ideas or creative combinations of existing ideas to the list. Input could be provided via a network of PCs and structured questions. Alternative input opportunities for those uncomfortable or unable to respond via PC were also provided. Comment cards, post-it notes for maps, and a court reporter were available to capture ideas. From the Public Workshops, the list of MsCIP ideas grew to over 180. Again the MsCIP Team reviewed these ideas or potential projects for consideration as near-term projects in the Interim Report or actions to be considered in the Final Comprehensive Report. It should be noted that the residents of coastal Mississippi have been through a terrific ordeal. In some cases, their lives have returned to normal while in others the recovery process is just beginning. These conditions made acquiring public input difficult. Frequent comments were made that people were generally "tired of the storm and tired of meetings about the storm." In spite of that, needs and opportunities for specific areas were gathered from the public.

3.9.4.3 Website and Webcast

As discussed previously, the website (www.MSCIP.usace.army.mil) was established and maintained as a repository of MsCIP information and a different vehicle to allow interested public and agencies to provide comments and ideas including those who were displaced from there homes or could not attend the workshop opportunities. A webcast was created and provided on April 18, 2006 to allow those that could not attend the public workshops and online alternative for participating in the project. The webcast had conference call participation for all callers, a video and PowerPoint presentation delivered through a special webcast, polling, and a question and answer portion with Mobile District staff fielding questions.

3.9.5 Coordination with LaCPR

The MsCIP team took a systematic and regional integration approach with the Louisiana Coastal Protection and Restoration (LaCPR) study team. For a detailed account of this approach, please see the Main Report.

3.9.6 Public Input and Review of Planning Options: Round Two

3.9.6.1 Regional Coordination Workshop

The Round Two, Regional Coordination Workshop was held in Biloxi on April 26, 2006 with similar participants as Round One. The purpose of the Round Two Regional Coordination Workshop was to review the planning options that emerged from the Round One workshops. Prior to the workshop, participants were provided via the MsCIP website a list of ideas that emerged Round One and the screening criteria to be used to recommend near-term projects for inclusion in the Interim Report or retain them for evaluation in the Final Report. There was general understanding of the concept of near-term projects that can be implemented quickly to help in the immediate recovery of coastal Mississippi while the Comprehensive Plan is being developed. The screening criteria and their application to the potential projects were discussed. The Mobile District presented a preliminary, by-county, list of projects to be potentially recommended in the Interim Report. The potential near-term projects were discussed and none recommended for Interim Report received objection. However, participants requested review of a limited number of additional projects for inclusion in the Interim Report. As a result of this discussion, additional projects were considered and at least one additional potential near-term project (Jackson Marsh Restoration) was recommended for the Interim Report. No potential projects were deleted from consideration in the MSCIP, simply deferred to consideration in the Comprehensive Analysis and Final Report. Using these recommendations, the MsCIP team then began developing the structural lines of defense concepts. The MsCIP environmental and non-structural team analyzed environmental benefits anticipated from restoration while the other team assessed flood-proofing techniques.

3.9.6.2 Public Workshops

The Round Two, Public Workshops were held May 1, 2, and 4, 2006. The purpose of the Round Two Public Workshops was to review the planning options that emerged from the Round One workshops and discuss recommendations for near-term projects to be recommended in the Interim Report. The Mobile District presented a by-county list of projects to be potentially recommended in the Interim Report and the screening criteria for selecting those projects. None of the projects recommended for Interim Report received objection. However, participants requested and received clarification regarding why specific potential projects were not recommended as near-term projects. No potential projects were deleted from consideration in the MSCIP, simply deferred to consideration in the Comprehensive Analysis and Final Report. The MsCIP team had another public workshop on December 19, 2006 to present general ongoing efforts and to discuss conceptual solutions for coastal Mississippi. On April 5, 2007, the MsCIP team then presented detailed plans for environmental, non-structural, and structural plans to protect coastal Mississippi from future storms.

3.9.6.3 Web-site and Webcast

A Round Two webcast was created and provided on May 3, 18 to allow those that could not attend the public workshops and online alternative for participating in the project.

3.9.7 Public Scoping

Public and agency involvement has been a critical, early, and continuing part of the MsCIP project. Public and agency involvement accomplished to date has been a multi-step and multi-component process. Persons and organizations having a potential interest in the proposed action, including minority, low-income, disadvantaged, and Native American groups, have been urged to participate in the environmental impact analysis process.

Scoping can lay a firm foundation for the rest of the decision-making process. Scoping is often the first contact between project planners and the public. The MsCIP team held many meetings prior to the actual formal Public Scoping meeting on 19 December 2006. These initial meetings were held due to the accelerated timeframe involved in preparing the 6-Month MsCIP Interim Report. At the December Public Scoping meeting, individuals presented their concems to the MsCIP team and also to each other. The issues brought forth included concerns regarding construction of levees, preservation of the natural environment, impacts to natural resources especially wetlands regulatory permits for wetland fill, future growth, potential future storms, and etc. Possibilities and clarifications on initial thoughts were discussed during the Public Scoping meeting. This scoping process led the MsCIP team to think about the proposal early on, in order to explain it to the public and affected agencies. The participants were able to respond with their own concerns about significant issues. Incorporation of public and resource agency input will likely reduce the need for changes after the draft documentation is finished, because it reduces the chances of overlooking a significant issue or reasonable alternative.

4 PLANNING CONSTRAINTS

There are a number of issues that constrain the development of certain potential measures that might be used to address the identified problem set. Planning constraints are limited to laws and regulations that constrain the planning process. Among these include:

- Measures developed must not negatively impact the resources within the NPS's Gulf Islands National Seashore, particularly with respects from those constraints created by inclusion of Horn and Petit Bois Islands as Wilderness Areas;
- Measures developed must avoid, minimize, or mitigate any negative impacts to T&E species identified as residing within areas potentially impacted by study recommendations;
- Measures developed must be consistent with State of Mississippi Coastal Management Plan;
- Measures developed must meet the guidelines directed at maintenance of State Water Quality standards;
- Measures must be consistent with provisions of CWA;
- Measures must be consistent with provisions of NHPA;
- Measures must be consistent with Clean Air Act (CAA);
- Measures must be consistent with the ESA and the Fish and Wildlife Coordination Act (FWCA);
- Measures must be consistent with CBRA;
- Measures must be consistent with EO – Environmental Justice and Protection of Children; and
- Measures must be consistent with the Magnuson-Stevens Fishery Conservation and Management Act as amended by the Sustainable Fisheries Act of 1996.

5 INVENTORY AND FORECAST OF FUTURE CONDITIONS/RESOURCES

As mentioned earlier, six future "no-action" scenarios were developed to evaluate the impacts of plan components over time. The six scenarios were evaluated over a 100-year period of analysis and include two redevelopment, and four sea-level rise scenarios. The first redevelopment scenario assumes the residential and commercial rebuilding that existed before Katrina will be built back as the same type (residential or commercial). The second rebuilding scenario assumes that a majority of the waterfront properties destroyed will be built back as commercial (i.e. high-rise condominiums). The three relative sea level rise scenarios are comprised of existing sea level, a moderate relative sea level rise, and high relative sea level rise. Scenario one is a residential redevelopment with no relative sea level rise over the 100-year period of analysis. Scenario two is a mixed residential and commercial redevelopment with no relative sea level rise, scenario three is a residential redevelopment with a maximum relative sea level rise depending on location of 2.0-feet over the period of analysis, scenario four is a mixed residential and commercial redevelopment and a maximum relative sea level rise of a 2.0-foot, scenario five is a residential redevelopment with a relative sea level rise depending on location of 3.4-feet, and scenario six is a mixed residential and commercial redevelopment with a maximum relative sea level rise depending on location of 3.4-feet. The detailed evaluation of these scenarios is outlined below, and a technical description of the calculation of relative sea level can be found in the Engineering Appendix.

The first round of inventory and forecast indicated that several future conditions scenarios should be revised. Key among these was the uncertainty of forecasts of future re-development and relative sea level rise. Future relative sea level rise is an especially important factor in defining conditions of the barrier islands, estuarine circulations, water quality, etc. A detailed discussion of relative sea level rise has been provided earlier in this report. As discussed earlier, this was accommodated by the inclusion of sensitivity analysis for both factors, to determine what effect alternative future scenarios might have on benefits, costs, and other considerations, under each scenario.

5.1 Forecasting of Future Re-development: Scenarios

The Mississippi Coast is rebuilding from the aftermath of the storms of 2005. Due to numerous factors (i.e. insurance payments, business opportunities, etc.), the exact rate at which re-development will continue to occur is not known. For this study an approximation was made based on the following assumptions:

- The structures destroyed as a result of Hurricane Katrina will be rebuilt and the population will return to at least pre-Katrina levels.
- Full redevelopment of structures will occur by 2012. Redevelopment is defined as the building back structures that existed before Hurricane Katrina, not development that occurs on land that was undeveloped.
- Redevelopment of the study area could take the form of residential redevelopment (exactly the way it was pre-Hurricane Katrina) or a mixture of commercial/condominium and residential redevelopment.
- FEMA guidelines require minimum heights that the first floor elevation must be built to in order to be included in the National Flood Insurance Program (NFIP). For the purposes of the redevelopment projected in this report, houses that will be rebuilt before the start of 2009 are assumed to be rebuilt to the Pre-Hurricane Katrina Base Flood Elevation (BFE) and those that are rebuilt between 2009 and 2011 will be rebuilt to the Advisory Base Flood Elevation (ABFE) as existed May 2007.
- The surge damage characteristics (by depth) of structures vary by the type of construction and are assumed to be similar to those in the New Orleans area (where this type of data is available). It is also assumed that the duration of surge inundation is approximately 24 hours, which is considered a short-term duration. The depth-to-damage relationships are explained in more detail in the Economic Appendix.

- A depreciated replacement cost of structures was used unless a structure was destroyed fifty percent or more due to surge from Hurricane Katrina. For those structures damaged fifty-percent or more and must be rebuilt, the full replacement cost was used to denote the value in the structure inventory.

Redevelopment is anticipated to occur as follows:

Table 18.

Redevelopment Assumptions

Assumptions of Structure Redevelopment by Year

Year	Percent Redeveloped	Height of Redevelopment
2005	N/A	Hurricane Katrina Landfall (August 29th)
2006	10%	Pre-Hurricane Katrina Base Flood Elevations
2007	25%	Pre-Hurricane Katrina Base Flood Elevations
2008	40%	Pre-Hurricane Katrina Base Flood Elevations
2009	60%	Advisory Base Flood Elevations
2010	80%	Advisory Base Flood Elevations
2011	100%	Advisory Base Flood Elevations
2012	Full Redevelopment	Base Year

5.2 Forecasting of Relative Sea Level Rise: Scenarios

In addition to redevelopment, relative sea level rise could also impact solutions (and decisions) to the water resource problems being evaluated along the Mississippi coast. The following scenarios were evaluated to account for relative sea level rise:

- Baseline. This is the current condition (or existing sea level) from where all other scenarios would be measured. This condition, although unlikely, must assume no further sea level rise (or land subsidence)
- Medium. This scenario assumes a relative sea level rise of about 2.4 feet over the 100-year period of analysis and is consistent with current Corps policy.
- Increased. This scenario assumes a relative sea level rise of about 3.4 feet over the 100-year period of analysis. This represents a reasonable upper bound of what could happen over the life of the project.

Because the scenarios are so wide-ranging geographically, and so dramatic in some reaches and not in others, one may need to examine the detailed results of the potential damage functions contained in the Economic Appendix to see what effect adding two feet, for instance, has on the number of structures that would be inundated in a given area, for a given event, and of a given frequency in 2012, versus those that would be inundated in Reach X for an event of a given frequency in 2111 (i.e., illustrating the differences over the 100-year planning horizon). There are few general statements, or statements that apply to the entire coast that can be made for relative sea level rise. The single statement that applies is that sea level rise over the period of analysis, be it 50-year (used for evaluation of ecosystem restoration measures) or 100-year (used for storm damage reduction measures), would cause more damage over time, for an event of a given frequency. This is illustrated in Figure 9, below, which shows the increase in average annual damages for Hancock County, using 3 relative sea level rise scenarios.

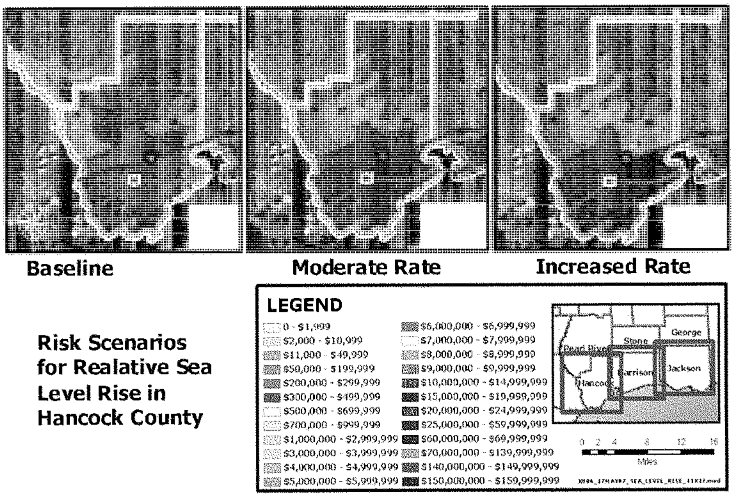


Figure 9 – Hancock County Annual Average Surge Damages by Sea Level Rise Scenario

It should be noted that the global debate over sea level rise is ongoing and the Corps will continue to design using the most up to date data available.

5.3 Preliminary Screening of Problem Areas

Following the initial identification of sites and problem areas, a preliminary screening analysis was conducted. Key to the success of this effort was the need to screen problem areas or sites that did not satisfy a link to:

- The problem being caused or exacerbated by the hurricanes of 2005;
- Based on the professional judgment of the study team that the problem area could not recover on its own;
- Congress' provided areas of investigation (storm damage reduction, erosion, fish and wildlife preservation [ecosystem restoration], saltwater intrusion, or related water resource issues;
- Ecosystem significance (scarcity of resource), from a national or regional perspective; and
- Being technically or environmentally feasible.
- Already being addressed by others.

The list of problem areas and sites screened as part of this process are shown in Table 19 below.

Table 19

Preliminary Screened List of Problem Areas

#	Name	Problem Resolution/Status
1	Coastal Mississippi Hurricane Evacuation Plan	1. FEMA "Integrated Public Alert and Warning System" update 2. State of MS. "Comprehensive Emergency Management Plan" update
2	Coastal Mississippi Artificial Reef Project for Remediation of 2005 Hurricane Damage	Mississippi Department of Marine Resources
5	USE selected levels of rip-rap instead of bulkheads for erosion control	Local Governmental Entities
7	Provide 100 acres of oyster reef restoration	MsCIP Interim & Comprehensive - Partnership with MDMR
8	Work with State to authorize transfer of development rights in state statutes	State of MS
9	Include repair standards in building codes	Local Governmental Entities
10	Dredge access channels to existing public marine industry and recreational boating	1. USCG clearing dredging tidal channels 2. FEMA evaluating remaining channels for debris and sediment removal
13	Form a monitoring network that will survive and function throughout a major storm to provide data that is critical to emergency managers	FEMA "Integrated Public Alert and Warning System" update
14	Provide an incentive for replacing failing septic systems in rural areas to improve water quality along bayous and bays.	1. Section 592 Program 2. State Regional Water and Wastewater Authority
17	Complete snagging/clearing, etc. to restore the capacity of existing drainage.	1. MsCIP, four Interim projects and recommendation for Forrest Heights 2. Jackson County Permitted for six drainage ways 3. FEMA evaluating remaining channels for debris and sediment removal
18	Repair existing bulkheads or other structural drainage components that were damaged during the storm to reduce future failures during similar events.	1. MsCIP, two Interim projects- Jackson Marsh, Courthouse Road 2. FCCE, Harrison County Beach project 3. City of Pascagoula has repaired
19	Maximize Beneficial Use of Dredge Materials	1. MsCIP Barrier Island recommendation 2. FCCE, Harrison County Beach project
20	Consider brown water system to minimize demand on ground and surface waters and limit saltwater intrusion.	USEPA
21	Re-establish Benchmark Information Coastal-wide	FEMA
22	Relocate wastewater treatment facilities out of the surge-prone areas	State Regional Water and Wastewater Authority
23	Inspect and Rehabilitate Wastewater and Piping Systems	State Regional Water and Wastewater Authority
28	Barrier Islands - Remove hazardous materials	Other
30	Barrier Islands - Protect From Spills	Other
31	Barrier Islands - Evaluate Sediment Transport - Ensure sand mining does not Impact Islands	1. MsCIP Barrier Island recommendation 2. MsCIP/ERDC Sediment Budget evaluation

#	Name	Problem Resolution/Status
34	Partnership Efforts with Louisiana to Marsh Island Areas	LaCPR Comprehensive
37	Provide protection for public facility (i.e., WW treatment plants).	1. State of MS Regional Water & Wastewater Authority via FDA funds. 2. MsCIP LOD-4 recommendation
38	Bay St. Louis Downtown HSDR	MsCIP Interim Project
39	Cowand Point Seawall Erosion Control	MsCIP Interim Project
40	Hancock County Beach Ecosystem Restoration and HSDR	MsCIP Interim Project
41	Clermont Harbor Seawall HSDR and Erosion Control	MsCIP Interim Project
42	Hancock County Comprehensive HSD - Ecosystem Restoration	MsCIP Interim & Comprehensive Ecosystem Restoration Recommendation
43	Jackson Wetland Restoration	MsCIP Interim Project
44	Bayou Caddy Shore Protection and Ecosystem Restoration	MsCIP Interim Project
46	Lakeshore Beach Ecosystem Restoration	State of MS - Environmental Concerns - Potential SAVs
48	Hancock County Communities Flood Damage Reduction	MsCIP Interim Project
49	White's Road Evacuation Route Protection	State of MS. "Comprehensive Emergency Management Plan" update
55	Restore more natural freshwater flows by closing the MRGO	USACE-MVN is funded to close MRGO
56	Remove storm debris (i.e., demolition debris carried in by surge retreat) from aquatic environments. Restore traditional shrimping and fishing areas rendered un-trawlable by storm debris.	1. City of Pascagoula funded to construct Boardwalk 2. MsCIP to construct Beach along entire sound-front from city park westward 3. MsCIP Environmental Restoration recommendation
57	Ferries to Temporarily Replace Bridges.	State of Mississippi, Bridges Repaired
59	Restore Hancock County Beaches to Pre-Katrina conditions	1. MsCIP Interim Project Dunes Only
60	Widen Hancock County Beaches, jump-start dunes	1. MsCIP Interim Project Dunes Only
61	Preserve Bayou Caddy Area	MsCIP Interim Project
62	Protect Hancock County wetlands from filling for development	1. MsCIP Environmental restoration recommendation 2. MsCIP Regulatory Collaboration
63	Construct a N/S rail link connecting Port Bienville Industrial Park to the Norfolk and Southern Railroad through Stennis Buffer. Hurricanes cause CSXT rail outages which cost > $20,000/day	State of Mississippi and Congressional Representatives
64	Open the east Pearl River channel so it can be used by commercial marine traffic from Port Bienville	USCG

#	Name	Problem Resolution/Status
66	Mississippi Coastal Pump Station Inundation Protection	1. State of MS Regional Water & Wastewater Authority via FDA funds. 2. MsCIP LOD-4 recommendation
68	Mississippi Coastal Barrier Island Restoration	MsCIP & NPS Barrier Island restoration recommendation
69	Mississippi Coastal Improvement and Hurricane Storm Damage Reduction Program	Mississippi Department of Marine Resources
70	White's Road Evacuation Route Protection	FEMA evaluating remaining channels for debris and sediment removal
71	White's Road Evacuation Route Protection	FEMA evaluating remaining channels for debris and sediment removal
72	Harrison County Beach Ecosystem Restoration and Erosion Control	MsCIP Interim Project
73	Long Beach Harbor HSDR	Harrison County Beach Authority
74	Highway 90 - Rodeburg to St. Charles St. HSDR and Flood Control	State of Mississippi DOT
75	Pass Christian Harbor HSDR	Harrison County Beach Authority
78	Gulfport Commercial Harbor	State of Mississippi Port Authority
80	Turkey Creek Flood Damage Reduction	1. MsCIP Forrest Heights Levee Recommendation 2. MsCIP Regulatory Collaboration 3. MsCIP Interim Project at Long Beach
81	North Gulfport Interior Drainage	1. FEMA evaluating remaining channels for debris and sediment removal 2. MsCIP Interim Project at Long Beach
82	Long Beach Interior Drainage HSDR (includes Canals 2 - 3)	MsCIP Interim Project
83	Harrison County Industrial Seaway Harbor of Refuge	State of Mississippi
85	Courthouse Road Wetlands Ecosystem Restoration and Preservation	MsCIP Interim Project
91	Extend South Side of Deer Island. Extend 200 yards to repair breach in island and restore original footprint of island.	SAM FCCE Project
92	Deer Island enhancements. Cap shell middens on western side of the island and restore top soil in maritime live oak forest	Section 528 Construction General & FCCE Funds
93	New Sewage Treatment Plant in Woolmarket Lagoon Area - Move the Woolmarket Lagoon to north of I10 north of the area. would protect the citizens by moving the sewage from the flood prone areas:	State Regional Water and Wastewater Authority
94	Flood-Proof Existing Infrastructure	State Regional Water and Wastewater Authority
95	Enhance Lee and Bayview Docks for commercial shrimpers.	Other Local and State Entities
96	Enhance Maine Street Docks for commercial shrimpers.	Other Local and State Entities
98	Develop Concrete Staging Center in Industrial Canal. Develop Harrison county industrial canal artificial reef staging area to stockpile concrete debris for oyster reef and other useful projects.	MDMR and MsCIP Comprehensive - Partnership with State

#	Name	Problem Resolution/Status
99	Restore or enhance Mississippi oyster reefs.	Mississippi Department of Marine Resources
100	Open hw 90 Bridges quickly	State of Mississippi DOT - Bridges are Open
101	Utilize HW 90 bridge as artificial reef material	State of Mississippi DOT
103	Economic Development of Downtowns. Orderly expansion of municipal harbors along with revitalization of downtowns would provide green space; non-water dependent retail, and a manageable beach blvd. (NOT HW 90).	State of Mississippi, Governors Renewal Initiative State of Mississippi Port Authority State of Mississippi DOT Alternate Hwy 90 proposal
105	Complete the purchase of "optional" Cat Island for inclusion into Gulf Islands Nationals Seashore	National Park Service
106	Rebuild the Harrison County boardwalk with concrete to accommodate pedestrians, bicycles, and possibly street vendors.	Harrison County Beach Authority
107	Provide inland marine vessel storm shelter location with adequate moorings.	State and Local Entities
113	Reconsider dioxin cleanup on navy base post Katrina.	USEPA
114	Long Beach Interior Drainage HSDR (includes Canals 2 - 3)	MsCIP Interim Project
115	Reduce toxic exposure which exacerbates storm damage – Dioxin, Creosote, Titanium Dioxide, and Gypsum.	FEMA evaluating area regarding hazardous materials
116	Turkey Creek watershed Greenway	MsCIP Comprehensive Future Studies and Gulf Coast Trails
117	Forrest Height Levee :- Restore; Vegetate with native species; Footbridges; Nature trail atop	1. MsCIP Forrest Heights Levee Recommendation 2. Rivers, Trails and Conservation Assistance Program
118	Dredge shoaled channels hindering storm evacuation	FEMA evaluating remaining channels for debris and sediment removal
119	Dredge shoaled marinas	US Coast Guard
120	Deer Island re-nourishment of south side.	SAM Project Section 528
122	Possibly add height to the existing beach elevation and redevelop lost dune vegetation.	1. MsCIP Interim Project 2. SAM FCCE Harrison County Beach Restoration Project 3. MsCIP Comprehensive, LOD 2
123	Flood-proof low-lying sewer treatment plants. Lift stations and wells and their electrical and electronic controls.	State of Mississippi Regional Water and Wastewater Authority
128	Shearwater Bridge Erosion Control	MsCIP Interim Project
131	Pascagoula Beach Blvd. Restoration	MsCIP Interim Project
133	Beach Boulevard Erosion Control	MsCIP interim Beach Project
135	Chicot Road Flood Damage Reduction	City of Pascagoula
138	Upper Bayou Cassotte Flood Damage Reduction	MsCIP Interim Project
142	Greenwood Island Ecosystem Restoration	State of Mississippi
146	Old Spanish Trail Comprehensive Flood Damage Reduction/Drainage	1. MsCIP Comprehensive - Non-Structural/SDSS for further evaluation

#	Name	Problem Resolution/Status
		2. FEMA evaluating remaining channels for debris and sediment removal
147	Old Spanish Trail Comprehensive Flood Damage Reduction	FEMA evaluating remaining channels for debris and sediment removal
148	Old Spanish Trail Comprehensive Flood Damage Reduction	1. MsCIP Interim Project 2. NRCS Recovery Project
150	Franklin Creek Floodplain Restoration/Franklin Creek and Pecan Hydrology Project	MsCIP Interim Project
152	Gautier Hurricane Storm Damage Reduction and Ecosystem Restoration/Ladnir Rd	1. MsCIP Interim Project 2. Coast Guard Dredging Project 3. FEMA evaluating remaining channels for debris and sediment removal
153	Bayou Chico Beach HSDR/Bayou Chico Bulkhead Rehabilitation	Local Governmental Entities
154	Round Island Ecosystem Restoration/Round Island Lighthouse Relocation	State of MS
155	Upper Old Fort Bayou Comprehensive Flood Damage Reduction/ C. Byrd Road Drainage	1. MsCIP Comprehensive - Non-Structural/SDSS for further evaluation 2. FEMA evaluating remaining channels for debris and sediment removal
156	Upper Old Fort Bayou Comprehensive Flood Damage Reduction/ C. Byrd Road Drainage	1. MsCIP Comprehensive - Nonstructural/SDSS 2. FEMA evaluating remaining channels for debris and sediment removal
157	Pascagoula beaches, offshore breakwater/dunes/reefs/marshes to dissipate wave energy	MsCIP Interim Project
158	Restore natural drainage ways upper Bayou Casotte (vic Fishhawk Rd, Meadow Dale Dr., Longwood Dr, and Bayou Casotte Dr)	1. MsCIP Comprehensive - Nonstructural/SDSS 2. FEMA evaluating remaining channels for debris and sediment removal
159	Restore natural drainage ways upper Sioux Bayou (vic Laville Subdivision and Westgate Subdivision)	FEMA evaluating remaining channels for debris and sediment removal
160	Restore natural drainage ways upper Mary Walker Bayou (vic Northwood Hills, Rolling Meadows, and Bayou Oaks subdivisions)	FEMA evaluating remaining channels for debris and sediment removal
165	Pascagoula Beach Restoration. Dunes, grasses, trees, with intermittent pockets of sand beach	MsCIP Interim Project
166	W Land Lake Pascagoula. Dredge to recover retention qualities and install new drainage pipes to north.	FEMA evaluating remaining channels for debris and sediment removal
168	Study same as 58	FEMA evaluating remaining channels for debris and sediment removal
169	11th St Bridge and Drainage Canal. Bridge is failing and canal walls are caving in.	Jackson County Road Repair
170	Drainage improvements - same as 65	FEMA evaluating remaining channels for debris and sediment removal
171	Old Mobile Hwy Bridge Failing	Jackson County Road Repair

#	Name	Problem Resolution/Status
172	Bridge at Old Mobile Highway and Hospital Road is Damaged	Jackson County Road Repair
173	Restore Bates St Drainage to Open Water	FEMA evaluating remaining channels for debris and sediment removal
174	Inspection & Rehabilitation of Sewer and Storm Piping for Pascagoula	MVK Section 592 Program
175	Relocate Pascagoula WWTP out of surge area	State of Mississippi Regional Water and Wastewater Authority
176	Re-establish benchmarks Pascagoula city-wide	FEMA
177	Pascagoula brown water system study	State of Mississippi Regional Water and Wastewater Authority
178	Pascagoula Beach Blvd. Restoration (Boardwalk, beach, and marsh addition along Pascagoula front beach)	1. MsCIP Interim Project 2. City of Pascagoula Renewal Project
179	11th St Bulkhead Rehab	City of Pascagoula
180	Pascagoula main drainage system restoration including additional wetland side storage. City-wide retention/detention system. Drain barrier valve system.	1. MVK Section 592 Program 2. State of Mississippi Regional Water and Wastewater Authority 3. MsCIP Comprehensive - Nonstructural/SDSS for wetland Evaluation
181	C. Byrd Road Drainage	1. MsCIP Comprehensive - Non-Structural/SDSS for further evaluation 2. FEMA evaluating remaining channels for debris and sediment removal
183	Use jetties to prevent sediment flow clogging channels	Local Governmental Entities
186	Dredge/clear area in front of beachfront outfalls.	1. MsCIP Interim at Pascagoula 2. MsCIP Comprehensive, LOD 2 at Ocean Springs
188	Improve the Jackson-county seawall. Provide additional county-wide seawall construction, boardwalks, beach construction, marsh construction, or a combination of these elements	1. Mississippi Rebuild Renew Initiative 2. MsCIP Interim Projects
189	Gautier improvements to drainage. Same as 158.	1. MsCIP Comprehensive - Nonstructural/SDSS 2. FEMA evaluating remaining channels for debris and sediment removal
190	Gautier, drainage improvements. Same as 159	1. MsCIP Comprehensive - Nonstructural/SDSS 2. FEMA evaluating remaining channels for debris and sediment removal
191	Bayou Outlets on the Mississippi Sound that require actions to remove deposited siltation	1. MsCIP Interim Project 2. Coast Guard Dredging Project 3. FEMA evaluating remaining channels for debris and sediment removal
192	Gautier improvements to drainage. Same as D.	FEMA evaluating remaining channels for debris and sediment removal
193	Dredge Davis & Simmons Bayous to include all connecting bayous to help prevent flooding.	FEMA evaluating remaining channels for debris and sediment removal
194	Rebuild and enlarge Marsh Island	State of Mississippi

1

6 FORMULATION ROUND ONE

After narrowing the list of problem areas, the MsCIP study team developed potential problem-solving measures. The initial measures were developed independently within the structural, environmental, and nonstructural sub-teams and then later evaluated by the entire group. These potential measures were also solicited at each of the Regional Coordination, agency, and public workshops, and through detailed discussion with the entire study team. In order to not short-cut the planning process, and to ensure that good ideas were allowed to proceed through the process, a simple definition of a potential *measure* was provided to the team members, as "a feature or activity at a particular site". This definition was reiterated over and over to the formulators of measures, as the team progressed through this phase and following phases of formulation.

Formulation of measures to reduce storm damage, reduce coastal erosion, restore damaged ecosystems, or deal with saltwater intrusion, generally fell under the category of *Engineering solutions* in the case of the first two issues, or under the category of *Environmental solutions*, in the case of the last two issues.

6.1 Development of the No Action Plan

NEPA regulations (40 CFR 1502.14(d)) require that no action always be considered a viable alternative in any final array of plans. The no-action plan is the default choice. The planning process is built on the default assumption that the Corps should do nothing to address the problems and opportunities. The Corps should become involved in a project only if it is better for society than doing nothing. Hence, the planning process must convincingly demonstrate that involvement in some project is preferred over no action by the agency. In other words, one should not overlook the importance of the first decision to be made at this step, should something be done? The "no action" alternative is the same as the 'without project' condition described in more detail in the Main Report.

The most notable adverse changes that would occur as a result of no actions being taken are within the areas of flood damages and fish and wildlife. It is anticipated there would be little or no change within the existing soils, sediments, climate, air quality, water supply, and geology of coastal Mississippi. Due to the current rebuilding throughout the coast, slight increases in noise could occur during rebuilding construction activities. It is anticipated that these disturbances would be temporary and have only minor impacts to the community.

The wetland community will likely suffer the most significant impacts under the no action alternative. A large amount of exotic specie vegetation has been colonizing parts of coastal Mississippi following the storms of 2005. Hurricane Katrina left extensive debris fields and sedimentation in the area destroying many native trees and vegetation. Due to the loss of the native species, this area has experienced a severe infestation of the invasive Chinese Tallow tree, which is invading the marshes and adjacent flatwoods. The native species of wetland vegetation act as filters removing pollution from runoff, and allow these areas to act as natural buffers improving water quality, storing floodwaters, and reducing erosion. Exotic species, however, out-competes the native vegetation so that it negatively alters the hydrology of the wetlands, reduces the available food source for fish and wildlife, and degrades the entire wetland community by impeding the natural biogeochemical process. Exotic vegetation would continue to persist under the no action alternative, and eventually worsen.

It is anticipated there would be a slight recovery of the vegetation within various habitats such as dune plants, emergent marshes, and pine savannah wetlands under the no action alternative, but these areas would also generally degrade over time. Further fragmentation of once contiguous wildlife corridors in the northern reaches of the study area will also continue to occur as new development continues to move further away from the coast.

Tidal habitat for fish and wildlife (i.e. barrier islands, marsh habitat, wet pine savannah, etc.) may also be adversely impacted under the no action alternative. Many marine species depend on sea grass beds that were destroyed during Hurricane Katrina for foraging opportunities and cover. An increase in saltwater intrusion will continue to degrade the estuarine environment of the Mississippi Sound. Examples of the species that are dependent on this type of habitat are oysters, shrimp, crabs, finfish, coastal shore birds, and sea birds.

Many threatened and endangered species (i.e. Sandhill Crane, piping plover, etc.) could also be adversely impacted under the no action plan. Their continuing loss of habitat could occur as development and further degradation occurs.

With no Federal action, the city's municipal services would not likely be relocated and the badly damaged or uninhabitable structures would have to be reconstructed in the same area as funding becomes available. It would also likely result in changes to existing land uses. The city of Biloxi in Harrison County is experiencing record number building permit requests for waterfront development, such as condominiums and commercial businesses. In fact, the number of building permit requests has increased to about six times more than prior to Hurricane Katrina. While over time the building rate should level off, building is still likely to continue under the no action plan, even into areas that are not suitable to support development.

Significant impacts to the cultural resources would likely occur under the no action alternative. Archaeological and architectural studies along the Mississippi Gulf Coast have documented the destruction caused by natural forces, most notably hurricanes. Standing structures are often the most dramatic and visible witnesses to this destruction. However, prehistoric and historic archaeological sites are also extremely vulnerable. Shell middens, found along the immediate shoreline and within coastal marshes and estuaries, often are flipped and re-deposited by the storm surge and wave action of hurricanes. This effectively destroys much of the value of the sites. Historic Indian villages and historic town sites, such as those along the bluff on Bay St. Louis, could be destroyed by continued exposure to wave action. In addition, post storm activities offer many more mechanisms for site destruction. These include clearing of timber by use of skidders and other heavy equipment, debris removal, and reconstruction. The destructiveness of these activities is well documented from the years following hurricane Camille which struck the area in 1969. Hurricane Katrina has been documented to have destroyed a vast majority of the standing historic properties within Hancock County, and a large number of those within Harrison and Jackson Counties. Future storms will likely continue this trend under the no action alternative. For a more detailed discussion on storm surge damages, please see the Economic Appendix.

6.2 Development of Storm Damage Reduction and Erosion Reduction Measures

Examples of preliminary measures for storm damage reduction, supplied by the study team, agencies, and public, included:

- Levees, seawalls, or embankments (barriers to surge);
- Gates, berms, and breakwaters (barriers to surge);
- Elevating structures (elevation above inundated area);
- Acquisition and removal from high-risk areas (removal from high-risk inundation zones);

- Zoning and Building Code modification (removal of the most damageable or critical infrastructure or services from highest risk areas);
- Floodplain Management (removal of the most damageable or critical infrastructure or services from highest risk areas);
- Moving back from the shoreline (removal of the most at-risk development, most damageable or critical infrastructure, or services from highest risk areas);

Examples of preliminary measures for erosion reduction, supplied by the study team and public, included:

- Placement of additional sand;
- Placement of harder erosion-control features, such as shell materials, construction debris, rubble, stone, geo-textiles;
- Supply of additional sand to littoral zone;
- Reduction of sand-robbing activities in the near-shore or barrier island zones.

Additional measures were added later, as more factual information became available, and as more input was provided and more technical results became available.

6.3 Development of Ecosystem Restoration, Preservation of Fish and Wildlife and Saltwater Intrusion Reduction Measures

Examples of preliminary measures for ecosystem restoration and fish and wildlife preservation, supplied by the study team and public, included:

- Removal of sediment and/or debris, choking streams and estuaries;
- Re-grading to historic conditions and topography;
- Removal of invasive species;
- Removal of dead vegetation, deadfalls, and other vegetation that interferes with natural functions;
- Planting of native species in areas in which those species were killed by the hurricanes; and
- Filling of drainage channels that interfere with natural functions.

Examples of preliminary measures for saltwater intrusion (actually encroachment into a freshwater body) reduction, supplied by the study team and public, included:

- Reallocation of freshwater supply by re-regulation of reservoirs and
- Diversion of freshwater sources to direct more freshwater into areas of critical need.

The list of potential measures that applies to each site was crafted to that specific site based on its characteristics. More detail is provided on the list of potential measures within its appropriate appendix.

Formulation of these preliminary measures was also based on consideration of both what resources it would reduce damages to (i.e. - targeted developed areas of the coast or targeted ecosystem features), as well as the potential negative outcomes it might cause (i.e. - induced flooding). All of the structural measures were also formulated in such a way that they could be laid out as either stand-alone concepts, or as components of a multi-featured plan for a given area (i.e. – structural, nonstructural, or ecosystem restoration plan).

6.4 Evaluation of Measures: General Discussion

Each problem area or site was then evaluated to determine the level of effort required for more detailed development of solutions, the need for more rigorous technical analyses (such as detailed modeling), the need for more detailed environmental analysis related to its implementation and long-term effects, such as the potential for impacts to sensitive, threatened or endangered species or habitats, and a host of other factors. Evaluation at this phase of study was based on discussion between study team members and technical experts, on the results of preliminary modeling of potential storm surge, for instance, or, in the case of ecosystem restoration, calculation of potential improvement output, to determine the relative potential damage reduction or environmental output improvement achievable, and problems encountered or solved.

6.5 Evaluation of Storm Damage Reduction and Erosion Reduction Measures

Early evaluation indicated many areas of the coast that are not highly developed, and other areas that contain significant obstacles to formulation of structural measures. Many areas were found to be extremely difficult to reduce damages when using structural measures, compared to areas such as those in certain areas of Harrison County, where the entire coastline is densely developed, but have lesser degrees of environmental resource concentration. Many outlying areas were found to require individual means to achieve storm damage reduction.

Almost any problem area or site along the Mississippi coastline was found to have environmental considerations that required adjustment or modification of formulated structural measures to address those concerns. However, in Jackson County, the Pascagoula River system separates the city of Pascagoula from most of the coast to the west. This river system with its vast marshes areas is one of the last major free-flowing rivers in the southeast, and has numerous environmental resource concerns. In the western portion of the state, extensive mashes create other concerns along with the Pearl River that separates Mississippi from Louisiana. Other technical issues also made structural damage reduction in these areas problematic.

Review of the coastline in Mississippi using aerial photographs, topographic maps, LIDAR surveys, and storm inundation data revealed that natural topography could play a major role in forming storm barriers. Other features such as the offshore barrier islands, extensive beaches in many areas, and existing beach-front roadways were also determined to have a substantial role in potential damage reduction. The modeling also indicated that the high ground followed by the CSX Railway crossing the entire state near the coast, functioned as a barrier to surge during Katrina, and thus, should be considered as a potential inland barrier during future events.

Review of the inundation maps generated during the surge modeling of Katrina and other events also indicated that the extensive low-lying areas associated with two bays that extend inland from the coast would require more refined methods than a simple barrier, to solve the surge inundation issue. It was apparent that any continuous storm protection systems would have to consider these as breaks in the line. Closing off rivers and bays with surge gates have been used in Europe to protect inland areas and different designs of gate structure had to be evaluated and considered in the development of comprehensive plans for coastal Mississippi.

6.6 Evaluation of Ecosystem Restoration and Saltwater Intrusion Reduction Measures

The following four models were utilized by the MsCIP environmental PDT to evaluate the performance of potential ecosystem restoration measures:

- Mississippi and Alabama Gulf Coast Tidal Fringe HGM;
- Wet Pine Savannah HGM;
- FHI Model for Evaluation of Coastal Maritime Forest/Beach-Dune Habitat; and
- GIS-tool Wetland Restoration SDSS Model.

The HGM and FHI models are discussed in more detail in the Environmental Appendix.

In addition to HGM and FHI, a SDSS model, which related areas of hydric soils and other factors related to long-term survivability of a wetlands resource, was also used as a formulation, evaluation, and ultimately, screening tool. The SDSS model scales and combines multiple GIS layers for the purpose of identifying and evaluating potential wetland restoration sites within the three coastal counties. The results of the model were used in conjunction with local expertise to evaluate potential wetland restoration areas.

The results of the HGM modeling were used for functional assessment of existing and future "without-project", and also preliminary "with-project" measure assessment, of both tidal fringe wetlands and wet pine savannahs habitats. The tidal fringe HGM model was also used to evaluate impacts to tidal fringe wetlands that would result from levee alignments including various ring levee alignments. The functional assessments helped to determine mitigation requirements for unavoidable wetland impacts by structural components of the comprehensive plan. The wet pine savannah HGM allowed the team to assess impacts to wet pine savannah habitats at several of the recommended environmental sites.

The results of the FHI modeling was used for functional assessment of existing and future "without-project", and also preliminary "with-project" measure assessment, of all potential coastal maritime forests/beach-dune habitat restoration measures.

Future with-project condition scores, established by the study team's modeling analysis of the specific functions that would be modified, either positively or negatively, at each site, plus "No-Action", existing and future "without-project" score, are shown in the Environmental Appendix, by site or problem area.

Evaluation of saltwater intrusion reduction methods involved the investigation of freshwater diversion measures at several locations. These would divert freshwater from the Mississippi River or other sources as a mechanism to promote a reverse of the recent increases in salinity in the Mississippi Sound/Biloxi marshes areas. This would support fresher marshes and oyster reef health and productivity, thus enhancing both their economic value and the ecological services they provide.

In an effort to initiate the proper evaluation of freshwater diversions, a water quality model (WQM), which is based on the CE-QUAL-ICM water quality model code, is coupled to output from a three-dimensional hydrodynamic model of the region, which is based on the CH3D hydrodynamic model. The version of CH3D with sigma coordinate in the vertical dimension is being used. The model grid extends seaward beyond the Chandeleur Islands and includes Mobile Bay, Lake Borgne, Lake Pontchartrain, the Inner Harbor Navigation Channel of New Orleans and the Mississippi River Gulf Outlet Channel. Predicted water quality constituents, including nutrients, phytoplankton, dissolved oxygen, temperature, salinity, and underwater light intensity were evaluated for several scenarios and compared to modeled existing baseline conditions to assess relative changes.

The WQM was applied at three locations: (1) a diversion of freshwater flow from the Mississippi River at Bonnet Carre' spillway, (2) a diversion of freshwater flow from the Mississippi River at Violet Marsh, and (3) a diversion of all of the Escatawpa River flow into Grand Bay. The modeled release of water at the Bonnet Carre' diversion was varied by month, and the Violet Marsh model was designed to have a constant flow. The Escatawpa diversion was modeled after the flow that occurred in the Escatawpa River during 1998. The WQM was applied for the period April through September 1998. The hydrology model was run with the same conditions as used for the base conditions used in the WQM calibrations for 1998 except that the additional freshwater flows were introduced.

6.7 Comparing Measures: Formulation Round One

Each preliminary measure (potential solution, activity, or feature) for each problem area or site was then compared to other measures developed for that site or problem area. Again, comparison at this phase of study was based on discussion between study team members and technical experts, to determine the *relative* potential damage reduction or environmental output achievable, and problems encountered or solved, particularly in comparison with the "No-Action" Plan, or the condition in which no action is taken to solve as problem or provide the means for improvement of a given degraded condition or set of circumstances.

Comparison of structural and non-structural damage reduction measures, and erosion control measures, was done by comparison of their relative ability to reduce damages, with consideration given as to their potential environmental mitigation requirements or negative impacts, potential costs, and other potential issues. Comparison of ecosystem restoration measures, and saltwater intrusion measures, by the means discussed in the immediately preceding sections, was done by comparison of their relative ability to achieve the previously-discussed criteria, as well as their potential costs, and potential environmental outputs as compared to the "No-Action" Plan.

6.8 Screening Measures: Formulation Round One

6.8.1 Initial Screening Criteria

After the preliminary screening of problem areas and sites, and development and evaluation of measures was developed for each problem area, the list of problem areas and sites was then screened based on the input of the inter-disciplinary study team's understanding of each site's potential to meet a variety of criteria.

For storm damage reduction or erosion reduction, the site or problem area had to have:

- **Technical feasibility** (i.e., will a given measure provide a sound technical solution to the identified problem(s)?), and thus, at least one technically-feasible solution from the above list;
- **Environmental feasibility** (i.e., will a given measure provide a sound solution to the identified problem(s), without creating environmental resource problem of its own?), and;
- There were identified some potentially **cost-effective** solutions to the identified problem suite.

For ecosystem restoration or saltwater intrusion reduction, the site or problem area had to be identified as having:

- no ability to either heal on its own, unaided by human intervention, or;
- national and/or regional significance in regards to the type of ecosystem it represents;
- the need for assistance to restore vital hydrologic links;
- the potential need to manually remove blockages created by hurricane-deposited debris that was impacting function;
- the potential need to remove excess sediment deposited by the hurricanes that had changed the nature of the land's surface and resulted in degraded function and value;
- the potential need to remove invasive species that had entered the area since the hurricanes and caused displacement of native plant species (and potentially wildlife depending on native species), degrading function of the ecosystem;
- or the potential need for planting of native species vital to restoration of a significant ecosystem and restoration of its functions and values.

6.8.2 Screening of Preliminary Measures

The MsCIP planning process required this screening process to "weed out" unproductive measures, or those that did not meet the planning objectives. Application of the screening criteria above resulted in the screening of a large number of less significant areas, as well as many that the study team determined was capable of recovery on their own.

Additionally, as more technical and environmental data became available, more judgment is able to be applied as to the relative value of any given measure, when compared to others applied to that same site or problem area. Preliminary analysis again indicated that there were many solutions or measures that were *obviously* cost-prohibitive, unequivocally environmentally damaging, or simply technically infeasible, when compared to other measures, when each problem area or site was evaluated individually.

Due to the large number of measures involved, and the fact that initial evaluation and screening was done on a case-by-case basis by the study team in the field or in discussion held for each site, no detailed discussion of each of them is contained here, although numerous preliminary measures and their evaluation, comparison, and screening are referenced in the Engineering and Environmental appendices.

The screened list of remaining ecosystem problem areas and sites was narrowed to the following:

- Restoration of barrier islands. Includes entire restoration of the MS barrier islands including littoral placement, re-vegetation, and restoration of Submerged Aquatic Vegetation.
- Restoration of Dune habitat. Using dune barriers along the MS coast as either an ecosystem restoration measure, or in combination with dune use as a storm damage reduction barrier.
- Reduction of saltwater intrusion by restoring fresh water flows from the Escatawpa, Pearl, and Mississippi Rivers.
- Restoration of coastal Mississippi wetlands and forests by evaluating historical wetland areas frequently flooded populated areas, and current wetland and forest areas degraded by the storms of 2005.

For damage reduction concepts, a structural "Lines of Defense" concept (see Figure 11) was developed that started with the offshore barrier islands and progressed inland to what could be considered the surge extent of the worst possible theoretical storm. This storm, labeled the

Maximum Possible Intensity (MPI) event would be used to define a line, based on ground surface elevation that the storm surge would not exceed. The lines of defense would be designed to provide increasing levels of protection as you transgressed inland. Some lines would not provide protection from large storms, and several areas of the coast could not be included in continuous line of defense. These areas would be either placed in a ring levee system or designated to a non-structural solution during the second round of evaluation.

Many types of structural and nonstructural protection were reviewed. Some examples of the types of measures that were screened out due to a lack of technical feasibility are identified below and depicted in Figure 10.

- Inflatable barriers,
- Concrete sidewalks or roadways that could be hydraulically rotated upwards to form a seawall,
- Sliding panel gates, and
- Offshore breakwaters.
- Contiguous Barrier Island 'Wall'
- Galveston type Seawall

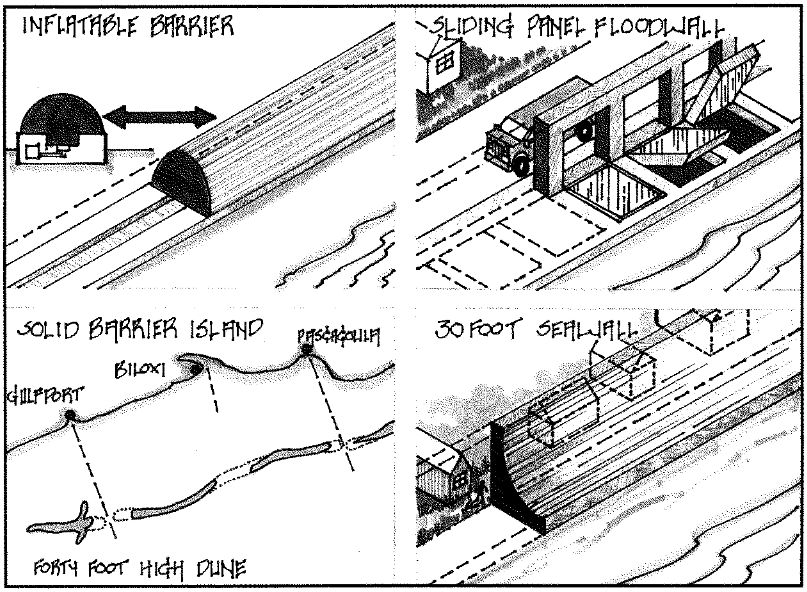


Figure 10 Preliminary Damage Reduction Measures Screened Out

The screened list of damage reduction concepts and/or alignments includes the following for further analyses and depicted in Figure 11:

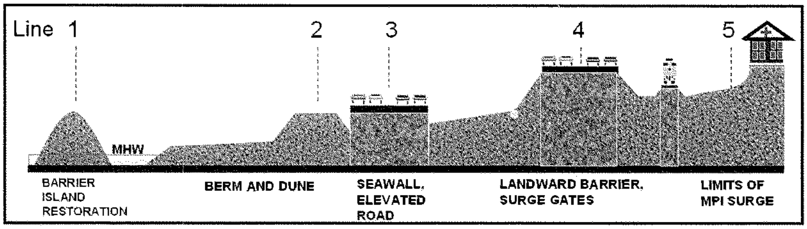


Figure 11 Lines of Defense Concept

First Line of Defense – Barrier Islands. The coastline of mainland Mississippi is bordered on the south by the Mississippi Sound, a shallow body of water that separates the coast from four barrier islands that lie several miles to the south. These barrier islands are located along a littoral drift zone that moves sand westward creating three elongated islands and then to the westward most island where littoral currents are not as well defined. From east to west, the islands are Petit Bois, Horn, Ship, and Cat. Ship Island has been breached by prior hurricanes and now is actually two small islands, West Ship Island and East Ship Island, with a shallow sand bar between the two. Since Hurricane Camille in 1969, this breach has existed with varying amounts of natural rebuilding between later storms. The western ends of both Petit Bois and Ship Islands have migrated to maintained navigation channels and the continuing littoral drift of the sand into the channels is causing an artificial termination of the migration. A new island has emerged on the west side of the channel from Petit Bois Island, created from the dredged sand coming from island that is disposed of on the west side of the channel. Soon after Hurricane Katrina, it was reported that many in Mississippi felt that if the islands had been in the condition that existed prior to Hurricane Camille, there would have been less damage along the coast from Hurricane Katrina. This idea was also included in the Mississippi Governor's Restoration Plan, which called for restoring the islands to a pre-Camille footprint. The idea was also included in the Mississippi Governor's Restoration Plan, which called for restoring the islands to pre-Camille footprint. This measure (identified as LOD-1) was selected to be carried forward for further analysis.

Second Line of Defense – Dunes along Existing Beaches. Essentially all the beaches along coastal Mississippi are man-made. Harrison County has the most beach-front with 26-miles extending from Biloxi Bay to St. Louis Bay. Hancock County has several miles of beach and Jackson County only a short length. In total, the beaches extend along less than half of the Mississippi coastline. Most of the dunes that previously existed along these beaches were destroyed by Katrina and much of the beach was damaged. Reconstruction of the dunes, where beaches exist, will likely provide reduction of damaging wave action from smaller storms.

The beaches, as situated immediately seaward of developed areas, provide a location where elevated dunes could be constructed to provide some protection from smaller hurricanes. This measure (identified as LOD-2) was selected to be carried forward for further analysis. First concepts would look at crest elevations of 10.0 and 15.0 feet above sea level (NAVD-88) as options for the all dunes.

Third Line of Defense – Raised Roadway or Seawall and Ring Levees. All of the beaches described in LOD-2 have a roadway landward (North) of the beach. These roads vary from local or county roads to US Highway 90, a major, four-lane, highway that extends across the entire Harrison County coast. The existing roadways vary in elevation from four to five feet above sea level (NAVD-88) in Jackson and Hancock County and up to about 15 feet above sea level in Harrison County. All of these roads are evacuation routes and all have been damaged in past hurricanes. In a damaged or destroyed condition, these roads make re-entry to the area difficult after a hurricane has passed. Raising and using these roadways as barriers or having an associated seawall defines a portion of the 3rd line of defense (LOD-3) and will be carried forward for further analysis. This line will be the first hard engineered structure and will be initially evaluated at elevations 12.0, 18.0 and 24.0 feet above sea level and will be supplemented by nonstructural solutions such as the elevating or buying out of structures.

Fourth Line of Defense – Inland Barrier. To preserve the shoreline environment as much as possible, a 4th line of defense (LOD-4) for very large storms is envisioned that would be inland from the coast (and LOD-3). This line of defense would be the highest line and could be designed to contain a larger storm surge, such as the "Maximum Possible Intensity" (MPI) hurricane, and will also be supplemented by nonstructural solutions such as the elevating or buying out of structures. This line of defense was selected to be carried forward for further analysis. First efforts would model LOD-4 as an infinitely high barrier against storms varying from a Camille type storm up to the MPI.

Fifth Line of Defense – Maximum Surge Limit. This line of defense will be a line on a map that indicates the extent of surge resulting from the "Maximum Possible Intensity" storm. Structures that are situated or built above (North of) this line should not be inundated from surge by large storm events. This fifth line of defense (LOD-5) was selected to be carried forward for further analysis. Initial efforts would look at nonstructural plans to either build future or relocate existing emergency services such as hospitals, or police and fire stations.

The following figures (12 - 14) indicate the initial alignments of the lines of defense concepts.

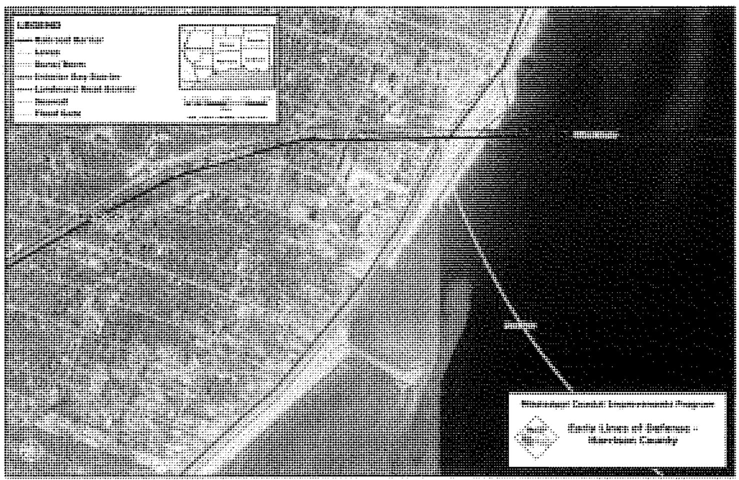


Figure 12 Initial Lines of Defense for Hancock County

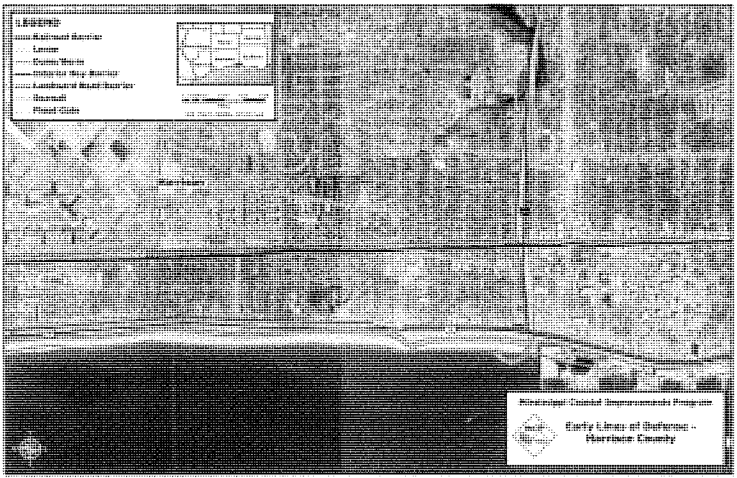


Figure 13 Initial Lines of Defense for Harrison County

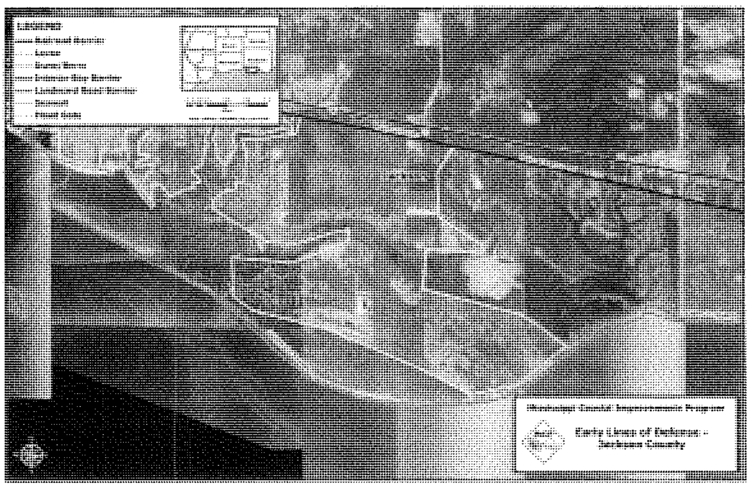


Figure 14 Initial Lines of Defense for Jackson County

Due to the relatively low elevations, type of construction, and the nature of storm surge throughout the coastal area, several preliminary nonstructural measures were also screened from further evaluations. These include:

- Elevating structures on fill material
- Dry floodproofing of residential structures (maximum protection is 3 feet), and
- Wet floodproofing of residential structures (elevating utilities)

Additional information on these measures can be found in the Engineering, Environmental, and Nonstructural Appendices.

7 RISK ASSESSMENT AND EDUCATION IN PLAN FORMULATION

7.1 Intro to Risk

The additional process of evaluating and appropriately integrating risk, uncertainty and consequences of potential actions in the plan formulation process used the following criteria of: a) identification, b) quantification, and c) characterization, of these factors. This process is summarized below.

7.1.1 Risk in Identification in Technical Analyses

Risk identification involved the selection of various parameters around which risk might be quantified. The first level of risk identification involved the selection of those parameters, by agreement of the study team, technical experts, and appropriately-trained risk-educated staff brought in to assist in this process, from the Corps Engineering Research and Development Center (ERDC).

Risk was initially identified for certain technical parameters, including stage (the depth to which water could rise during a surge event), frequency, wave height, first floor elevation of structures, structure value, and content value. Uncertainty was also accommodated by the evaluation of multiple storm tracks (paths), magnitudes (strength), and alignments, to ensure that the maximum number of potential conditions was incorporated into the assumptions that went into defining future without-, and with-project conditions.

7.1.2 Risk Identification in the Planning Process

In addition, to risks and uncertainties in technical parameters, numerous other factors were also identified as having the potential for risk, uncertainty, or consequences. These included risks associated with the potential for impacts to culture and historical properties, public service disruption, risk associated with long-term sustainability of measures, risk, uncertainty and potential consequences to individuals and families, and other societal issues.

Identification of factors that required assessment also included the definition of a unit of measure (or "metric") by which the factor would be judged, such as measuring risk of being off on an estimate of inundation depth by how many feet above or below the expected depth the technical expert could consider that value to vary for a given storm; another example could be the amount of money that a damage estimate might vary for a given storm event.

Input on the factors found to be of most importance to the public and decision-makers was sought at public workshops set up to establish *which factors* were of importance, and also get input on which factors they found of *highest* importance. A full discussion on the selection of risk "metrics" and their discussion and selection by the public, is contained in the appendix on the RIDF process.

7.2 The Risk-Informed Decision Framework (RIDF) Process

The first step in the planning process is determining the problems, opportunities, and objectives which guide the study team in developing solutions. The next step involving risk is to structure the objectives using a hierarchical approach. For example, the study team considers many different risks associated with a flood event in an effort to develop and implement measures to minimize damages cause by storm surge. Residual risk is that portion of the total sum of all risks that still exists after a flood damage reduction project is implemented. Therefore, the overall objective guiding the selection of measures could be expressed as minimizing the residual risk from storm surge in terms of the economic, environmental and societal consequences associated with a flood event. This overall objective might be further divided into its component, or sub-objectives (i.e. - economic, environmental, and societal). These sub-objectives are incorporated into the planning process through measurable metrics that are used to compare the performance of each measure in an economic context (e.g., cost effectiveness), an environmental context (e.g., preservation of fish and wildlife habitat for ecological stability), or a social context (e.g., societal displacement). Successful planning requires giving careful attention to clearly describing and structuring the objectives for the study in detail. The next step involves developing metrics to represent the objectives. These metrics will then be used to calculate performance scores and ranks for the measures during the evaluation and comparison steps of the planning process.

7.2.1 Risk "Metric" Development

The MsCIP team developed metrics to be used in evaluating measures to accomplish the study objectives. If a measure did not meet the performance goals, it would either be screened out (dropped from further consideration) or taken back to the "drawing board" for refinement. The metrics themselves would be scored (or weighted) and ranked by various stakeholder groups, which would in turn aid decision makers in identifying a plan or plans to be recommended for implementation.

Evaluating measures by a large set of metrics can be complex and very time consuming. With this in mind, the study team selected an effective set of metrics that, while representing the best available information, would not be so large as to hinder the evaluation process.

The following criteria were used in selecting metrics to insure that they were:

- Scientifically verifiable. Meaning that two independent assessments would yield similar results.
- Cost-effective. The technology required to generate data for the metrics is economically feasible and does not require an intensive deployment of labor.
- Communicable. Are easy to communicate to a wide audience. The public would understand the scale and context, and be able to interpret the metric with little additional explanation.
- Changeable by human intervention. The metric would describe a dependent relationship between the outcome of the measure and those things that are under a decision-maker's control. Metrics that are independent of human action does little to help evaluate a measure.
- Credible. It would be perceived by most stakeholders as accurately measuring what it is intended to measure.

- Scalable. It would be directional in nature, whether qualitative (best, good, worst) or quantitative (dollars, acres, percent damaged), as appropriate.
- Relevant. It would reflect the priorities of the public and other stakeholders and enhance their ability to execute their stewardship responsibilities. There is no point assembling a metric no one cares about.
- Sensitive. The metric must be able to capture the minimum meaningful level of change, make the smallest distinctions that are still significant, and any uncertainty about the metric is easy to communicate.
- Minimally redundant. What the metric measures is not essentially reflected by another metric.
- Transparent. The use and development of the metric is readily apparent.

It is important to acknowledge here that there will be "conflicts" among metrics, resulting in the need to make tradeoffs. For example, a tradeoff exists between achieving any significant benefit from a project and minimizing cost. As a consequence of such "conflicts", a given measure may not take clear precedence over other measures in respect to every "metric" for evaluating performance. This may present a dilemma to decision-makers, who are trying to choose a single measure. It is important to place development of metrics prior to the development of measures because the "hard thinking" that goes into developing the metrics can create an improved set of measures. This permits stakeholders to focus on thinking about the objectives rather than anchoring themselves to their "favorite" measures.

Within a particular scenario, the amount of uncertainty surrounding metric values must be clarified. Metric values depend upon either a mathematical model, empirical data from a study, or expert opinion. All of these sources share varying degrees of uncertainty, presumably more so for expert opinion than for models and studies. Therefore, along with indicating the basic source of the metric values, it is also necessary to describe the assumptions that went into calculating the value. Estimates of the uncertainty for a metric should be quantified (e.g., in terms of the variance or range associated with the estimate). This quantification must be captured and integrated into the decision analysis in order to make risk-informed decisions.

An initial set of metrics were developed by the study team and then shared with several "focus groups". They in turn helped to shape the final list of metrics, described and grouped by different accounts below.

Environmental Quality (EQ) Metrics

1) Tidal Habitat Restored - This metric measures (in acres) positive changes to the tidally-influenced wetlands that results from the implementation of a measure or plan. These are positive benefits from implementing a restoration plan or a combination of plans. Ecosystem components included in this metric are tidal wetlands (i.e., tidal fringes), associated threatened and endangered (T&E) and other species, associated essential fish and other tidal habitats (i.e. oysters, submerged aquatic vegetation), and related losses that require mitigation due from implementation of structural plans. There are 5 tidal wetland functions measured: wave energy attenuation (wave energy absorbed by wetland through landscape position, marsh width, and vegetation cover), biogeochemical cycling (receive, transform, and export nutrients through a wetland), nekton (swimming organisms) utilization potential (whether wetland contains suitable habitat for nekton), provide habitat for tidal marsh dependent vertebrate wildlife, and maintain a characteristic tidal marsh plant community. Units for this metric are the percentage increase of quality fish and wildlife habitat in functional habitat units (FHI).

2) Tidal Habitat Lost - This metric measures adverse impacts to the tidally-influenced wetlands that results from the implementation of a measure or plan. Ecosystem components included in this

metric are tidal wetlands (i.e., tidal fringes), associated threatened and endangered (T&E) and other species, associated essential fish and other tidal habitats (i.e. oysters, submerged aquatic vegetation), and related losses that require mitigation due from implementation of structural plans. There are 5 tidal wetland functions measured: wave energy attenuation (wave energy absorbed by wetland through landscape position, marsh width, and vegetation cover), biogeochemical cycling (receive, transform, and export nutrients through a wetland), nekton (swimming organisms) utilization potential (whether wetland contains suitable habitat for nekton), provide habitat for tidal marsh dependent vertebrate wildlife, and maintain a characteristic tidal marsh plant community. Units for this metric are also in acres.

3) Non-tidal Habitat Restored - This metric measures (as functional units) positive changes to the non-tidal ecosystems that result from the implementation of a measure or plan. These are positive benefits from implementing a restoration plan or a combination of plans. Ecosystem components included in this metric are maritime forests, beach nourishment, dune restoration and vegetation, and associated threatened, endangered and other species in non-tidal habitats. There are numerous functions provided by upland habitat: wildlife and birds (includes threatened and endangered species) roosting, nesting, and foraging utilization potential, wildlife corridors, sustainability of the Mississippi Flyway, restoration of the natural ecology and aesthetics of the area, and maintenance of plant community composition. Units for this metric are the percentage increase of quality fish and wildlife habitat in acres.

4) Non-tidal Habitat Lost- This metric measures (as functional units) adverse impacts to the non-tidal ecosystem that results from the implementation of a measure or plan. This has a negative impact of implementation of an array of alternatives as part of the comprehensive plan. Ecosystem components included in this metric are maritime forests, beach and dunes, threatened, endangered and other species and their non-tidal habitats, and related losses that require mitigation due to implementation of structural plans. There are numerous functions provided that will be evaluated and include: breaks in natural wildlife corridors, fragmentation of habitat, loss of critical habitat for threatened and endangered species, loss of foraging and roosting areas, loss of vegetation resulting in increased erosion, reduction in water quality and air quality. Units for this metric are the percentage decrease of quality fish and wildlife habitat in acres.

National Economic Development (NED) Metrics

5) Monetary Damages Reduced/Avoided (Expected Annual Damages) - The amount of storm damages reduced/avoided by a plan expressed as annualized dollars. Annualized dollars are calculated by comparing a future without a project in place versus a future with a project in place. Damages are calculated by using the Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA) model. This metric has become standard practice in the evaluation of the value of measures with respect to estimating damages to assets (i.e., residential, commercial, and industrial infrastructure and their contents) over the period of analysis. For more detail about the HEC-FDA model see Economics Appendix.

6) Residual Damage – This metric describes what a plan does not account for (or what happens if a plan is exceeded). Residual damage is defined as the storm damage that is not prevented with the implemented plan in place (expressed as annualized dollars).

7) Cost to Implement Plan – The amount of money in dollars needed to implement the plan. This metric measures the cost in today's dollars to local and Federal governments to implement the recommended plan.

Other Social Effects (OSE) Metrics

These metrics focus on the preservation of people's quality of life. OSE metrics were developed to address impacts to cultural heritage and preservation of historical structures, disruptions to public service and infrastructure and impacts to personal effects.

8) Cultural and historical heritage impacts – This metric addresses impact to social groups, church congregations, and groups with common heritages. This metric also includes impacts to aesthetics and the destruction of the human-created landscape such as historical structures. The units for this metric will be a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

9) Public service and infrastructure disruptions – This metric includes disruptions to schools, fire and police service, access to hospitals, libraries and community centers, and use of roads, bridges, and utilities. The units for this metric will be a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

10) Personal impacts – This metric includes loss of family possessions, photographs, and impacts to people's emotional and mental health. The units for this metric will be a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

Regional Economic Development (RED) Metrics

The RED metrics measure both positive and negative impacts to the regional economy. Positive impacts are captured by impacts to sales volume, personal income and employment and negative impacts by local cost burdens. Sales volume, income and employment will be sub-metrics under RED, and will be equally weighted. This metric is termed Positive regional economic benefits and will combine these 3 sub-metrics. The local cost burdens metric is also a sub-metric under RED and will receive a weight equal to combined weighting of the positive metrics under regional economic benefits.

11) Local Cost Burdens – This metric represents the costs and burdens to the local governments due to implementing a measure. This includes cost-sharing requirements with the Federal government to implement the plan and local costs for ongoing operations and maintenance (O&M) related to the implemented plan. The local cost burdens may also include those associated with additional workforce needed to maintain features of an implemented plan. This metric will be based on a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

12) Positive regional economic benefits – Economic benefits to the region with regards to sales volume, income and employment. This metric was evaluated using the economic impact forecasting system (EIFS) model. This model is an economic analysis tool that given the inputs for a particular plan will assess potential impacts of sales volume change and personal income in dollars and regional employment change in number of jobs to the local economy. Uncertainty will be based on several factors such as population, implementation cost, and social behavior of people in the region. This metric will be based on a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

Risk Metrics

The following risk metrics serve as additional information to decision makers. They are a way to address extreme cases of uncertainty.

13) Long-term Sustainability of Plan – The risk that features associated with the recommended plan will not perform as intended (over time) due to factors such as cost, human behavior, technical level of maintenance required, political concerns, resource availability, local funding per year, and operational reliability. The units for this metric will be a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

14) Residual Risk – This metric describes what a plan does not account for (or what happens if a plan is exceeded). Residual risk is defined as the storm damage risk that remains with the implemented plan in place (expressed as annualized dollars). It accounts for the following factors: erosion, wildlife species, wildlife habitat, salt water intrusion, surge damages, drainage, wind, maximum probable intensity (MPI) plan (accounts for more intense storm), cultural heritage, and infrastructure. The units for this metric will be a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

15) Consequences of Plan Failing – This criterion describe what happens if a plan does not work as intended. In other words, it describes consequences to humans and the environment due to a catastrophic failure of an implemented plan under design conditions or other sets of circumstances from a storm event. The greatest risk is risk of failure to structural measures, such as levees, flood gates, etc. Consequences and likelihood of failure vary depending on the line of defense. For example, risk of Line 2 failure is more likely, but consequences are relatively low; risk of Line 4 failure is highly unlikely, but consequences are very high. It includes the following factors: injuries to population, loss of infrastructure, loss of habitat, and loss of wildlife species. The units for this metric will be a unitless quantitative scale (0-10). A score of 10 is best, 1 is bad.

Once the 15 metrics were described, the study team developed the values associated with each measure. The team calculated the acres associated with each measure for the metrics within the Environmental Quality Account as discussed above. The NED metrics were developed through the use of the Corps' HEC-FDA program (further described in the Economics Appendix) and are expressed in dollars.

As mentioned above, the RED, OSE, and Risk metrics are based on a scale from 1-10. Guidelines for these metrics were given to the team to help provide consistency amongst the different measures and are defined in the following tables.

Table 20.

Regional Economic Development Scoring Definitions

Score	Local Cost Burdens	Regional Economic Benefits
1	All Local Government funds are exhausted to cover the cost-shared portion, an extremely large workforce must be hired to perform maintenance of plan features, and the plan results in increased support of the area infrastructure.	Little or no economic benefits, or increase in sales volume, income and employment to the region.
2	A very large percentage of local funds would be required for cost-share and a very large workforce must be hired to perform maintenance of plan features. The plan results in a large burden on local government to support the area infrastructure.	Very small economic benefits, and increases in sales volume, income and employment to the region.
3	A large percentage of local funds would be required for cost-share and a large workforce must be hired to perform maintenance of plan features. The plan results in a large burden on local government to support the area infrastructure.	Minor economic benefits, and increases in sales volume, income and employment to the region.
4	A significant percentage of local funds would be required for cost-share and maintenance support of plan features. Plan also puts a significant burden on local governments to maintain infrastructure.	Some economic benefits, and increases in sales volume, income and employment to the region.
5	A moderate percentage of local funds are required for cost-share and maintenance support of plan features. Plan puts moderate burden on local governments to maintain infrastructure.	Moderate economic benefits, and increases in sales volume, income and employment to the region.
6	Some local funds are required for cost-share and	Significant economic benefits, and increases in sales

Score	Local Cost Burdens	Regional Economic Benefits
	maintenance support of plan features. Plan puts mild burden on local governments on infrastructure.	volume, income and employment to the region.
7	A minor percentage of local funds are required for cost-share and maintenance support of plan features. Plan also puts a minor burden on local governments to maintain the infrastructure.	Large economic benefits, and increases in sales volume, income and employment to the region.
8	A very small percentage of local funds will be required for cost-share and maintenance support of plan features. Plan puts mild burden on local governments to maintain the infrastructure	Very large economic benefits, and increases in sales volume, income and employment to the region.
9	Extremely small disruption to local funding, infrastructure, or maintenance support of plan.	Extremely large economic benefits, and increases in sales volume, income and employment to the region.
10	No burdens on Local Government to cost-share, operate and maintain plan features, or support infrastructure.	Tremendous economic benefits, and increases in sales volume, income and employment to the region.

Table 21

Other Social Effects Metric Scoring Definitions

Score	Cultural & Historical Heritage	Public Service Disruptions
1	Total Loss of Community and Cultural and Historical Heritage.	All Public Services are interrupted and are interrupted during all events that currently affect them; no police or fire service or schools that would be affected would be available; hospitals, libraries, etc., would remain closed indefinitely. Roads, bridges, utilities, and other infrastructure destroyed.
2	A portion of community exists but much of what is culturally and or historically significant would continue to be lost.	Significant Disruptions that last for weeks to months. Measure may provide a very small measure of improvement.
3	A portion of community exists but most of the Cultural and Historical Significance is lost.	Severe Interruptions to Public Services. Significant amount of damage to roads, bridges, and utilities.
4	Significant Losses, or Changes to - - - Historical Setting (i.e. Aesthetics – view, Loss to Community Defining Landmarks and/or Structures, Change in Land Use (i.e. : A complete change in how they use their community)	Very limited public services would still be provided. Hospital offers emergency services. Schools and other services may close. Road and Bridges damaged and could remain closed for moderate amount of time.
5	Moderate Loss to, or Change to Historical Setting (i.e. Aesthetics – view, Loss to Community Defining Landmarks and/or Structures, Change in Land Use (i.e. : An almost complete change in how they use their community)	Limited public services provided. Small portion or numbers of hospitals are able to operate. Schools and other services remain closed. Road and Bridges damaged but most are usable in a few weeks.
6	Low Chance of Loss to, or Change to Historical Setting (i.e. Aesthetics – view, Loss to Community Defining Landmarks and/or Structures, Change in Land Use (i.e. : Almost complete change in how they use their community)	Mild Disruption to public services. Most everything back to normal operations within 7 days
7	Divide Community Cohesiveness – Community still exists but functions separately. Some of cultural and historical essence and features are lost, but community may still retain some of what makes it culturally and historically significant.	Minor Disruption to public services. Most everything back to normal operations soon after the event.
8	Community Still Functions and retains Cultural and Historical Heritage Significances but Notable Changes are Be Community Still Functions and retains Cultural and Historical Heritage Significances but Subtle Changes may occur that do impact community integrity.	Very minor disruption to public services. Most everything back to normal operations soon after the event.
9	Community Still Functions and retains most Cultural and Historical Heritage Significance; There may be small, subtle changes.	Extremely small disruption to public services. All services back to normal operations within days.
10	Complete Preservation of Community values, historical	No impacts to normal way of life. Virtually no

Score	Cultural & Historical Heritage	Public Service Disruptions
	significance, and cultural heritage.	impacts to public services.

Table 22.

OSE / Risk Metric Scoring Definitions

Score	Personal Impacts	Long-Term Sustainability
1	Total Loss of Family Possessions due to Continued Hurricane Occurrence or to Plan Implementation (i.e. Property and Livelihood, Irreplaceable Items, Sense of Security, Mental Stability & Emotional Well-being) – Everyday Life no longer exists - Numerous Persons would be affected by events and might require professional therapy; most persons would likely not overcome effects of events	Complete failure (lack of sustainability) of plan (i.e. - will not perform as intended (over time) due to factors such as cost, human behavior, technical level of maintenance required, political concerns, resource availability, local funding per year, and operational reliability), is a certainty, at some time within period of analysis.
2	Majority of Family Possessions Lost (i.e. Property and Livelihood, Irreplaceable Items, Sense of Security, Mental Stability & Emotional Well-being) – Everyday Life no longer exists - Numerous Persons would be affected by events and might require professional therapy; many persons would likely not overcome effects of events	Will almost certainly fail within lifetime of project due to some factor associated with sustaining the plan. The plan will likely not be politically supported for funding or be reliably and fully maintained during its intended project life. Human behavior will almost certainly interfere with project performance sometime during project life, very high technical level of maintenance will be required, and very high risk that plan will not be operated correctly during time of need.
3	Significant Amount of Family Possessions Lost (i.e. Property Severely Damaged, Livelihood Significantly Changed, Many Irreplaceable Items Lost, Sense of Security, Mental Stability & Emotional Well-being Significantly Altered – Everyday Life no longer exists - Many people would be affected by events and could require professional therapy; many would likely not overcome effects of events for a very long time	Plan failure highly likely within project life. Minimal political support and project sustainability highly unlikely (i.e. maintenance and funding). Human behavior will interfere with project performance sometime during project life, high technical level of maintenance will be required, and high risk that plan will not be operated correctly during time of need.
4	Moderate Amount of Family Possessions Lost (i.e. Property Damaged, Livelihood Changed, Some Irreplaceable Items Lost, Sense of Security, Mental Stability & Emotional Well-being Shaken – Everyday Life Changed - Many people would be affected by events and might require professional therapy; a significant number of people would likely not overcome effects of events; some would benefit from professional therapy	Plan could possibly fail within project life. Minimal political support resulting in reduced funding and/or maintenance abilities. Human behavior may negatively affect project performance, moderate technical level of maintenance is required, and moderate risk of plan not being operated correctly.
5	Some loss of personal possessions remains likely over period of analysis; livelihood may be changed; irreplaceable items might be lost; some loss of security; property damages do affect one's sense of well-being; life for most could be altered; some loss of family possessions remains likely	Plan should perform as intended over entire project life, but possibility exists that it would not be sustained. Plan may not get sufficient political support for either sustained funding or maintenance over the life of the project. Human behavior may negatively affect project performance, moderate technical level of maintenance is required, and moderate risk of plan not being operated correctly.
6	Some loss of personal possessions is somewhat likely over period of analysis; livelihood could be changed at some point; irreplaceable items could be lost; some would suffer from loss of security; property damages could potentially affect one's sense of well-being; life for some would be altered at some point;	Plan will likely perform as intended over entire project life. There is general political support to implement the plan, but there is a risk of funding and maintenance being interrupted over project life. Negative human behavior may have some effect on project performance, and technical maintenance is required. There is also a moderate risk of the plan not being operated correctly.
7	Some loss of personal possessions could happen during period of analysis; chance exists that livelihood could be changed; irreplaceable items could be lost, but chance is not good; some might suffer from loss of security, but although shaken, overall emotional well-being is good for vast majority of period of analysis; property damages affecting one's sense of well-being is not likely; life for	Plan will most likely perform as intended over entire project life. There is general political support to implement the plan, but there is a moderate risk of funding and maintenance being interrupted over life of project. Negative human behavior has some effect on project performance, and a moderate level of technical maintenance is required. There also remains some risk

Score	Personal Impacts	Long-Term Sustainability
	small number of people could be altered at some point; Family Possessions could be impacted but most would be recoverable.	of the plan not being operated correctly.
8	Some loss of personal possessions could happen during period of analysis; small chance exists that livelihood could be changed; irreplaceable items have low likelihood of being lost; sense of security would not be shaken for vast majority, overall emotional well-being is good to very good; property damages affecting one's sense of well-being is highly unlikely; Family Possessions might be impacted, but most would be recoverable.	Plan is very unlikely of not performing as intended over entire project life. There is general political support, but some issues could arise causing delay to fully implement the plan. There is low risk of funding and maintenance being interrupted over life of project. Negative human behavior has some effect on project performance, a low to moderate level of technical maintenance is required, and there is a low to moderate risk of plan not being operated correctly.
9	Very low likelihood that loss of personal possessions would happen during period of analysis; chance exists that livelihood could be changed; irreplaceable items could be lost, but chance is extremely unlikely; very few would suffer from loss of security; overall emotional well-being is very good to excellent for vast majority of period of analysis; property damages affecting one's sense of well-being is extremely unlikely; life for very small number of people could be altered at some point; family possessions impacted but most recoverable; Recovery is Immediate.	Plan will almost certainly perform as intended over entire project life. There is strong political support and will to implement the plan, and an extremely low risk of funding and maintenance being interrupted over life of project. Negative human behavior would have extremely low likelihood of having any effect on project performance, an extremely low technical level of maintenance is required, and an extremely low risk of plan not being operated correctly.
10	Complete preservation of family possessions (i.e. Property and Livelihood, Irreplaceable Items, Sense of Security Mental Stability & Emotional Well-being)	Plan will absolutely perform as intended over entire project life. It is fully politically supported; resources are more than adequate to maintain the project, human behavior will not negatively affect project performance, minimal to no maintenance required, extremely low risk of funding being interrupted, and extremely low risk of plan not being operated correctly.

Table 23

Risk Metric Scoring Definitions

Score	Consequence of Plan Failing	Residual Risk
1	Plan failure would result in extremely widespread and extensive injuries and large number of deaths; enormous number of structures destroyed, and almost all of remainder damaged significantly; community would suffer total loss of infrastructure; wildlife would suffer severely as result of plan failure; habitat loss would be extreme as result of plan failure	Tremendous residual risk; All or almost all damages and risks remain unaddressed; Risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion remain unabated; threats to cultural or historical heritage remain extremely high.
2	Plan failure would result in extremely widespread injuries and significant number of deaths; Very large number of structures destroyed, and most of remainder damaged significantly; total infrastructure loss, wildlife, and habitat loss throughout Coastal Mississippi	High to extremely high residual risk; almost all damages and risks remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion remain unabated; threats to cultural or historical heritage remain very high.
3	Plan failure would result in widespread injuries, large number of deaths, and large number of structures destroyed, with many of remainder damaged; significant damage to infrastructure, and loss of wildlife; widespread habitat damage or loss would occur	High residual risk; vast majority of damages and risks remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion remain high; threats to cultural or historical heritage remain high, and cultural heritage could be severely compromised.
4	Very numerous people would be injured; moderate to large number of deaths; fairly large number of structures destroyed, and some of remainder damaged significantly; loss of infrastructure would be moderate to highly significant; much wildlife would be impacted; habitat damage or loss would be moderate to highly significant	Moderate to high residual risk; majority of damages and risks remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion remain high; threats to cultural or historical heritage remain moderate to high, and cultural heritage could be compromised.

Score	Consequence of Plan Failing	Residual Risk
5	Numerous people could be injured; moderate number of deaths; fair number of structures destroyed, and some of remainder damaged; loss of infrastructure would be moderate, but would require significant amount of time for recovery; wildlife would be impacted, but much would recover; habitat damage or loss would be moderate	Moderate residual risk; much of damage and risks remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion remain moderate, but for a significant number, risk is reduced; threats to cultural or historical heritage remain moderate, and little of cultural heritage would be compromised. Environmental habitat could suffer but most could be restored with minor effort.
6	Moderate to minimal number of injuries as a result of plan failure, small to moderate number of deaths; some structures destroyed, and some number of remainder damaged; still substantial potential impacts to infrastructure, but much would recover quickly; habitat damage or loss would be moderate to small	Small to moderate residual risk; some of damage and risks remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion are at small to moderate risk, but significant amount of risk is reduced; threats to cultural or historical heritage would be small to moderate, and very little risk of cultural heritage being compromised. Environmental habitat could suffer but most could be restored with very little effort.
7	Minimal number of injuries as a result of plan failure, small number of deaths might result; small number of structures destroyed, some damaged; moderate potential impacts to infrastructure, but almost all would recover quickly; habitat damage or wildlife loss would be small, and could recover quickly, impacts to infrastructure would be minimal, and recovery of most would be rapid	Small amount of residual risk; some damage and risks remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion are at small risk, but most risk is reduced; threats to cultural or historical heritage would be small, and almost no risk of cultural heritage being compromised. Limited risk of environmental habitat impact and that which did would be restored with very little effort.
8	Very small number of injuries would occur as a result of plan failure, very small number of deaths; minimal number of structures damaged or destroyed; minimal potential impacts to infrastructure, and almost all would recover quickly; habitat damage or wildlife loss would be very small, and would recover quickly, impacts to infrastructure would be minimal, and recovery of majority would be rapid	Very small amount of residual risk; very limited amount of remaining risk or potential damages would remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion are at very small risk; vast majority of risk is reduced; threats to cultural or historical heritage would be very small, and cultural heritage at very low risk of any compromise. Very limited risk of any environmental habitat suffering over project life, and that which did would be restored with very low effort.
9	Extremely small number of injuries would occur as a result of plan failure; Few to no deaths would result; very small number of structures, if any, destroyed, and small number of remainder damaged; minimal impacts to infrastructure, and all would recover quickly; habitat damage or wildlife loss would be extremely small, and would recover quickly; and recovery of majority would be rapid. No Injuries, very minimal infrastructures, wildlife, and habitat impacts	Extremely small amount of residual risk; extremely limited amount of remaining risk or potential damages would remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion are at extremely small risk; almost all risk is reduced; threats to cultural or historical heritage would be extremely small, with cultural heritage at almost no risk of compromise. Extremely limited risk of any environmental habitat suffering over project life.
10	Complete Performance of Plan No Impacts due to Failure	Almost no residual risk would remain unaddressed; risks of continued damage to ecosystems, infrastructure, erosion or saltwater intrusion are almost non-existent; threats to cultural or historical heritage would be almost non-existent, with cultural heritage at no risk of temporary or permanent compromise. Almost no risk of any environmental habitat suffering significantly over project life.

Using these definitions, the planning team starting developing metrics for the different measures. These metrics were used to help refine the measures.

7.3 "Weighting" of Risk metrics by Stakeholders of coastal Mississippi

Three sequential "risk weighting" workshops were held in July, September, and December of 2007 with various stakeholder groups. The first workshop was used primarily to make sure that the stakeholders understood the RIDF process and that the metric definitions were sound and easily understood. At this workshop, the stakeholders were subjected to two different weighting (or scoring) techniques and their feedback helped to refine the process. This process was repeated at the September workshop, where the stakeholders used example metric data to aid their understanding of the measures. Again, feedback from this workshop allowed the team to finalize the weighting process and in the December, the stakeholders were able to see the actual data for the metrics associated with the final list of alternatives. The MsCIP weight elicitation workshops yielded 45 complete sets of weights on fifteen metrics. These initial weights were used to establish the importance of each factor as determined by the stakeholders, and are shown in Table 24. An exploratory data reduction technique called a cluster analysis was used to group stakeholders with similar preference patterns expressed through their allocation of weights to metrics. These results, as shown in Figure 15, enabled the MsCIP team to compare the different stakeholder preferences that exist for potential solutions. A more detailed description of how the weights of these metrics were developed can be found in the RIDF Appendix.

Table 24.

Point Allocation to Metrics

Cluster	Session	Tidal Habitat Restored	Tidal Habitat Lost	Non-Tidal Restored	Non-Tidal Lost	Damage Reduced	Residual Damage	Implementation Cost	Local Cost Burdens	Regional Benefits	Cultural Heritage	Disruptions	Personal Impacts	Sustainability	Consequences	Residual Risk
A	Business	1	1	1	1	35	3	5	5	5	4	2	2	15	16	4
A	Business	5	3	5	3	5	4	9	10	10	6	8	8	15	3	6
A	Federal	2	1	2	1	20	4	10	4	10	1	10	4	17	10	4
A	Local	2	2	2	2	7	7	12	24	10	5	10	5	5	2	5
A	Local	1	1	1	1	3	3	25	25	10	10	5	1	7	3	4
A	Local	1	2	1	2	13	8	1	12	13	1	8	5	12	12	9
A	Local	3	4	1	2	15	5	5	3	4	3	12	8	18	13	4
A	Local	1	1	1	1	20	8	12	9	10	6	7	2	15	5	2
A	Local	1	1	1	1	10	10	10	16	3	7	7	7	15	10	1
B	Business	8	6	6	2	15	6	10	8	8	8	5	7	4	3	4
B	Business	10	8	1	1	7	10	10	12	5	3	8	5	9	6	5
B	USACE	12	12	10	10	12	7	2	2	2	5	5	2	7	7	5
B	USACE	10	12	10	14	10	9	8	5	7	3	2	4	2	3	1
B	USACE	5	5	5	5	10	5	10	10	5	5	5	5	7	15	3
B	Federal	6	6	5	5	20	6	6	4	7	4	5	3	9	8	6
B	Federal	5	5	5	5	10	10	10	5	5	5	5	5	10	10	5
B	Federal	10	10	5	5	10	1	10	7	5	1	5	1	5	5	20
B	Local	1	10	1	10	10	12	18	1	8	4	8	3	1	12	1
B	Local	15	9	5	2	8	5	6	8	3	8	5	5	8	5	8

Cluster	Session	Tidal Habitat Restored	Tidal Habitat Lost	Non-Tidal Restored	Non-Tidal Lost	Damage Reduced	Residual Damage	Implementation Cost	Local Cost Burdens	Regional Benefits	Cultural Heritage	Disruptions	Personal Impacts	Sustainability	Consequences	Residual Risk
B	NGO	5	10	5	10	17	1	10	5	2	3	3	3	18	7	1
B	State	5	5	5	5	10	10	10	10	10	5	10	5	10	0	0
B	State	7	12	7	12	6	3	11	6	3	3	2	2	16	5	5
B	State	5	4	5	3	9	5	5	7	6	5	10	10	8	6	12
B	State	3	15	2	2	8	10	8	8	7	1	5	12	5	6	8
C	Business	8	30	1	1	5	1	10	10	9	5	5	3	10	1	1
C	USACE	11	12	11	12	5	7	6	6	4	2	3	2	9	8	2
C	Federal	12	12	12	12	5	5	3	3	2	5	5	5	10	5	4
C	Federal	10	10	12	15	4	4	1	1	1	15	1	1	5	15	5
C	NGO	16	16	11	11	4	3	3	1	1	2	1	1	18	8	4
C	NGO	10	20	5	20	6	3	5	3	5	2	5	2	5	8	1
C	State	12	15	11	13	9	1	10	9	2	2	1	2	10	2	1
C	State	8	15	8	16	5	5	5	10	2	5	4	4	8	3	2
C	State	15	20	10	10	5	0	10	0	3	2	3	2	10	10	0
C	State	15	15	5	5	5	5	5	5	5	5	10	10	4	4	2
D	Federal	15	20	15	15	10	5	1	2	3	4	2	4	1	1	2
D	Federal	30	25	12	8	1	1	1	1	1	1	1	1	7	5	5
D	Federal	50	1	20	2	6	5	2	2	1	2	2	2	2	1	2
D	NGO	14	20	14	20	1	1	1	3	7	2	1	1	5	8	2
D	NGO	14	25	15	24	2	1	3	2	1	2	2	3	2	3	1
D	State	5	15	2	40	1	10	5	1	1	2	1	1	10	1	5

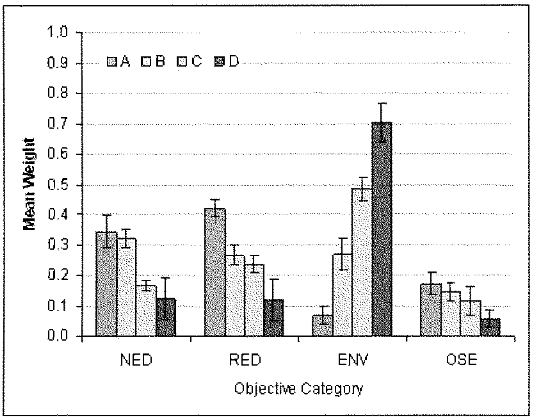


Figure 15. Stakeholder Weights for Clusters by Planning Objective

8 FORMULATION ROUND TWO

The refinement of measures consisted of modifying measures to achieve higher desired outputs (better benefits, more damage reduction, more ecosystem benefit), and to better serve the original intended purpose, based on feedback from modeling efforts or better data availability. This refinement process also included the development of data at a higher level of detail on remaining measures, and the development of data on additional areas of concern, such as cultural and environmental effects, for technical considerations not developed in detail in the first round of measure development, and for other factors.

If all of the earlier screening criteria were met, each remaining measure for a given problem area was then forwarded on for further analysis and to be evaluated and compared at a higher level of detail, in the next phase (Round Two) of analysis. This refinement process included the development of more detail in design, cost estimation, environmental components and potential impacts, potential damages prevented, site considerations, more detailed technical requirements, source material and source area considerations, variations in materials that could be used to solve the problem in a similar way, species benefits or impacts considerations, and many other technical, environmental, or economic issues.

The list of measures developed during this round by zone is presented in Table 25 below.

Table 25.

Round 2 Measures

Name (Measures screened during this round are in red)	Description
Offshore Zone	
Deer Island Restoration	Complete Restoration of Island back to its pre-Camille footprint
Increasing Islands Footprint (Option A)	Restore islands by sand dredged from off-shore
Placing River Sand in Littoral Zone (Option B)	Restore islands by placing dredged river sand in the littoral zone
Placing Off-shore Sand in Littoral Zone (Option C)	Restore islands by placing dredged sand in the littoral zone
Creating 2 FT Island Dunes with Beach Sand (Option D)	Restore islands by shaping existing beach sand into 2' high dunes
Creating 6 FT Island Dunes with Off-shore Sand (Opt E)	Restore islands by creating 6' high dunes with off-shore sand
Barrier Island No Action	
Barrier Island Restoration to Protect MS Sound Estuary	Study to recommend optimal solution to protect the MS Sound Estuary
Emergency Ship Island Restoration	Phased Advanced Engineering and Design to protect Ft. Mass. and Estuary
Sub Aquatic Vegetation Pilot Project	Tests various methods of planting SAVs in MS Sound
MS Sound Sub Aquatic Vegetation Restoration	Restore 4400 acres of lost SAVs in MS Sound using pilot results
Coastal Zone	
Hancock 40' Dune @ Elevated Roadway (Option A)	Dune adjacent to the seawall with a 40' crest at elevation 10
Hancock 50' Dune @ Elevated Roadway (Option B)	Dune adjacent to the seawall with a 50' crest at elevation 8
Hancock 20' Dune @ Elevated Roadway (Option C)	Dune adjacent to the seawall with a 20' crest at elevation 10
Hancock 30' Dune @ Elevated Roadway (Option D)	Dune adjacent to the seawall with a 30' crest at elevation 8
Hancock Dune Option A plus sea oats (Option E)	Like option A + plantings on toe of dunes
Hancock Dune Option B plus sea oats (Option F)	Like option B + plantings on toe of dunes
Hancock Dune Option C plus sea oats (Option G)	Like option C + plantings on toe of dunes
Hancock Dune Option D plus sea oats (Option H)	Like option D + plantings on toe of dunes
Hancock 55' Dune and beach berm (Option I)	Dune w/ 55' crest at elev. 10 & beach berm on south side
Hancock Dune Option I plus sea oats (Option J)	Like Option I but with plantings on toe of berm
Coastal Beach No Action	
Comprehensive 60' wide x 2' high Dune plus sea oats (Option K)	60' wide X 2' high berm with sea oats planted on 30" centers
Harrison 40' Dune @ Elevated Roadway (Option A)	Dune adjacent to the seawall with a 40' crest at elevation 10
Harrison 50' Dune @ Elevated Roadway (Option B)	Dune adjacent to the seawall with a 50' crest at elevation 8
Harrison 20' Dune @ Elevated Roadway (Option C)	Dune adjacent to the seawall with a 20' crest at elevation 10
Harrison 30' Dune @ Elevated Roadway (Option D)	Dune adjacent to the seawall with a 30' crest at elevation 8
Harrison Dune Option A plus sea oats (Option E)	Like option A + plantings on toe of dunes
Harrison Dune Option B plus sea oats (Option F)	Like option B + plantings on toe of dunes
Harrison Option C plus sea oats (Option G)	Like option C + plantings on toe of dunes
Harrison Dune Option D plus sea oats (Option H)	Like option D + plantings on toe of dunes
Harrison 55' Dune and beach berm (Option I)	Dune w/ 55' crest at elev. 10 above datum and add beach berm
Harrison Dune Option I plus sea oats (Option J)	Like Option I but with plantings on toe of berm
Hancock Seawall/Elevated Roadway at Elevation 11	Seawall and Elevated Beach Road to Elevation 11
Harrison Seawall/Elevated Roadway at Elevation 16	Seawall and Elevated Beach Road to Elevation 16

Jackson Seawall/Elevated Roadway at Elevation 11	Seawall and Elevated Beach Road to Elevation 11
Biloxi Bay Surge Gate at Elevation 20	Required for LOD3 (same as LOD4 Biloxi Surge Barrier Option A)
St Louis Bay Surge Gate at Elevation 20	Required for LOD3 (same as LOD4 St Louis Bay Surge Option A)
Pearlington No Action	
Pearlington Nonstructural at ABFE (Reach 6)	Buyouts and/or raising structures accounting for a 20' surge
Pearlington Ring Levee at Elev. 20 (Reach 6)	Ring levee around Pearlington 20' above datum (NAVD 88)
Pearlington Nonstructural for Elevation 20 (Reach 6)	Buyouts and/or raising structures accounting for a 20' surge
Pearlington Ring Levee at Elev. 30 (Reach 6)	Ring levee around Pearlington 30' above datum (NAVD 88)
Pearlington Nonstructural for Elevation 30 (Reach 6)	Buyouts and/or raising structures accounting for a 30' surge
ABFE Nonstructural for (Reach 5)	Includes everything in Reach 5
ABFE Nonstructural for (Reach 36)	Includes everything in Reach 36
Pearlington Ring Levee for up to a 'Moderate to Low Risk Event'	Ring levee around Pearlington designed for a 100-500 year event
Pearlington Nonstructural for up to a 'Moderate to Low Risk Event'	Nonstructural options for Pearlington to handle a 100-500 year event
Pearlington Ring Levee plus NS up to a 'Moderate to Low Risk Event'	Reach 5-6
Pearlington Ecosystem Restoration with NS Buyouts	Buyouts and Ecosystem Restoration of high risk properties
ABFE Nonstructural for Reaches 5,6,36)	Nonstructural buyouts / elevation of structures
Pearlington North Eco Restoration Plan - 1	76 Acres - residential infrastructure
Pearlington South Restoration Plan - 2	11 Acres - residential infrastructure
Port / West Ecosystem Restoration Plan - 3	49 Acres - residential infrastructure
Ansley Ecosystem Restoration Plan - 4	2024 Acres - residential infrastructure
Heron Bay Ecosystem Restoration Plan - 5	595 Acres - residential infrastructure
Bayou Caddy Ecosystem Restoration Plan - 8	362 Acres - residential / commercial infrastructure
Bay St. Louis / Waveland No Action	
ABFE Nonstructural for Reach 4	Nonstructural buyouts / elevation of structures
Clermont Harbor Ecosystem Restoration Plan - 9	210 Acres - residential infrastructure
ABFE Nonstructural for Reach 3	Nonstructural buyouts / elevation of structures
ABFE Nonstructural for Reaches 3,4	Nonstructural buyouts / elevation of structures
Henderson Point No Action	
Henderson Point Nonstructural for Reach 9	
Henderson Point B Accelerated Buyout	Nonstructural buyout of properties
Pass Christian Nonstructural for Reach 10	Nonstructural buyouts / elevation of structures
Pass Christian Beach Front Eco Restoration Plan - 20	21 Acres - Low forested drainage area / residential
Pass Christian Nonstructural for Reach 13	Nonstructural buyouts / elevation of structures
Pass Christian Nonstructural for Reach 15	Nonstructural buyouts / elevation of structures
Biloxi Front Beach Ecosystem Restoration Plan - 26	41 Acres South of Hwy 90 (commercial retail outlet)
Pass Christian Nonstructural for Reach 18	Nonstructural buyouts / elevation of structures
Nonstructural for Reaches 10,13,15,18	Nonstructural buyouts / elevation of structures
Ocean Springs No Action	
Ocean Springs Ring Levee at Elev. 20	Ring levee around Ocean Springs 20' above datum (NAVD 88)
Ocean Springs Nonstructural for Elevation 20	Buyouts and/or raising structures accounting for a 20' surge

Ocean Springs Ring Levee at Elev. 30	Ring levee around Ocean Springs 30' above datum (NAVD 88)
Ocean Springs Nonstructural for Elevation 30	Buyouts and/or raising structures accounting for a 30' surge
Ocean Springs Nonstructural for Reach 22	Nonstructural buyouts / elevation of structures
Ocean Springs Nonstructural for Reach 24	Nonstructural buyouts / elevation of structures
Nonstructural for Reaches 22,24	Nonstructural buyouts / elevation of structures
Gulf Park / Belle Fontaine No Action	
Pine Island Plan - 30	238 Acres - restore to emergent tidal marsh
Nonstructural for Reach 28	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 26	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 27	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 31	Nonstructural buyouts / elevation of structures
Gulf Park Estates Ring Levee at Elev. 20 (Option A)	Ring levee around Gulf Park Estates 20' above datum (NAVD 88)
Gulf Park Estates Alternate Ring Levee at Elev. 20 (Option C)	Ring levee around Gulf Park Estates 20' requires ABO plan
Gulf Park Estates Nonstructural for Elevation 20	Buyouts and/or raising structures accounting for a 20' surge
Gulf Park Estates Ring Levee at Elev. 30 (Option B)	Ring levee around Gulf Park Estates 30' above datum (NAVD 88)
Gulf Park Estates Alternate Ring Levee at Elev. 30 (Option D)	Ring levee around Gulf Park Estates 30' require ABO plan
Gulf Park Estates Nonstructural for Elevation 30	Buyouts and/or raising structures accounting for a 30' surge
Gulf Park Estates Nonstructural ABO Plan	Nonstructural Advanced Buyout Plan for areas not in Ring Levee
Belle Fontaine Ring Levee at Elev. 20 (Option A)	Ring levee around Belle Fontaine 20' above datum (NAVD 88)
Belle Fontaine Alternate Ring Levee at Elev. 20 (Option C)	Ring levee around Belle Fontaine 20' require ABO plan
Belle Fontaine Nonstructural for Elevation 20	Buyouts and/or raising structures accounting for a 20' surge
Belle Fontaine Ring Levee at Elev. 30 (Option B)	Ring levee around Belle Fontaine 30' above datum (NAVD 88)
Belle Fontaine Alternate Ring Levee at Elev. 30 (Option D)	Ring levee around Belle Fontaine 30' require ABO plan
Belle Fontaine Nonstructural for Elevation 30	Buyouts and/or raising structures accounting for a 30' surge
Belle Fontaine Nonstructural ABO Plan	Nonstructural Advanced Buyout Plan for areas not in Ring Levee
Belle Fontaine Ecosystem Restoration Plan - 31	1517 Acres (Contained in ABO area named Belle Fontaine)
Nonstructural for Reaches 26,27,28	Nonstructural buyouts / elevation of structures
Gautier No Action	
Nonstructural for Reach 29	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 30	Nonstructural buyouts / elevation of structures
Gautier Ring Levee at Elev. 20	Ring levee around Gautier 20' above datum (NAVD 88)
Gautier Nonstructural for Elevation 20	Buyouts and/or raising structures accounting for a 20' surge
Gautier Ring Levee at Elev. 30	Ring levee around Gautier 30' above datum (NAVD 88)
Gautier Nonstructural for Elevation 30	Buyouts and/or raising structures accounting for a 30' surge
Nonstructural for Reaches 29,30	Nonstructural buyouts / elevation of structures
Moss Point / Pascagoula No Action	
Pascagoula/Moss Point Ring Levee at Elev. 20 (Option A)	Ring levee around Pascagoula/Moss Point 20' above datum
Pascagoula / Washington St. Ring Levee at Elev. 20 (Option C)	Ring levee around Pascagoula/Washington Street @ 20'
Moss Point Alternate Ring Levee at Elev. 20 (Option E)	Ring levee around Moss Point 20' above datum (NAVD 88)
Washington St + Moss Point Alternate Ring Levee at	Ring levee around Washington St + Moss Point Alt at Elev 20

Elev. 20 (Opt G)	
Pascagoula / Moss Point Nonstructural for Elevation 20	Buyouts and/or raising structures accounting for a 20' surge
Pascagoula/Moss Point Ring Levee at Elev. 30 (Option B)	Ring levee around Pascagoula/Moss Point 30' above datum
Pascagoula / Moss Point Nonstructural for Elevation 30	Buyouts and/or raising structures accounting for a 30' surge
Pascagoula / Washington St. Ring Levee at Elev. 30 (Option D)	Ring levee around Pascagoula/Washington Street @ 30'
Moss Point Alternate Ring Levee at Elev. 30 (Option F)	Ring levee around Moss Point 30' above datum (NAVD 88)
Washington St + Moss Point Alternate Ring Levee at Elev. 30 (Opt H)	Ring levee around Washington St + Moss Point Alt at Elev 30
Nonstructural for Reach 54	Nonstructural Plan for areas not inside Ring Levee
Nonstructural for Reach 53	Nonstructural Plan for areas not inside Ring Levee
Nonstructural for Reach 52	Nonstructural Plan for areas not inside Ring Levee
Nonstructural for Reach 51	Nonstructural Plan for areas not inside Ring Levee
Nonstructural for Reaches 51,52,53, 54	Nonstructural buyouts / elevation of structures
Griffin Point Ecosystem Restoration Plan - 32	183 Acres - restore to emergent tidal marsh
Bayou Chico Ecosystem Restoration Plan - 33	259 Acres - restore to emergent tidal marsh
Grand Bay / Bayou Cumbest Ecosystem Restoration Plan - 34	1517 Acres (Contained in ABO area named Belle Fontaine)
Inland Zone	
Inland Zone No Action	
Inland Barrier A Levee at Elev. 20	3 County Levees at Elev. 20' plus surge gates
Inland Barrier D Levee at Elev. 20 with Roadway	3 County Levees at Elev. 20' plus surge gates with roadway on top
Inland Barrier F Menge Ave. Levee at Elev. 20	3 County Levees at Elev. 20' with no Bay St. Louis Surge gate
Inland Barrier I Menge Ave. Levee at Elev. 20 w/ Roadway	3 County Levees at Elev. 20' with no Bay St. Louis Surge gate w/ roadway
Nonstructural at Inland Barrier Footprint for Elevation 20	Coast-wide Nonstructural comparison for inland barriers
Inland Barrier B Levee at Elev. 30	3 County Levees at Elev. 30' plus surge gates
Inland Barrier E Levee at Elev. 30 with Roadway	3 County Levees at Elev. 30' plus surge gates with roadway on top
Inland Barrier G Menge Ave. Levee at Elev. 30	3 County Levees at Elev. 30' with no Bay St. Louis Surge gate
Inland Barrier J Menge Ave. Levee at Elev. 30 w/ Roadway	3 County Levees at Elev. 30' with no Bay St. Louis Surge gate w/ roadway
Nonstructural at Inland Barrier Footprint for Elevation 30	Coast-wide Nonstructural comparison for inland barriers
Inland Barrier C Levee at Elev. 40	3 County Levees at Elev. 40' plus surge gates
Inland Barrier H Menge Ave. Levee at Elev. 40	3 County Levees at Elev. 40' with no Bay St. Louis Surge gate
Nonstructural at Inland Barrier Footprint for Elevation 40	Coast-wide Nonstructural comparison for inland barriers
Nonstructural for Reach 7	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 37	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 38	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 1	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 2	Nonstructural buyouts / elevation of structures
Lower Bay Rd Ecosystem Restoration Plan - 6	227 Acres - residential infrastructure
Lakeshore Ecosystem Restoration Plan - 7	275 Acres - residential / commercial infrastructure
Bay St. Louis No Action	
Bay St. Louis Ring Levee at Elevation 20	Ring levee around Bay St. Louis 20' above datum (NAVD 88)

Bay St. Louis Nonstructural for Elevation 20	Buyouts and/or raising structures accounting for a 20' surge
Bay St. Louis Ring Levee at Elevation 30	Ring levee around Bay St. Louis 30' above datum (NAVD 88)
Bay St. Louis Nonstructural for Elevation 30	Buyouts and/or raising structures accounting for a 30' surge
Shoreline Park ABO Plan	buyouts of structures in high risk zones
Shoreline Park Ecosystem Restoration Plan	Restore tidal marsh - Requires buyout
Bayou LaCroix Ecosystem Restoration Plan - 10	260 Acres - residential infrastructure
Admiral Island DSS Ecosystem Restoration Plan - 11	245 Acres - (ABO area in Shoreline Park B and 2/3 of site is demo project and state owned)
State's Admiral Island Ecosystem Restoration	Exotic control and Debris Removal
Chapman Road Ecosystem Restoration Plan - 13	146 Acres - (ABO area in Shoreline Park C)
Diamondhead Ecosystem Restoration Plan - 15	434 Acres
Henderson Point / Pass Christian No Action	
Henderson Point A Nonstructural ABO Plan	Nonstructural Advanced Buyout Plan for areas not in Ring Levee
Delisle Ecosystem Restoration Plan - 16	Harrison County 121 Acres - removal of residential infrastructure
Ellis Ecosystem Restoration Plan - 17	443 Acres
Pine Point Shores East Ecosystem Restoration Plan - 18	103 Acres - removal of residential structures
Pine Point Shores West Ecosystem Restoration Plan - 19	84 Acres - removal of residential structures
Bayou Portage Ecosystem Restoration Plan - 21	44 Acres - Restore to emergent tidal marsh
Nonstructural for Reach 8	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 39	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 40	Nonstructural buyouts / elevation of structures
Gulf Port No Action	
Nonstructural for Reach 12	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 40	Nonstructural buyouts / elevation of structures
Turkey Creek Ecosystem Restoration Plan - 22	948 Acres - Restore Wet Pine Savannah
Brickyard Bayou at Courthouse Rd Eco Plan - 23	15 Acres - Restore to emergent tidal marsh
Biloxi River - Shorecrest Eco Restoration Plan - 24	15 Acres - Restore to emergent tidal marsh
Biloxi River - Eagle Point Eco Restoration Plan - 25	17 Acres -
Biloxi No Action	
Nonstructural for Reach 14	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 17	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 19	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 16	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 20	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 48	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 50	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 47	Nonstructural buyouts / elevation of structures
Keegan Bayou Ecosystem Restoration Plan - 27	55 Acres - restore to emergent tidal marsh
Ocean Springs No Action	
Nonstructural for Reach 21	Nonstructural buyouts / elevation of structures

Nonstructural for Reach 23	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 25	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 32	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 33	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 34	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 35	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 41	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 42	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 43	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 44	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 45	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 46	Nonstructural buyouts / elevation of structures
Nonstructural for Reach 49	Nonstructural buyouts / elevation of structures
Nonstructural Elevations for Waveland	Elevation of Houses in the City of Waveland
Moss Point Municipal Structures Relocation	Relocating Municipal services to higher ground
Escatawpa Freshwater Diversion	Decrease salinity to wetlands / MS Sound by diverting freshwater
Pearl River Freshwater Diversion	Decrease salinity to wetlands / MS Sound by diverting freshwater
Bonnie Carrie Freshwater Diversion	Decrease salinity to wetlands / MS Sound by diverting freshwater
Violet Freshwater Diversion	Decrease salinity to wetlands / MS Sound by diverting freshwater
St. Martin Ecosystem Restoration Plan - 28	Jackson County 468 Acres - restore to emergent tidal marsh
Fort Point Ecosystem Restoration Plan - 29	84 Acres - restore to emergent tidal marsh

8.1 Refinement of Damage Reduction Measures

During early discussion with the public, many people stated the opinion that the barrier islands could be "armored", or otherwise modified to produce a greater damage reduction effect than their current or even pre-Camille condition. Suggestions for their modification included adding additional height or length, closing off the gaps between them, or armoring them. While some thought that this idea was not a valid means of reducing damage on the mainland, the idea had a great deal of credence among numerous residents. In fact, there is a strong feeling among many that the erosion of the barrier islands contributed to the level of damage created by Katrina. While the application of armor would not be possible (due to their environmental value and inclusion in the National Parks system), the concepts of adding additional height or length were examined, to determine what degree, if any, of surge or wave reduction the barrier islands do contribute, and what they might also contribute if restored to their former dimensions and elevation. The various configurations of the barrier islands were modeled in a sensitivity analysis and are presented in Section 2.10 of the Engineering Appendix.

In conjunction with the development of various barrier islands damage reduction modeling scenarios, a structural "Lines of Defense" concept was drafted that started with an initial (or outermost) line along the alignment of the barrier islands, progressing inland to offshore breakwaters, beaches with elevated dune systems, seawalls or elevated roads (immediately inland from the beach), levees or embankments along the shoreline, or levees on various inland alignments (Highway 90, the railroad alignment, Interstate 10).

These same "lines" could also be designed to provide an increasing level of damage reduction (by increasing height) as one progressed inland.

The "Lines of Defense" (LOD) concept was modeled using both the ADCIRC model, to determine the degree of surge height reduction, and also the Beach-FX model, which was used to determine beach behavior (primarily the erosion resulting) during a hurricane event. In addition to numerous separate "lines" (barriers to surge), additional combinations of measures were also modeled to determine the most productive package of measures.

Although all iterations of the process of creating and modifying "lines" are placed under this single section of "Round Two", there were dozens of rounds of iteration of the LODs that occurred.

The first Line of Defense, designated as LOD-1, included restoration to a pre-Camille condition, restoration to a pre-Katrina condition, restoration to a condition equivalent to the 1920's, and one in which additional height and length was created on each island. In 1969, Hurricane Camille caused extensive erosion on the islands and created a large breach in Ship Island. This breach began to heal from the east as the littoral drift of sand added land mass to the west end of East Ship Island. This large scale breaching occurred again during Katrina, eroding away all the sand that had collected over the previous 35 years. After Katrina, it was widely expressed that if the islands had been in a pre-Camille condition, the storm surge would have been much less along the mainland coast. This scenario was modeled to help predict what effects the islands play in storm reduction. These results are discussed in Section 2-10 of the Engineering Appendix. There are a total of seven different options included in this report covering a wide range of possible ways to mitigate erosion of the islands.

The beaches (manmade in the 1950s) that extend along much of the coast were also considered as a feature that could be modified to provide some level of protection by construction of dunes on the beaches. Other projects are underway to improve the some of the beaches and proposed projects would construct small dunes on most of the beaches. Improving on these features by adding higher dunes and/or dune vegetation was designated as LOD-2. These would not provide protection from large storms, but would be beneficial for smaller storms and would provide recreational and environmental benefits. Each of the three counties has beaches that fit this scenario for adding dunes. For each county, 11 options were considered for adding some measure of dune creation. Most of the options have versions that included adding vegetation and sand fencing as well as dunes without these features. Eight of the options in each county have the dune placed against roadways that parallel the beaches with the assumption that these roadways would be elevated as a separate measure. Each of these options have a dune crest elevation less than the adjacent roadway(possibly raised in the future under LOD-3 options) to prevent sand from constantly being blown onto the road These options have some value as protection for the road, but more value as an ecological benefit. Two other options include a stand-alone dune out on the beach that could provide some level of surge defense along with ecological benefits. Each county also has an option with a wide sand berm fully planted with sea oats, the preferred vegetation to help stabilize dunes. This option will allow the sea oats to trap wind-blown sand and naturally build a dune with time. The dune options in all three counties total 33 different measures that could be considered.

As mentioned above, another existing condition along much of the coast is roadways that coincide with the beaches. It was envisioned that raising these roadways would have minimal environmental impact and provide the first hardened barrier to surge damage. These roadways, while not continuous along the coast, were designated as LOD-3. The new road elevations would not be as high as to act as a seawall for very large storms, but like LOD-2, they would be beneficial for smaller, more frequent storms. While different elevations were initially considered for the roadways, the technical difficulty of raising the roads over six feet was realized. This is due to the numerous intersecting roads, driveways, and parking areas that could not be constructed without extreme grades. The existing beachfront roads in Hancock and Jackson have a typical grade elevation of 5.0 and the general grade elevation for US 90 in Harrison County is 10.0 although it varies from elevation7.0 to 16.0 depending on the exact location. With the existing road elevations, a top elevation of 11.0 was selected for study in Hancock and Jackson County and a top elevation of 16.0 was selected for study in Harrison County for a total of three options. It was also recognized that LOD-3 would require that a barrier be placed at the mouths of the bays to be effective against back-flooding. The location of the barriers is shown in Section 2-1 of the Engineering Appendix.

Some areas of the coast were not associated with beaches or existing roadways that allowed for a continuous defense line. When including environmental and/or technical reasons, these areas could only be viewed as stand-alone projects such as ring levees. These areas included five communities in Jackson County and two in Hancock County. For discussion purposes, these were also included in LOD-3. Each of the conceptual ring levees have been evaluated for construction at two elevations, 20.0 and 30.0 (except for the Forest Heights neighborhood). The costs also included interior drainage, pumping stations, gates for roadways and overtopping protection. Some sites also have one or more alternate alignments. The alternate alignments were selected to lessen the impacts on wetlands, lessen the intensity of wave action or to decrease the construction costs versus adding non-structural solution areas. With all ring levee elevations and alternate alignments, there are 24 different options for further consideration.

Further inland, an existing railroad grade provided a levee-like barrier to storm surge from Katrina in some areas. This railway extends all the way across the State crossing both St. Louis Bay and Biloxi Bay. In Harrison County, the railway parallels the coastline just a few blocks inland. Using a parallel, high-ground alignment as the railway system, an inland barrier was envisioned that could be constructed to such an elevation as to protect from a large storm surge, even larger than Katrina. Like LOD-3, this system would require that the bays be closed off with barriers from surge to be effective. As LOD-4, this barrier was studied at elevations up to the maximum storm surge or maximum possible intensity (MPI) storm that could be predicted based on simulated hurricane events. These selected elevations are 20.0, 30.0 and 40.0. Possible options for LOD-4 also included omitting the surge barrier across St. Louis Bay. This would require that LOD-4 be terminated along the east side of the bay. An alternate alignment to satisfy this option was selected at Menge Avenue in Pass Christian where the LOD-4 levee could be extended northward to higher ground. This option would also leave the town of Bay St. Louis without any type of surge protection. If this alternate alignment is used, Bay St. Louis hurricane defenses could be included as a ring levee with an option under LOD-3. Many alignments for project termination on the western and eastern sides of the state were considered before one that was selected, mostly due to technical and environmental reasons. This system would not cross the Pearl River on the western side of the state nor the Pascagoula River in Jackson County. Including all the different elevations and alignments for LOD-4, there are a total of 22 options including the six options for the surge gates. A general discussion of the LODs is included in Section 2.1 of the Engineering Appendix. A more detailed discussion can be found in Part 3 of the Engineering Appendix.

As high-level protection from the largest storm surge event, the limits of surge predicted from the MPI event was transposed to maps. While actually a non-structural measure, it was designated as LOD-5. It would be an area north of any potential surge damage that would be recommended for location of critical infrastructure such as hospitals, long-term care facilities, and emergency facilities.

To proceed with initial cost estimates, various components of the structural options were conceptually designed to the selected elevations described in previous paragraphs. The initial elevations selected for each component of the lines of defense are assumed to bracket a wide range of potential storms with corresponding surge elevations. Using these preliminary designs, rough order of magnitude cost estimates were completed for each of the structural options. These cost estimates can used to develop cost curves for future use to estimate rough estimates after final design elevations are selected. With these cost curves, future studies can also select varied levels of protection based on risk assessments as well as taking into account future estimates of relative sea level rise.

8.2 Evaluation of Measures – Formulation Round Two

Evaluation of measures carried forward into Round Two focused on the discussion about modeling results and technical analyses on each measure and site or problem area. The study team then discussed their evaluations as a group to arrive at consensus as to what was being discovered about the benefits or issues with each remaining measure, and its conceptual application to the site or problem area in question. This evaluation process also involved the application of numerous technical models, to determine, for instance, the behavior of waves, under both a without-project and with-project condition, or the benefit over time to a particular ecosystem created by a particular measure.

At the same time as the lines of defense were being modeled and evaluated, it was also realized that some measures would not provide damage reduction from large storms. As an example, a dune placed on the beach could only be constructed to a height far short of what would be required to prevent surge resulting from a large storm event. It was also evident that several areas of the coast could not be included in continuous line of defense and would have to be addressed with either a ring levee system, or a non-structural solution. An example of this would be the original concept of a series of state-wide barriers along the coast following any one of several alignments (LODs). One concept that was initially discussed was a hard seawall type barrier southward (seaward) of any development across the entire coast, but later modified to follow only existing beach-front roadways. This eliminated the technical and environmental problems of crossing sparsely populated marshes and blocking extensive river systems. Locally populated areas were included, but defended with barriers not included with the continuous lines. These areas were included in the LOD system with individual ring levees.

The planning session of five conceptual lines of defense, resulted numerous refined variations of each of the lines. The evaluation of these concepts was made in a study team meeting that included engineers, environmentalists, planners, and geologists. Information from along the coastline was utilized that included large scale aerial photography, topographic maps, navigation maps, and a large collection of pre and post-Katrina photographs.

The list of measures developed for each problem area was refined once more, and additional data presented for consideration, based on their continued technical, environmental, and cost-effectiveness feasibility, based on more detailed input from the resource agencies, public and private entities, and technical staff, with consideration of their ability to be combined into multi-purpose alternatives, capable of dealing with more than one identified problem at a given site. The screened list of measures was then combined into a group of well-balanced alternatives, that included both non-structural and if applicable, structural measures that could potentially address the entire suite of environmental problems plaguing an individual site or problem area. Formulation of these alternatives also incorporated the following criteria:

- Does a potential alternative provide for an improvement in function and/or habitat values of significant resources that might also provide for potential preservation of fish and wildlife and their habitats?
- Does a proposed action or project negatively impact low income or minority populations and/or children [i.e. Executive Orders (EOs) Environmental Justice and Protection of Children)?
- Does a proposed alternative provide a potential reduction in coastal erosion?
- Does a proposed alternative provide a potential reduction in the extent or level of saltwater intrusion (encroachment)?

- Does the proposed project fit in, with, or complement the objectives of the State of Mississippi and/or locals' plans and desires for the area?
- Does the proposal contribute to the short-term or long-term recovery of coastal Mississippi?

Using these questions, as continued evaluative tools, the PDT provided for consideration, the additional criteria:

- effectiveness;
- completeness;
- acceptability; and,
- efficiency (cost-effectiveness).

Additional evaluative questions being asked by the study team, in its development of information on potential measures, but not considered screening criteria, also included:

- Does that measure provide a reduction in risk at that specific site, or in other locations?
- Does that measure provide a reduction in damage at that specific site, or in other locations?
- Can that measure be combined as a component of a multi-purpose alternative?
- Can that measure be capable of dealing with more than one identified problem at a given site?
- Does a proposed measure or alternative provide an increase in the level of education on hurricane risks?
- Does a proposed measure or alternative provide a decrease in time before one would be warned of an impending hurricane event (i.e., more time to prepare)?
- Does a proposed measure or alternative provide an increased level of precision in information on the level of threat (i.e., better information on landfall location and magnitude of the event)?
- Does a proposed measure or alternative provide an increase in the effectiveness of hurricane/storm warning to area residents and visitors?
- Does a proposed measure or alternative provide better education as to evacuation options, required items a family or business might want to evacuate, and definitive information on routes to safety?
- Does this effort duplicate or compliment the work of others?
- Does the problem (or would lack of a solution to the problem) enhance protection of life?
- Does the problem (or would lack of a solution to the problem) enhance protection of property?
- Is a potential alternative sustainable after implementation?
- Does a potential alternative still provide a potential reduction in hurricane or storm damage (if applicable)?
- Does a potential alternative still provide a potential reduction in coastal erosion (if applicable)?
- Does a potential alternative still provide a potential reduction in the extent or level of saltwater intrusion (if applicable)?
- Does a potential alternative still provide for potential preservation of fish and wildlife and their habitats (if applicable)?

- Does a proposed action or project negatively impact low income or minority populations?
- Is the cost reasonable in the light of the risk and consequences of not implementing the project?
- Are there unresolved issues (with other groups or organizations) regarding this problem or proposed solution that may lead to longer implementation times?
- Would a proposed activity or project have potential regulatory and/or environmental issues that would preclude being implemented in the near-term?
- Does the proposed project fit in with, or complement the objectives of the State and/or locals plans and desires for this area?
- Would the implantation of the proposed project preclude other future options that may have a higher level of contribution or damage reduction?
- Does the proposed project contribute to the short or longer-term recovery of coastal Mississippi?

8.3 Comparison of Measures – Formulation Round Two

Comparison of Round Two measures consisted of presentation of conditions and potential change in conditions, under "No-Action", future "without-project", and future "with-project" conditions for each site or problem area. Data presented for comparison in Round Two included preliminary costs, benefits (monetary, or economic, environmental outputs, societal, etc.) to be derived from measure implementation, problems related to implementation, more detailed design considerations, environmental outputs and potential impacts, potential damages prevented, geotechnical/site considerations, more detailed technical requirements, source material and source area considerations, variations in materials that could be used to solve the problem in a similar way, species benefits or impacts considerations, and many other technical, environmental, or economic issues.

Comparison of damage reduction measures centered on the performance of a given measure in regards to how effectively it reduced surge height and extent, compared to other measures of similar output. This involved numerous iterations of potential height and geographic coverage, since literally thousands of potential alignments of levee or embankment might be created. The goal in damage reduction measure formulation was to reduce damages to the maximum extent possible for a given type of structural or non-structural measure. While many different measures such as levees, gates, seawalls, relocations, or structure elevations might produce a similar monetary damage reduction benefit, numerous iterations were necessary to develop the best measure of a given type, given the large number of variations that might be required to produce the least costly and most productive measure. The most notable differences in flood damage reduction measures were found when comparing 3rd line of defense (elevated seawall and beach roadways) with nonstructural measures along the same area (see Table 26). The structural measures are very costly for the amount of damages reduced compared to the nonstructural measures, especially when taken in consideration that they must be constructed in tandem with surge barriers across the bays.

Table 26.
Expected Annual Damage Reduction

Measures	Expected Annual Damage Reduction (Annual $)[1]	Residual Damage (Annual $)[1]	Implementation Cost ($)	Annual O&M (Annual $)	Average Annual Cost (Annual $)
(No Action)	$0	$0	$0	$0	$0

Measures	Expected Annual Damage Reduction (Annual $)[1]	Residual Damage (Annual $)[1]	Implementation Cost ($)	Annual O&M (Annual $)	Average Annual Cost (Annual $)
Seawall/Elevated Roadway[2]	$52,030,000	$374,010,000	$5,002,500,000	$60,148,000	$306,127,051
ABFE Nonstructural at Seawall/Elevated Roadway Footprint	$200,860,000	$225,180,000	$8,483,400,000	$110,000	$417,249,166

1/ Expected annual damages reduced are rounded to the nearest thousand dollars.
2/ The elimination of the seawall and elevated roadway option also eliminate the beach and dune placement options that are dependent on the raising of the seawall and roadway.

Comparison of ecosystem restoration measures involved the comparison of costs versus outputs, expressed in functional capacity units, FHIs, and other measures of benefit output, such as achievement of a critical level of restoration in regards to the number of a certain plant required to sustain long-term restoration of a specific ecosystem, or removal of an invasive plant that would prevent full restoration of that ecosystem.

The following four models were once again utilized by the MsCIP environmental team to evaluate the performance comparison of potential ecosystem restoration measures:

- Mississippi and Alabama Gulf Coast Tidal Fringe HGM;
- Wet Pine Savannah HGM;
- FHI Coastal Maritime Forest/Beach-Dune Evaluation Model; and
- GIS-based Wetland Restoration SDSS.

Future with-project conditions were established by the study team, in analysis of the specific functions that would be modified, either positively or negatively, at each site. Those scores are presented in the Environmental Appendix, and summarized below.

Table 27.

Summary of Environmental Benefits.

Site	Restoration Acres	Plan	Average Annual Functional Unit Benefit
Turkey Creek	879	Existing Condition (plans 1-2)	0
Turkey Creek	689	Existing Condition (plans 3-4)	0
Turkey Creek	190	Existing Condition (plans 5-6)	0
Turkey Creek	879	No-action plan (plans 1-2)	0
Turkey Creek	689	No-action plan (plans 3-4)	0
Turkey Creek	190	No-action plan (plans 5-6)	0
Turkey Creek	879	plan 1	2,046
Turkey Creek	879	plan 2	1,352
Turkey Creek	689	plan 3	1,565
Turkey Creek	689	plan 4	815

Site	Restoration Acres	Plan	Average Annual Functional Unit Benefit
Turkey Creek	190	plan 5	481
Turkey Creek	190	plan 6	327
Bayou Cumbest	373	No-action plan	0
Bayou Cumbest	373	plan 1	647
Bayou Cumbest	373	plan 2	637
Bayou Cumbest	373	plan 3	622
Bayou Cumbest	373	plan 4	582
Bayou Cumbest	373	plan 5	572
Bayou Cumbest	373	plan 6	557
Dantzler	385	No-action plan	0
Dantzler	385	Plan 1	1,244
Dantzler	385	Plan 2	943
Dantzler	151	Plan 3	488
Dantzler	151	Plan 4	370
Dantzler	234	Plan 5	756
Dantzler	234	Plan 6	573
Admiral Island	118	No-action plan	0
Admiral Island	118	Plan 1	1,244
Admiral Island	118	Plan 2	943
Admiral Island	118	Plan 3	488
Admiral Island	118	Plan 4	370
Admiral Island	118	Plan 5	756
Franklin Creek	149	No-action plan (plans 1-2)	0
Franklin Creek	56	No-action plan (plans 3-4)	0
Franklin Creek	149	plan 1	516
Franklin Creek	149	plan 2	399
Franklin Creek	56	plan 3	194
Franklin Creek	56	plan 4	150

(1) AAFU's are based on a 50-year period of analysis.

(2) See Economic Appendix for cost-effective analysis.

8.4 Screening of Measures – Formulation Round Two

Screening of remaining measures again involved comparison of the relative benefits, impacts, costs, societal impacts, or other outputs of a given plan, as compared to each other and the "No-Action" Plan. Screening of measures during Round Two also included the incorporation of data presented to the public and other local decision-makers, as part of the public involvement process.

Screening in Phase Two eliminated a large number of site-specific measures, such as certain seawall or beach berm/dune alternatives, based on their failure to achieve significant damage reduction. Screening also eliminated a large number of embankment/levee options, as simply too environmentally damaging or technically infeasible for further consideration. These included levees, embankments, and floodwalls across embayments and channels in western Hancock and eastern Jackson Counties, levees across Grand Bay Marsh, or the Pearl River delta systems, and across wetland areas along other parts of the coast, as shown in Table 28.

Table 28.

Summary of Round2 Measures Screened

Measures Screened During Round 2
Increasing Islands Footprint (Option A)
Hancock 40' Dune @ Elevated Roadway (Option A)
Hancock 50' Dune @ Elevated Roadway (Option B)
Hancock 20' Dune @ Elevated Roadway (Option C)
Hancock 30' Dune @ Elevated Roadway (Option D)
Hancock Dune Option A plus sea oats (Option E)
Hancock Dune Option B plus sea oats (Option F)
Hancock Dune Option C plus sea oats (Option G)
Hancock Dune Option D plus sea oats (Option H)
Hancock 55' Dune and beach berm (Option I)
Hancock Dune Option I plus sea oats (Option J)
Harrison 40' Dune @ Elevated Roadway (Option A)
Harrison 50' Dune @ Elevated Roadway (Option B)
Harrison 20' Dune @ Elevated Roadway (Option C)
Harrison 30' Dune @ Elevated Roadway (Option D)
Harrison Dune Option A plus sea oats (Option E)
Harrison Dune Option B plus sea oats (Option F)
Harrison Option C plus sea oats (Option G)
Harrison Dune Option D plus sea oats (Option H)
Harrison 55' Dune and beach berm (Option I)
Harrison Dune Option I plus sea oats (Option J)
Hancock Seawall/Elevated Roadway at Elevation 11
Harrison Seawall/Elevated Roadway at Elevation 16
Jackson Seawall/Elevated Roadway at Elevation 11
Biloxi Bay Surge Gate at Elevation 20
St Louis Bay Surge Gate at Elevation 20

The screening of measures also included the dropping of large-scale modifications (i.e., adding additional height, closing off the channels between them) to the barrier islands or Mississippi Sound, as not creating a significant (or even moderate) reduction in damages and being too environmentally destructive. In addition, measures, such as offshore breakwaters and other offshore features designed for damage reduction, were also dropped from further consideration due to their inability to significantly affect surge height or extent.

The Corps' SDSS tool further allowed the team, in cooperation with the USFWS and MDMR, to further screen those potential wetland restoration areas that were forwarded from earlier phases of study. A subset of potential restoration sites were identified by use of SDSS then ground-truthed by the MsCIP environmental team, including ERDC, Corps, MDMR, and USFWS, for verification of appropriate properties, the degree of environmental damage, and to further refine the applied No-Action and With-Project functional scores for each area and each potential alternative output.

This effort was also further coordinated at this stage with the ongoing efforts of the MsCIP non-structural damage reduction committee, and their results were used as the team identified potential restorations sites in coastal Mississippi that had been previously developed residential or commercial sites that no longer hosted significant amounts of development and were, therefore, subject to analysis as both buy-out and restoration sites. Thirty-four restoration sites were selected for further analysis based on this screening process, based on a combination of results from the SDSS tool and input from MDMR and USFWS personnel using personal local knowledge of the study area and adjacency to existing sensitive protected natural areas (i.e. State and/or Federal lands). In addition, eleven sites that also appeared as State of Mississippi Initiative Projects were additionally evaluated for inclusion as part of the next round of evaluations by the MsCIP study team.

9 FORMULATION ROUND THREE

The final refinement of measures consisted of incorporating comments from team members and stakeholders, as well as making adjustments based on the last set of evaluations, to narrow the list down to a small set of alternatives to be analyzed at the highest level of detail. This final refinement was directed at maximum effort to identify the most cost-effective options within the four key areas of study:

- Ecosystem restoration for preservation of fish, wildlife and habitat functions and values;
- Saltwater intrusion/encroachment reduction;
- Hurricane Storm Damage Reduction;
- Coastal Erosion Reduction.

Each was refined to achieve better benefits, more damage reduction, more ecosystem benefit, greater freshwater inflow or better salinity reduction, particularly during the period of greatest importance in the life cycles of select organisms.

9.1 Refinement of Damage Reduction Measures in the Lines of Defense Framework

Based on the screening of measures in Formulation Round Two, many of the options presented in the Engineering Appendix were dropped from further consideration. After the evaluation of the many measures, the screening process has reduced the ones that will be either recommended for construction, accelerated engineering and design, or further study. In some cases, the measures being carried forward are alternates of options that were initially proposed, but modified to accommodate enhanced damage reduction, environmental reasons or technical problems. As presented in the Engineering Appendix, the following discussions are listed by order in the defined "Lines of Defense" (LOD).

Modifications to the Mississippi barrier islands were identified as LOD-1. The islands were among the first storm reduction aspects that were discussed in Mississippi's Recovery Plan. Calls to restore the islands to a pre-Camille condition presented an option that encompassed work on all four islands, but was met with resistance from the National Park Service who has ownership of the vast majority of the islands. Through many meetings with the Park Service, a selection of options were formulated that could be combined into an alternative that would meet the objectives of Mississippi's plan plus win the endorsement of the Park Service. This alternative also meets three of the four key areas defined above. The alternative selected for accelerated engineering and design consists of the restoration of Ship Island, littoral zone sand additions at the east ends of Petit Bois and East Ship Island, changes in maintenance dredging practices that meet the requirements of the Regional Sediment Management Practice, and a study to define the best restoration option for Cat Island.

With the consideration that the Park Service has an immediate need to mitigate storm damage to two historical sites on the islands; an emergency project has also been included to help protect these sites until the full comprehensive project is completed. Without support of the NPS, the other options were screened out from further consideration.

Measures that would provide some degree of protection along the mainland beaches (LOD-2) initially included constructing dunes in several configurations, some with planted dune vegetation and other without, and elevating adjoining roadways (LOD-3). Having either of these measures at sufficient elevation to avoid requiring non-structural storm damage elements in areas landward was found to be technically difficult without major modifications to the immediate coastline. The results of the surge modeling has indicated that unless the top elevation of the dune or roadway is comparable to a levee with certification, the property owners behind the structures would still be required to elevate or relocate as if these structures were not in place. Due to the technical problems and associated non-structural requirements, most of these options were screened from further consideration. The remaining option associated with the beaches and adjoining roadways is the addition a low dune with dune vegetation onto the existing beaches due to environmental benefits.

Many parts of the Mississippi coast do not have the topography or population density that would support the concept of a continuous barrier such as a levee parallel to the coast. To help provide some storm defense for these areas, ring levees could be used. The alignment of these ring levees was initially selected to provide the maximum protection for the population centers. As these alignments were evaluated, alternate alignments were selected in some cases to minimize impact on wetlands, provide attenuation from direct wave attack, or decrease the quantity of fill required fro levee construction. Examples of this can be found in the alternate alignments at Gulf Park Estates, Belle Fontaine, and Pascagoula in Jackson County. The crest elevations for these ring levees could vary depending on the amount of risk that that community wanted to assume. The recommended crest elevation is typically designed for a surge and waves with a 0.2 percent annual chance of being exceeded.

As a set of options that could provide an inland defense from larger storms (LOD-4), a conceptual design has been completed that would be comprised of inland levees with surge barriers across the mouths of the two large bays in Mississippi. In combination, this barrier could extend from the first watershed divide east of the Pearl River in Hancock County westward to the last watershed divide west of the Pascagoula River following parallel to an existing railway. This barrier could be designed to provide a defense from a very large storm, but would have some aspects that may not have public or political support. Depending on the selected crest elevation, the levee may be hardly noticeable in some areas with naturally high topography such as portions of Biloxi, but may be a very high feature in areas with low topography such as Pass Christian. Another feature is the surge gates that would be required to prevent back-flooding into the bays. Evaluation of the requirements to have the gates as a component revealed that the closure of St. Louis Bay could be omitted provided that the levee did not cross into Hancock County, but the closure of Biloxi Bay is required to provide any beneficial defense for Gulfport or Biloxi. The surge gate evaluation provided an alternate levee alignment in Harrison County that could omit this defense in western Harrison County and Hancock County. The alternate alignment would parallel the railway through Harrison County westward to the Menge Avenue crossing where the levee would turn north to high ground. Due to its east-west extent in Harrison County, this portion of the levee system could also be used to support the construction of a major roadway on top of the levee by widening the crest.

Due to the accelerated nature of this study, the study team was unable to develop a sufficient level of detail for any of the structural measures to recommend for construction. Further, based on input received at the various public and stakeholder meetings, the structural measures did not receive a majority of support. Therefore, the study team feels that should decision makers like to see any of the structural measures further developed, a full feasibility study would be required. There is, however, sufficient information to make basic comparisons with nonstructural flood damage reduction measures.

9.2 High Hazard Area Risk Reduction Plan

While the discussion of nonstructural measures at public meetings was emotionally charged, there was a general consensus that any relocations resulting from the 2005 storms not displace large portions of communities. This resulted in the development of multiple non-structural elements of the comprehensive plan, including evacuation planning, building codes etc. and acquisition or flood proofing of properties within the area identified as having a 1% annual chance of inundation from hurricane and storm surges (aka '100-yr' floodplain). A portion of this area is designated the high-hazard zone and in this area flood proofing by elevation is not considered appropriate due to the forces associated with the surge therefore permanent acquisition of properties and removal of structures is the only option for risk reduction. Permanent acquisition of coastal properties is an effective way to reduce flood damages and loss of life due to drowning as a result of hurricane surge. Parcels within the designated area (with or without structures) can be purchased at fair market value under the provisions of the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646).

Last resort housing benefits may be available to those displaced persons who relocate to a DSS structure located above the Katrina inundation elevation (or the 500 yr. flood event as defined on FEMA NFIP mapping) to further the objectives of migrating the population northward and away from the coast. Specific recommendations for implementation of provisions of the Uniform Relocations Act as they may apply to acquisitions of property in the project area are contained within the Real Estate Appendix.

Acquisition or flood proofing of all properties within the '100-yr' floodplain equates to approximately 59,000 parcels. Obviously it is not realistic to consider that this action could be undertaken within a short timeframe due to impacts on local tax base, ability to acquire, cost etc. It is more realistic to consider that this component could be phased in over a 25 – 40 year period. Therefore, a phased implementation of separable elements was developed, including a flood proofing demonstration, a municipal acquisition and relocation project, a high hazard area risk reduction plan (HARP Phase I) and a long-term risk reduction plan (HARP Phase II). The flood proofing demonstration could lead to further study of specific areas of the coast and subsequent implementation by the Federal government or it could lead to increased involvement of local government or residents in providing for the risk reduction. Each of these elements is described in more detail below.

High Hazard Area Risk Reduction Plan (HARP) Phase I

The first phase of the non-structural High Hazard Area Risk Reduction Plan (HARP Phase I) involves the buyout of those properties that have been frequently flooded, or are at very high probability of future damage due to storm surge. The HARP would target parcels within the high-hazard zone that are currently occupied or could be re-occupied by new structures or those interspersed vacant parcels that could be occupied in the future. Of the total approximated 15,000 parcels located in the high-hazard zone, 2,000 parcels would be included in the first phase HARP. That number of parcels could be addressed by Corps real estate resources over approximately a 5 year period, provided that Federal funds would be appropriated. Further information on the High Hazard Area Risk Reduction Plan can be found in the Nonstructural and Real Estate Appendices.

Also within the HARP footprint are 4 municipal structures in Moss Point, MS that have been identified as being public facilities that would be eligible for replacement through the Real Estate "substitute facility doctrine" in lieu of acquisition. The Moss Point municipal complex is discussed in more detail in Section 3.15.5.3 below.

High Hazard Area Risk Reduction Plan Phase II

During public involvement sessions a significant portion of the population believed that the rebuilding process might already be too far advanced to relocate a significant number of residents to another location at this time. Therefore, the second phase of the HARP is to develop a strategy where buyouts along the coast can occur quickly over a long period of time as properties and funding become available. This could also occur after the next significant storm event, and before another major reconstruction effort within the high-hazard surge-plain begins. The long-term risk reduction plan is envisioned as a coordinated effort between HUD, FEMA, and the Corps that would be applied as future storms impact the area. .Further information on the High Hazard Area Risk Reduction Plan can be found in the Nonstructural Appendix.

9.3 Elevating Structures and Relocating Municipal Services

In addition to the High Hazard Area Risk Reduction Plan, the team developed alternatives for projects involving relocating municipal facilities and evaluating new methodologies in elevating structures in the hardest hit areas of the coast.

Relocating Municipal Services

During the delineation of the coastal high-hazard zone (HARP footprint) and the non-floodproofing zone (where surge inundation depths would exceed 13 feet at the BFE), it became apparent that a number of structures within the municipal facilities complex of Moss Point, MS would be included in the area where permanent acquisition would be the recommended action to reduce flood damages. As discussed below, public facilities, when determined to be eligible for substitution in lieu of acquisition, can be relocated to a flood-safe area. For public facilities that are considered to be critical components of a local or regional post-disaster response and recovery system, relocation to a flood-safe site enables that facility to operate both during and immediately after the disaster to reduce loss of life and maintain essential emergency services.

In acquisition situations where the existing structure or facility is determined by Corps Real Estate staff to be a publically-owned and operated building or facility, the Corps of Engineers Real Estate regulations (ER 405-1-12) concerning the disposition of public facilities and structures would establish the methodology for determining value. Under this regulation, acquisition of publically-owned facilities and structures required to be purchased to meet the project design objectives should be based upon the "Substitute Facility Doctrine". Since just compensation for an acquisition is based upon fair market value at the time of purchase and since publically-owned and operated structures and property may not have a "market value" such as do residential and commercial structures, the cost of constructing a substitute facility may be used as a measure of just compensation.

Generally the substitute facility will serve the owner in the same manner as the existing facility with regard to size, usage and functionality. Typically the substitute facility doctrine is used to address the acquisition of schools, city halls, police and fire stations, and other state, municipal and county owned and operated facilities and structures and they are all collectively referred to as "relocations" in Corps water resources projects. Within the zones identified by the Corps to be too hazardous to elevate structures (high-hazard zone and non-floodproofing zone), there are likely to be publically-owned and operated facilities and structures that will fall under the category of "relocations".

Coincidently, the team became aware of local efforts by the leadership of Moss Point, MS to address surge inundation damages to several public buildings within that same municipal complex. Members of the team met with the Mayor of Moss Point and other city officials to discuss whether the proposed acquisition of those structures under the Corps MsCIP may lead to a plan for relocating those facilities that would be in concert with the replacement concepts described above.

As a result of those meetings, a preliminary public facilities replacement plan for Moss Point, MS. The purpose of this replacement component of the HARP (in addition to protection of critical public facilities) would be to demonstrate to the other 10 affected municipalities that replacement of critical facilities is an effective way of maintaining services within the community while protecting those structures from flood damages. Communities that face such issues outside of the delineated Corps' HARP area could use their Capital Improvements Programs to fund fully or partially (cost-sharing situation) the necessary relocations. For those public structures that may be located in the high-hazard zone (HARP) or where surge inundation depths would preclude floodproofing, the Moss Point Public Facilities Replacement would yield valuable information to the Corps on new building construction costs under the latest IBC requirements.

The public buildings replacement project would include the Moss Point city hall, police station, fire station and community recreation center. Each of these four facilities was severely damaged during Katrina by surge inundation and waves and prevented local authorities from assisting citizens during the emergency. The City of Moss Point identified several strategic locations within the city where relocated public facilities would be safe from future events. Tentative replacement locations for each of the four facilities to be relocated are shown on Figure 16. The final arrangement of the replacement facilities (multi-use single structure, multiple-structure complex or dispersed facilities) would be determined in collaboration with the municipal officials during the relocations planning phase of the project. Should other similarly situated facilities by identified during the implementation of the HARP Phase I they would be included as part of that comprehensive plan element.

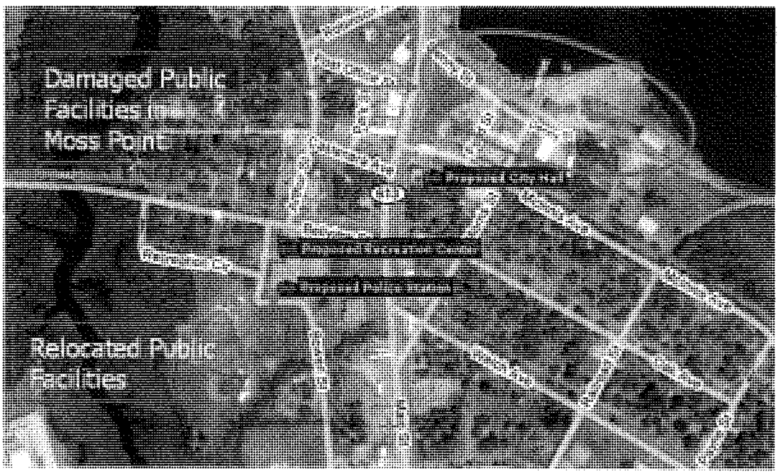


Figure 16: Moss Point Public Facilities Relocation Pilot Project

Waveland Floodproofing Project

In an effort to demonstrate the feasibility and effectiveness of wet floodproofing as a means of reducing flood damages in the project area, a project has been formulated as a part of the overall nonstructural program. This project would provide an opportunity to evaluate the technical aspects of the FEMA 550 guidelines as a basis for elevating structures in the program, allow for the public and local officials to see first-hand the application of floodproofing measures by elevating residential structures and affirm Corps cost data and contracting procedures that would support expanded applications of this flood damage reduction method in the MsCIP project area. Given the large number of parcels which would be eligible for floodproofing by elevation and other methods, innovative contracting methods would need to be tested to assure that good quality construction that was both acceptable to the structure owner and that limited the liability of the Corps could be applied in an efficient manner across the project area.

Using available GIS data a geographic area within one of the most hard hit areas of the coast, Waveland, was identified where wet floodproofing would be an effective method of reducing flood damages. This selected area is outside of the identified high-hazard zones where wave action and surge would endanger an elevated residential structure and its occupants. In this initial study phase the ABFE-2 feet was used as the design flood elevation for elevating approximately 25 residential structures. Prior to implementation (if the project is approved), the newest approved local ordinance (City of Waveland local floodplain management ordinance) base flood elevation (or higher) would be used to set the raised elevation of the first habitable floors of the structures.

The 25 residential structures are mainly single-family, wood frame structures on structural slab foundations (two observed crawl-spaces). Many of the residences have a brick veneer exterior. Heights of elevation range between 4 and 6 feet at the ABFE-2 feet inundation level. Using the elevation methods described above, it is anticipated that a combination of the segmented block foundation (0-4 feet high) and the concrete column foundation (> 4 feet elevation) would be used in the project.

The results of this project, including design aspects and costs, would be made available to local municipal officials as well as residents for their use in applying the 550 Guidelines or in developing local ordinances governing the wet floodproofing of structures within appropriate areas of the 100 year floodplain.

9.3.1 Maximum Possible Intensity Line

The one option that will provide a very low degree of risk from storm surge is in moving all future critical or emergency infrastructure construction northward of the extent of the surge based on the "Maximum Possible Intensity" (MPI) storm event modeling. While this is only a recommendation without a program requirement, it has no direct cost.

9.4 Refinement of Ecosystem Restoration Measures

The environmental PDT was faced with assessing the three counties in coastal Mississippi, which consists of hundreds of thousands of acres of uplands, wetlands, urban, coastal forest, etc. This assessment had to be conducted in a consolidated amount of time in order to meet the MsCIP condensed schedule; therefore, the team quickly began compiling various data, such as topographic maps, navigational charts, water quality reports, soil maps, etc, that would be useful in assessing potential restoration efforts. The environmental PDT also had ERDC develop the GIS-based SDSS analysis tool that could effectively assist the team in quickly narrowing down restoration sites.

The plan formulation process began with defining the overall comprehensive natural system and its current state post-hurricane season of 2005. The MsCIP environmental PDT compared the post-hurricane conditions to the pre-hurricane conditions. In some cases, environmental contrasts were very great while in other instances not much change had occurred. The environmental team worked with a variety of Federal, state, and local entities to adequately address the magnitude of problems plaguing coastal Mississippi. Minor problems to complex integrated problems were identified and discussed amongst the team members – structural, environmental, and non-structural. Development of a comprehensive list of problem areas consisted of single or multiple problems associated with a given site that were first identified as having been caused or exacerbated by the 2005 hurricane events. These sites were identified with damage to fish and wildlife resources, and/or saltwater intrusion. The following measures were carried forward.

9.4.1 Freshwater Diversion

A freshwater diversion project may serve to enhance the wildlife resources of the area. While there is some disagreement to the benefits of freshwater diversion projects (Turner 2006), further study will assist in determining if such diversions are ecologically feasible in eastern Jackson County, Grand Bay Savannahs and Marshes, and in western Hancock County, Hancock County Marshes. Freshwater diversions enable redistribution of freshwater and much needed sediments to these systems that are experiencing losses and erosion. Hydrodynamic circulation, salinity, and water quality model calibrations have been conducted for Mississippi Sound. Existing or baseline salinity and water quality distributions were established for March – September 1997 and 1998. Alternative freshwater diversion scenarios were developed and simulated with the calibrated models to examine changes to the baseline salinity and water quality distributions. Freshwater diversion did impact the environment in Jackson and Hancock Counties. Oysters are sensitive to specific ranges of salinity; therefore, freshwater diversions have the potential to either enhance or threaten the resource.

Several projects are presently being considered to divert freshwater from the Mississippi River or other sources as a mechanism to promote reversing a historic increase in salinity in the Mississippi Sound/Biloxi marshes area in order to support fresher marshes and oyster reef health and productivity; thus, enhancing both their economic value and the ecological services they provide.

Oysters not only support a commercial fishery but interact directly with local hydrodynamic conditions, affecting currents, flow conditions, and sedimentation patterns (Lenihan 1999). They filter large amounts of phytoplankton and detritus exerting a powerful influence on water quality, phytoplankton productivity, and nutrient cycling of estuaries (Dame 1996). Oyster reefs provide habitat for a wide range of other invertebrates present either on the oyster shell itself or in the interstices between shells. Oyster reefs also support numerous resident, transient, and juvenile fish and decapod species and may provide a refuge from predation and poor water quality conditions.

Oysters are sensitive to specific ranges of salinity; therefore, freshwater diversions have the potential to either enhance or threaten the resource. For instance, where the average salinity exceeds 15 ppt oysters often experience increased predation rates by oyster drills whereas young oysters are more susceptible to certain diseases at salinities greater than 9 ppt (Cake 1983; Chatry et al. 1983). Similarly, salinities averaging below 7.5 ppt can inhibit oyster growth and sexual maturation while salinities that persist for extended periods of time below 2 ppt can result in direct mortality (Sellers and Stanley 1984). The relationship between oyster productivity and river flow is a complex one and there does not appear to be a close link between oyster harvests and freshwater inflow (Turner 2006).

Alternately, the water diverted from riverine sources not only has lower salinity, but it usually carries more sediment and nutrients. Diversions may result in areas of excess nutrients and thus cause algal blooms, lower light attenuation and other signs of eutrophication. Therefore, any proposed diversion project needs to be carefully evaluated in order to insure the maximum probability that proper habitat and water quality conditions are met. Because of the potentially large number of projects that might require evaluation, it is essential that a screening tool be developed to cost-effectively identify those proposals which warrant the level of detailed study required to make informed decisions. It is essential that proposals that have no likelihood of success are eliminated early in the evaluation process in order to maximize the effectiveness, eliminated negative impacts from poorly designed projects, and reduce costs of evaluating the remaining candidates.

In an effort to initiate the proper evaluation of freshwater diversions, a water quality model, which is based on the CE-QUAL-ICM water quality model code, is coupled to output from a three-dimensional hydrodynamic model of the region, which is based on the CH3D hydrodynamic model (Dorth et al 2007). The version of CH3D with sigma coordinate in the vertical dimension is being used. The model grid extends seaward beyond the Chandeleur Island and includes Mobile Bay, Lake Borge, Lake Pontchartrain, the Inner Harbor Navigation Channel of New Orleans and the Mississippi river Gulf Outlet Channel. Predicted water quality constituents, including nutrients, phytoplankton, dissolved oxygen, temperature, salinity, and underwater light intensity, were evaluated for several scenarios and compared to modeled existing baseline conditions to assess relative changes.

The water quality model was applied for three alternative scenarios: (1) diversion of freshwater flow from the Mississippi River at Bonnet Carre' spillway, (2) diversion of freshwater flow from the Mississippi River at Violet Marsh, and (3) diversion of all of the Escatawpa River flow into Grand Bay. The Bonnet Carre' diversion varied by month while the Violet Marsh diversion was a constant flow of 7,500 cubic feet per second. The Escatawpa diversion is the flow that occurred in the Escatawpa River during 1998, and those values were varied daily in the model. The water quality model was applied for the period April through September 1998 using the same inputs as the final calibration run except for different hydrodynamics and different boundary conditions for the diverted flow and associated concentrations of the flow. The hydrologic model was run with the same conditions as used for the base conditions used in the water quality model calibrations for 1998 except that the additional freshwater flows were introduced.

In an effort to apply this water quality data to ecological issues, MsCIP and ERDC convened a panel of representatives from TNC, MDMR, and USM at the Gulf Coast Research Laboratory. The aim of the panel is to suggest simplistic ecological models that can be incorporated with projections from the combined hydrodynamic and water quality models to identify simulations which might result in an improvement in oyster habitat quality. The panel has identified several key attributes that need to be incorporated into the evaluation of freshwater diversion options. The first is that salinities average as closely as possible to the optimal range for oyster health and productivity. This is clearly of critical importance since the primary purpose for contemplating freshwater diversions is to improve habitat conditions for oysters. Second, a diversion should not result in extended periods of low salinity resulting in mortality or poor growth and reproduction. This consideration is particularly critical during times of high river flow or other extreme conditions. Third, a diversion should not unduly influence habitat conditions for other critical resources. Diversions that result in favorable conditions for oyster health may not be conducive to other equally important resources. For instance, most seagrasses do poorly at salinities less than 20 ppt. A diversion that results in excellent conditions over the prime commercial beds but drives salinities below 20 ppt in the seagrass elsewhere would not be acceptable. Other important habitat requirements that should also be considered for seagrass health include light availability and nutrient concentrations. These environmental concerns associated with water diversions, in addition to potential impacts on important fisheries species of those areas, require conservative actions and more study of potential impacts (positive and negative) of such practices for the long-term sustainability of nearshore and estuarine resources.

As an example, the results from a simulated diversion of 7,500 cubic feet per second of Mississippi River water near Violet, Louisiana is presented in Figure 17. The results suggest that 180 days after initiation of the diversion salinities were lowered in western Mississippi Sound. Dortch et al. (2007) sufficiently warrant additional examination. However, at present, absolute salinity values predicted by the model poorly match calibration data. Further refinement of the models should correct this limitation and must be made to allow the usefulness of the model results for estimating potential beneficial or deleterious effects on oysters and other coastal resources.

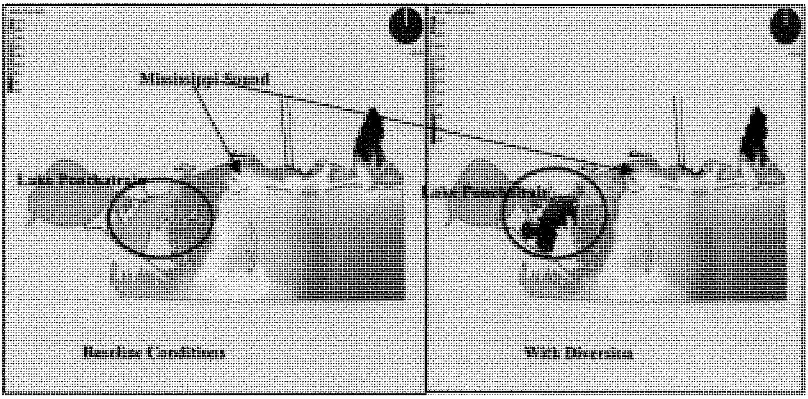


Figure 17. Projected Salinity Values 180 days after initiation of a diversion of 7,500 cfs of Mississippi River water at Violet, LA Simulated Diversion of Mississippi River into Lake Borgne Near Violet, Louisiana

Results also showed that diversion through the Bonnet Carre and through the Escatawpa/Grand Bay system have the potential to significantly influence coastal salinities. The more freshwater (i.e. 0 to about 20 ppt) areas are designated with blue and green colors while more saline (i.e. 20 to 33 ppt) conditions are designated with yellow, orange and red colors.

Ongoing and future studies can be used to refine the hydrodynamic and water quality model and tighten the calibrations. This will allow for better integrating the water quality results to ecological concepts. Also, this preliminary effort just developed information for some possible discharge scenarios in order to do a sensitivity analysis as to whether diversion could potentially affect the areas of concern. These efforts showed the potential for freshening the systems. Future studies and model runs will need to be performed to test precise operational discharge plans and seasonal influences.

Historically, the estuarine marsh within the Grand Bay NERR represented the former deltaic environments of the Pascagoula and Escatawpa Rivers in eastern Jackson County. The outlets of these rivers have shifted westward over time, severely limiting the inflow of freshwater, nutrients, and sediments into the Bayou Cumbust area of the reserve.

Currently, it is speculated that much of the freshwater entering the Grand Bay NERR estuary is from surface runoff through Bayou Heron and Bayou Heron, within the Bangs Lake Hydraulic Unit, measuring approximately 21,374 acres. Human disturbances to the area have also altered historic sheet flow and surface water flows into the area, as well as the natural migration of the Pascagoula and Escatawpa Rivers. A freshwater diversion project in the area, if feasible, may serve to enhance the wildlife resources of the area. The need for freshwater diversion at the Grand Bay savannahs and marshes would help restore the predominant wet pine savannah habitat. Shoreline erosion along the Grand Bay area (i.e. loss of the Grand Batture Islands) has also contributed to the increased salinity in the area.

The proposed project will seek to develop a refined hydrodynamic model for the area, inputting biological, water quality, and physical data into the model to evaluate a variety of freshwater diversion scenarios. This work represents a critical first step in the final assessment of potential water diversion projects for this area. Community information will be solicited and a public workshop will be held to share the results.

Diversion of Mississippi River freshwater and/or sediments in the vicinity of Violet, Louisiana has been strongly considered because of a number of positive factors. These include proximity of the river to target coastal wetlands restoration areas, strong public support, and high confidence in potential environmental benefits. The Violet Diversion Project is under consideration by the MsCIP (Corps, Mobile District) and Corps, New Orleans District as a freshwater diversion project that could potentially have a positive impact to the Hancock County Marshes. Preliminary results from modeling a simulated diversion of 7,500 cubic feet per second of Mississippi River water near Violet, Louisiana, suggest that after 180 days of initiation of the diversion, salinities were lowered in Western Mississippi Sound sufficiently to warrant additional examination (Dortch et al 2007). Further refinement of the models should address current limitations and must be made to estimate potential beneficial or deleterious effects on oysters, seagrasses, marsh systems, and other coastal resources. Although the idea is viable, at this point, additional information is needed to determine current problems within Hancock County Marshes and potential impacts to existing coastal resources as well as navigational impacts.

9.4.2 Environmental Restoration of Historical Wetland Sites

The Corps, Mobile District began investigations for identifying potential environmental restoration sites for the purposes of storm and flood damage reduction, flood reduction, preservation of fish and wildlife habitat, and removal of habitable structures within high hazard areas. When residential and/or commercial structures and/or land are purchased for the purpose of restoring floodplain areas (i.e. non-structural component), the structures are demolished and the land is no longer available for residential and/or commercial development. Historically, when land is purchased across the U.S., it is left with all or some of the infrastructure at the site rather than restoring it to its historic setting. With the MsCIP environmental plan, land that is purchased (i.e. non-structural component – refer to Non-structural Appendix) would then be restored into historical functional wetlands. The Corps, Mobile District, in cooperation with ERDC, developed a tool to help identify potential restoration sites throughout the study area.

Development of a GIS based SDSS tool allowed the Corps, Mobile District, working in cooperation with the USFWS and MDMR, to identify and prioritize potential wetland restoration areas throughout coastal Mississippi (Lin 2007). A detailed discussion of this GIS based SDSS tool is included in the Environmental Appendix. A subset of potential restoration sites were identified by the SDSS tool and then ground-truthed by the MsCIP environmental team, including ERDC, Corps, MDMR, and USFWS. This interagency team allowed us to both confirm the accuracy of the SDSS results and to collect additional on-site information pertinent to restoration efforts. There are some major benefits in using a GIS-based SDSS approach to wetland restoration. First, it allows for the relatively rapid assessment of the large number of restoration sites across the wide study area. Second, potential sites can be evaluated and restored in a watershed or landscape context, which allows us to comprehensively evaluate the overall natural system. This approach can maximize the benefits of wetland restoration, as opposed to simply restoring wetlands where convenient or where property is available. Essentially use of this SDSS tool allowed the MsCIP environmental team to assess the entire coastline as a holistic natural system; thus, the team was more effectively able to analyze needs in coastal Mississippi.

The SDSS effort resulted in the following products:

1) A Model Builder based SDSS tool, which can be subsequently edited and applied to other areas along coastal Mississippi in the future as funding becomes available;

2) Maps, such as aerial photography, topographic, soil layers, etc., depicting areas in the study region that have a high probability of being successfully restored into wetland functions that buffer and/or store stormwater, and provide suitable habitat for fish and wildlife;

3) Photograph documentation and data sheets containing information on ground-truthed potential restoration sites.

This project has been further coordinated with the ongoing efforts of the MsCIP non-structural flood-proofing committee, and their results were used as the team identified potential restorations sites in coastal Mississippi. The selection of 34 restoration sites, discussed in detail in Section *4.1.5.2 Environmental Restoration of Historical Wetland Sites* of the Environmental Appendix, was based on a combination of results from the SDSS tool and input from MDMR personnel based on local knowledge of the study area and adjacency to existing sensitive protected natural areas (i.e. State and/or Federal lands).

The SDSS tool evaluated potential wetland restoration sites that had been initially selected based on having a non-natural land cover (i.e. urban, deforested, and agricultural land cover, based on MDMR 2001 land cover GIS layer) and were located in the 100-year floodplain (Lin 2007). Numerous potential environmental restorations sites were initially identified. This initial group of sites was narrowed down based on the results of the SDSS. Sites with the following characteristics were screened out:

- < 5 acres in size
- Restorability class of Low or Medium Low
- Habitat class of Low or Medium Low
- Storm Surge/Flood Protection class of Low

Initial screening yielded hundreds of sites that were then reviewed by the Corps, Mobile District, MDMR, and USFWS personnel. A more detailed discussion of the initial sites yielded is located in the Environmental Appendix. Following detailed assessment, the Environmental PDT screened these sites and selected the following 34 final restoration sites. These final environmental restoration sites include a combination of those identified based on the SDSS results, as well as some additional sites. These were made using only the non-natural land-use and 100-year flood calculations as the original site selectors (i.e. no damage layers were used), and sites were greater than or equal to 5 acres (Table 29).

Table 29.

Environmental Restoration Sites in Coastal Mississippi

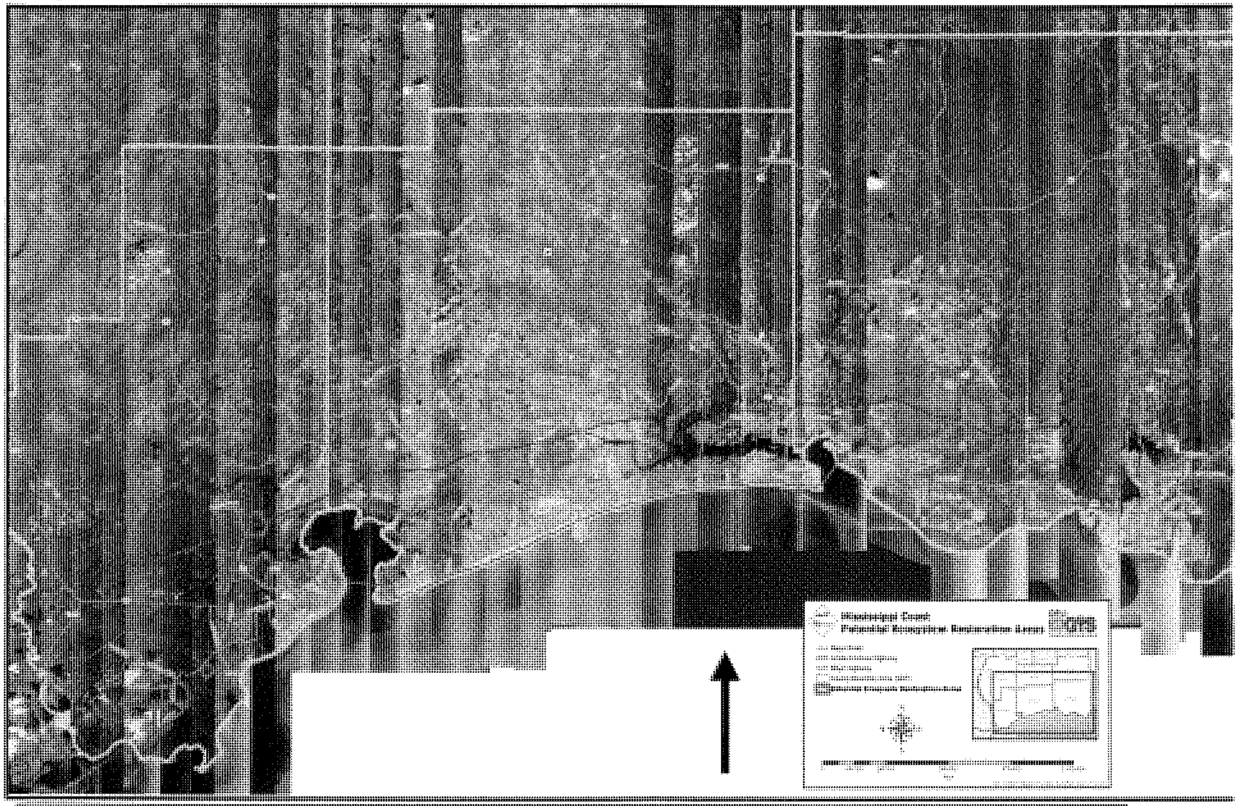
Site	Restoration Acres	Environmental Setting
(1) Pearlington, Hancock	76 acres (State owns 2,200 acres in the Pearlington area)	Emergent aquatic vegetation Bayhead Swamps trees Bayhead Swamps shrubs Riverine/levee forests

Site	Restoration Acres	Environmental Setting
(2) Pearlington South, Hancock	11 acres	Emergent aquatic vegetation Bayhead Swamps trees Bayhead Swamps shrubs Riverine/levee forests
(3) Port /West, Hancock	49 acres	Emergent aquatic vegetation
(4) Ansley, Hancock	2,023 acres (State owns 6,000 acres west of Lakeshore Road)	Emergent aquatic vegetation Wet pine savannah
(7) Lakeshore, Hancock	275 acres	Emergent aquatic vegetation
(8) Bayou Caddy/Lakeshore, Hancock	362 acres	Emergent aquatic vegetation
(9) Clermont Harbor, Hancock	209 acres	Emergent aquatic vegetation
(10) Bayou La Croix, Hancock	259 acres	Emergent aquatic vegetation
(11) Shoreline Park, Hancock	889 acres	Emergent aquatic vegetation
(12) Chapman Road, Hancock	146 acres	Emergent aquatic vegetation
(13) Jourdan River – Interstate 10 Development, Hancock	638 acres	Emergent aquatic vegetation
(14) Diamondhead, Hancock	433 acres	Emergent aquatic vegetation
(15) Delisle, Harrison	120 acres (State owns 1,000 acres)	Emergent aquatic vegetation Bayhead swamps trees Bayhead Swamps shrubs
(16) Ellis Property, Harrison	443 acres	Emergent aquatic vegetation Pine savannah - wet pine flatwoods.
(17) Pine Point East, Harrison	103 acres (State owns 40-50 tax forfeited lots)	Emergent aquatic vegetation Wet pine savannah habitat
(18) Pine Point West, Harrison	83 acres (State owns 40-50 tax forfeited lots)	Emergent aquatic vegetation Wet pine savannah habitat
(19) Pass Christian Beach Front, Harrison	21 acres	Emergent aquatic vegetation Bayhead swamps trees Bayhead Swamps shrubs
(20) Pass Christian Site – Bayou Portage, Harrison	43 acres	Emergent aquatic vegetation Bayhead swamps trees Bayhead Swamps shrubs
(21) Brickyard Bayou, Harrison	14 acres	Emergent aquatic vegetation Bayhead swamps trees Bayhead swamps shrubs
(22) Biloxi River – Shorecrest, Harrison	15 acres	Emergent aquatic vegetation Bayhead swamps trees Bayhead swamps shrubs Riverine/levee forests
(23) Biloxi River – Eagle Point, Harrison	17 acres	Emergent aquatic vegetation Bayhead swamps trees Bayhead swamps shrubs Riverine/levee forests
(24) Biloxi Front Beach - South of Highway 90, Harrison	40 acres	Dune System
(25) Keegan Bayou, Harrison	54 acres	Emergent aquatic vegetation Wet Pine Savannah habitat
(26) St. Martin, Jackson	467 acres	Emergent aquatic vegetation
(27) Fort Point, Jackson	83 acres	Emergent aquatic vegetation
(28) Pine Island, Jackson	237 acres	Emergent aquatic vegetation
(29) Belle Fontaine, Jackson	1,516 acres	Dune System
(30) Griffin Point, Jackson	182 acres	Emergent aquatic vegetation
(31) Bayou Chico, Jackson	258 acres	Emergent aquatic vegetation

Site	Restoration Acres	Environmental Setting
(32) Grand Bay/Bayou Cumbest, Jackson	2,666 acres	Emergent aquatic vegetation
(33) Wachovia, Hancock	1,200 acres total – 800 marsh, 200 forested, 200 savannah	Emergent aquatic vegetation, Bayhead Swamps trees Bayhead Swamps shrubs Riverine/levee forests
(34) Ansley, Hancock	900 acres – 800 marsh, 100 forested	Emergent aquatic vegetation, Wet pine savannah
(35) LaFrancis Camp Trenaisse, Hancock	45 acres total – all open water	Open Water
(36) DuPont, Harrison	650 acres – 170 marsh, 480 forested	Emergent aquatic vegetation, Bayhead Swamps trees Bayhead Swamps shrubs Riverine/levee forests
(37) Danztler, Jackson (Alternate)	900 acres – 500 marsh, 385 forested	Emergent aquatic vegetation, Bayhead Swamps trees Bayhead Swamps shrubs Riverine/levee forests
(38) Pascagoula River Marsh, Jackson	11,150 acres	Emergent aquatic vegetation, Bayhead Swamps trees Bayhead Swamps shrubs Riverine/levee forests

This project has been further coordinated with the ongoing efforts of the MsCIP non-structural flood-proofing committee, and their results were used as the team identified potential restorations sites in coastal Mississippi. The following selection of 38 restoration sites was based on a combination of results from the SDSS tool and input from MDMR personnel based on local knowledge of the study area and adjacency to existing sensitive protected natural areas (i.e. State and/or Federal lands). See Figure 18 for the specific identified environmental restoration sites.

Figure 18 Potential Ecosystem Restoration Site



9.4.3 Submerged Aquatic Vegetation

The continued survival and growth of seagrasses (i.e. SAVs) may be threatened by the cumulative effects of man's activities, in addition to, natural processes in the coastal marine environment. Natural causes of SAV (i.e. *D. wrightii, C. manatorum, T. testudinum*, and *R. maritime*) decline, such as disease, storm events, salinity fluctuation, and hypoxic events, coupled with declining water quality caused by anthropogenic eutrophication currently threaten the health of many SAV systems (Montague and Ley 1993, Durako and Kuss 1994, Olesen and Sand-Jensen 1994, Zieman et al 1994). These habitats provide vital refuges, feeding, resting, staging, and spawning grounds for a variety of species found in Mississippi Sound and also in the Gulf of Mexico. Past studies throughout the years have attributed anywhere from 50% to 90% of all marine species to utilize this vital habitat at some point in their life state.

In 1969, an estimated 20,000 acres of SAVs were documented and as of 1998, only 2000 acres were documented (Moncrieff 1998), see Table 30. Dramatic decreases have been noted on every Mississippi barrier island. Areas of SAV habitat loss coincide with areas where rapid coastal erosion and massive long-term movement of sand has been well-documented (Otvos 1981 and Oivanki 1994). Loss of vegetated areas corresponds with potential loss in water clarity over time due either to: (1) anthropogenic influences, (2) cyclic shifts in precipitation patterns, which would affect both salinity and turbidity, or (3) a combination of these factors (Moncrieff 1998). Primary reasons for the disappearance of SAVs are most likely an overall decline in water quality, extended periods of depressed salinities, and physical disturbances, such as tropical storms and hurricanes (Moncrieff 1998). Physical loss of habitat and decreased light availability coupled with declining water quality are the most visible features that directly affect SAVs (Moncrieff 1998). Moncrieff (1998) identified approximately 14,900 acres as being suitable SAV habitat [i.e. Potential Seagrass Habitat (PSGH)].

Table 30.

SAV Historical, 1992 and Potential Habitat

Location	1969 (acres)	1992 (acres)	PSGH
Buccaneer State Park	206	55	316
Cat Island	598	169	5,128
Ship Island	1,536	253	1,603
Dog Keys Pass	2,079	0	1,149
Horn Island	5,567	530	4,350
Petit Bois Island	1,690	364	1,810
Point-aux-Chenes Bay	1,306	627	534
Totals	12,982	1,998	14,890

Reference: Moncrieff 1998

Areas of SAV habitat loss coincide with areas where rapid coastal erosion and massive long-term movement of sand has been well-documented (Otvos 1981 and Oivanki 1994). Loss of vegetated areas corresponds with potential loss in water clarity over time due either to: (1) anthropogenic influences, (2) cyclic shifts in precipitation patterns, which would affect both salinity and turbidity, or (3) a combination of these factors (Moncrieff 1998). Primary reasons for the disappearance of SAVs are most likely an overall decline in water quality, extended periods of depressed salinities, and physical disturbances, such as tropical storms and hurricanes (Moncrieff 1998). Physical loss of habitat and decreased light availability coupled with declining water quality are the most visible features that directly affect SAVs (Moncrieff 1998). Moncrieff (1998) identified approximately 14,900 acres as being suitable SAV habitat (i.e. PSGH).

Mapping techniques have very much advanced since Moncrieff's last mapping of Mississippi Sound in the late 1990s. In discussing a potential SAV restoration project with the scientific community, the one consistent need was to re-inventory the existing SAVs in Mississippi Sound. Mississippi Sound and barrier island sedimentary processes as related to seagrass biomes are important, but not currently available. The nature, extent and volumes of sediment types within both Mississippi Sound and the barrier islands are constantly in flux, necessitating a comprehensive and ongoing assessment of sedimentary dynamics. Further studies would determine existing conditions and remaining problems that challenge establishment of SAVs within Mississippi Sound. Opportunities exist to create partnerships with other Federal and state resource agencies, and NGOs to begin identifying potential SAV restoration and establishment projects. Restoration efforts should target historical locations as a starting point to begin determining current conditions and challenges, including water quality issues, available nursery stock of plants, etc., prior to implementation of actual projects.

9.4.4 Deer Island Ecosystem Restoration

Deer Island, located within the boundaries of Harrison County, Mississippi near the mouth of Biloxi Bay and the City of Biloxi, has a history of tropical storm damage. Damages from these storms has varied based on varying degrees of storm surge, wave action and wind depending on the speed, intensity, direction of travel, and proximity of the given storm. Figure 19 displays a recent aerial photograph of Deer Island, which damage was acerbated during Hurricane Katrina.

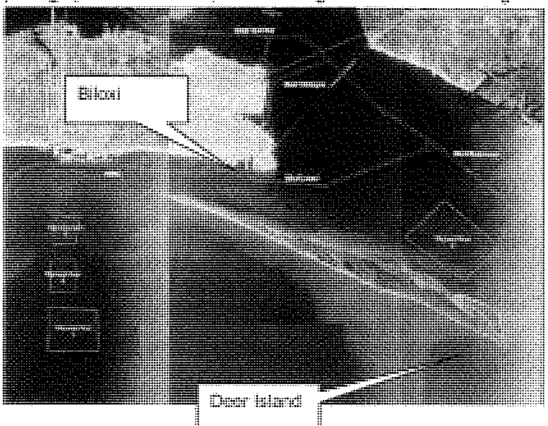


Figure 19 Deer Island Aerial Photograph

The island is considered a mainland remnant and is not part of the coastal barrier system of islands along the Mississippi Coast. The island contains a diversity of habitat areas including beach/dune areas, marsh area, and maritime forest areas. It's proximity to the City of Biloxi provides a certain amount of protection to the city from waves generated by approaching hurricanes. This protection comes at a cost to the island as that energy affects the seaward shoreline and the interior marshes. It has been estimated that the island has lost approximately 300 acres or about 34 percent of its area since 1850, due to eroding shoreline.

In 2003, because of loss of wetland marsh areas, an aquatic restoration project was proposed near the eastern tip of Deer Island. The project was authorized under the continuing authority of Section 204 of the Water Resources Development Act of 1992, as amended. Dredged material from maintenance of Biloxi Harbor was used to create approximately 45 acres of tidal marsh on the north shore of the east end of the island. Wetland vegetation was planted by over 100 volunteers in April 2005. The created marsh area withstood Hurricane Katrina with minor scouring within the site but with a minor breach of the containment dike of the marsh area. Plants within the marsh area are thriving. Figure 20 displays the existing Section 204 project.

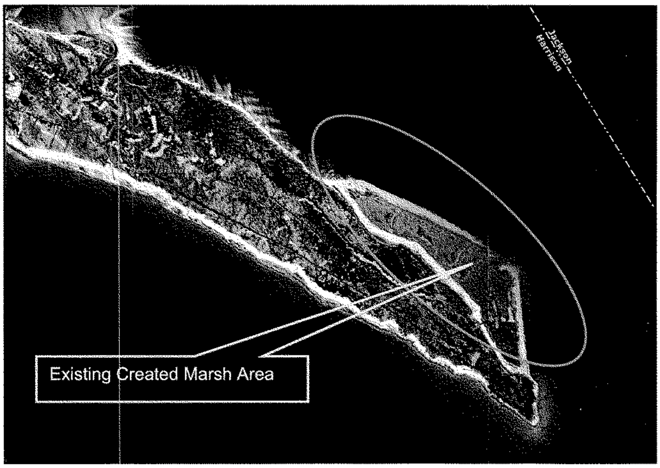


Figure 20. Existing Section 204 Project

Currently, the island has a large breach on its western end and a small breach has formed in the central area of the island in what is known as the Grand Bayou area. As the island degrades, the federally authorized shallow draft Biloxi West Approach and Biloxi Lateral navigation channels that run between the City of Biloxi and Deer Island will experience increased shoaling and will require more frequent, and costly, maintenance dredging activities. Dredging frequency in this area is typically as much as half the frequency of similar nearby channels. Deer Island also provides erosion protection to the mainland of the City of Biloxi. As the island continues to degrade, the impacts of increased wave action on the mainland shoreline will increase the amount of storm damages that can be suffered by commercial development congregated in this area. Figure 21 displays the general location of the west end breach and the Grand Bayou area.

In summary, there is a need to restore the shoreline of Deer Island, fill the breach areas, repair/improve existing marsh and maritime forest areas, and add additional marsh area. These efforts will provide protection to the mainland areas behind the island and improve critical coastal wetlands.

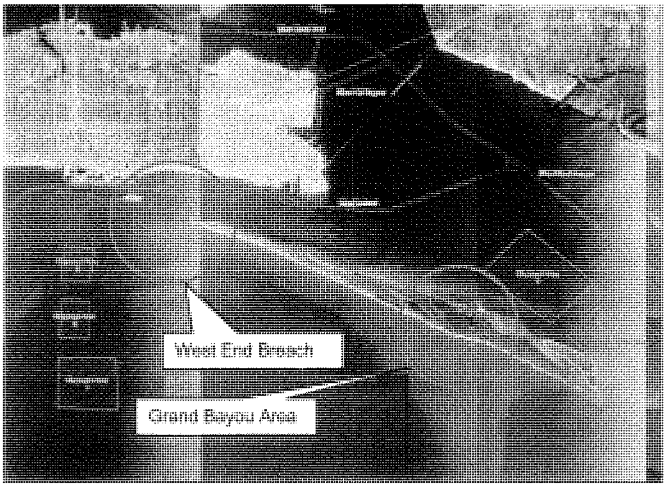


Figure 21. Areas of Concern

There are a number of possible solutions that can be implemented to provide improvements on Deer Island. Restoration of the seaward shoreline is needed with filled areas graded and planted to establish/restore marshes and maritime forest areas. Restoration of the created marsh at the eastern end of Deer Island is needed to preserve, maintain, and enhance the aquatic habitat established by that project. Listed below, in order of precedence, are the proposed actions and their approximate cost:

Because of the shoreline losses and concern about the breaches and the resulting loss of area, following Hurricane Katrina, Federal authorization and funds were provided to restore the lost seaward shoreline and fill the breaches. That project, scheduled to begin construction in early 2008, will provide for ecosystem restoration as well as preservation of critical coastal wetlands by restoring portions of the island and its shoreline lost during storm events. However, funding for this effort is not adequate to completely restore the entire seaward shoreline. The estimated cost to completely restore the seaward shoreline of Deer Island is about $4,750,000.

Repair/replace the damaged portion of the containment dike: The small failure area of the containment dike during Hurricane Katrina contributed to the loss of material within the site. Repair or replacement of this portion of the containment dike is necessary to restore the marsh area to its pre-Katrina level and would prevent further loss of marsh area. The estimated cost to repair/replace this portion of the containment dike is about $200,000.

Add/replace material in the containment area: New material is needed to restore the marsh area to its pre-Katrina level. This additional material will replace that which has been lost and will also be used to raise marsh areas that had through consolidation had become too low to sustain marsh habitat. The estimated cost to add this material is estimated to be about $600,000.

Analyze new stone training dikes on the north and south ends of the island: Initially, short training dikes were constructed on the eastern side of the Section 204 project. These dikes were to protect the containment dikes from erosive forces within the Mississippi Sound. Review of the failure of the containment dike suggests that the shortness of the training dikes may have contributed to the failure. A modeling analysis of the training dikes needs to be conducted to insure that the dikes are long enough to prevent future failures. The estimated cost to conduct this analysis is about $50,000.

Lengthen stone containment dikes on north and south ends: Lengthening the stone containment dikes may be necessary to reduce/eliminate the reoccurrence of failure of the containment dike. The modeling noted above will help in this determination. The estimated cost to lengthen the stone containment dikes is about $1,000,000.

Create additional marsh area adjacent to existing created marsh: The existing created marsh area and that which will be restored with the shoreline restoration project help to replace marsh areas that have been lost over time on Deer Island. The creation of additional marsh area will help to offset losses that have occurred and will enhance aquatic habitat on the island. The existing created marsh successfully demonstrates the durability of the design of the marsh area as well as the selection of the site for the creation of the marsh. The project proved its ability to withstand a fairly strong hurricane event during Hurricane Katrina. An additional marsh area can be created adjacent to the west side of the existing created marsh. The created marsh area will be about 20 acres in size and is estimated to cost about $2,400,000.

The total estimated cost for the proposed work items totals $9,000,000. Figure 22 displays the location of the proposed work items 2 through 6.

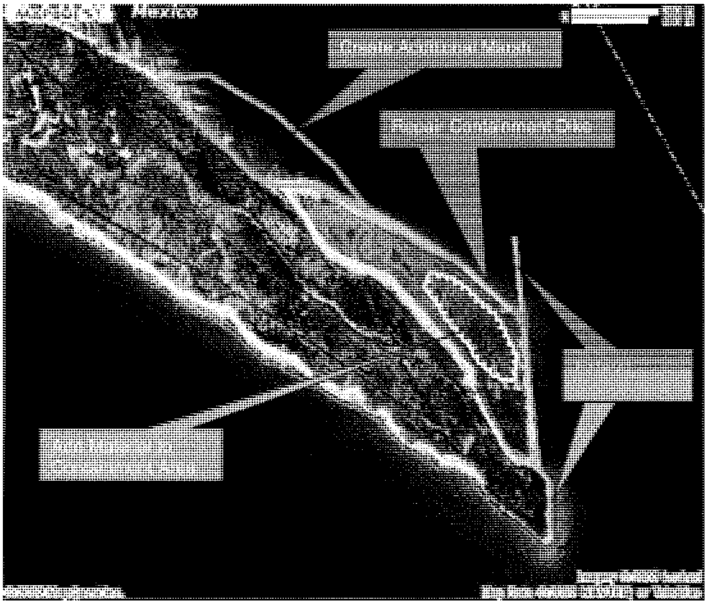


Figure 22. Location of Proposed Work Items

9.5 Evaluation of Measures – Formulation Round Three

Evaluation of measures carried forward into Round Three focused on the results of the final refinement of modeling results and technical analyses on each final measure or alternative. The study team then discussed their final evaluations as a group to arrive at consensus as to what alternatives would be compared in the System of Accounts analysis. This final evaluation process involved the determination of final surge and wave heights for a given event frequency, surge behavior under these same events, costs required for those structural and non-structural designs or lists of features applying to a certain design level, final determination of damage reduction benefits derived for a certain design, potential societal and other OSE benefits and outcomes fort each plan, or the benefit over time to a particular ecosystem created by a particular measure. Table 31 shows the results of the final evaluation of measures to be carried over into the System of Accounts analysis.

Measure	Tidal Habitat Restored	Tidal Habitat Lost	Non-Tidal Habitat Restored	Non-Tidal Habitat Lost	Damages Reduced / Avoided	Residual Damages	Cost to Implement Plan	Local Cost Burdens	Regional Economic Benefits	Cultural and Historical Heritage	Public Service Disruptions	Personal Impacts	Long-Term Sustainability	Consequences of Plan Failing	Residual Risk
	(Acres)	(Acres)	(Acres)	(Acres)	($)	($)	($)	(1-10)	(1-10)	(1-10)	(1-10)	(1-10)	(1-10)	(1-10)	(1-10)
Barrier Island No Action	0	4058	0	2705	$-	$426,040,000	$ -	10	1	1	1	1	1	2	1
Barrier Island Option A	644	0	2036	0	$ -	$426,040,000	$ 942,200,000	4	5	5	3	3	6	5	5
Barrier Island Option B	1029	0	686	0	$ -	$426,040,000	$ 1,013,800,000	3	5	4	2	3	4	3	4
Barrier Island Option C1 & C2	326	0	217	0	$ -	$426,040,000	$ 232,900,000	7	2	6	2	3	5	4	5
Barrier Island Option D	0	0	820	0	$ -	$426,040,000	$ 14,200,000	9	1	5	2	3	1	2	3
Barrier Island Option E	0	0	907	0	$ -	$426,040,000	$ 39,200,000	8	1	6	2	3	1	3	3
Barrier Island Option F	4400	4058	0	2705	$ -	$426,040,000	$ 264,500,000	3	2	2	2	3	1	2	3
Barrier Island Option G	130	1227	477	2453	$ -	$426,040,000	$ 114,100,000	5	1	7	2	3	3	4	3
Barrier Island Comp Plan	456	0	694	0	$ -	$426,040,000	$ 347,902,000	5	2	8	3	3	6	6	6
LOD2 No Action	0	0	0	0	$ -	$426,040,000	$ -	10	1	3	1	1	2	2	2
LOD2 Option I	0	0	351	0	$ -	$426,040,000	$ 63,880,000	3	2	4	2	2	4	5	2
LOD2 Option J	0	0	351	0	$ -	$426,040,000	$ 65,480,000	4	2	5	3	3	5	4	2
LOD2 Option K	0	0	304	0	$ -	$426,040,000	$ 15,430,000	7	1	6	3	3	7	4	2
Turkey Creek No Action	0	0	0	0	$ -	$ 16,890,000	$ -	10	1	3	1	1	10	10	1
Turkey Creek Ecosystem Plan 1	0	0	879	0	$ -	$ 16,890,000	$ 7,200,000	4	1	6	1	1	5	7	5
Turkey Creek Ecosystem Plan 3	0	0	689	0	$ -	$ 16,890,000	$ 5,900,000	6	1	5	1	1	6	6	4
Turkey Creek Ecosystem Plan 5	0	0	190	0	$ -	$ 16,890,000	$ 2,300,000	8	1	4	1	1	7	5	3
Bayou Cumbest No Action	0	0	0	0	$ -	$ 6,674,000	$ -	10	1	3	1	1	10	10	1
Bayou Cumbest Acquisition	0	0	0	0	$ 459,000	$ 6,674,000	$ 15,500,000	7	1	1	2	2	7	10	5
Bayou Cumbest Ecosystem Plan 1	373	0	0	0	$ 459,000	$ 6,674,000	$ 74,610,000	4	1	1	2	2	6	7	6
Bayou Cumbest Ecosystem Plan 2	373	0	0	0	$ 459,000	$ 6,674,000	$ 58,720,000	5	1	1	2	2	5	7	6
Bayou Cumbest Ecosystem Plan 3	373	0	0	0	$ 459,000	$ 6,674,000	$ 50,830,000	6	1	1	2	2	4	7	6
Bayou Cumbest Ecosystem Plan 6	373	0	0	0	$ 459,000	$ 6,674,000	$ 50,780,000	6	1	1	2	2	4	7	6
Admiral Island No Action	0	0	0	0	$ -	$ 150,860,000	$ -	10	1	2	1	1	10	10	1
Admiral Island Ecosystem Plan 1	118	0	0	0	$ -	$ 150,860,000	$ 42,900,000	4	1	3	1	1	6	7	6
Admiral Island Ecosystem Plan 2	118	0	0	0	$ -	$ 150,860,000	$ 38,400,000	5	1	3	1	1	5	7	6
Admiral Island Ecosystem Plan 3	118	0	0	0	$ -	$ 150,860,000	$ 36,100,000	6	1	3	1	1	4	7	6
Admiral Island Ecosystem Plan 6	118	0	0	0	$ -	$ 150,860,000	$ 36,000,000	6	1	3	1	1	4	7	6
Dantzler No Action	0	0	0	0	$ -	$ 7,130,000	$ -	10	1	3	1	1	10	10	1
Dantzler Ecosystem Plan 1	0	0	385	0	$ -	$ 7,130,000	$ 1,880,000	6	1	6	1	1	5	7	5
Dantzler Ecosystem Plan 3	0	0	151	0	$ -	$ 7,130,000	$ 870,000	7	1	5	1	1	6	6	4
Dantzler Ecosystem Plan 5	0	0	234	0	$ -	$ 7,130,000	$ 1,040,000	8	1	4	1	1	7	5	3
Franklin Creek No Action	0	0	0	0	$ -	$ 7,130,000	$ -	10	1	3	1	1	10	10	1
Franklin Creek Ecosystem Plan 1	0	0	149	0	$ -	$ 7,130,000	$ 1,630,000	6	1	6	1	1	5	7	5
Franklin Creek Ecosystem Plan 3	0	0	56	0	$ -	$ 7,130,000	$ 550,000	7	1	5	1	1	6	6	4
Forrest Heights No Action	0	0	0	0	$ -	$ 816,791	$ -	10	1	3	2	2	10	10	1
Forrest Heights Plan 1	0	0	0	9	$ 331,036	$ 485,755	$ 6,000,000	5	1	8	5	5	6	8	5
Forrest Heights Plan 2	0	0	0	20	$ 331,508	$ 485,283	$ 9,000,000	5	1	9	6	6	5	9	6
Nonstructural No Action	0	0	0	0	$ -	$426,040,000	$ -	10	1	3	2	2	10	10	1
Long-term Homeowners Assistance and Relocations Plan	0	0	0	0	$ 209,665,350	$ 216,374,650	$ 7,999,019,430	2	6	3	6	8	5	9	9
Very High Risk Homeowners Assistance and Relocations Plan	0	0	0	0	$ 22,380,000	$ 403,660,000	$ 482,000,000	6	3	5	5	5	8	9	7

Table 31 Evaluation Results of Final Plans

9.6 Comparison of Measures – Formulation Round Three

Comparison of Round Three measures consisted of presentation of conditions and potential change in conditions, under "No-Action", future "without-project", and future "with-project" conditions for each site or problem area, in both a descriptive presentation, and also in a "System of Accounts" comparison format. Data presented for comparison in Round Three included revised costs, benefits (monetary, or economic, environmental outputs, societal, etc.) to be derived from measure implementation, potential impacts related to implementation, detailed design considerations, environmental outputs, damages prevented, geotechnical/site considerations, more detailed technical requirements, source material and source area considerations, and other technical, environmental, or economic issues. The "System of Accounts" analysis presents information in four separate "accounts" or categories for comparison, that include "National Economic Development" (NED), which in this case only compares and contrasts the cost-effectiveness of each group of alternatives, "Regional Economic Development "(RED), which discusses the potential regional impacts of each group of alternatives, Environmental Quality (EQ), which discusses potential positive and negative environmental impacts of each group of alternatives and their environmental quality implications, and Other Social Effects (OSE) evaluations, which discusses and contrasts the potential social, and other effects of each group of alternatives.

The alternatives were also compared and contrasted according to their achievement of the additional criteria of a) effectiveness; b) completeness; c) acceptability, and d) efficiency (cost-effectiveness) according to applicable Corps guidelines.

In addition to these four traditional accounts, information on potential risks, uncertainties, and consequences, is also presented in System of Accounts format, for comparison at the same level of scrutiny of the information presented in other accounts.

After the weighting of the metrics, a multi-criteria decision analysis was made to obtain a multi-attribute utility or stakeholder risk score for each of the final plans. This number rates each alternative as a percentage of a theoretical "perfect plan" (in the eyes of the stakeholder groups). In other words, the higher the percentage, the more acceptable the alternative should be to that stakeholder group.

The stakeholder risk scores presented in the system of accounts help to identify plans that meet stakeholder expectations. The results of the metric weighting analysis identified four distinct stakeholder groups, each clearly showing which accounts are more important to them. Therefore, the "perfect plan" would show high scores from each of the cluster groups, as well as rate well in the other accounts. Table 32 summarizes how the stakeholder risk scores vary for each alternative by each cluster group.

Table 32.

System of Accounts table for Nonstructural Alternatives

	Preference Pattern			
Location	**A**	**B**	**C**	**D**
Barrier Islands	Barrier Island Comp Plan	Barrier Island Comp Plan	Barrier Island Option A	Barrier Island Option A
LOD2	LOD2 Option K	LOD2 Option K	LOD2 Option K	LOD2 Option K
Turkey Creek	Turkey Creek No Action	Turkey Creek No Action	Turkey Creek No Action	Turkey Creek Ecosystem Plan 1
Bayou Cumbest	Bayou Cumbest Acquisition	Bayou Cumbest Acquisition	Bayou Cumbest Acquisition	Bayou Cumbest Ecosystem Plan 1
Admiral Island	Admiral Island No Action	Admiral Island No Action	Admiral Island No Action	Admiral Island Ecosystem Plan 1
Dantzler	Dantzler No Action	Dantzler No Action	Dantzler No Action	Dantzler Ecosystem Plan 1
Franklin Creek	Franklin Creek No Action	Franklin Creek No Action	Franklin Creek No Action	Franklin Creek Ecosystem Plan 1
Forrest Heights	Forrest Heights Plan 2	Forrest Heights Plan 2	Forrest Heights No Action	Forrest Heights No Action
Non-Structural	Phase I High Hazard Area Risk Reduction Plan	Long-term High Hazard Area Risk Reduction Plan	Phase I High Hazard Area Risk Reduction Plan	Long-term High Hazard Area Risk Reduction Plan

The full set of system of accounts evaluation tables are presented in the Main Report. A detailed discussion of the development of stakeholder risk scores, including an example system of account evaluation table is presented in the Risk Appendix.

10 SELECTION OF RECOMMENDED MEASURES, PLANS AND ACTIVITIES

Members of the public, agencies, and local decision-makers, weighed in on the final list of alternative plans. Those plans identified by the "best-buy" analysis as possessing Federal interest in implementation, and passing all screening criteria, fell into one of these categories:

a) Inclusion as a project recommended for Construction Authorization;
b) Inclusion as a project requiring additional preconstruction engineering design (PED) for specific features (i.e. a long-term solution that needs more technical analyses based on the complexity of the system);
c) Inclusion as project(s) under a Programmatic Plan Authorization;
d) Inclusion as a project requiring additional Feasibility Studies Authorization (i.e. requiring extensive evaluation); and
e) Inclusion as a project requiring Advanced Design Studies for Innovative Concepts Authorization.

10.1 Projects Recommended for Construction Authorization

Eight (8) potential restoration sites (Barrier Islands, Deer Island, Turkey Creek, Bayou Cumbest, Franklin Creek, Admiral Island, Dantzler, and Bayou Cumbest SAV), and two flood damage reduction areas (Forrest Heights and HARP), were chosen as initial projects to be carried forward in the environmental component of the MsCIP Comprehensive Plan and Integrated Programmatic EIS. The potential restoration sites are located throughout the study area, in each coastal county. Two of the sites consist of restoring emergent tidal marsh habitat, three other sites restore wet pine savannah habitat, and one restores SAVs in Bayou Cumbest, one will restore the barrier islands, and one will complete restoration efforts on Deer Island. These sites allow the Corps, Mobile District to demonstrate the planning process involved in developing environmental restoration measures at each site and county, development of alternatives, and selection of a cost-effective restoration plan for each potential environmental restoration site. If authorized for further study, all other potential ecosystem restoration sites previously identified in this report would go through a similar planning and evaluation process under a Programmatic Authority.

In addition, two pilot projects are recommended. The Moss Point Municipal Structure Relocation Project is a pilot project involving relocating municipal services to higher ground within Moss Point. The information gained from this effort could help other communities in relocating their facilities to reduce the risk from future storm surge. The Waveland Flood Proofing Project is a pilot project involving new methods for elevating structures in the hardest hit areas of Waveland. The information gained from this effort could help other communities in elevating structures using FEMA's new 550 guidelines, thereby reducing their risk from future storm surge. These projects are discussed in more detail below, and are fully developed in the Non-structural Appendix.

10.1.1 Turkey Creek Ecosystem Restoration

This project site is located in north Gulfport, Mississippi, adjacent to U.S. Highway 49, a major north-west thoroughfare, and within the impaired Turkey Creek watershed. The area is becoming increasingly urbanized and development pressures are resulting in increased wetland degradation and loss by direct filling with the incumbent decrease in flood storage capability. The Turkey Creek site is approximately 880 acres of predominately undeveloped land. The site is divided by an east-west running railroad berm and contains a number of dirt road/paths and several miles of drainage ditches. These drainage ditches were constructed in the past in an effort to drain the site and control the drainage across the site into specified areas in hopes of making the site more attractive for development. Approximately 689 acres are south of the existing railway and 190 acres are located north. The railway berm effectively separates the two portions of the site and therefore these areas functions separately. The site is primarily comprised of degraded pine savannah wetland habitat. The elevated railway berm, miles of drainage ditches, and undeveloped fragments the wetland habitat and substantially alters the hydrology of the wetlands located to the north. Hurricane Katrina damages and/or destroyed much of the remaining habitat (wind and salt damage to vegetation as well as salinity increases in the soils from the surge) such that the area has been determined to be incapable of unassisted recovery.

Figure 23. Location of Turkey Creek Restoration area.

Several plans were evaluated in order to determine the most cost-effective plan for restoration. The Turkey Creek site had an HGM assessment performed in 2000, using the *Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Wet Pine Flats on Mineral Soils in the Atlantic and Gulf Coastal Plains* (Rheinhardt et al 2002). Results from this earlier assessment were used to establish baseline (current) conditions at the site.

The east-west railroad berm effectively divides the site into two distinctive areas for restoration options. These options included evaluating on the basis of addressing the degraded nature of the entire site (879 acres), the northern portion of the site (190 acres), and the southern portion of the site (689 acres). Any restoration option considered would require the acquisition of the specific portion of the site as well as any removal and/or demolition of structures.

Seven plans were developed (including no action) that considered filling in man-made ditches, maintaining native vegetation (by either burning or mowing), and excavating and removing the existing roadbeds and any additional fill placed by man. The economically ineffective plans were identified and eliminated in a cost-effective analysis which can be found in the Economic Appendix. An economically ineffective plan is a plan that costs more or the same as a subsequent plan but produces less benefit than that subsequent plan. Of the seven plans analyzed, three plans were eliminated because they produced less benefit at greater cost than a subsequent plan as shown in Figure 24. All three of the plans eliminated included the use of mowing as a management measure for restoring and/maintaining the wet pine savannah habitat.

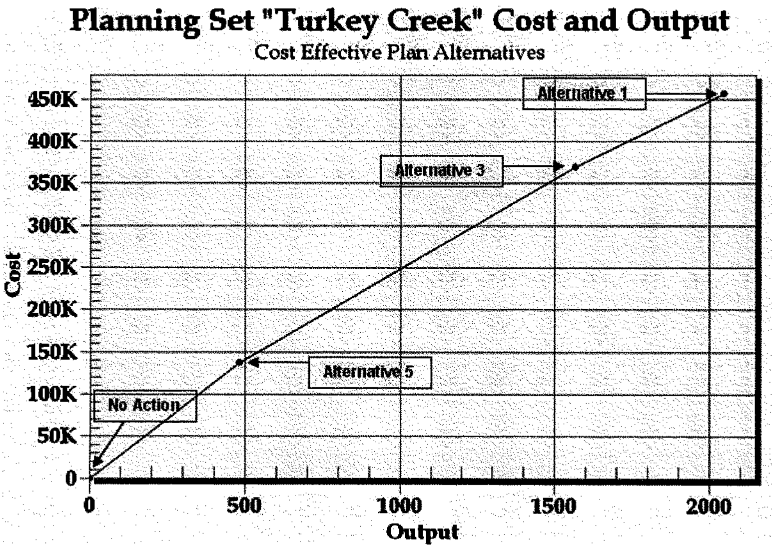


Figure 24. Display of Cost Effective Alternatives for the Turkey Creek Area

Of the three remaining plans, Plan 3 (shown as Alternative 3 above) proved to be the most cost-effective. There is not very much difference in the benefits gained in Plan 1 when compared to extra cost. There is, however, a much bigger difference in benefits for a small amount of cost when comparing Plan 3 with Plan 5, or the No Action Plan.

As shown in the System of Accounts (Table 1.18-3), the major differences between the 4 remaining plans are with the sustainability of the plan, as well as the cost to maintain the site. Again, Plan 3 has a distinct advantage over the larger Plan 1 because of the sheer volume with regards to maintenance, and in sustainability because of getting water to flow through the railroad barrier.

An essential component necessary when selecting the recommended plan at Turkey Creek was the need for burning. Burning allows the wet pine savannah environment to continue naturally as a functioning system. Although mowing does effectively keep understory plants from over colonizing the area, it does not simulate the natural conditions (i.e. seed germination, heating the pine bark, etc.) Therefore, Plan 2 is not as effective as Plans 1 and 3 due to its mowing component. The benefits are also different between Plans 1 and 3, primarily due the acreages. Plan 1 includes both the north and south parcels while Plan 3 included only the south parcel. Also, the man-made barrier within the project site will make it more difficult to maintain the necessary hydrology (water flow) for Plan 1. The MsCIP team took all of these factors into consideration and believes that Plan 3 would do the best job of achieving the desired environmental restoration outputs (i.e. a functioning wet pine savannah) while also being a cost-effective plan.

Plan 3 consists of requires the acquisition of 689 acres of predominately undeveloped land, filling the previously constructed draining ditches, excavating and removing existing roadbeds and any additional fill, and maintaining vegetation growth by burning the project area in the initial year of construction as well as maintaining it by burning every three years over the life of the project as needed. The cost of acquisition of properties and the demolition of structures and restoration work on the site will cost approximately $ 6,840,000, and the average annual cost of operating and maintaining the project is estimated to be $47,000.

10.1.2 Bayou Cumbest Ecosystem Restoration

The Bayou Cumbest site is located in the extreme southeastern portion of Jackson County adjacent to Bayou Cumbest and the Mississippi Sound. The area contains approximately 373 acres to be restored to emergent tidal marsh. The area currently consists of a degraded tidal marsh, as well as filled and developed areas (see Figure 25). Due to the severity of Hurricane Katrina, most of the residential development was severely damaged or destroyed. The area contains low elevations and since most residential structures have been destroyed, the opportunity exists reduce the risk of future hurricane and storm damage and to restore the once existent tidal marsh. Pursing this initial restoration project would relocate residents outside of the low-lying areas and would help demonstrate the environmental recovery of this area of the valuable marsh resource. In addition, this would also provide additional future storm surge protection to the overall coastal area by increasing the natural protection that marsh provides.

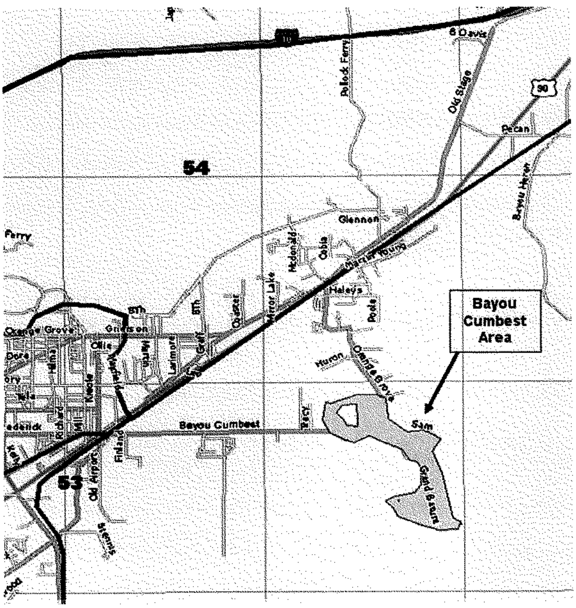


Figure 25 Bayou Cumbest Area

The acquisition of 178 parcels and the removal of 62 structures would be required for all alternatives considered for this area. The acquisition of many, if not, all of the parcels with structures for this area are being considered as part of a Jackson County request to the Mississippi Emergency Management Agency for funding via FEMA Hazard Mitigation Grams Program (HMGP). As part of all of the plans (except the no action plan) considered for this site, the Corps in cooperation with the State and Jackson County would undertake the acquisition of those properties not acquired via the HMGP which would effectively reduce the future risk of damage from hurricane and storm surges. No Ecosystem Restoration would be performed as part of the HMGP, and the 373 acre area would be allowed to remain in a degraded nature, as with the No Action alternative. Alternatives to this option include the implementation of various management measures including excavating old fill material, removing exotic species, filling in existing artificial ditches, and planting native vegetation at various densities ranging from a ½ meter to 2 meter spacing.

These management measures were combined to create seven plans (including no action) that were analyzed to determine the cost-effectiveness of each. The economically ineffective plans were identified and eliminated to determine which plans are cost-effective. An economically ineffective plan is a plan that cost more or the same as a subsequent plan but produces less benefit than that subsequent plan. Of the seven plans analyzed, Plans 4 and 5 were eliminated because they produced less benefit at greater cost than a subsequent plan. These plans lack the aspect associated with filling the artificial ditches and with native vegetation at 0.5 and 1.0 meter spacing. Similarly, Plan 6 was eliminated because it would not be a "best-buy" plan in that it produces much less benefit for only slightly less cost than Plan 3 as shown in Figure 26 below.

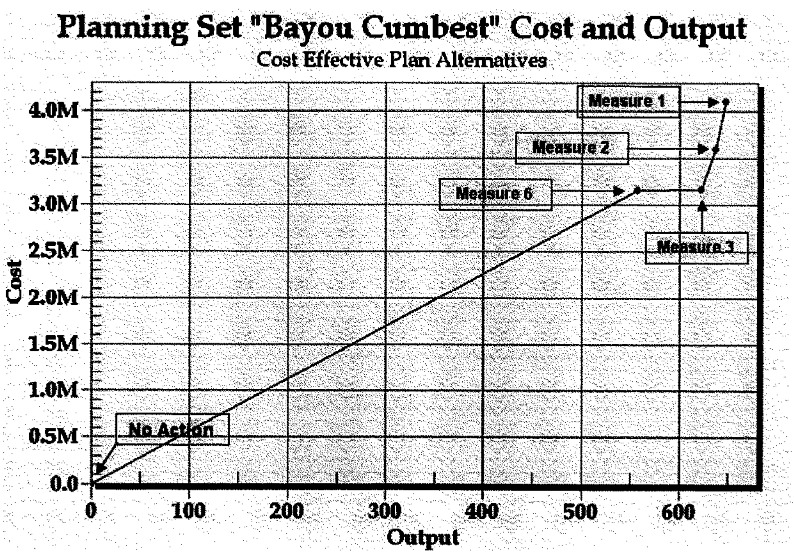


Figure 26 Cost Effective Measures (Plans) for Bayou Cumbest Area.

Plan 1 only produces slightly more benefits than Plan 2 and at a significant increase in cost. In addition, the MsCIP team has had found that the 1 meter spacing has a higher success rate than the 2 meter based on professional experience by the Corps, universities, NGOs, State, and other Federal agencies with restoration of similar emergent marsh habitats. Past experience in coastal Mississippi has proven that spacings, elevation, and hydrology are the three key essential components to obtain a successful emergent marsh site. The three spacing techniques (0.5, 1.0, and 2.0 meters) have been used recently at a local coastal Mississippi project on Deer Island in Harrison County. Although the 0.5 meter spacing may have a slightly higher success rate, the overall goal of the restoration project can be achieved by spacing the tidal emergent plants out to 1.0 meters per plant at a significant reduction in cost. The 2.0 meter spacing of Plan 3 was determined to leave the site too vulnerable to storms and/or hurricanes; thus, this spacing technique proofed to be rather risky.

The recommended plan (Plan 2) will restore 373 acres. The recommended plan consists of restoring the natural ecosystem by excavating old fill material, removing exotic plant species from non-excavated areas, filling existing artificial ditches, and planting native vegetation, such as *Spartina alterniflora* (Smooth Cordgrass) at the seaward edge of marsh; *Juncus roemerianus* (Black Needle Rush). The construction cost is estimated to be $25,530 with an annual average operation and maintenance cost of $114,000.

10.1.3 Admiral Island Ecosystem Restoration

The 118 acre restoration area is located in Hancock County adjacent to Bayou La Croix and near Bay of St. Louis (Figure 27). The property is owned and maintained by the State of Mississippi and consists of degraded wetland habitat as a result of debris and sediment deposited during the storm surge event of Hurricane Katrina.

Figure 27. Admiral Island Ecosystem Restoration Area

The tidal marshes in this area were ditched during the 1960s causing changes in the natural hydrology and subsequent changes in the species composition. Hurricane Katrina left extensive debris fields and sedimentation throughout the area and destroyed many native trees and vegetation. Due to the loss of native species, this area is experiencing a severe infestation of the invasive Chinese tallow tree, which is invading the marshes and the adjacent flatwoods. These exotic species out-compete the native vegetation, which provides food sources to the many fish and wildlife important species, including T&E species. Without any native competing species, these exotic species eventually become the only species in the area and result in a much degraded function of the wetlands.

Since the entire site is owned by the State and is not divided by any natural or manmade hydrologic divide, the entire site is evaluated with combinations of measures including no action, excavating old fill material, removing exotic species, and filling in the existing artificial ditches on the site.

The management measures were combined to create seven plans that were analyzed to determine the cost-effectiveness of each. Economically ineffective plans are identified and eliminated to determine which plans are cost-effective. An economically ineffective plan is a plan that cost more or the same as a subsequent plan but produces less benefit than that subsequent plan. Of the seven plans analyzed, Plans 4 and 5 were eliminated because they produced less benefit at greater cost than a subsequent plan (see Figure 28). The plans that were eliminated included leaving artificial ditches in place with native vegetation planted at 0.5 and 1.0 meter spacing.

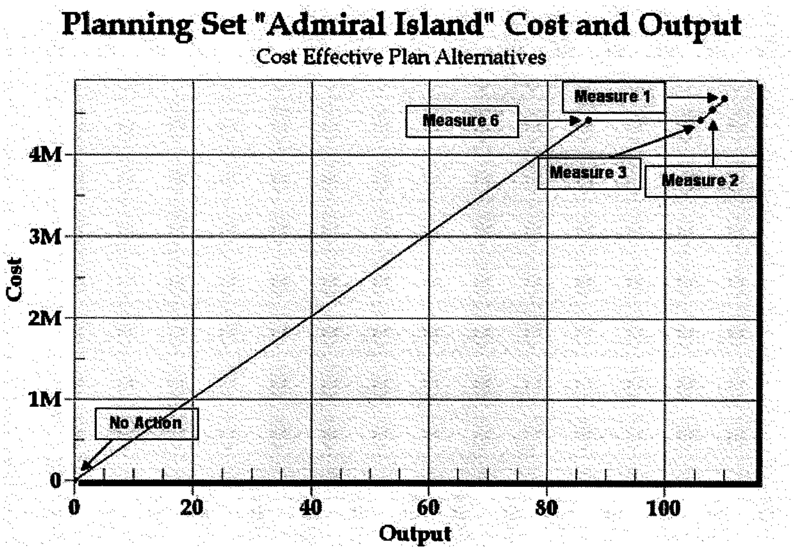


Figure 28 Display of Cost Effective Measures (Plans) for the Admiral Island Area.

Plan 1 only produces slightly more benefits than Plan 2 and at an increase in cost. In addition, the MsCIP team has had found that the 1 meter spacing has a higher success rate than the 2 meter spacing. The 2.0 meter spacing of Plan 3 was determined to leave the site too vulnerable to storms and/or hurricanes; thus, this spacing technique proofed to be rather risky.

The recommended plan (Plan 2) will restore 118 acres. The recommended plan consists of restoring the natural ecosystem by excavating old fill material, removing exotic plant species from non-excavated areas, filling existing artificial ditches, and planting native vegetation, such as *Spartina alterniflora* (Smooth Cordgrass) at the seaward edge of marsh; *Juncus roemerianus* (Black Needle Rush). The construction cost is estimated to be $21,810,000 with an annual average operation and maintenance cost of $58,000.

10.1.4 Dantzler Ecosystem Restoration

This 385-acre State-owned site is located in central Jackson County near the Pascagoula River (Figure 29).

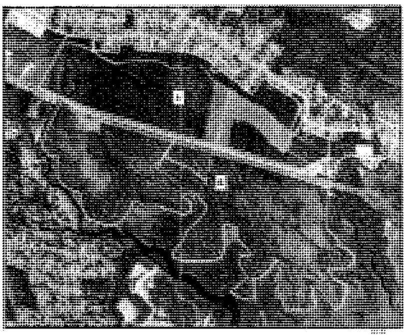


Figure 29. Dantzler Ecosystem Restoration Area.

The site was planted in plantation pine during the 1960s and drainage ditches and stormwater lines were constructed in the early 1970s in anticipation of residential development of the site. The restorable area is split by a road, 151 of the acres are north of the road and the remaining 234 acres are south of the road. The long-term exclusion of fire and the invasion of non-native species, such as Cogon grass and Chinese tallow tree, have also severely degraded the site. These exotic species out compete the native vegetation, which provides food sources to the many fish and wildlife important species, including T&E species. Without any native competing species, these exotic species eventually become the only species in the area and result in a continuing degradation of the functional value of the wetlands. The importance of the wet pine savannah has been previously been discussed in the Turkey Creek ecosystem restoration project above.

Winds from Hurricane Katrina destroyed most if not all of the plantation pine leaving massive amounts of tree litter on the ground. In addition, debris and sedimentation resulting from the storm surge added even more litter. The exotics that were present in the site prior to the storm thrive in this type environment and it is likely that without restoration of the site they will become the dominant species inhabiting the site. Six alternative plans were developed to address the ecosystem restoration of the area.

The site is divided into two portions which could be addressed separately or in combination. Plans were evaluated on the basis of addressing the degraded nature of the entire site (385 acres), the northern portion of the site (151 acres), and the southern portion of the site (234 acres). Since the State is the owner of the site no lands would need to be acquired to accomplish this plan. The plans were also developed using a combination of measures including no action, maintaining native vegetation by burning or mowing, removing exotic vegetation, filling in artificial ditches.

These seven plans were analyzed to determine the cost-effectiveness of each. Economically ineffective plans were identified and eliminated to determine which plans are cost-effective. An economically ineffective plan is a plan that cost more or the same as a subsequent plan but produces less benefit than that subsequent plan. Of the seven plans analyzed, Plans 2, 4, and 6 were eliminated because they produced less benefit at greater cost than a subsequent plan. All three of the plans eliminated included the use of mowing as a management measure for restoring and/maintaining the wet pine savannah habitat. Of the three remaining plans, Plan 1 proved to be more cost-effective (see Figure 30) and consists of restoration of 385 acres of restoration maintained by burning. Details of the plan evaluation may be found in the Environmental Appendix to this report.

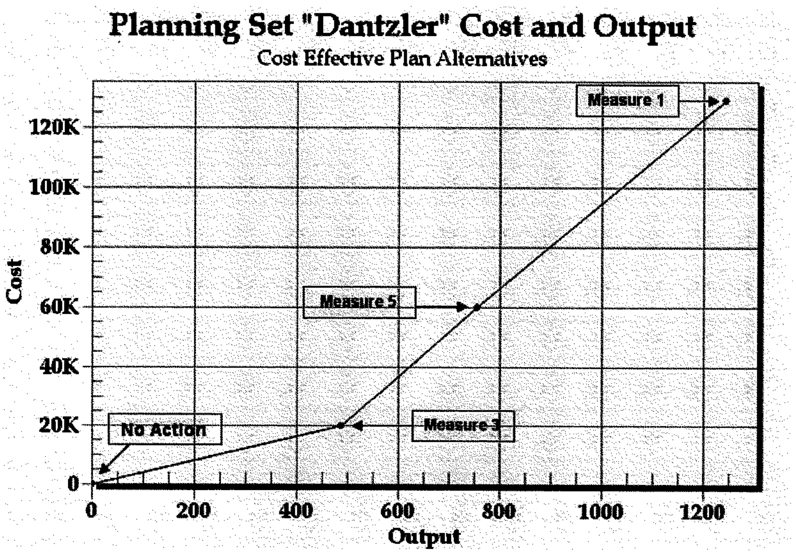


Figure 30. Display of Cost Effective Alternatives for the Dantzler Area.

An essential component necessary when selecting the recommended plan at for this restoration site was the need for burning. Burning allows the wet pine savannah environment to continue naturally as a functioning system. Although mowing does effectively keep understory plants from over colonizing the area, it does not simulate the natural conditions (i.e. seed germination, heating the pine bark, etc.) Therefore Plan 1, with its burning measure, ranked higher than that of the mowing.

Plan 1 requires filling ditches, excavating and removing existing roadbeds and any additional fill, and maintaining vegetation growth by burning the project area in the initial year of construction as well as maintaining it by burning every three years over the life of the project as needed. As with the Turkey Creek ecosystem restoration, periodic burning of the site is a critical element to the success of the restoration. The cost of this plan is estimated to be $2,210,000 with an annual average operation and maintenance cost of $26,000.

10.1.5 Franklin Creek Ecosystem Restoration

The Franklin Creek ecosystem restoration area is located near the communities of Orange Grove and Pecan, Mississippi in eastern Jackson County, near the Mississippi - Alabama state line (see Figure 31). This area has already been funded for acquisition and demolition of 30 structures as part of the MsCIP Interim Report. The restoration area consists of 149 acres located north and south of U.S. Highway 90, a major thoroughfare through the community. This area routinely floods with only a slight rainfall; thus, this would also provide additional flood storage capacity by restoring the natural habitat. Pine savannah wetlands are commonly referred to as sponges that provide floodwater retention, groundwater recharge, and water purification. This wetland habitat is under increased developmental pressures due to the extreme and urgent housing need faced by Mississippians as they are trying to rebuild. This habitat is becoming fragmented and with the increased development, fire maintenance is increasingly harder to perform.

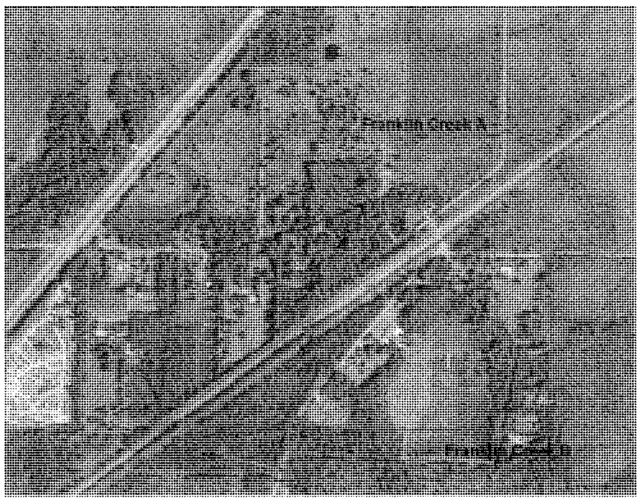


Figure 31. Franklin Creek Restoration Site.

Site evaluation options are limited to restoring the ecosystem of the entire 149 acre area or just restoring the portion of the site south of U.S. Highway 90 / L&N Railroad. Restoring the portion of the site north of the highway is not an option due to the frequent flooding of the area.

Five plans were created from a combination of measures including no action, maintaining native vegetation, excavating and removing roadbeds and fill material, filling in artificial ditches, and adding culverts to improve hydrology. The addition of culverts under the railroad berm is a necessary management measure in the restoration of the entire site as this would allow the flow of water from the frequently flooded northern area into the southern area for restoration of the natural hydrology. These plans were analyzed to determine the cost-effectiveness of each. Economically ineffective plans are identified and eliminated to determine which plans are cost-effective. An economically ineffective plan is a plan that cost more or the same as a subsequent plan but produces less benefit than that subsequent plan. Of the five plans analyzed, Plans 2 and 4 were eliminated because they produced less benefit at greater cost than a subsequent plan. These plans all involved maintenance of vegetation via mowing. Of the two remaining plans, Plan 1 proved to be by far the most cost effective and this recommended plan consists of restoration of 149 acres of restoration aided by managed water flow and maintained by burning.

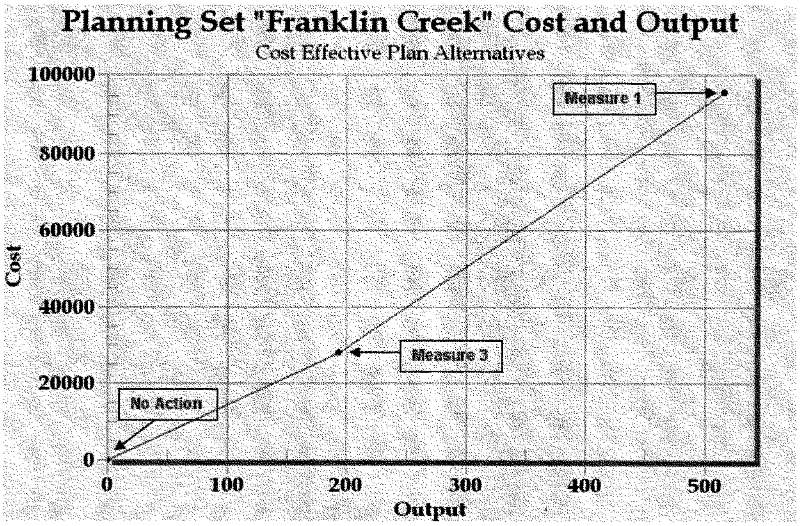


Figure 32. Display of Cost Effective Measures (Plans) for the Franklin Creek Area.

The recommended plan (Plan 1) requires filling ditches, excavating and removing existing roadbeds and any additional fill, installing culverts under the highway, and maintaining vegetation growth by burning and mowing the project area in the initial year of construction as well as maintaining it by burning every three years over the life of the project as needed. The cost of this plan is estimated to be $1,860,000 with an average annual operation and maintenance cost of $11,000 over the life of the project.

10.1.6 SAV Restoration Pilot Project

Additional study is required to assess the complex environmental make-up impacting SAVs in Mississippi Sound due to the fact that mere planting would possibly not survive. Many questions must be answered (i.e. water quality, circulation, etc.) prior to SAV restoration implementation throughout the Mississippi sound. SAV restoration efforts across the nation have proven to be rather challenging and many examples can be identified close to Mississippi over in Florida. Therefore, the MsCIP team is recommending a pilot project in the Bayou Cumbest area. Opportunities exist to partner with Federal, state, and local resource agencies as well as NGOs. Extensive coordination with the NPS, responsible for managing and operating the Gulf Islands National Seashore, would be required for areas of potential restoration within their park boundaries. Involvement of local colleges and universities with ongoing research programs would also help to identify and pinpoint specific problems for development of potential solutions.

The first goal of this proposed community-based restoration pilot project in the Grand Bay National Estuarine Research Reserve (NERR) will result in restoration of up to 5 acres of *Ruppia maritima* resulting in the recovery of an equal amount of SAV habitat to that lost during the 2005 hurricane season. The second goal is to evaluate 3 restoration techniques to demonstrate their feasibility for larger restoration projects. The third and final goal to be achieved through volunteer involvement and educational outreach will increase awareness of the importance of SAV habitat in Mississippi Sound and provide coastal managers and restoration practitioners with the knowledge of techniques to maximize their return on dollars spent.

Three transplanting methods for restoring *R. maritima* will be evaluated as follows: 1) direct planting from the donor site, 2) harvesting plant sprigs with one or more meristems (growth regions) from the donor site with subsequent growth in a greenhouse setting prior to planting, and 3) spreading seeds or mature flowering shoots over the restoration site. All plants and seeds would be acquired from a common donor site within the same system. After transplanting, quarterly monitoring for two years would be conducted to determine plant establishment, photosynthesis, growth, and expansion.

The education and outreach components of the project will consist of volunteer involvement and dissemination of results through a professional workshop conducted at the end of the project. Volunteers will be recruited from Grand Bay NERR's established volunteer base, which includes local schools, universities, agencies, and civic groups. This effort will help determine the most successful and cost- and labor-effective transplanting method for restoring SAV. Results will be disseminated through Grand Bay NERR's Coastal Training Program to inform coastal decision-makers and resource managers of successful restoration techniques.

This community restoration project will address the larger issue of SAV losses nationally and rates of natural recovery following disturbance versus recovery via restoration following disturbance. An estimated $900,000 would be required for the Bayou Cumbest SAV ecosystem restoration pilot and includes all effort associated with the planting and monitoring and producing a final restoration report.

10.1.7 Deer Island Ecosystem Restoration

Deer Island, located within the boundaries of Harrison County, Mississippi near the mouth of Biloxi Bay and the City of Biloxi, has a history of tropical storm damage. Damages from these storms has varied based on varying degrees of storm surge, wave action and wind depending on the speed, intensity, direction of travel, and proximity of the given storm. Figure 3-6 displays a recent aerial photograph of Deer Island, showing the damage exacerbated during Hurricane Katrina. The breach on the west end was significantly widened, coastal marshes were impacted by debris and sedimentation, and the maritime forest was killed by wind and salt spray. With all this damage, it is amazing that the wetland created via Section 204, Beneficial Use of Dredged Material, on the eastern end of the island survived and is currently thriving.

The island is considered a mainland remnant and is not part of the coastal barrier system of islands along the Mississippi Coast. The island contains a diversity of habitat areas including beach/dune areas, marsh area, and maritime forest areas. It's proximity to the City of Biloxi provides a certain amount of protection to the city from waves generated by approaching hurricanes. This protection comes at a cost to the island as that energy affects the seaward shoreline and the interior marshes. It has been estimated that the island has lost approximately 300 acres or about 34 percent of its area since 1850, due to eroding shoreline.

A second restoration effort is currently underway which will fill the western breach and provided selective restoration to critical areas on the southern shoreline. This project is authorized under Section 528 WRDA 2000 and will be complete in 2009. Funding for this effort, however, is inadequate to completely restore the island and to remediate for the additional damage to the island caused by Hurricane Katrina.

Due to the interrelated nature of some of the features, i.e. a+b, c+d, the team evaluated a total of 7 combination plans. Of these 7 the plan which best meets the planning objectives is the most cost effective is Combination Plan 7 which includes implementation of each of the alternatives.

Implementation of the combination plan would significantly improve the sustainability of Deer Island and result in the creation of approximately 20 acres of tidal emergent fringe marshes, restore beach and dune habitat, create hard bottom habitat through the use of stone containment, provide protection from coastal erosion, remove sedimentation and debris, and restore the coastal maritime forest an ecosystem of regional importance and concern. The cost of this plan is estimated to be $21,520.000 with an average annual operation with minimal maintenance over the life of the project.

10.1.8 Coastwide Beach and Dune Restoration

This report supports the recommendation for authorization to construct beach and dune restoration improvements along the Mississippi coast. Essentially all the beaches along Coastal Mississippi are man-made. Harrison County has the most beachfront with a 26-mile stretch extending from Biloxi Bay to St. Louis Bay. This beach is the longest man-made beach in the U.S. Hancock County has several miles of beach while Jackson County only has a small beach located in the Cities of Pascagoula and Ocean Springs. In total, the beaches extend along less than half of the Mississippi coastline.

Most of the dunes that previously existed along these beaches were destroyed by Hurricane Katrina and much of the beach was damaged. Many Federal, state, and local entities raised environmental concerns regarding the various Mississippi beaches during initial discussions held to receive local citizenry input. In some areas, such as in the City of Pascagoula, the beach was completely gone. Reconstruction of the dunes, where beaches exist, will provide a reduction of damaging wave action from smaller storms (i.e. normal summer storms, tropical storms, and/or lower energy hurricanes).

A project to restore the beaches in Harrison County has been funded and is underway as part of the Flood Control and Coastal Emergencies (FCCE). Other projects to construct dunes to a height of 5-foot in Harrison County and to 2-foot in Hancock and Jackson County were proposed as part of the MsCIP Interim Report. That dune restoration project has since been funded and the Corps, Mobile District is underway preparing the plans and specifications.

The beaches, situated immediately seaward of developed areas, provide an excellent location where elevated dunes could be constructed to provide some additional protection against smaller hurricanes. Furthermore, the seaward side of the dunes also provides excellent feeding grounds at the nearshore and intertidal shore areas for various birds, crabs, and other fauna.

The storms of 2005 destroyed a large percentage of critical habitat for the piping plover, various shorebirds including the Least Tern, and numerous fish and wildlife species. Beach nourishment and dune restoration would benefit piping plover as well as providing lost habitats for other shorebirds, additional eco-tourism opportunities, and enhancement to the overall quality of life in Coastal Mississippi. Placement of the dunes directly against a raised seawall or roadway would also serve aesthetically to mask the appearance of a structural barrier. Thus, adding to the public acceptance and/or appeal of this proposal.

Dunes are consistent with public preference for a more natural appearing defense mechanism rather than a hardened structure. Construction of dunes will include planting vegetation, such as sea oats (*Uniola paniculata*), and sand fencing to help stabilize the dunes. Sand dunes are naturally occurring dynamic coastal features, which are formed by the accumulation of wind blown sand. Sand is naturally carried along the beach by the wind. Sand fences help facilitate the building of sand dunes by trapping and collecting this wind driven sand. Sand fences are usually made of wood or biodegradable material. Dune plants tolerate harsh beach conditions including wind, salt spray, storms, scarce nutrients, limited freshwater, and intense sunlight and heat. The plants and/or seedlings provide feeding sources to a variety of animals while also providing nesting and roosting habitat.

The recommended plan for this element of the Comprehensive Plan was determined by a combination of cost-effectiveness analysis and achievement of key restoration objectives. The most cost-effective and functionally complete alternative was determined to consist of creation of a dune field that would be constructed approximately 50 ft seaward of the existing seawall and about 2 feet above the existing berm with a width of approximately 60 ft. The most functionally-effective alternative included dune vegetation and sand fencing to enhance establishment and survival of the dune vegetation.

Coastwide Beach/Dune Ecosystem Restoration Summary of Benefits

Plan	Plan Description	Functional Habitat Index
Existing Condition	Existing Condition	-
No Action	No Action	96
Recommended Plan	2-foot High x 60-foot Wide Dune With Planting & Sand Fencing	248

The recommended plan (Plan 1) requires placement of sand, planting of native dune vegetation and sand fencing. The cost of this plan is estimated to be $23,320,000 with minimal maintenance over the live of the project.

10.1.9 Barrier Island Ecosystem Restoration

The barrier islands have historically constituted a barrier to saltwater, maintaining a careful balance of saltwater and freshwater flows, which sustain the valuable marine resources of Mississippi Sound. The barrier islands also provide a barrier to onshore movement of waves, and to a lesser extent storm surge, by attenuation.

Alternatives being evaluated include very limited restoration of Ship Island, only in the vicinity of the endangered cultural sites of Fort Massachusetts and French Warehouse, on (the post-Katrina condition) "West" and "East" Ship Islands, respectively up to 'massive' restoration of the historic island dimensions. Although the protection of the cultural resource sites appears to be a justified option, this alternative would neither represent a complete solution, nor a completely effective means of addressing the larger problem faced on that island and the others. On the other hand, a more massive plan for barrier island restoration, or more direct application of sand, was rejected by many on the team, as unmanageable and potentially damaging, due to the unknown effects that might be introduced by placing sand into an area that could not be maintain by littoral drift over the long-term. More massive measures did not appear to provide a significantly greater volume of functional increase, for a much larger outlay of funds.

As part of the evaluation increasing the volumes of sand to the system is determined to be increasingly effective in achieving additional functional value, particularly when sand was provided directly into the littoral drift that created and nourishes the islands, so that "Mother Nature" can finish the job of distributing the sand in a natural way, to those areas of the island most suited to the current drift climate.

Several alternatives have been evaluated regarding the restoration of the Mississippi barrier islands. The most promising alternative for barrier island re-nourishment and protection of Mississippi Sound is the comprehensive plan. This plan would produce the greatest functional benefit per dollar expended, is a complete solution, represents an efficient use of Federal and local funds, is effective in its treatment of the problem (particularly in comparison to less effective structural wave reduction measures), and is acceptable to stakeholders in terms of existing laws, policies and priorities. In addition, the public is highly supportive of its measures to address the degradation of the barrier islands, as an element of a natural barrier to storms, and in the restoration of marine resources associated with Mississippi Sound.

This alternative includes the direct placement of sandy sediments to fill the breach in Ship Island and thereby reconnect West and East Ship Islands to their historic condition and to place sandy sediments within the littoral zones of Ship, Horn and Petit Bois Islands to ensure that the sediment budget of the islands is sufficient to maintain the islands in the future. This littoral zone placement would also benefit from the modification of dredging and disposal practices of the federally maintained Gulfport and Pascagoula Harbor navigation projects. These coupled efforts would begin the long-term process of barrier island repair and sustainability. Another consideration that still must be addressed is the best alternative for dealing with the erosion of Cat Island. This island is geomorphically different from the other 3 barrier islands and our understanding of the processes controlling Cat Island is not well developed. Additional effort would be required to add this island into an overall comprehensive barrier island restoration plan. The estimated construction cost of the barrier island comprehensive plan is $479,710,000.

10.1.10 Forrest Heights Flood Damage Reduction

In Harrison County Mississippi the Forrest Heights community is located within the city of Gulfport at the lower end of the Turkey Creek floodplain and in a part of the larger historic Turkey creek community. Harrison County was over topped and heavily damaged by the hurricanes of 2005. Particularly, the storm surge and winds generated by Hurricane Katrina on August 29, 2005, caused structural damage to the existing levee that provides inland flood protection to this low lying residential community.

Storm surge inundation reached a depth of 2-8 ft over the entire community during Hurricane Katrina. In addition, prior to Hurricane Katrina, Forrest Heights was frequently inundated by flood waters due to inland flooding along the lower reach of Turkey Creek that overtopped the existing levee. An economically justified improvement to the existing earthen levee for inland flooding protection was evaluated in July 2005, prior to landfall of Hurricane Katrina. These evaluations included 100-year, 250-year and 500-year protection and elevations up to 19.5 feet above sea level.

This plan was put on hold following Katrina in order to evaluate suitable defense of Forrest Heights from hurricane storm surge flooding. The levee was evaluated at elevations 17 ft and 21 ft above sea level.

All evaluated alternatives were also gauged against the intent of Executive Order 12898, "Federal actions to address environmental justice in minority and low-income populations". Since the establishment of the Turkey Creek Community by freed slaves and their descendants, federally funded construction programs including the Gulfport Regional Airport, US Highway 49 and Interstate Highway - 10 have impacted the Turkey Creek Watershed. In addition, numerous other constructions including hotels, shopping centers and housing developments have been federally permitted to fill wetlands and construct within the Turkey Creek watershed.

Through modeling results, a levee height of approximately 21 feet above sea level was determined to be consistent with the levee certification guidelines with the basis measure being a storm surge elevation that has a 0.2% probability (500-year event) of occurrence in any given year. The levee is estimated to be 6,500 linear feet and require 93,000 cubic yards of fill. An existing park of 12 to 14 feet in elevation would serve as a water detention area for temporary containment of rainfall during storm events. The cost of this plan is estimated to be $ 14,070,000, with an average annual operating and maintenance cost of $ 114,000 over the 100-year life of the project.

10.1.11 High Hazard Area Risk Reduction Plan

The most effective alternative for reducing the risk from future hurricane surge events is to relocate structures and population from the high risk zones. Formulation of alternatives ranged from those which would provide for a minimum level of risk reduction (approximate base flood elevation) up to those that would provide for risk reduction from increasing levels of inundation. In addition an alternative concentrating on acquisition in the high to moderately high hazard areas was evaluated.

Hurricane Katrina destroyed an estimated 32,446 structures, which were "significantly" (i.e., 51% to 100%) damaged, and caused substantial damage to another 15,000 to 25,000 structures located within the inundation footprint of the three coastal counties in Mississippi. The vast majority of all destroyed homes within the inundation footprint have not yet been rebuilt, more than two years after the event. The rebuilding rate within the inundated area is much slower than might typically be expected following a hurricane. This is due in part to a significant increase in construction costs since Katrina, higher flood insurance rates and uncertainty resulting from the fact that FEMA has only in late 2008 released the revised Flood Insurance Rate Map (FIRM) and requirements outlining the elevation future first-floor construction must adhere to in order to qualify for flood insurance through the FIP. Limited rebuilding is occurring within the surge-plain, at a variety of elevations. Those that are rebuilding at former elevations are largely self-insured (or un-insured), while those rebuilding at higher elevations are doing so with an assumptions as to what the Base Flood Elevation (BFE) may be for their area. Regardless, most of those that would need flood insurance have not rebuilt at the time of this report, due to unavailability of that BFE data.

10.1.11.1 Phase I High Hazard Area Risk Reduction Plan (HARP)

Phase I involves the buyout of those properties that have been frequently flooded, or are at very high probability of future damage due to storm surge. The first phase of the HARP would include acquisition of approximately 2,000 properties which can be implemented over the next five years. Further information on the High Hazard Area Risk Reduction Plan can be found in the Nonstructural and Real Estate Appendices. The advantages of such a program are numerous including:

- Reduces future property loss and potential loss of life;

- Eliminates costly structural alternatives and associated long term operation and maintenance costs;
- Provides a buffer and aids in reducing storm surge to adjoining properties; and
- Provides a potential opportunity to initiate alternative uses of the acquired land for fish and wildlife, ecosystem restoration and public recreation.

Benefits of the program include reduction of future damages and risks to lives within those areas, and incidental recreation and social effects benefits. Select areas within certain acquired areas would be available for ecosystem restoration, and could also produce additional restoration benefits. Regional economic benefits include an increase in sales volume of $1,171,260,000, a $246,056,800 increase in local income, and a net increase of 7,213 jobs. The estimated costs for implementation of Phase I range between $187,500,000 and $397,000,000 depending on the ultimate number of parcels acquired and range of benefits provided under P.L. 91-646.

10.1.11.2 Long-term High Hazard Area Risk Reduction Plan Evaluation

Evaluation of long term HARP is warranted to address the relocation of structures from the high to moderately high risk areas of the Mississippi coast. This program which could cover risk reduction opportunities over the next 20 to 40 years could target those properties which have been rebuilt but are still susceptible to significant future damage. A long-term HARP could involve the acquisition of large contiguous properties immediately following any large future hurricane events and be a joint effort between the USACE, FEMA, and the State of Mississippi.

The benefits of an ongoing acquisition and relocation program for coastal Mississippi could be tremendous taken into account the implications of sea level rise, continued development along the coast, and the frequency and magnitude of storms known to affect this area of the northern Gulf of Mexico. The additional study effort aimed at developing the framework and guidelines, detailed benefits, and costs would involve local and State interests as well as the Federal Emergency Management Agency.

Estimated study cost for development of a long-term HARP program is $5,000,000.

10.1.11.3 Waveland Floodproofing

This report supports the recommendation for authorization to immediately implement the flood proofing at Waveland, MS. The city of Waveland is located in Hancock County and was directly in the path of Hurricane Katrina. Because of the low lying nature of the city, the only flood damage reduction measures available to a portion of Waveland are either acquisition or floodproofing of individual structures. FEMA has released a manual for "Recommended Residential Construction for the Gulf Coast" which is meant to aid residents in rebuilding on strong and safe foundations. The design manual (FEMA 550) provides recommended foundation design and guidance for rebuilding homes destroyed by hurricanes in the Gulf Coast. The Waveland floodproofing alternatives are designed to evaluate the FEMA 550 guidelines with regards to current Corps' floodproofing practices. In addition to showing the application of existing elevation techniques and construction practices to reduce flood damages, this alternative would evaluate the use of possible innovative contracting techniques. These techniques would be designed to improve the Corps – contractor – homeowner relationship, focusing on using more timely and customer focused approaches. The 25 structures selected for floodproofing represent an adjacent group of structures that were not destroyed by Hurricane Katrina.

In order to evaluate the different foundation and building types, 25 structures would be selected in the Waveland area that could be safely elevated out of the 1% chance storm event, and which could not be protected by any other structural measures evaluated as part of this study. Damages to these structures would be significantly reduced and the area would serve as an example of smart growth. Regional economic benefits include an increase in sales volume of $20,250,000, a $4,286,426 increase in local income, and a net increase of 129 jobs. The construction cost is $4,450,000. There are no operations and maintenance costs.

10.1.11.4 Moss Point Municipal Services Relocation

This report supports the recommendation for authorization to immediately implement the Moss Point Municipal Services Relocation component of the Comprehensive plan. The City of Moss Point is located north of the City of Pascagoula in Jackson County. All of the City's municipal services were disrupted by Hurricane Katrina, and their structures were either severely damaged or deemed uninhabitable. The MsCIP has formulated alternatives that would aid the city in providing basic community services in a more timely fashion after future storm events, and further demonstrate the effectiveness of relocations projects as a hurricane and storm damage reduction measure along the Mississippi coast. The best means of achieving these goals consists of relocating the city's municipal buildings to a lower risk site with regards to flooding within the incorporated limits. These buildings include the city hall, police station, fire station and community services building. Future use of the existing site of these buildings would be as open space that would provide a buffer between City and the Escatawpa River further reducing the damages from hurricane surge and flooding events.

The relocation of these facilities would greatly reduce future damages to the local infrastructure and provide a higher confidence in uninterrupted public service in future events. Regional economic benefits include an increase in sales volume of $20,250,000, a $4,286,426 increase in local income, and a net increase of 129 jobs. The construction cost of this project is $10,860,000. There are no operations and maintenance costs.

10.2 Studies Recommended for Further Study

Using the GIS based SDSS model, the MsCIP environmental team was able to effectively analyze needs in coastal Mississippi. A subset of potential restoration sites was identified by the SDSS tool and then ground-truthed by the MsCIP environmental team, including ERDC, Corps, MDMR, and USFWS. Using this interagency team allowed us to both confirm the accuracy of the SDSS results and to collect additional on-site information pertinent to restoration efforts. The MsCIP environmental team recommends immediate construction of the above 2 initial environmental restoration projects – Turkey Creek, Harrison County and Bayou Cumbest, Jackson County. In addition, the team recommends potential environmental restoration projects specified in *Table 1.16.2.2-1* that would be studied further and restored under a MsCIP Environmental Restoration Programmatic Authority. The Environmental PDT anticipates studies, such as Project Information Reports (PIR), would range from $100,000 to $350,000 depending upon the specific project complexness. This cost has been incorporated into the cost-estimates. A rough order of magnitude cost-estimate has been prepared so that an upward construction budget is determined. The Environmental PDT will utilize the SDSS tool to prioritize environmental restoration site construction.

Development of partnerships with Federal resource agencies, state agencies, and NGOs is crucial to the success of this program. These partnerships would provide opportunities to access local knowledge of the existing environment. Specialists in specific restoration techniques would be available as well as opportunities to build on existing programs.

Once the restoration sites have been prioritized, a sequencing plan would need to be developed identifying the events necessary to accomplish restoration. This would ensure prioritized sites received immediate attention and further details developed for the required analysis. This plan would serve as an outline of the programmatic authority structure.

Once the PIR received approvals, a contracting mechanism would need to be put forward. The District PDT would need to incorporate Contracting Division in order to establish the most efficient type and beneficial use of contracting options and/or existing construction contracts. Oversight and quality assurance would ensure restoration was accomplished as envisioned.

Development of individual project monitoring plans should be incorporated into each restoration project. Adaptive management of ecosystem restoration projects, which would include the implementation of adaptive measures if required, would enhance the likelihood of the project achieving its goals and interim targets.

10.3 Additional Recommendations

While not compared in a system of accounts analysis, there are other areas that warrant either additional feasibility study or implementation by others. These include education on hurricane risk, hurricane and storm warning, evacuation plans, other structural measures, flood insurance, zoning changes, and saltwater intrusion plans. These are described in detail in the Main Report.

11 REGIONAL CONSIDERATIONS AND ACROSS-REGION INFLUENCES OF MSCIP AND LACPR ALTERNATIVES

11.1 MSCIP-LACPR COORDINATION ON REGIONAL ISSUES

11.1.1 Interaction/Coordination Between the Study Teams

The hurricanes of 2005 affected the entire region of the northern Gulf of Mexico from the panhandle of Florida to the Texas coast causing direct destruction to the immediate coast and its population centers. It also had unprecedented impacts to the much broader region from the subsequent migration of the affected population, wholesale disruption of the region's economy, disruption of the region's educational infrastructure, and untold impacts on the human resources of the region. In essence, these impacts were not only local, but regional, and system wide as well. In its response to this disaster, the Congress of the United States authorized the U.S. Army Corps of Engineers (USACE) to initiate two important and comprehensive planning efforts to address the impacts caused by these storms and to plan actions that would make the region more resilient and less susceptible to future risk from such disasters. In formulating these actions, the USACE has taken a systematic and regional approach and has required that both the Louisiana Coastal Protection and Restoration (LaCPR) and Mississippi Coastal Improvements Program (MsCIP) efforts be fully coordinated with each other. In addition, both efforts used the same plan formulation strategy, as well as shared the use of the many technical tools required to perform the evaluations.

To this end, both teams are considering structural, nonstructural, and coastal restoration measures during the plan formulation. To ensure consistent communication and coordination, both teams have attended critical meetings regarding study goals and objectives, plan formulation, and Independent Technical and External Peer Review efforts. All modeling used in both efforts has been well coordinated, and both teams made use of, and jointly coordinated, the efforts of those USACE laboratories, Centers of Expertise, and ITR and EPR teams involved in these studies. In addition, the development of the Risk Informed Decision Framework (RIDF) has been a joint effort of the two studies.

All potential impacts, both adverse and beneficial impacts, are being considered without regard to geographic boundaries. Any measures which induce adverse impacts must be eliminated from further consideration or their impacts satisfactorily mitigated on a regional basis. Several measures may have beneficial impacts outside specific study boundaries. For example, the diversion of freshwater from the Mississippi River to Lake Borgne via the Violet marsh area could not only reduce saltwater intrusion in the Mississippi Sound south of Hancock County, but it could also provide much needed sediments to the Biloxi marshes of Louisiana. Also, the systematic restoration of the coastal sediment budget and sand transport system along the Mississippi barrier islands could provide benefits to eastern Louisiana.

11.1.2 Identification of Key Regional Issues

There are several key issues that are common to both Mississippi and Louisiana. These include problems with shoreline erosion, wetlands loss, salinity intrusion, and storm surge and waves. Besides the obvious economic and societal impacts associated with hurricanes, both states have a significant problem with eroding barrier islands. These islands reduce wave energy and help significantly in reducing erosion to the mainland. The loss of wetlands along the coast is also a critical issue. Wetlands, including marshes and near shore marine and estuarine habitat, are the nursery grounds for the entire marine food chain in the Gulf of Mexico. And, like the barrier islands, they also help to reduce wave energy. Linked to both the degradation and loss of the wetlands and barrier islands is the increase of salinity in the estuarine areas of the Mississippi, Breton, and Chandeleur Sounds. These increasingly scarce areas of the United States require a delicate mix of fresh and salt water to provide habitat for oysters, shrimp, sturgeon, and other fisheries which also provide an important economic source for both states. Both LaCPR and MsCIP teams are working together to solve these issues at the local, regional, and national levels. Multiple focus groups, public meetings, and regional workshops have been held to make sure that the solutions presented in this report are comprehensive in nature, and also maintain the delicate balance between people and their environment.

11.1.3 Coordination with FEMA

In addition to the significant coordination between the MsCIP and LACPR teams, the teams have also coordinated fully with the Federal Emergency Management Agency (FEMA) to ensure a unified approach in the development of appropriate hurricane and storm damage reduction alternatives. FEMA has different regional offices to manage different areas of the United States. FEMA Region IV serves the state of Mississippi, and FEMA Region VI serves the State of Louisiana. After Katrina, Regions IV and VI began the complex process of updating their Flood Insurance Rate Maps (FIRMS) to include storm surge. FEMA Region VI utilized the Corps, New Orleans District to provide the model for updating their FIRMS, while Region IV contracted with an Architect-Engineer firm for this effort. Both the MsCIP and LACPR teams employed a consistent methodology for storm surge modeling, and coordinated their efforts closely with both FEMA regions. FEMA Region IV's contractor adopted some slight differences in terms of the specifics of their modeling approach; however, the agencies reconciled the differences in water levels generated for Regions IV and VI, and used an averaging technique to achieve a unified approach and result.

11.2 REGIONAL STORM SURGE AND WAVE MODELING

11.2.1 Interaction of Storm Surge and Waves with Coastal Protection Measures

Large-scale levee systems; other man-made barriers; restoration of barrier islands that involve substantial increases in an island's cross section, crest elevation or length; or wetland restoration on a massive scale, all have the potential to influence storm surge levels and wave conditions produced by extreme hurricanes on a regional scale. Levees and barriers are intended to protect against storm surge, but they also can cause a build-up of storm surge by obstructing or completely blocking the movement of water that is driven by hurricane-force winds. The pocket formed by the natural barriers of the Mississippi coast, the Mississippi River delta, and, when the wetlands of the delta become inundated, the levee systems along the Mississippi River facilitates a build-up of storm surge as winds push water into the pocket. Barrier islands alter the movement of water toward the coast, providing some blocking action and by forcing the water to move through gaps between islands, an effect that is lessened once the storm surge overtops an island. The enhanced roughness of wetlands can slow the advance of storm surge somewhat, which can cause a small local increase in storm surge seaward of the wetland and slightly reduce the surge landward of the wetland or slow its arrival time slightly. Each of these processes might tend to retard the storm surge propagation in one area; but in the process of slowing the storm surge advance, the movement of water might be slightly redirected toward another location causing a local storm surge increase elsewhere. Natural and man-made protection and buffering features like wetlands and barrier islands do not decrease the mass of water driven into the region by the hurricane winds (mass is conserved); however, they do change the momentum and redistribute the storm surge.

Natural and man-made coastal protection measures can also significantly alter wave conditions during hurricanes, reducing the potential for wave-induced damage along the coastline during elevated storm surge levels. Levees and barriers can completely block wave energy; and barrier islands act to block ocean waves from reaching the mainland coastline or reduce wave energy. Even though the reduction is less, barrier islands greatly reduce ocean wave energy even when the surge has overtopped the barrier island. Wetlands reduce wave energy, although it is difficult to accurately quantify the reduction given the current lack of detailed knowledge about the physics of this process.

In both the MsCIP and LaCPR studies, the regional influences of several proposed project alternatives on storm surge levels were examined with regional storm surge and wave modeling. The regional surge/wave model was specifically designed with this requirement in mind by having model domains and grid meshes that encompassed both Louisiana and Mississippi, and by developing the models consistently (for example, adoption of similar grid resolution throughout the model domain). The process for developing the regional model is briefly described below. Additional details can be found in appropriate appendices to the LaCPR and MsCIP reports (cite references to those appendices).

11.2.2 Initial Model Development by the IPET

As part of Interagency Performance Evaluation Task Force (IPET) work to examine the response of the southeast Louisianan hurricane protection system to Hurricane Katrina, regional storm surge and wave models were set up and applied for the coasts of Mississippi and Louisiana. The suite of models included ADCIRC, the regional storm surge model, WAM, the offshore wave model (a basin-scale wave model covering the entire Gulf-of-Mexico), and overlapping STWAVE shallow-water wave models for the complete nearshore zone spanning both states. The ADCIRC and STWAVE models were coupled to treat the very important interactions between waves and storm surge. Coupling was done to maximize accuracy of the regional models.

The IPET was a community effort, drawing on experts from several federal agencies (including the USACE, FEMA, NOAA, and the USGS), state agencies, the private sector, and academia. The work involved considerable sharing of data, model technology, and expertise among all the agencies, groups, and individuals involved. Work of the IPET was reviewed by two panels: one assembled by the American Society of Civil Engineers and the other by the National Research Council. Both panels included experts from the public and private sectors, and each was comprised of individuals representing a wide range of technical disciplines. Both review panels gave extremely high marks to the regional storm surge and wave modeling approaches used by the IPET.

11.2.3 Regional Consistency Between the LaCPR and MsCIP Projects

A collaborative effort was undertaken to meet the storm surge and wave modeling needs of both the USACE MsCIP and LaCPR studies and the FEMA work to update flood insurance rate maps for the region. The MsCIP and LaCPR studies required storm surge and wave modeling for the entire coastline of both states. The IPET modeling had focused only on southeastern Louisiana and western Mississippi. Therefore, the regional storm surge and wave models that were initially developed by the IPET were expanded and refined with higher model resolution to create regional models that spanned the entire Louisiana and Mississippi coastal zone. The linked ADCIRC and STWAVE models are completely consistent from the perspectives of regional model resolution, level of model detail, and input data quality. Higher resolution enables: (1) a more detailed representation of the landscape features that influence surge and wave propagation and coastal flooding, and (2) a more accurate representation of certain wave and surge physical processes. Model accuracy is directly related to model resolution. Figure 11.2.3-1 shows the portion of the regional ADCIRC storm surge model domain for the Mississippi/Louisiana coastal region, and Figure 11.2.3-2 shows the overlapping regional STWAVE model domains.

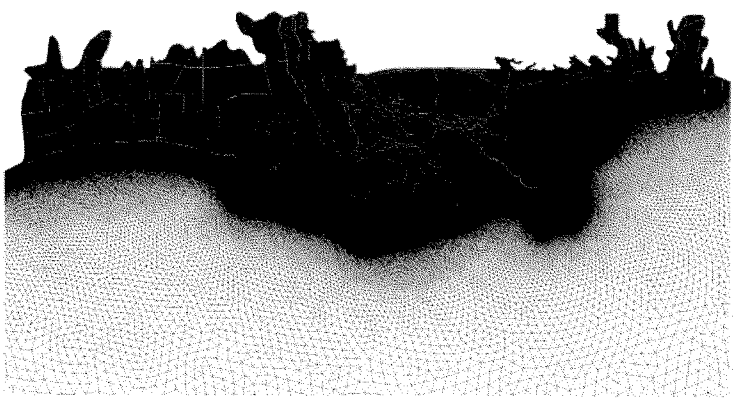


Figure 11.2.3-1. Representation of the Mississippi/Louisiana coastal region in the regional ADCIRC storm surge model

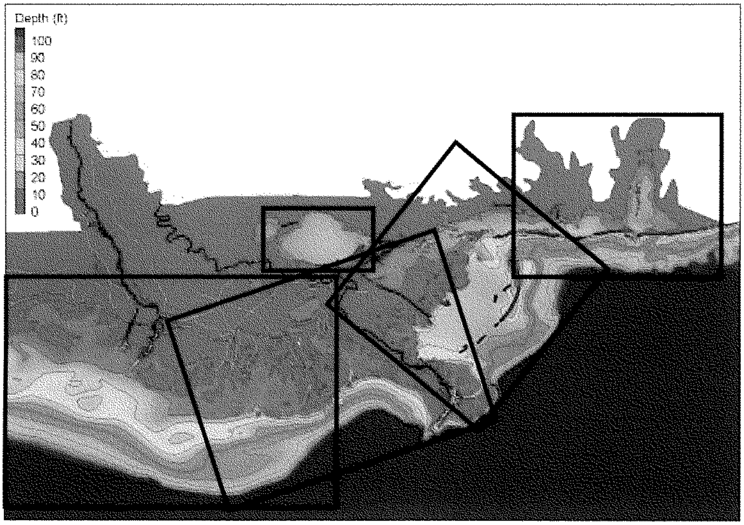


Figure 11.2.3-2. Overlapping STWAVE shallow water wave model domains spanning the Louisiana and Mississippi coasts (only the eastern portion of the westernmost Louisiana STWAVE model domain is shown here)

11.2.4 Hurricane Hazard Definition

In addition to having a regional-scale and regionally-consistent storm surge/wave model, a regionally consistent definition of the hurricane hazard was also important. A multi-disciplinary team, the Risk Assessment Group (RAG), was assembled by the Corps to characterize the probabilities of different hurricanes that can impact the northern Gulf of Mexico region. Their work fully utilized the best of today's knowledge, data and technology. Many of those involved in the work of the IPET contributed to the RAG, along with others from around the country (including members from NOAA and FEMA), in the same community spirit as the IPET. Consequently, results generated by the RAG have strong technical credibility and inter-agency acceptance. A significant achievement of the RAG, which supported both the MsCIP and LaCPR work and FEMA's remapping efforts, was the adoption of a unified general coastal flooding methodology that is being applied by USACE and FEMA. The unified approach involves coupled regional storm surge and nearshore wave models, the same approach originally taken by the IPET. The RAG developed a number of new insights into the behavior of hurricanes. One notable and extremely important finding was the tendency for all major intense hurricanes to decrease in intensity prior to landfall. The RAG developed a regionally-consistent Joint Probability Method-Optimal Sampling approach (JPM-OS) for defining hurricane probabilities and for calculating probabilities associated with hurricanes having a certain set of characteristics (track, intensity, size, forward speed). Figure 11.2.5.2-1 shows an estimate of the frequency of occurrence for major hurricanes in the north central Gulf of Mexico that was produced by the RAG. The figure shows the relatively higher probability of severe hurricane occurrence for southeastern Louisiana and Mississippi, relative to the probability of occurrence elsewhere in the Gulf of Mexico.

11.2.5 Corps-FEMA Coordination in Louisiana and Mississippi - Consistency of Hurricane Frequency Estimates

11.2.5.1 Development of Louisiana Data

Both FEMA Region VI and USACE employed the ADCIRC-WAM-STWAVE regional storm surge and wave model described above and the JPM-OS approach recommended by the RAG. The same set of model results was used in both the LaCPR work and in the FEMA Region VI remapping effort to characterize the hurricane hazard.

11.2.5.2 Development of Mississippi Data

Storm surge and wave modeling done for the MsCIP study was performed by USACE using the same regional modeling methodology as the LaCPR study (the approach outlined above). The MsCIP modeling work was coordinated with FEMA Region IV. However, results for the MsCIP project were required well before final numbers would become available from the FEMA contractor (URS Corporation) working on Region IV remapping. URS used a similar coupled surge and wave modeling

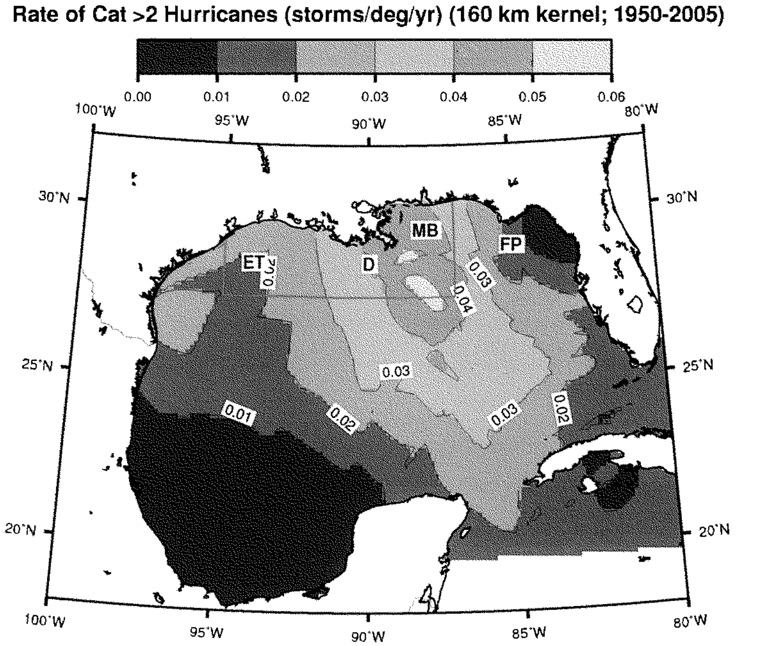


Figure 11.2.5.2-1. Analysis of hurricane frequency from Toro (Risk Engineering) from an analysis using an optimized spatial kernel (from the White Paper on Estimating Hurricane Inundation Probabilities by Resio et. al. 2006)

methodology but used the nearshore wave model SWAN, whereas USACE used the STWAVE model. However, the biggest difference in the approach used by the FEMA contractor was not in the modeling methodology, but rather in the specification of storm parameters and in the statistical computations. The FEMA Region IV/URS effort used different storm parameters and a different landfall (more inland) than USACE, which resulted in less pre- and post-landfall filling (i.e. less weakening) of the storms. In essence this resulted in stronger storms, producing higher water levels than those calculated by USACE. The agencies met and reconciled the differences in water levels for the Mississippi Gulf Coast through an averaging technique to achieve a unified Federal government set of results. Thus, there is a single Federal number for water levels corresponding to certain return periods. However, it should be noted that much of the MsCIP work proceeded with the preliminary values computed by the Corps to meet the Congressional schedule. The vast majority of storm surge-frequency curves computed by USACE and the FEMA contractor were within +/- 1 ft across the Mississippi coast. This is within the level of accuracy expected from these types of storm surge simulation models.

11.2.6 Comparison: Mississippi and Louisiana Data

When the Mississippi storm modeling results were compared to the Louisiana results near the Louisiana-Mississippi border, the Mississippi FEMA approach resulted in higher elevations around the state line than those resulting from the approach used by the LaCPR and FEMA Region VI studies. To resolve the issue, the USACE Engineer Research and Development Center (ERDC) provided a "blending algorithm" to achieve a smooth transition. As a result, the predicted still water elevations in the vicinity of the MS-LA border, corresponding to certain frequencies of occurrence, are considered scientifically accurate.

11.2.7 Present State of the Regional Storm Surge and Wave Model

A completely coupled and consistent regional storm surge and wave modeling capability is available to examine the regional influences associated with planned and proposed project alternatives being developed in the LaCPR and MsCIP studies, but only from the perspectives of project influences on storm surge levels and wave conditions. The model is based on the coupled ADCIRC-STWAVE models that were described above. The regional surge and wave model has been extensively validated using measured data acquired during Hurricanes Katrina and Rita, during the IPET and MsCIP and LaCPR projects.

This regional modeling capability was applied to examine regional-scale changes to storm surge levels associated with several of the proposed project alternatives, for example the influence of proposed barriers across Lake Pontchartrain on storm surge levels along coastal Mississippi, the influence of widespread Louisiana wetland restoration on storm surge levels in Mississippi, and the influence of Mississippi barrier island restoration on storm surges in Louisiana. Results from these applications are presented later in this chapter.

11.3 REGIONAL SALINITY/WATER QUALITY MODELING

In addition to regional influences on storm surge and waves, construction of large-scale levee systems or other man-made barriers, restoration of barrier islands that might involve increasing an island's footprint or length, or wetland restoration on a large scale, all have the potential to influence water exchanges and current patterns during normal tidal action and typical wind conditions. Such persistent changes to the hydrodynamic regime can alter salinity and water quality regimes leading to changes to habitat. These types of influences have not yet been examined in detail in either the LaCPR or MsCIP studies.

Wetland restoration measures proposed for construction in the MsCIP study are relatively small-scale features within small estuaries, and the barrier island changes proposed for construction in the MsCIP study do not involve significant changes to the barrier island footprints. Therefore regional-scale influences on salinity and water quality due to these alternatives are not expected to be significant. Wetland restoration and barrier island restoration at a much larger and widespread scale are being considered in the LaCPR study. These restoration measures can induce significant regional changes in terms of salinity, water quality and habitat and, therefore, will be examined in more detail in the future.

11.3.1 Consideration of Freshwater Diversions

Several alternatives are presently being considered in both the MsCIP and LaCPR studies to divert freshwater from the Mississippi River or other sources as a mechanism for promoting a reversal of a historic increase in salinity in the Mississippi Sound/Biloxi Marsh area. The intent of the diversion is to build wetlands, support fresher marshes and improve oyster reef health and productivity thus enhancing both their economic value and the ecological services they provide. However, the water diverted from riverine sources not only has lower salinity, but usually carries more sediment and nutrients than marine water. Diversions may result in areas of excess nutrients and thus cause algal blooms and eutrophication, greater light attenuation, and changed substrate characteristics, so their system-wide impacts need to be carefully evaluated. Spatially-explicit evaluations of habitat change over large areas are required for such system-wide impacts.

Stated goals for the freshwater diversions in the lower Mississippi River/Mississippi Sound area include the following:

1) The enhancement of oyster resources in the Bay St. Louis area;

2) Desire to maintain oyster and shellfish resources in the Lake Borgne area;

3) The return of the ecosystem to historical salinity conditions;

4) The utilization of Mississippi River sediments to build and support wetland development;

5) The return of wetlands to a "fresher" condition, with particular emphasis in restoring areas of historical cypress forests.

These goals may in fact compete with one another, and may not be able to be met simultaneously. In addition, other competing resources in the system include the presence and location of shrimp fisheries, the survival and restoration of seagrass beds and the presence and survival of gulf sturgeon, a federally-listed, threatened subspecies. Therefore, any proposed diversion alternative needs to be carefully evaluated in order to fully understand the positive and negative aspects of various diversion scenarios and to assess their ability to meet any or some of the goals listed above.

11.3.2 Initial Model Development

To initiate evaluation of freshwater diversions, a regional water quality model (WQM) has been developed. The WQM, which is based on the CE-QUAL-ICM water quality model code, has been coupled to output from a three-dimensional hydrodynamic model of the region, which is based on the CH3D hydrodynamic model. The horizontal model grid (see Figure 11.3.3-1) extends seaward beyond the Chandeleur Island and includes Mobile Bay, Lake Borgne, Lake Pontchartrain, the Inner Harbor Navigation Channel of New Orleans and the Mississippi River Gulf Outlet Channel; and it includes all the major tributaries that introduce fresh water into the system, from the Tickfaw and Amite Rivers west of Lake Pontchartrain to the Mobile River in the east end of the grid. The model simulates changes in water quality constituents, including nutrients, phytoplankton, dissolved oxygen, temperature, salinity, and underwater light intensity.

11.3.3 Present State of the Regional Salinity/Water Quality Model

The regional salinity and water quality model has been extensively validated for the Mississippi Sound region, as part of previous work done by the ERDC and Mobile District. The model has not yet been as extensively validated for the Lake Pontchartrain and Biloxi Marsh areas; however, in light of past experience with the model in numerous studies, it is expected that the current state of the model is yielding reasonable results in this region for the purposes of the screening-level studies that have been conducted to date to examine the possible benefits of freshwater diversions.

To more accurately answer detailed questions about changes to salinity and water quality, and to answer them with greater confidence (a level which can withstand a high

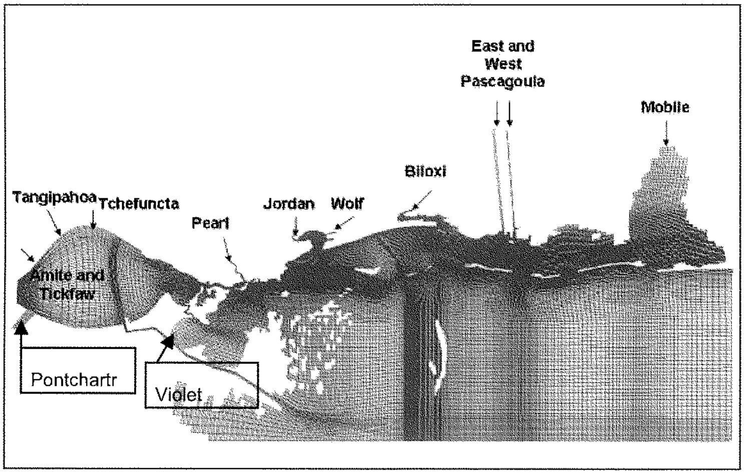


Figure 11.3.3-1. The model domain for the 3-D current hydrodynamic/water quality model, WQM

level of technical scrutiny), additional resolution and model refinement and validation, is needed. To answer more detailed questions about how changes in sedimentation, salinity and water quality translate to changes in landscape and habitat, additional model development, testing, and validation will be required. Requirements are discussed later in this chapter where the path ahead is discussed. Also note that the WQM model domain does not cover the entire coast of Louisiana. To properly examine questions regarding regional salinity, water quality and habitat questions throughout coastal Louisiana, the regional water quality model would have to be extended into those areas with a consistent level of resolution and detail, and be developed further in concert with work that is underway by Louisiana State University on habitat and ecological responses. For example, there might be regional influences in Texas associated with alternatives that are developed for western Louisiana. The need for expansion of the model will depend on the specific project alternatives that surface as preferred alternatives within the LaCPR study.

To date, the WQM has been applied to examine freshwater diversions at three locations: (1) diversion from the Mississippi River at Violet Marsh, (2) diversion of all of the Escatawpa River flow into Grand Bay, and (3) diversion from the Mississippi River at Bonnet Carre' spillway. Locations of these three diversions are shown in Figure 11.3.3-1 (annotated with boxes). Results were evaluated for several scenarios and compared to modeled existing baseline conditions to assess relative changes in the various water quality parameters. Results from these applications are discussed later in the chapter.

11.3.4 PRELINARY ASSESSMENT OF ACROSS-REGION INFLUENCES

11.3.4.1 Lake Pontchartrain Surge Reduction plan.

In general, there were four ADCIRC grids (levee alignments) used to investigate the feasibility of blocking or reducing the storm surges from entering Lake Pontchartrain via the tidal passes from Lake Borgne to Lake Pontchartrain and via overtopping of the land bridge that separates Lake Pontchartrain from Lake Borgne. The ADCIRC grids were designated as Grids A, B, C and D. See Figures 11.3.4.1-1 through 11.3.4.1-4.

Grid A was developed essentially as a theoretical plan that was designed to study the maximum reduction in surge responses in Lake Pontchartrain by eliminating any inflow into Lake Pontchartrain regardless of the intensity and surge heights in Lake Borgne. The features of this plan called for non-overtopping gated closure structures in the Chef and Rigolets Passes and connecting levees that were set sufficiently high so as to prevent overtopping from any of the storms used in the JPM-OS application. Grid A therefore isolated Lake Pontchartrain from having additional water volumes inflowing into the lake and restricted surge responses in the lake to the maximum extent possible.

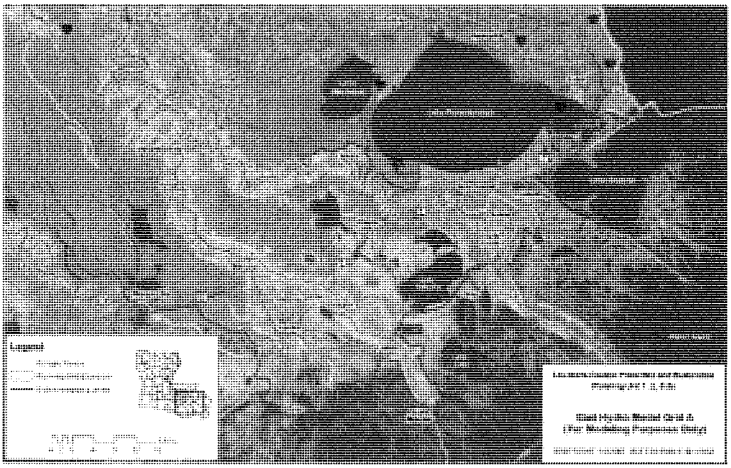


Figure 11.3.4.1-1. LACPR Model Grid A

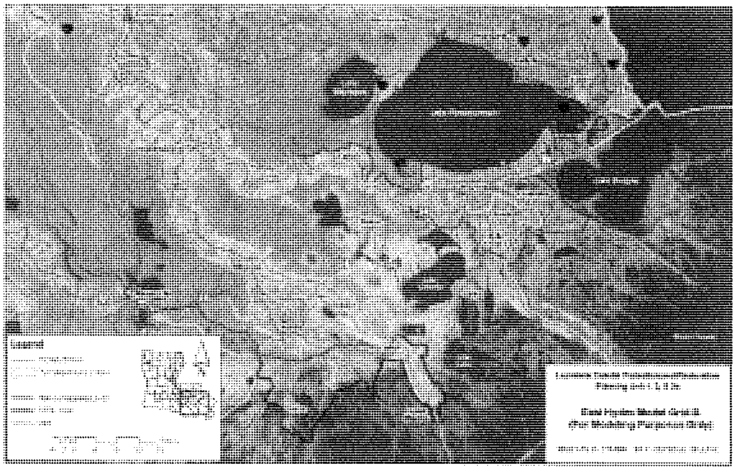


Figure 11.3.4.1-2. LACPR Model Grid B

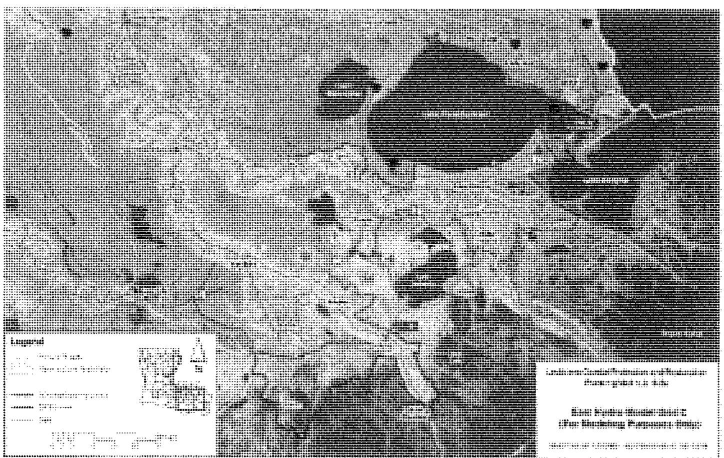


Figure 11.3.4.1-3. LACPR Model Grid C

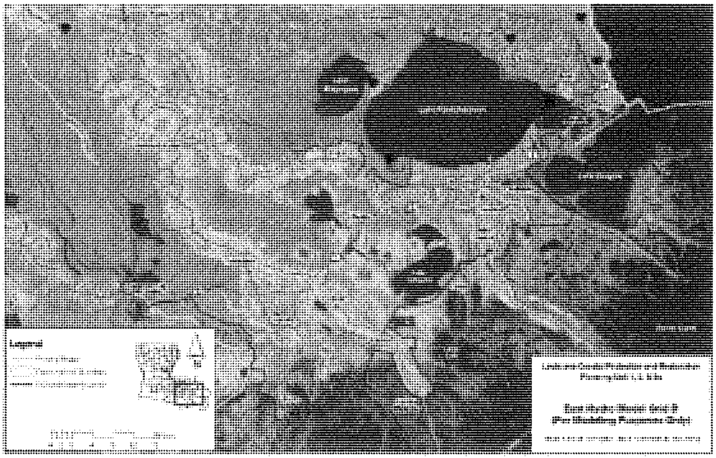


Figure 11.3.4.1-4. LACPR Model Grid D

Note that Grid A was not considered feasible and was eliminated due to the extreme height of the levees required to prevent overflow and the large increases in water levels in Lake Borgne and the Mississippi Sound.

Grid C contained the same non-overtopping levees but the gated control structures proposed for the Chef and Rigolets passes were removed from the grid so that the passes were left open during the hurricane simulation. The plan calling for removal of the control structures was suggested as an environmental plan by the US Fish and Wildlife Service. It was found that the surge responses in and around Lake Pontchartrain for this grid were essentially the same as with the Base 2010 Grid which represents the authorized 100-year hurricane protection system. Therefore the Grid C plan was eliminated as not being effective.

Grid D involved a barrier at a different location compared to the other barrier plans. Results for Grid D were similar to those for Grid A in that there were significant lowering of water levels in Lake Pontchartrain but outside stages were increased due to the Grid D levee alignment having closer proximity to the Mississippi Gulf Coast. Therefore the Grid D plan was eliminated from further consideration. Elimination of the alternatives reflected in Grids A and D were based in part on cross-region influences of these alternatives.

The Grid B, the Lake Pontchartrain surge reduction plan, essentially follows the Grid A alignment and has similar closures at the tidal passes. The connecting levees in grid B were, however, set to a lower elevation so that the levee would function as a weir and the more intense or severe storm surges would overtop this system and enter the Lake Pontchartrain Basin. The Grid B plan also showed substantial reduction in surges in Lake Pontchartrain; however, it caused increases in water levels on the Lake Borgne side of the proposed alignment and the Mississippi Sound. Figures

11.3.4.1-5 through 11.3.4.1-7 show the increase in water levels on the outside of the Grid B Pontchartrain surge barrier structure for the 100, 400 and 1000 year frequency events. It should be noted that due to the limited time for conducting the LACPR work an optimization of the weir height for a proposed surge reduction plan was not done. However, the results suggest that adjustments to the weir height could lead to perhaps a more cost effective plan that maximizes risk reduction and minimizes costs over the entire Louisiana/Mississippi project area. Should a surge reduction plan move to the next phase of planning, then a comprehensive assessment of weir elevations will be performed to evaluate any impacts.

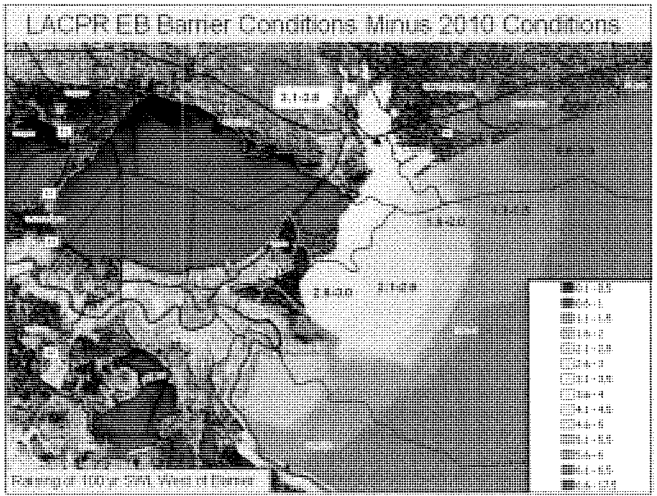


Figure 11.3.4.1-5. Regional-scale changes to 100-yr storm surge levels associated with the Grid B being considered in the LaCPR study

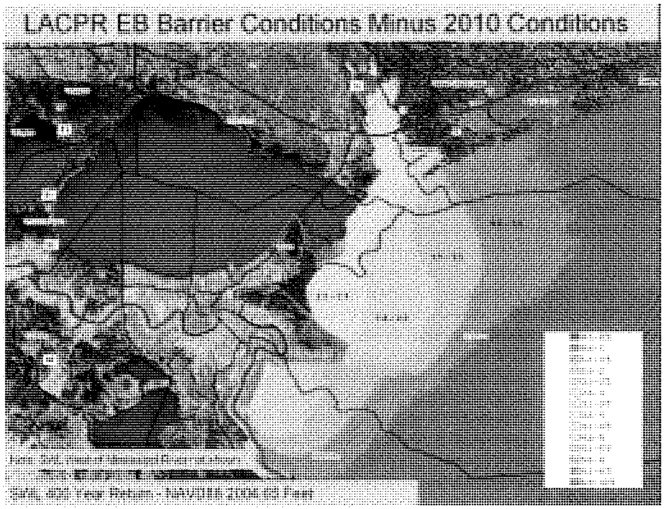


Figure 11.3.4.1-6. Regional-scale changes to 400-yr storm surge levels associated with the Grid B being considered in the LaCPR study.

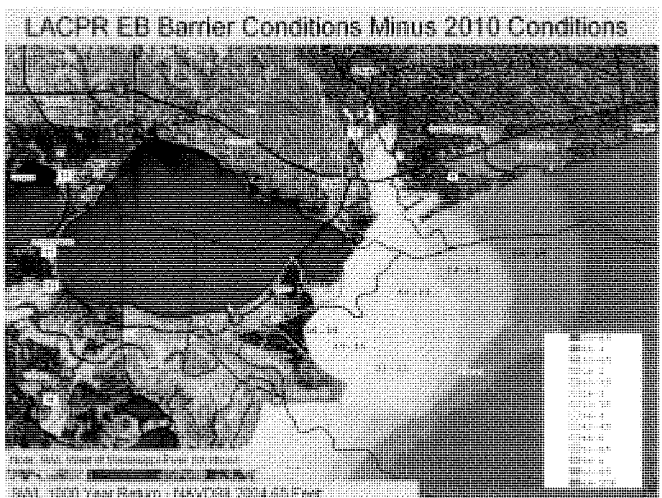


Figure 11.3.4.1-7. Regional-scale changes to 1000-yr storm surge levels associated with the Grid B being considered in the LaCPR study

11.4 Mississippi Barrier Island Restoration

The options being considered for MsCIP include potential projects involving the placement of sand in two of the planning zones, the Offshore Zone which includes the barrier islands of Mississippi, and the Coastal Zone which includes the mainland beaches of Mississippi. The barrier islands are mostly owned by the National Park Service (NPS) and are included in the Gulf Islands National Seashore. The mainland beaches are all man-made and stretch along about 40 miles of Mississippi's coast.

Immediately following Hurricane Katrina, the State of Mississippi proposed restoring the barrier islands back to a pre-Hurricane Camille condition with the concept that this would reduce storm surge on the mainland. Analysis of the land loss among the four islands indicated that from 1917 to 2006 (post-Katrina) over 1600 acres of the islands had been lost. To return the islands back to a 1917 footprint, approximately 66,000,000 cubic yards of sand of a quality similar in color, grain size, and roundness to the sand that currently comprises the barrier islands would be required. The NPS had concerns over the State's proposal because it directly contradicted their policy of letting nature take its course unless it was to restore by mitigating for the activities of man or to protect historical sites within Park boundaries.

Studies by the USGS and ERDC showed a continuing trend in erosion of the islands and that West and East Ship Island would probably be totally lost in the future. Loss of the islands would also be expected to drastically change the ecology of the estuary formed between the islands and the mainland. With all these considerations, the NPS and USACE formulated a plan (referred to as the NPS Plan) for the barrier islands that would help mitigate some of the loss at the islands due to frequent intense storms, relative sea level rise, and anthropogenic activities that may have resulted in a reduction in sand supply and prolong the existence of the islands. This plan includes direct placement of sand to fill a breach in Ship Island, commonly called Camille Cut that has existed since Hurricane Camille, add sand to the littoral zone in two areas, and proposed changes in the disposal practices of littoral zone sediment removed from local navigation channels.

The proposed restoration of barrier islands has regional implications with respect to sediment sources that are required to achieve the restoration and may have impacts on storm surge in Louisiana. Landscape features such as barrier islands have the potential to reduce storm surge elevations. Land elevations greater than the storm surge elevation provide a physical barrier to the surge. Landscape features (e.g., ridges and barrier islands) even when below the surge elevation have the potential to create friction and slow the forward speed of the storm surge. The barrier islands serve as the first line of defense for the Mississippi coast.

The restoration of these islands is a large-scale project and regional influences on storm surge, waves and salinity/water quality should be considered. Any significant lengthening of a barrier island or reductions to the width and cross-section of gaps between barrier islands has potential for altering tidal exchange and the regional salinity and water quality regimes.

11.4.1 Assessment Approach

The impact of barrier island restoration on storm surge at the mainland coast of both Mississippi and Louisiana was assessed with a sensitivity study of various barrier island configurations. Influences on salinity and water quality have not been examined. The sensitivity study is a primarily a qualitative assessment that provides valuable information on trends and relative performance but one should be cautious about making quantitative assessments of surge reduction. The barrier island sensitivity study was conducted on a grid consistent with that applied for the IPET study. It should be noted that the analysis does not consider the morphologic changes to the barrier islands caused by erosion that occur during a storms passage. In these sensitivity tests, the barrier island cross-section was assumed to be invariant, which might be a reasonable assumption for the very high restored barrier island elevation that was considered in the sensitivity tests, but it would not be a good assumption for a low more natural Mississippi barrier island elevation. The analysis also does not consider changes in the structure of the hurricane itself due to landfall infilling phenomenon that may be influenced by landscape features such as barrier islands.

A suite of storms were identified for evaluating storm surge response to changes in barrier island configuration. The suite included two historical storms, Camille and Katrina, because those hurricanes did in fact make landfall on the Mississippi coast in 1969 and 2005, respectively. The storm simulated that would most affect the Louisiana coast was Hurricane Katrina. The barrier island configurations modeled for the historical Katrina were: 1) the existing Post-Katrina degraded condition (elevations ranging from approximately 2 to 6 ft (NAVD88 2004.65)); and 2) a Restored-High barrier island configuration with an extended (pre-Camille) footprint and an elevation of 20 ft NAVD88 2004.65. The Restored-High configuration represents a massive barrier island configuration that would be difficult to achieve; it was modeled for sensitivity purposes. The proposed restoration referred to as the NPS plan above is substantially less than the restoration modeled for sensitivity purposes and thus impacts on regional surges are expected to be much less than those reported below.

11.4.2 Preliminary Results

For the purposes of discussion and comparison, Figure 11.4.2-1 plots the difference in the Post-Katrina and Restored-High peak surge levels for simulations of Hurricane Katrina. There is a reduction in peak storm surge levels of 1.0 to 3.5 ft landward of the barrier islands and an increase in water level of less than 1 ft seaward of the barrier islands. The most significant change in peak storm surge is in the Pascagoula basin where levels are reduced 1 to 3 ft. Note that the impact of the restoration decreases moving east to west and there are smaller changes in the Louisiana area, on the order of tenths of feet. Surge reductions at the Mississippi mainland were approximately 20% in the Pascagoula area, 5 to 10% in the central part of the state, and less than 5% in Waveland. The increase in water level in Louisiana is less than 0.5 ft. The level of restoration recommended in the MsCIP study is much less than the Restored-High configuration and thus the impact on Louisiana is also expected to be less than the results presented in Figure 11.4.2-1. These preliminary results indicate that the restoration of the Mississippi barrier islands, as it is being proposed, is not likely to adversely impact storm surge levels in Louisiana. Once a barrier island restoration level is set, the specifics of the restored barrier island configuration for all islands can be used to modify the regional storm surge and wave model and simulated to more accurately estimate regional impacts. Impacts on waves and salinity should also be evaluated.

11.4.3 Regional Sediment Management Issues

The total quantity of sand required for NPS barrier island plan and mainland beach restoration is considerably less than what would be required for the total restoration of the islands, but still substantial. To fill the breach, the sand would have strict requirements on color, grain size, and roundness. In discussions with the USGS, a potential source of sand was identified at St. Bernard Shoals which is a submerged chain of barrier islands approximately 45 miles south of the Mississippi barrier islands. Both quality and quantity are assumed to be available, but further investigations are required to verify the source. Activity from oil and gas production in the local area must also be considered. Approximately 8,000,000 cubic yards of the high quality sand are needed to fill the breach. An additional 10,000,000 cubic yards of sand is being proposed for placement into the littoral zone east of East Ship Island. This sand would not require the same quality as the direct beach placement, but would still have some physical characteristics that must be considered.

If additional studies are performed on these two measures, another potential source of sand would be investigated that would be much closer to the project site and would allow the beneficial reuse of dredged material. This further study would look at historical disposal areas for the Gulfport navigation channel that crosses through the littoral zone. The sediments that are removed from the channel during routine maintenance dredging have been placed in approved disposal areas that have been used for an extended period of time. While the material placed in these areas was not segregated by grain size, there may be substantial quantities of beach quality material that has potential for use at Ship Island, either for filling Camille Cut, adding to the littoral zone, or both. Reuse of the sediments from the disposal areas would follow Regional Sediment Management practices that promote keeping sediments in the littoral system and/or beneficial use of material that is removed during both new and maintenance dredging.

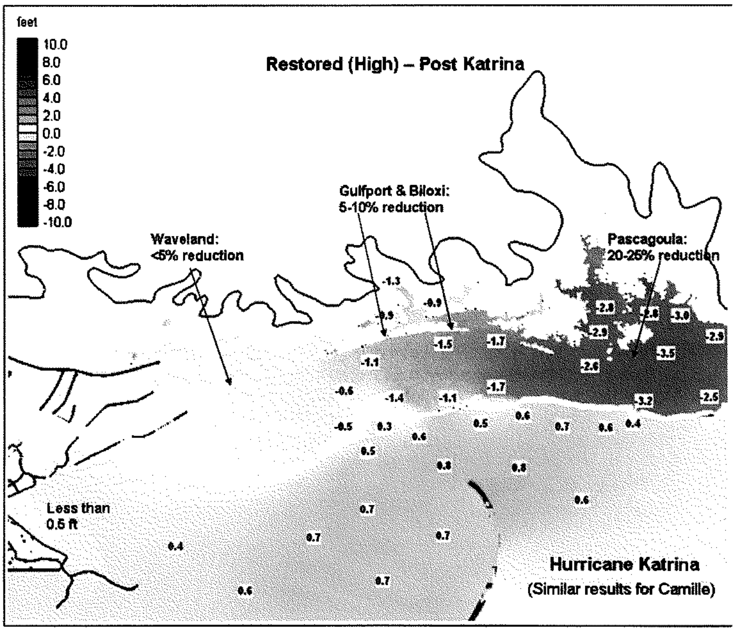


Figure 11.4.2-1. Difference in peak storm surge level (Restored-High – Post Katrina) for Hurricane Katrina

In this same local area, recent sediment transport studies have shown that westward sediment migration has been affected by the southward extension of the Mississippi River delta. This extension has cut off the littoral current and terminated the westward migration of sediments in the pass in the vicinity between Cat and West Ship Island. The fate of these sediments has not been determined, but there may be a large deposit of sand that could be used at Camille Cut or replaced in the littoral system.

Another segment of the Comprehensive Barrier Island Restoration Plan would be to add sand into the littoral zone east of Petit Bois Island. The source of this sand is proposed to be from the inland river system that flows into Mobile Bay provided that the sand is found to be compatible with sediment that exists within the littoral system. Prior to its use, these physical characteristics will be determined by sampling and testing of the inland sand for color, gradation, and particle shape (angularity). To maintain channel depths, sand is dredged from these rivers and placed in numerous upland disposal areas along the river. The lower Tombigbee River has several million cubic yards of sand stored along its banks that could potentially be used for the littoral zone placement based on the compatibility requirements mentioned above. Prior testing, including toxicity studies, has already been conducted on many of the sites. Due to the location of the disposal areas, this sand is being considered for use for the Petit Bois Island littoral zone placement. This source will provide the beneficial use of sand suitable for the littoral placement and at the same time provide additional dredged material storage capacity along the river system.

The placement of sand to fill Camille Cut and the two large littoral zone placements are planned as one-time events to restore some of the islands' land surface that may have been lost to erosion due to man's past activities or from mass erosion during storm events. This decision was based on an agreement with the NPS that allows them to mitigate ay damage from man's activities or to perform necessary means to preserve historic sites. This agreement has a positive aspect to MsCIP with the replacement of sand that has been lost from the littoral system. This sand addition will extend the life of the islands and the closure of Camille Cut will help maintain the boundaries of the estuary. It is understandably difficult to quantify either of these sand loss causes because the barrier islands themselves are dynamic systems that are undergoing constant change. The presence of two deepwater navigation channels that pass through the littoral zone have created artificial boundaries to the westward migration of the islands. The continued maintenance of these channels will require that sand and other sediments be removed, but under the guidelines of the Regional Sediment Management Practices, the sand removed from the channels will be returned to the littoral system.

The continuing study would evaluate future placement of maintenance material dredged from the Pascagoula Harbor Navigation Channel. It has been recommended that sand from the channel be placed down-drift in a newly designated disposal area located in the littoral zone near Sand Island. Much of the sand dredged in the past was placed down-drift, but was formed into a small island commonly called Sand Island. Sand Island has become a prime environmental resource vegetated with dune grasses that provide habitat to many types of shore birds. With no further sand additions, the sand within this island will probably return to the littoral system as wind, waves and currents erode the land mass.

Material removed from the Gulfport Channel has historically been placed in disposal areas south of the littoral zone. In keeping with the guidelines of the Regional Sediment Management Practices, new recommendations have been made to dispose of the material removed from the littoral zone segment of the channel. The channel at the western tip of West Ship Island is a trap for the migrating sand. It has been recommended to place the dredged sand in the littoral zone east of East Ship Island. This practice will allow the sand to nourish Ship Island and slow erosion of the land mass. How to best achieve this will be considered in the continuing study of the islands. Initial ideas include stockpiling the sand in selected areas so the material would be available in the future to relocate it into the littoral zone.

The mainland beaches that are in the Coastal Zone were created in the 1950s to provide protection to the seawalls along beachfront roads. Through time, the beaches have evolved into recreational use and environmental habitat. Some of the beaches have been periodically re-nourished by the local sponsors, primarily the counties. Options that have been studied under MsCIP have included the construction of dunes of various sizes and configurations. The sand for any dune construction will be purchased from any of numerous commercial sources along coastal Mississippi. This sand is typically of good quality and has been used in some of the past nourishments. There is also limited sand reserves available in approved borrow areas just offshore of the mainland beaches. This offshore sand is currently being used for a re-nourishment project in Harrison County.

Many of these same types of issues will be considered for alternatives that involve barrier island restoration in Louisiana. All of the sediment requirements discussed above must be considered in concert with any sand-source requirements that develop from the LaCPR study. Sediment management will be carried our in accordance with Regional Sediment Management practices.

11.5 LaCPR Wetland Restoration Plan

The LaCPR study is considering various restoration alternatives that will provide multiple benefits, particularly ecological benefits. Figure 11.5.1-1 shows an outline of the marsh restoration features being considered for eastern Louisiana. These features have the potential to reduce storm surge and wave action, and the regional implications of these projects will be considered. Landscape features such as wetlands also have the potential to create frictional resistance and affect storm surge even when vegetation is inundated by the storm surge.

11.5.1 Assessment Approach

The impact of wetland restoration on storm surge at the mainland coast of both Louisiana and Mississippi was assessed with a sensitivity study. The sensitivity study was primarily a qualitative assessment that provides valuable information on trends and relative performance but one should be cautious about making quantitative assessments of surge reduction. It should be noted that the analysis does not consider the morphologic and vegetation cover changes to the wetlands caused by erosion and/or damage to vegetation that occurs during a storm's passage. The analysis also does not consider changes in the structure of the hurricane itself due to landfall infilling phenomenon that may be influenced by landscape features such as wetlands.

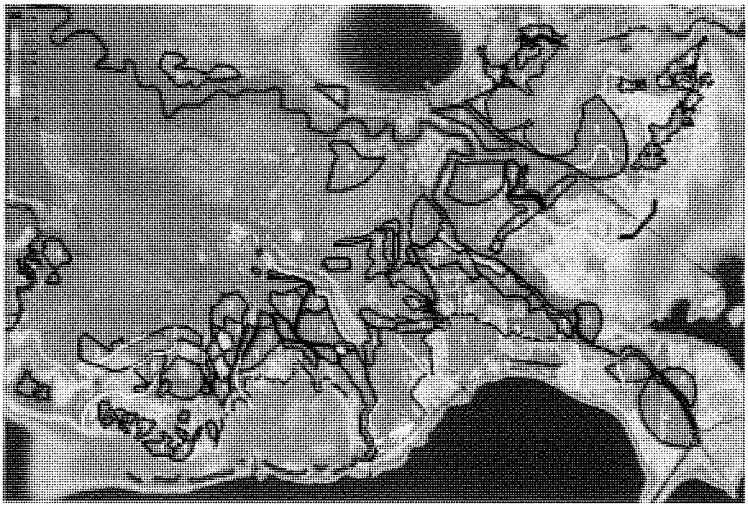


Figure 11.5.1-1. Outline of marsh restoration features. Marsh types are outlined as follows: 1 = saline, 2 = intermediate, 3 = brackish, 4 = fresh, 5 = cypress, white lines = ridges, purple = shrub/scrub for barrier islands. Colors indicate topographic/bathymetric elevation.

The restoration features outlined in Figure 11.5.1-1 were represented in the regional storm surge and wave model through modifications to the bathymetry, Manning's n values, and directional roughness lengths. A suite of 24 hypothetical storms was simulated on the restored condition and maximum water elevations were compared to maximum water elevations for the base condition.

11.5.2 Preliminary Results

Figure 11.5.2-1 presents the difference in maximum water level between the restored marsh configuration and the base case for the suite of 24 storms simulated for the immediate metropolitan New Orleans area. Note that the scale uses the color white to denote areas where changes in peak surge level are between + 1 ft and -1 ft. The wetland restoration has less than 0.5 ft impact on surge levels in both Louisiana and Mississippi. Based on these preliminary results, wetland restoration activities in Louisiana are not expected to adversely affect storm surges in the Mississippi area.

In a general sense, the influence of wetland restoration activities on storm surge and waves will be local in nature and relatively small for the types and spatial-scale of wetland restoration that are being considered and proposed in both the LaCPR and MsCIP studies. Impacts on waves may be greater than impacts on storm surge, but they are expected to be more local and are not expected to have significant regional influences outside the local area. For example, the wetland restoration proposed in the MsCIP study is local, and will not have significant storm surge or wave influences in Louisiana.

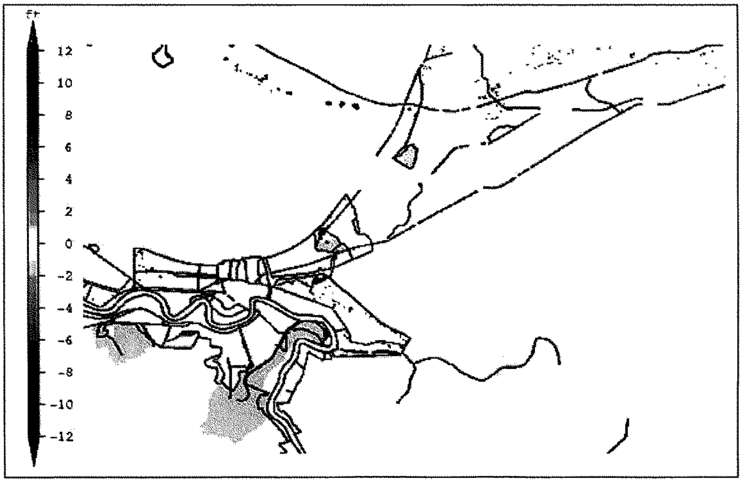


Figure 11.5.2-1. Difference in maximum surge level (ft) between the restored marsh configuration and the base case for the restored marsh storm suite

11.6 Mississippi River Diversions

The regional salinity and water quality model, WQM, has been applied to three alternative locations: (1) diversion of freshwater flow from the Mississippi River at Violet Marsh, (2) diversion of all of the Escatawpa River flow into Grand Bay, and (3) diversion of freshwater flow from the Mississippi River at Bonnet Carre' spillway. The purpose of these screening-level simulations was to examine whether or not freshwater diversions at these locations could produce reductions in salinity of a magnitude that are needed to achieve some of the objectives outlined previously for diversions.

11.6.1 Assessment Approach

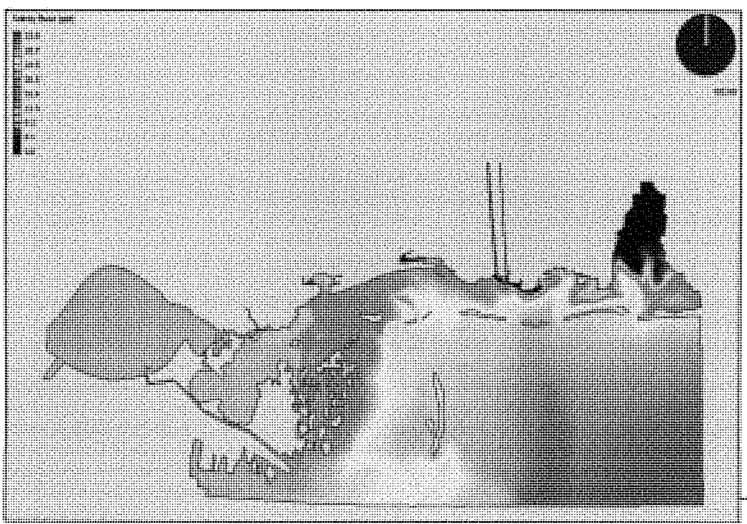
A small range of potential diversion scenarios have been run and are reported in the appendices in the MsCIP report (Dortch et al. 2007). A limited number of operational schedules were considered. For example, the discharge from the Bonnet Carre' diversion was varied by month. The Violet Marsh scenario was a diversion with a constant flow of about 210 cu m/s (7500 cubic feet per second, cfs). The Escatawpa diversion scenario was the flow that occurred in the entire Escatawpa River during 1998. The hydrodynamic model was run with the same conditions as used for the base conditions used in the WQM calibrations for 1998 except that the additional freshwater flows were introduced. The WQM was applied for the period April through September 1998 using the same inputs as the final calibration run except for different hydrodynamic input and different boundary conditions for the diverted flow and associated concentrations of the flow.

11.6.2 Preliminary Results

As an example, the results from a simulated diversion of 7,500 cfs of Mississippi River water near Violet, Louisiana, are presented in Figure 11.6.2-1. The top panel of Figure 11.6.2-1 presents salinity results after 180 days for the baseline condition without a diversion; the bottom panel shows results after 180 days for the simulated Violet diversion. The results suggest that 180 days after initiation of the diversion, salinities were lowered in western Mississippi Sound sufficiently to warrant additional examination. However, at present, absolute salinity values predicted by the regional salinity/water quality model need to be improved to match calibration data. Further refinement of the model should correct this limitation and must be made to improve its potential to quantify the potential beneficial or deleterious effects on oysters and other coastal resources.

Preliminary efforts were made to relate the WQM model results to ecological communities by utilizing oysters as a "target species." Oysters not only support a commercial fishery but interact directly with local hydrodynamic conditions, affecting currents, flow conditions, and sedimentation patterns (Lenihan 1999). They filter large amounts of phytoplankton and detritus exerting a powerful influence on water quality, phytoplankton productivity, and nutrient cycling of estuaries (Dame 1996). Oyster reefs provide habitat for a wide range of other invertebrates present either on the oyster shell itself or in the interstices between shells. Oyster reefs also support numerous resident, transient, and juvenile fish and decapod species and may provide a refuge from predation and poor water quality conditions.

Oysters are sensitive to specific ranges of salinity; therefore, freshwater diversions have the potential to either enhance or threaten the resource. For instance, where the average salinity exceeds 15 ppt oysters often experience increased predation rates by oyster drills whereas young oysters are more susceptible to certain diseases at salinities greater than 9 ppt (Cake 1983; Chatry et al. 1983). Similarly, salinities averaging below 7.5 ppt can inhibit oyster growth and sexual maturation while salinities that persist for extended periods of time below 2 ppt can result in direct mortality (Sellers and Stanley 1984, 1986). The relationship between oyster productivity and river flow is a complex one and there does not appear to be a close link between oyster harvests and freshwater inflow (Turner 2006).



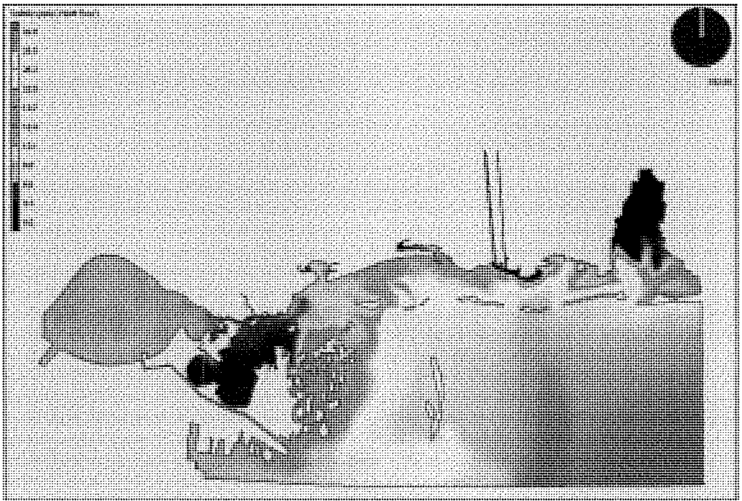


Figure 11.6.2-1. Baseline (upper panel) and projected with-diversion (lower panel) salinity values in parts per thousand (ppt) after 180 days. The royal blue color represents freshwater, while the red indicates sea water with salinity concentrations greater than 30 ppt.

To further refine the ecological concerns, during the summer and fall of 2007, MsCIP and ERDC convened a panel of representatives from the Nature Conservancy, Mississippi Department of Marine Resources, and the University of Southern Mississippi at the Gulf Coast Research Laboratory. The aim of the panel was to suggest simplistic ecological models that can be informed by results from the regional salinity/water quality model to identify diversion actions which might result in an improvement in oyster habitat quality. The panel identified several key attributes that need to be incorporated into the evaluation of freshwater diversion options. The first is that salinity averages should be as close as possible to the optimal range for oyster health and productivity. This is clearly of critical importance since the primary purpose for contemplating freshwater diversions is to improve habitat conditions for oysters. Second, a diversion should not result in extended periods of low salinity resulting in mortality or poor growth and reproduction. This consideration is particularly critical during times of high river flow or other extreme conditions. Third, a diversion should not unduly influence habitat conditions for other critical resources. Diversions that result in favorable conditions for oyster health may not be conductive to other equally important resources. For instance, most seagrasses do poorly at salinities less than 20 ppt. A diversion that results in excellent conditions over the prime commercial oyster beds but drives salinities below 20 ppt in the seagrass elsewhere would not be acceptable. Other important habitat requirements that should also be considered for seagrass health include light availability and nutrient concentrations.

During the autumn of 2007, several meetings with representatives from the States of Mississippi and Louisiana, non-governmental organizations such as the Lake Pontchartrain Foundation and the Environmental Defense Fund, various federal agencies, including US Fish and Wildlife Service, and representatives from both Mobile and New Orleans Districts have been held to discuss options, centering on details associated with a Violet Diversion. Additional work will be required to refine the

WQM regional model and apply it to examine the regional influences of proposed freshwater diversion projects on salinity, water quality and habitat.

11.7 PATH AHEAD

11.7.1 Continued LACPR-MSCIP Northern Gulf of Mexico Planning and Analysis

During the next steps in plan development in the LaCPR and MsCIP investigations beyond December 2007, the joint study teams will collaborate at a Northern Gulf of Mexico integrated systems scale. The purpose of this effort will be to identify common stakeholder agreement on the configuration, performance, and cost of alternatives with a goal of achieving no adverse impacts, levels of risk reduction, and coastal restoration in those plans. The LaCPR and MsCIP teams will hold joint meetings with stakeholders of the coastal areas in Louisiana and Mississippi during the winter-spring 2008 timeframe to accomplish this task, as follows:

- Explain the process on how the range of alternatives were initially developed in both projects for coastal restoration and risk reduction, as described in the December 2007 Technical Reports for LaCPR and MsCIP,
- Present the individual elements and integrated system configurations of the array of developed alternatives that were evaluated through these investigations,
- Describe the performance, costs, and unintended adverse consequences found through modeling simulations of these alternatives,
- Solicit the viewpoints of stakeholders for both studies in joint meeting sessions to identify consensus and differences of opinion on the makeup, performance, and costs of these alternatives,
- Interact with the stakeholders of both studies for screening, refinement, and/or re-formulation of alternatives from a Northern Gulf of Mexico integrated systems scale perspective,
- Conduct iterations of planning and analysis for identifying common agreement on the configuration, performance, and cost of alternatives for attaining no adverse impacts, risk reduction, and coastal restoration, and
- Describe requirements for further alternative plan development and analysis.

11.7.2 Regional Assessment Using Surge and Wave Modeling

In its current state, the regional storm surge and wave model is ready for use in examining regional influences and interactions that are created by MsCIP projects which are slated for construction in the near-term, and proposed LaCPR measures that remain in the final array of alternatives after the screening process. The alternatives proposed for construction in the MsCIP study and the most likely LaCPR alternatives will be evaluated using the regional storm surge and wave model to address regional influences of the proposed projects. Alternatives will be evaluated by the teams' storm surge and wave experts for the potential to produce significant regional influences. That evaluation will be reviewed and concurred upon by the external peer reviewers for both projects and those alternatives will be assessed based upon regional storm surge and wave influences. All proposed projects/alternatives will be integrated into the regional storm surge and wave model and compared to results for the 2010 baseline case. By comparing the results to those obtained for the baseline case, the MsCIP and LaCPR study teams can evaluate the regional influence of the proposed alternative(s).

Together, the MsCIP and LaCPR study teams, along with key stakeholder representatives, will evaluate the issue of regional storm surge and wave influences and assess whether or not there is a significant regional influence, and if so jointly decide whether any additional risk is acceptable, whether the project(s) must be modified to lessen the increased risk, or whether the project(s) need to be reformulated.

11.7.3 Regional Impact of the Lake Pontchartrain Surge Barrier

Analysis of storm surge barriers across Lake Pontchartrain indicates that a barrier can lead to significant undesirable increases in storm surge levels along the coast of Mississippi areas of southeast Louisiana. The increased surge levels are of great concern in light of the fact that coastal flood protection levees, revetments, or seawalls are not being pursued for construction in western coastal Mississippi. Therefore, any regional increase in storm surge levels induced by a Lake Pontchartrain barrier place the population at greater risk in an area that is already at relatively high risk of hurricane-induced flooding compared to other regions of the Gulf.

Lake Pontchartrain barriers provide considerable surge reduction benefits to certain communities around Lake Pontchartrain. The design of a storm surge barrier has not been optimized. Additional studies will be undertaken to assess the benefits of a lower surge barrier, which would likely also reduce adverse regional influences of the barrier. The regional influence issue will be addressed in the same manner as outlined above. Any barrier plan which induces adverse impacts must be eliminated from further consideration or its impacts satisfactorily mitigated on a regional basis.

11.7.4 Regional Assessment Using Salinity/Water Quality Modeling

All alternatives that involve barrier island restoration (specifically, those involving significant changes to island footprint or length), large-scale wetland restoration, storm surge barriers, or large-scale levee/floodwall systems will be evaluated for regional influences on salinity, water quality and habitat. The hydrodynamic, water quality, and habitat experts from the MsCIP and LaCPR study teams, plus outside peer reviewers for both projects, will make the assessment of which alternatives should be considered and integrated into the regional WQM model for this assessment. As was the case for the regional storm surge and wave model, the WQM model will be applied to examine regional influences of the alternatives (which fall into the categories outlined above) proposed for construction in the MsCIP study and the most preferable alternatives that surface in the LaCPR study.

The MsCIP study also is recommending construction of a freshwater diversion at Violet, Louisiana. Results achieved to date show that diversion at Violet has potential to achieve the salinity reduction that is sought for the Lake Borgne and Biloxi Marsh region in order to meet some of the objectives for diversions. It is expected that a freshwater diversion into this region will also be among the alternatives that surface in the LaCPR study. The issue of freshwater diversion into this region will be examined further, maintaining a regional perspective and building upon the work done to date to examine the relative benefits of freshwater diversions at Violet and the Escatawpa River, and Bonne Carre' as another possible diversion. A diversion at Violet was included in the 2007 Water Resources Development Act. In addition, a diversion at Caernarvon, Louisiana also will be examined in this same regional context.

It is proposed that a bi-state group be formed to assess freshwater diversions into this particular region, with support from the Mobile and New Orleans Districts and the Mississippi Valley and South Atlantic Divisions. One of the first activities of this group will be to fully articulate the goals of the potential diversions and to reconcile conflicts between these goals. Subsequent to this, potential, realistic, operational plans will be developed so that they can be evaluated using the regional WQM modeling framework.

Refinements of the WQM model are required and they will be initiated immediately. The existing model will be expanded to the south and refined with additional resolution to include possible diversions at Caernarvon, and be readied for use in making event, seasonal and long-term simulations. Salinity changes at a number of time scales are of interest. The WQM model will be validated through comparisons to existing measured salinity and water quality data in Lake Pontchartrain, Lake Borgne, Biloxi Marsh, and the vicinity of Caernarvon in order to increase confidence in model predictions and to be able to withstand the close technical scrutiny of the modeling that is done to inform decision-making regarding this highly sensitive issue.

These model improvements will allow for more accurately relating the water quality results to ecological concepts and interpretation, and enable questions and issues that have been raised regarding diversions (pros and cons) to be more thoroughly and accurately addressed. The WQM model should be linked to ecological tools to be able to test the impacts of precise operational discharge plans and seasonal influences on key ecological resources. Our current collaboration with Louisiana State University on the ecological integration will be continued and expanded to more fully include representation from Mississippi.

Once recommended diversions and operational plans for those diversions are defined, they will be integrated into the regional WQM model, along with all the other features that are proposed for construction in the MsCIP study and proposed in the LaCPR study which have possible regional influences on salinity water quality and habitat. The modified regional model will be applied and results will be compared to the 2010 baseline condition. Differences will be examined to assess the regional performance of alternatives and to assess regional influences from salinity, water quality and habitat perspectives.

If alternatives emerge in LaCPR for regions west of the Mississippi River that have the potential for regional salinity, water quality and habitat influences, work will commence to expand coverage of the WQM to cover the areas where influences are of concern. This will be a significant effort.

11.7.5 Recommendations for Research to Benefit Regional Modeling

Both the regional storm/surge and WQM models and inferences made using the results from the WQM model to infer ecological response, have a number of areas of technical uncertainty in the model formulation and knowledge base for making interpretation and analysis. This uncertainty can only be reduced through research and development that is focused on improving model capability in the areas having the greatest uncertainty. The LCA Science and Technology program will focus on these areas of technical deficiency via collaborative research conducted by USACE, State of Louisiana, other federal agencies and the academic community.

The greatest uncertainty lies in inferences made regarding ecological response to changes in hydrodynamics, sediment loading, salinity, and water quality and how they contribute to the general process of marsh creation and ecological health. This will be one area of focused research and development. Wetland and barrier island restoration will have to be undertaken accepting the fact that adaptive management will be required. Not everything will respond as originally envisioned and planned. The system is extremely fragile and complex and knowledge and data volume/quality are poor in a number of technical areas. There are ongoing difficult-to-predict-and-quantify long-term processes like subsidence and sea level rise that complicate matters and render accurate long-term predictions to be highly uncertain and suspect. Changes to wetland restoration practices will be required, and constantly improving regional models can help better inform the adaptive management process and more accurately assess regional influences. The goal for the research and development should be reductions in the uncertainties inherit in forecasts and predictions of ecological response.

A second area for focused research will be the area of beneficial use of wetlands for storm surge and wave reduction. Considerable scientific knowledge gaps, and lack of data volume/quantity, exist in this area. Reliable use of wetlands for surge and wave reduction benefits will require increased understanding of the friction resistance and energy dissipation characteristics provided by a wide range of vegetation species, changes of resistance and energy dissipation with increasing degree of inundation, and response of the vegetation and surrounding wetlands to the destructive forces of wind and energetic waves at varying levels of inundation. The goal for the research and development should be reductions in the uncertainties inherit in forecasts and predictions of wetland influence on storm surge and waves.

11.8 References

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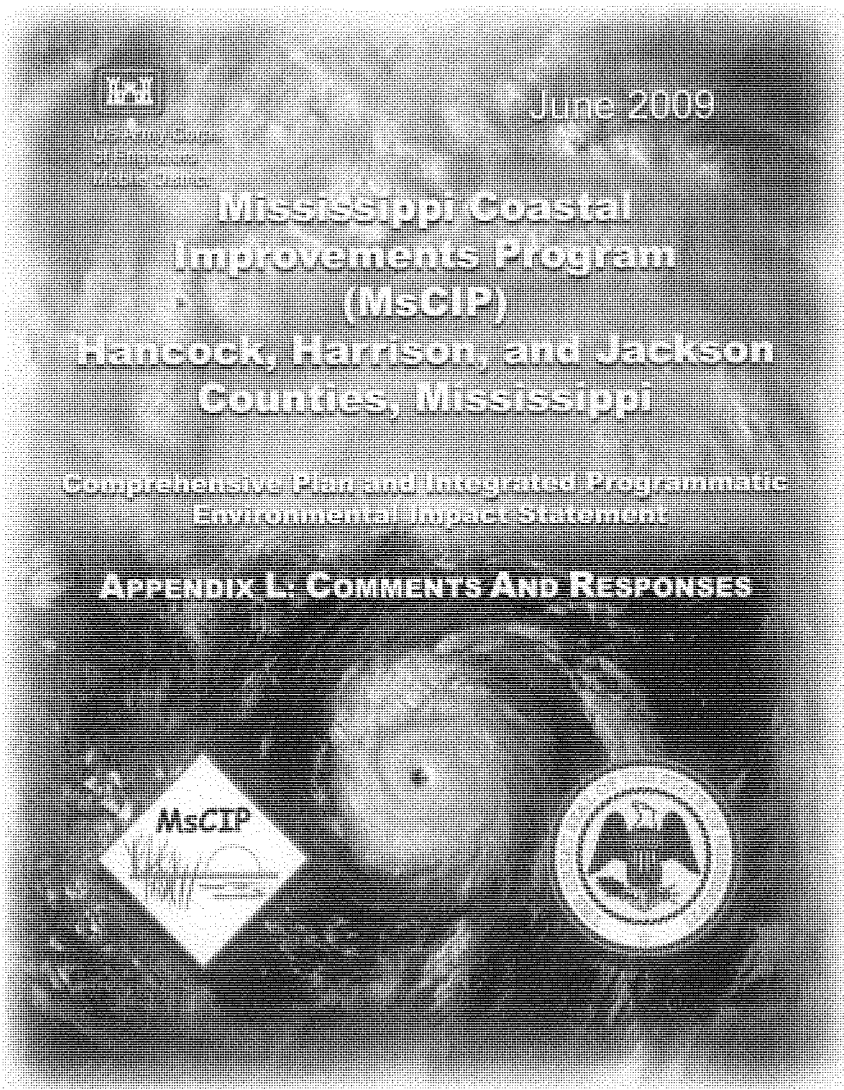
June 2009
Mississippi Coastal Improvements Program (MsCIP)
Hancock, Harrison, and Jackson Counties, Mississippi
Comprehensive Plan and Integrated Programmatic Environmental Impact Statement
APPENDIX L: COMMENTS AND RESPONSES
MsCIP

Choctaw Nation

From: Ian Andrew Thompson [iatc97@unm.edu]
Sent: Friday, March 27, 2009 9:59 AM
To: Rees, Susan I SAM
Cc: vrobison@choctawnation.com; iatc97@unm.edu
Subject: Draft EIS Comments

Dr. Rees,

I am writing you in response to a request that was made of the Choctaw Nation of Oklahoma to comment upon the US Army Corps of Engineers Mobile District's Integrated Programmatic EIS for the Mississippi Coastal Improvement Program.

In terms of cultural resources / TCPs, the plan as outlined in the Comprehensive Report is acceptible to the Choctaw Nation of Oklahoma. As described in the Report, we will be willing to consult on a project-by-project basis rather than through a PA. As a general protocol, we do ask that an archaeological site file search and survey be conducted for ground-disturbing projects that will occur in previously unsurveyed areas that have a high archaeological potential. We ask that we are notified of the survey results before ground breaking begins. We also ask that we be included in any MOUs involving cultural resources that may be created for specific projects. If a project, whether directed by an MOU or not, uncovers archaeological materials, we also ask that we be contacted immediately to begin consultation.

Thank you for your time and correspondance. Please let us know if there is anything further we can do to assist you at this point. We are looking forward to working with you.

Sincerely,

Ian Thompson PhD, RPA
Tribal Archaeologist
Choctaw Nation of Oklahoma

Response to Choctaw Nation of Oklahoma, Email dated March 27, 2009

Comment Response: Thank you for your input and your comment was noted.

Rees, Susan I SAM

From: Bryant J. Celestine [celestine.bryant@actribe.org]
Sent: Thursday, March 05, 2009 10:38 AM
To: Rees, Susan I SAM
Cc: 'Carlos Bullock'
Subject: Mississippi Coastal Improvements Plan

Dear Ms. Rees:

On behalf of Chief Oscola Clayton Sylestine and the Alabama-Coushatta Tribe of Texas, our appreciation is expressed on the U.S. Army Corps of Engineers (USACE), Mobile District's efforts to consult us regarding the Mississippi Coastal Improvements Plan. As a federally recognized Tribe, we maintain ancestral associations throughout southeastern United States despite the absence of written documentation to completely identify Tribal activities, villages, trails, or burial sites.

In reference to the February 24, 2009 message by Joseph A. Giliberti, the three coastal counties of Mississippi contain migratory routes and temporary habitation sites utilized by ancestral members of the Alabama and Coushatta Tribes. Therefore, we would appreciate the opportunity to assist your agency in this endeavor as we seek to protect religious, cultural, and historical assets of our Tribe.

For consultation purposes, our current leadership comprises of Chief Oscola Clayton Sylestine and Tribal Council Chairman Carlos Bullock. Official correspondence may be direct to either leader at the address below with consultation coordinated through my office.

Feel free to contact us should you require additional assistance regarding this matter. Again, we welcome the opportunity to collaborate with the USACE, Mobile District and look forward to a successful partnership.

Respectfully submitted,

Bryant J. Celestine

Historic Preservation Officer

Alabama-Coushatta Tribe of Texas

571 State Park Rd 56

Livingston, Texas 77351

936 - 563 - 1181

Celestine.bryant@actribe.org

Cc Carlos Bullock, Tribal Council Chairman

Response to the Alabama-Coushatta Tribe of Texas, Email Dated March 5, 2009

Comment Response: Thank you for your comment and the comment was noted.

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

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April 28, 2009

Dr. Susan I. Rees
Army Engineer District, Mobile
P.O. Box 2288
Mobile, AL 36628-0001

Subject: Draft Environmental Impact Statement for the Mississippi Coastal Improvements Program, Hancock, Harrison, and Jackson Counties, MS

Dear Dr. Rees:

As requested, the U.S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Mississippi Coastal Improvements Program (MsCIP). The following comments include the review and comments made by the U.S. Geological Survey, the National Park Service, and the U.S. Fish and Wildlife Service.

U.S. Geological Survey

Structural and Non-Structural Measures and Alternatives

The following should be considered in the development and implementation of structural and non-structural measures and alternatives.

- Direct and indirect environmental impacts due to hurricane protection measures should be clearly documented to avoid possible conflicts and unintended consequences (e.g., Summary, p 2, lines 45; Section 1, p 8, line 9; p15 line 38).
- Flood risks and levels of protection should be evaluated at regular intervals (adaptive management) and protection measures modified as needed to maintain adequate flood protection (Section 5.20, p 32). 1
- Structural measures should be designed to have the smallest physical footprint possible to minimize impacts to hydrologic pathways and allow for natural cyclic exchange of water, sediment, nutrients and biota (e.g., Section 2.2.4, p 8).

- Borrow material for levee construction should be from sources external to the coastal wetland system to the extent practical (Section 4, p 52, line 40; Section 6, p 1, line 22).
- Opportunities for natural processes to distribute sediments through flood protection structures should be provided (Section 4, p 40, line 28).
- Non-structural alternatives should be adopted to the extent practical

Adaptive Management

The DEIS recognizes the value of an adaptive management approach and acknowledges that monitoring is an essential part of this approach. The DEIS outlines a 5-year monitoring plan; however, long term monitoring over the lifespan of a project will be necessary to evaluate the effectiveness and impacts associated with management actions addressed by the DEIS. Consideration could be given to developing a system-scale long-term monitoring program in collaboration between the States of Mississippi and Louisiana.

Consideration also should be given to improving the availability and accuracy of baseline data from which change can be measured when applying adaptive management. Without the acquisition of baseline data, change cannot be quantified and subsequent monitoring may provide an incomplete or inaccurate picture of success or failure of restoration activities on the ecosystem. Examples of suggested baseline data acquisition include:

- Barrier Islands – Post-Katrina and Rita (perhaps post-Gustav and Ike) baseline data, including bathymetry and shoreline change, are needed prior to final project planning. Available bathymetric data are inadequate. For example, sediment transport modeling and comparisons of historic to present day bathymetry prior to sand placement are needed to support estimates of sand movement. Present day bathymetry being conducted by James Flocks, USGS St. Petersburg, will confirm whether these sediment transport estimates are accurate.
- Elevation data – Available elevation data should be updated to improve the accuracy of predictive models. For example, modeling conducted for the New Orleans area was based on the 1929 datum and should be updated to the North American Vertical Datum of 1988 (NVD88). In Mississippi, bathymetry, baseline seafloor characterization, and sub-bottom assessment (post-Katrina) data for the barrier islands, Mississippi Sound, and the mainland coast are needed to support sediment transport and storm surge modeling, storm surge warning systems, storm-impact assessment of island and mainland coastlines and submerged features, quantification of sediment resources, identification of areas of potential instability (e.g. breach hotspots), and identification of areas favorable for efficient littoral renourishment. Renourishment options will affect sturgeon and turtle habitat. 2
- Salinity data – Baseline salinity data may be available; however, the availability of salinity data should be discussed in the DEIS. For example, salinity data can be used to evaluate the potential consequences of fresh water inputs delivered either through Lake Pontchartrain or Lake Borgne to Mississippi Sound before proposed diversions are implemented. Salinity data also can be used to evaluate the potential for saltwater intrusion into ground-water resources.

Climate Variability: Potential Effects of Sea-Level Rise

Sea-level rise is one of several primary factors contributing to the widespread coastal erosion and land loss occurring around the U.S. and the world. Theory and predictions suggest that with increased climate variability, sea level will continue to rise and is likely to greatly accelerate due to ocean warming and expansion and melting of ice sheets and glaciers (J. L. Gonzalez and T. E. Tornqvist, Eos, Vol. 87, No. 45, November 7, 2006, pp 493-508). Such increases in sea level will increase storm-surge flooding, coastal erosion, wetland loss, salt-water intrusion into fresh-water aquifers, and property damage; however, details on the effects and risks to natural landforms and human development in coastal regions has been lacking. 3

Relative sea level rise, a combination of sea-level rise and subsidence, is a concern in the MsCIP program and plans. Consequences of relative sea level rise, especially shoreline change, will affect surge predictions. Therefore, future erosion effects of sea-level rise and altered hydrodynamics will have to be considered for surge predictions to be useful. Otherwise storm surge models will be inaccurate and misleading. The latest scientific knowledge should be incorporated into the DEIS.

National Park Service

SEIS Required before Project Implementation

As established within the DEIS, additional environmental analyses and evaluations must be addressed within a supplemental EIS (SEIS) and associated Record of Decision pertinent specifically to the barrier islands restoration component of the MsCIP. The National Park Service (NPS) requests status as an official cooperating agency with the USACE in developing the SEIS, 4
which will provide a more detailed evaluation of viable barrier island restoration alternatives, tiered from the DEIS. The additional environmental analysis and evaluation pertaining to the barrier islands of Gulf Islands National Seashore (GUIS) will need to conform to NPS Director's Order 12, Conservation Planning, Environmental Impact Analysis and Decision Making.

Restoration of the Sediment Transport and Budget System

NPS endorsement of the MsCIP, and specifically the barrier islands restoration component, is predicated upon the opportunity to restore the sediment transport and budget system, as articulated in Section 1.7.3.3 of the DEIS. The Mississippi barrier islands have experienced substantial changes in shoreline position and island area since the mid-1800s. Lateral island migration (erosion along the eastern end of the islands and deposition to the west) has occurred, driven by dominant east-to-west long shore sediment transport. The long-term and accelerating erosion and land loss experienced by the barrier islands is of major concern to the NPS. 5

Although some erosion is due to storms and relative sea level rise, anthropogenic activities, including dredging of navigation channels throughout the coastal system have also been a major contributing factor. The result has been a progressive reduction in sand supply to the barrier island sediment budget and increased island land loss, ranging from 24% to 64% of upland island volume since the 1840s. The regional shortage of littoral sand for barrier island maintenance is most profound at Ship Island, at the terminus of the sediment transport system along the islands (Rosati et al., 2007). Consequently, Ship Island's vulnerability to breaching has progressively increased with time. Because of the island's diminished state, it may now have lost the ability to restore and maintain itself as in the historical past (Morton, 2007), placing the island's cultural resources (structural and archeological sites) at greater risk. Thus, given the altered state of natural resource processes due in part to human-caused intervention, as well as the resulting threats to cultural resources, the NPS in collaboration with other agencies has concluded that restoring the sediment transport processes of the Mississippi barrier islands to conditions similar to pre-human intervention offers the best opportunity to restore the inherent resiliency of these islands.

More specifically, as tiered to in NPS Management Policies, 2006, Section 4.8.1.1 pertaining to shorelines and barrier islands, the overarching NPS management objective applicable to the barrier islands restoration component of the MsCIP is to restore the sediment transport and budget system, including littoral processes to as natural state as possible given channel dredging, frequent intense storms, climate change (sea level rise) and other anthropogenic influences.

Monitoring and Adaptive Management - Barrier Island Ecosystem Restoration

Successful restoration of the littoral sediment flow system for the Mississippi barrier islands will require adaptive management through the life of the project. Timely, targeted monitoring of a range of biologic and geologic conditions will be needed to provide sufficient data for informed adaptive management decisions. If possible within project time constraints, baseline data should be collected about pre-project conditions including barrier island footprint and topography, bathymetry around barrier islands, sediment flux and currents through Camille Cut and within the littoral system, salinity of Mississippi Sound, and biodiversity of benthic habitat around barrier islands and within Mississippi Sound. As the project progresses, this data should be monitored at appropriate intervals and locations, and analyzed to assess project effectiveness. 6

Monitoring by USACE scientists and engineers and by NPS resource managers will be an important component of data collection for project assessment. However, involvement by scientists from the U.S. Geological Survey and universities will be necessary to ensure that a full complement of monitoring and assessment capacity is available to the project to ensure that the science used for project management decisions is objective and will be perceived as such by the public, the State of Mississippi, and the Congress.

The need for pre-project data, monitoring during the project to support adaptive management (to be assessed by an interagency adaptive management team), and post-project assessment is addressed in section 5-20 on p. 5-32 of the main report and Appendix H, sections 6.5.1 & 7.5, and Tables 8.1 & 8.3, in which total funding of $4.95 million is proposed. However, these sections should be enhanced to emphasize that targeted, objective, scientific information will be crucial to project effectiveness. 7

NPS requests continued involvement as a cooperating agency if the barrier islands restoration component of the MsCIP is approved and funded by Congress. To ensure and document the success of barrier island restoration, and to provide critical information for adaptive management 8 during the project, the NPS requests that the project budget include sufficient funding for : 1) quality assurance and quality control of sand replenishment adjacent to the MS barrier islands; 2) monitoring of a range of mutually agreed biologic and geologic conditions, as well as regular and recurring synopses of data necessary to make informed adaptive management decisions; 3) development and evaluation of criteria to determine the short- and long-term success of the restoration project(s); and, 4) formation of an interagency scientific team to make timely assessments of monitoring data and recommend adaptive management actions to senior management. To ensure that the project has access to objective scientific data of the highest quality, the NPS recommends that in addition to scientists from the NPS and the USACE, scientists from the U.S. Geological Survey and, if appropriate, from universities be involved in the monitoring process and included on the interagency scientific team.

Cat Island

While not officially included under the auspices of the MsCIP, Cat Island has also experienced land loss due to a depleted sand supply. Because a portion of Cat Island is included within the boundaries of GUIS, NPS endorses continued study of the Cat Island littoral system as alluded to within the report to assess potential actions to address the sand supply issue 9

Presentation of Barrier Island Restoration Information throughout Document

It is often difficult to distinguish which alternative for barrier island restoration is referred to by text within the document. For example, is the use of river sand still being considered? If not, does an analysis still need to be included in the EIS? Is submerged aquatic vegetation restoration still being considered (option F), or has it been eliminated with the tentative selection of Barrier Island Plan H? Is revegetation beyond planting of sea oats to stabilize direct placement within Camille Cut still an option? To make the document clearer for readers, particularly those not familiar with National Environmental Policy Act (NEPA) documents, the text should clarify where possible which components refer to Plan H and which to other alternatives. 10

Environmental Impacts Resulting from Sand Removed at St. Bernard Shoals

The NPS recommends inclusion of more detailed analysis in this document, or in a Supplemental EIS, concerning the anticipated environmental effects of removing perhaps as much as 22 million cubic yards (mcy) of sand from St. Bernard Shoals or other open-water areas in the Gulf of Mexico for use in restoration of the barrier island sediment budget and transport system, including restoration of Ship Island. 11

NPS Wetland and Floodplain Compliance Requirements

NPS Management Policies (2006) and NPS Procedural Manual #77-1: Wetland Protection (2008) establishes a "no-net-loss of wetlands" policy for the NPS, which requires avoiding, minimizing, and compensating for adverse impacts on wetlands. If a proposed action such as sand replenishment on barrier islands will have such impacts, then compliance with these policies and procedures must be recorded in a Wetland Statement of Findings (WSOF) and approved by NPS. Likewise, such actions would trigger compliance with NPS *Procedural* 12

Manual #77-2: Floodplain Management, including preparation and approval of a Floodplain Statement of Findings.

Upon completion of a Supplemental EIS for barrier islands sand replenishment, a Wetland/Floodplain Statement of Findings, as addressed above, will need to be incorporated. Please reference "Editorial & Procedural Comments" section below, for additional details in completing this document.

Potential Impacts to NPS Classified Wetlands

Following selection of the preferred alternative for barrier island restoration, the Supplemental EIS should address habitat changes and/or alterations to NPS classified wetlands and deepwater 13
habitats using the Cowardin Classification system that occur within GUIS boundaries. These habitats include the marine system, both subtidal and intertidal, which extends from the outer edge of the continental shelf shoreward to the landward limit of tidal inundation and to the seaward limit of wetland vegetation; and the estuarine system which consists of deepwater tidal habitats and adjacent tidal wetlands (emergent and scrub/shrub habitat).

Sea Level Rise

According to reports out of the International Scientific Congress on Climate Change (IPCC) conference recently held in Copenhagen, new research indicates that the upper range in sea level 14
rise could be approximately 1 meter, and possibly more, by the year 2100. The previous IPCC report, published in 2007, projected a sea level rise of 18 – 59 centimeters by 2100. The NPS suggests evaluating and including this new information in the document, and addressing the implications of such information in future MsCIP project planning, particularly with respect to the barrier islands.

Freshwater Diversion, Salinity and Seagrass

The document's discussion on salinity and seagrass within Mississippi Sound (MS) is somewhat deficient. The data available on salinity conditions within the Sound, including seasonal
variations etc., should be fully summarized. Although the proposed freshwater diversion is not 15
the focus of this DEIS and will need to be further scoped and planned in conjunction with the state of Louisiana and the New Orleans District of the USACE, there are several issues raised in Appendix A, Environmental, that point to potentially conflicting desired outcomes of such a diversion. For example, "decreased availability of light" and "extended periods of depressed salinity" is listed as potential causes of seagrass decline in MS Sound. Introduction of Mississippi River water into the system could contribute to both of those factors. Given that there are proposed projects to restore seagrass beds, this apparent conflict would need to be resolved. A more detailed and comprehensive assessment of water quality parameters in MS would need to be conducted in order to better model the impacts and gradients in salinity and other parameters expected with the proposed river diversion.

Page S-7, Table S-2, Environmental Effects of Recommended Alternatives

With respect to environmental effects of the recommended barrier island restoration alternative on "Geology," the table states "No Impacts." While this determination may be correct with respect to impacts on geologic formations, the recommended alternative for barrier island restoration is based on the assumption that identified actions would likely result in positive impacts to barrier island coastal geologic features and processes by attempting to restore and maintain the barrier island sediment budget and transport system. Reconstructing the severely eroded Ship Island to a circa 1917 geomorphic condition, the reintroduction of sand in the littoral zone near East Ship Island and Petit Bois Island and modifying future navigation channel maintenance dredging practices would likely reestablish natural coastal geologic processes as much as possible given continued dredging of navigation channels near the barrier islands. In addition, the reintroduction of 22 mcy of compatible sand into the barrier island system, (i.e., 13 mcy to reconnect East and West Ship Islands, 5 mcy and 4 mcy placed in the littoral zone near East Ship Island and Petit Bois Island, respectively), sand that was historically removed from the littoral drift zone at the Horn Island Pass Outer Bar Channel, will at the very least place that volume of sand back into the disturbed system to mitigate past adverse impacts which should result in a net benefit to barrier island coastal geologic features and processes. 16

<u>Page 1-3, Section 1.2, Study Purpose and Scope, Line 1-3</u>

The definition of resilience presented in the document is the "engineering" definition – resistance to disturbance and speed of return of a system to equilibrium state. There is an "ecosystem" definition that, in light of ecosystem theory and climate change, is probably a better choice – the capacity of a system to undergo disturbance and maintain its existing functions and controls and its capacity to adapt to future change (Gunderson, L.H. 2000. Ecological resilience- in theory and application. Annual Review of Ecology and Systematics 31: 425-439. Carpenter, S., B. Walker, J.M. Anderies, and N. Abel. 2001. From metaphor to measurement: resilience of what to what? Ecosystems 4: 765-781.). 17

<u>Page 1-10, Section 1.6.2, Regional Salinity / Water Quality Monitoring, Line 30-31</u>

The text states "....the barrier island changes proposed for construction in the MsCIP study do not involve significant changes to the barrier island footprints." The recommendation to place 13 mcy of compatible sand in "Camille Cut," which is 3-4 miles in length, to reconnect East and West Ship Islands as they were historically in the past will likely be viewed by some reviewers as a significant change to the barrier island footprint. Recognizing that the shallow sand shoal (footprint) upon which the subaerial and largely intact Ship Island existed prior to Hurricane Camille, we suggest qualifying the referenced statement as follows: "...the barrier island changes proposed for construction in the MsCIP study do not involve significant changes to the barrier island footprints as compared to that which existed in 1969 prior to Hurricane Camille." 18

<u>Page 1-13, Section 1.7.2, Additional Required Coordination, Line 30-32</u>

In view of the fact that the NPS is the Federal land management agency with jurisdiction on the barrier islands and adjacent waters within GUIS, we request the addition of the NPS in this section of the document as additional coordination between the USACE and NPS is imperative as we move forward in this planning process. 19

Page 2-6, Section 2.2.2, Relative Sea Level Rise; and Page 3-8, Section 3.3.3.3, Accommodating Uncertainty in Future Sea Level Rise Through Scenario Testing 20
These two sections address relative sea level rise, using the same endpoint values (2 feet and 3.4 feet) for periods of 100 years (p. 2-6) and 50 years (p. 3-8). Time periods of analysis should be checked, and the timing made consistent.

Page 2-12, Section 2.2.6.3, Federal T&E Species and Their Critical Habitats, Table 2.1

The seven T&E marine species noted on lines 27-31 should be included in this table as project activity in the Gulf of Mexico and near the barrier islands could impact habitat use. The NPS notes that Table 2.1 does not include state listed species, and suggests that such species should be included if any are known to occur in the project area. The NPS also suggests inserting "West Indian" before manatee to differentiate it from the other two species of manatee. The footnotes below Table 2.1 include "PE = proposed endangered," however no such species are presented in the table. The footnote could be deleted and a short sentence could be included in the text to tell the reader that no proposed threatened or endangered species are known to occur in the project area. 21

Although the Bald eagle was delisted in 2007, it should be included in Table 2-1 as the species will be monitored every five years for a total of 20 years. (i.e., the table then could be titled as "T&E and Species of Management Concern" or something to that effect.) Should there be a drop in its numbers, it is conceivable that it could be relisted. The code would be "DM" for delisted/monitored. It will also be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act – and as such, is a Species of Concern (this is also noted in the FWS Table 2). The source for the table should really be the United States Fish Wildlife Service (USFWS) and their ECOS website (www.ecos.fws.gov) for most current information (not a 2000 document, which by the way there are two Mann entries in the reference section, neither which seem like good citations for the T&E species in the area.). The National Marine Fishery Service also has a website and lists T&E species along with federal species of concern (i.e., something that USFWS no longer lists except at some field offices and states). So, both should be cited as references.

Page 3-13, Section 3.4.2.3, Damage to Fish and Wildlife, Line 42-45

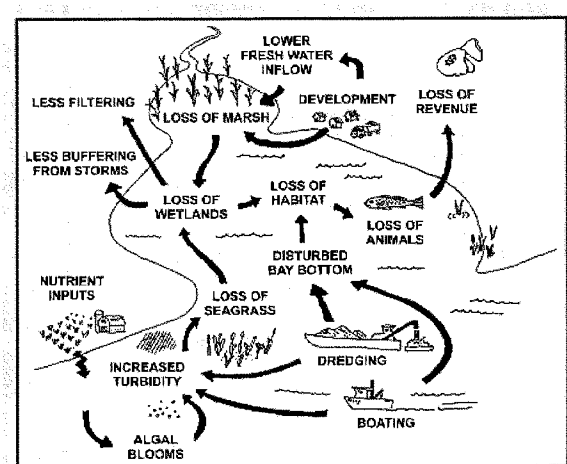
The DEIS states, "Hurricane Katrina and other recent storms have over washed all barrier islands in the Northern Gulf causing severe erosion, severely damaging or destroying facilities and resources, depositing massive amounts of debris, degrading habitats, and setting the stage for rampant infestations of noxious, invasive plant and animal species." This level of impact apparently did not occur on all islands and the statement should be qualified. 22

Page 3-17, Section 3.5, Planning Goals and Objectives, Line 20-22

The text states, "(m)anage seasonal salinities within the western Mississippi Sound such that optimal conditions for oyster growth (surrogate for other aquatic resources, 15 ppt during summer months) are achieved on an annual basis by 2015." It would be helpful to the reader to include current salinity values. 23

Page 3-47, Section 3.15.2.4, Preliminary Submerged Aquatic Vegetation, Line 22-24
The document states "...Primary reasons for the disappearance of SAVs are most likely an overall decline in water quality, extended periods of depressed salinities, and physical disturbances, such as tropical storms and hurricanes (Moncrieff 1998)..." According to Texas Parks and Wildlife, the primary reasons for the loss of SAV are primarily from human induced activities (see Figure 1 below). The Gulf of Mexico Regional Collaborative (http://www.gomrc.org/sav/analysis-findings.html) found a negative correlation between land use (impervious surface) and the distribution of seagrasses and other SAV: 24

Figure 1. The major factors that contribute to loss of seagrass habitat are primarily human induced impacts and include dredging, excessive nutrient inputs, and boating activities. - *Texas Parks and Wildlife*.



"Increases in impervious surface are negatively correlated with SAVs, though the strength of relationship differs in different estuaries as does the relationship itself. Increases in impervious surfaces are also related to other potentially damaging side effects of coastal development, which may not be terrestrial. For example, recreational boating (propeller scarring), an increase in the construction of docks and armoring, as well as the need for structures like bridges and causeways will increase as populations increase and impervious surfaces increase."

Page 3-71, Section 3.20, Systems of Accounts Table for Barrier Island Alternatives, Table 3-11

With respect to Impact Assessment, National Economic Development, Beneficial Impacts items 1-4, the table presents the same costs for Plan H (combination of Plans C and G) as under Plan A. The same issue appears in the table relative to costs and impact descriptions pertaining to 25

Environmental Quality (impact items 2, 3, 5, 6, 7, 8 and 13), Other Social Effects, and several other factors. Are these costs and descriptions accurate?

Page 4-3, Section 4.1.1, Comprehensive Plan – No Action Alternative, Line 15-16

The document states, "(t)hese islands are also essential habitats for some T&E species, such as piping plover and sea turtles." The Gulf sturgeon should be included in this sentence. 26

Page 4-6, Section 4.1.5, Comprehensive Plan Geology Impact, Line 2

The document states, "(n)o geological changes are anticipated to occur by implementation of these type projects." As suggested above (refer to comments pertaining to Page S-7, Table S-2, Environmental Effects of Recommended Alternatives), the NPS recommends noting that that identified actions would likely result in positive impacts to barrier island coastal geologic features and processes by attempting to restore and maintain the barrier island sediment budget and transport system. 27

Page 4-6, Section 4.1.9, Comprehensive Plan Vegetation Impact, Line 26-30

The document states, "Restoration at the barrier islands would consist of shaping existing sand into dunes on the beaches. Dune features would be planted with native vegetation on the barrier islands and along the mainland shoreline. Planting of marshes, maritime forests, and seagrasses in the nearshore areas of the islands and mainland would serve to restore or enhance lost habitat. Implementation of this measure would provide significant benefits to the existing damaged vegetation." Does this description reflect expected barrier island work under the recommended alternative? 28

Page 4-7, Section 4.1.10, Comprehensive Plan Fish and Wildlife Impact, Line 42-44

The text states, "(g)enerally, restoration of barrier islands would entail filling of existing water bottoms to pre-Hurricane Camille conditions, restoring dunes along beaches, and re-planting of native vegetation within the island interiors." This brief description appears to address a combination of several alternatives presented for restoration of the barrier islands and the sediment budget and transport system, but does not reflect specifics presented in the "Comprehensive Barrier Island Plan" (Appendix H - Barrier Islands, Chapter7). If the intent of this section is to describe the range of barrier island restoration alternatives considered in the document, the NPS recommends including text that briefly describes the full breadth of the analyzed alternatives, including the "Comprehensive Barrier Island Plan." If the intent of this section is to describe only the "Comprehensive Barrier Island Plan," the NPS recommends revising the text accordingly to present a more accurate summary. 29

Page 4-9, Section 4.1.11, Comprehensive Plan Threatened and Endangered Species Impact, Line 45-48

The document states "Manatees, Gulf sturgeon and sea turtles could be in the project area and there is potential for adverse impacts to occur. It is anticipated these species would primarily 30 avoid the construction areas due to noise and activity resulting in less risk for harm or harassment." Where is it documented that these disparate species will avoid "noise and activity?" Is this speculation? Many bottom feeding fishes, like the Gulf sturgeon, are drawn to disturbances of the bottom because their benthic and epibenthic prey become more available (i.e., the prey are displaced from their shelter or lose their cryptic advantage when they move). For example, fish will congregate around and follow feeding rays and whales when they are digging for prey in the substrate.

Page 4-15, Section 4.1.15, Comprehensive Plan Land Use Impact, Line 9-17

With respect to barrier island restoration, the text states, "Alteration of land use is expected due to the change from filling in of water bottoms being converted to sandy barrier islands resulting in expanded acreage. It is anticipated this change in land use would be insignificant as the islands would be expanded to historical sizes and the relative size of the project to the surrounding land use. Environmental restoration and construction of a dune feature would provide a benefit to current land use as restoration would provide enhancement to the existing environment. Restoration of sea grasses would result in an enhancement of the water bottoms and existing seagrass beds as a result of implementation of this measure. The project would result in a positive benefit to land use." Is this information accurate in terms of specific elements included in the Comprehensive Barrier Island Restoration Plan? 31

Page 4-38, Section 4.3.2, Restoration of Barrier Islands, Line 45-46

The document states "Additionally, river sands could be used and would be obtained from upland disposal areas adjacent to inland rivers." Is this alternative source of sand still being contemplated? 32

Page 4-40, Section 4.3.2.3, Barrier Island Restoration Fish and Wildlife Impact, Line 7-17

The text discusses use of river sand for the littoral zone placement near the barrier islands. Is this still a valid option? Similar discussions are repeated elsewhere in the document. 33

Page 4-43, Section 4.3.2.5, Barrier Island Restoration Threatened and Endangered Species Impact, Line 21-25

The document states, "Prey Abundance: Activities associated with placement cover epibenthic crustaceans and infaunal polychaetes within the littoral zones and breach areas that serve as potential prey items for the Gulf sturgeon. The impacts are considered short-term in nature and consist of a temporary loss of benthic invertebrate populations where the shoreline extends seaward. It is believed that this will not alter critical habitat..." On a MsCIP conference call on 9/16/08, Richard Heard (University of Mississippi) said that based on his work on the barrier islands, the benthic infauna on the shallow sand platforms (to about 2 m depth) with low DO is unique. Dr. Heard said the ghost shrimp- polychaete community can recover "but they have to have a place to recover to. Unsorted sediments that get dumped can be a problem to benthos." Dr. Heard thought it best that the sediments get sorted by natural processes. 34

Page 5-32, Section 5.2, Monitoring and Adaptive Management, Lines 6-9

The text states "Post-implementation monitoring of ecosystem restoration components of the Comprehensive Plan is projected to be conducted for no more than five years at a cost of less than 1% of the total first cost of the project's ecosystem restoration features." This seems in direct conflict with the monitoring strategy described in the Appendix H – Barrier Islands; Page 76; Lines 33-35: "Monitoring activities should be continued for a specified time period after project activities are completed to measure long-term or cumulative impacts, and whether the goals of the project have been met." One of the project benchmarks states that Ship Island should remain continuous for 20 years and the minor breaches should heal within 10 years. Although the collection of orthoimagery is proposed for 10 or 11 years, project monitoring should continue during this 20 year period to evaluate this benchmark, and would ideally also include periodic evaluation of bathymetry, and island geomorphology and vegetation derived from CHARTS, out to the 20 benchmark. 35

If this DEIS is approved as-is will the monitoring on the barrier islands be limited to the 5 years as stated in the main part of the report, or the slightly expanded timeline in the Appendix? Ideally, the monitoring would continue the full 20 years included in the project benchmark.

Appendix A Section 1.3 Impact Analysis of Alternatives Not Being Considered in Main Report; Page 8, Section 2.10.1.7 Option G: Restoration of Ship Island Breach, Line 35; and Page 11, Section 2.13.1.7, Line 21

Figures given for the amount of sand needed to fill Camille Cut for this option are 8 million Cubic yards (page 8) and 21 million cubic yards (page 11). Figures given for the amount of sand needed for this option also vary from 7 to 8 to 13 in Appendix E Engineering and Appendix H Barrier Islands (see comments below for those Appendices). This inconsistency may be misleading and confusing to the public and other reviewers of the document. One best estimate figure needs to be used consistently throughout the Comprehensive Plan/DEIS. 36

Appendix A Section 2.1 Fish and Wildlife Coordination Act Report and Biological Assessment and Biological Opinions, Page 7, Fish and Wildlife Coordination Act Report, Mississippi Coastal Improvements Program, Table 2, Threatened and Endangered Species with Associated Habitat Descriptions 37

The Eastern indigo snake, a listed threatened species known to occur in the project area, is not listed in the table. This table has more information than Table 2-1 and 1.4.1-1.

Appendix A Section 3.4 Compliance with Environmental Laws and Regulations, Table Entitled "Environmental Laws and Regulations"

For Executive Orders 11988 and 11990, we disagree with the entries under the "Principal Federal Responsible Agencies" column. All federal agencies are required to comply with these Executive Orders, and must have their own procedures in place to do so. For the barrier island restorations proposed within GUIS, NPS procedures for implementing both Executive Orders will need to be followed (see *NPS Procedural Manual #77-1* for wetlands and *NPS Procedural* 38

Manual #77-2 for floodplains). Since NPS will need to certify the required Statement of Findings for wetlands and floodplains for proposed barrier island restoration actions, the NPS should be included among the responsible agencies. See comments pertaining to NPS wetland and floodplain compliance requirements.

Appendix E Page 230, Section 3.1.1, General, Line 5

The amount of sand to fill the breach between East and West Ship Islands (Camille Cut) is estimated here as 8 million cubic yards. This estimate is not consistent with the revised estimate of 13 million cubic yards (see Section 5.1.1, page 48 in Appendix H. Barrier Islands), and the inconsistency may be misleading and confusing to the public and other reviewers of the document. 39

Appendix E Page 264, Section 3.1.2.11, Option G – Restore Ship Island Breach, Line 24; and Page 265, Line 37 40

The amount of sand to fill the breach between East and West Ship Islands (Camille Cut) is estimated as 8 million cubic yards. This estimate is not consistent with the revised estimate of 13 million cubic yards (see Section 5.1.1, page 48 in Appendix H. Barrier Islands), and the inconsistency may be misleading and confusing to the public and other reviewers of the document.

Appendix H Page 1, Background and General Information, Line 18-20

The document states "(t)he new land mass would be shaped into dunes and marshes and planted with native marsh, maritime forest and dune vegetation or simply planted with these types of vegetation and allowing the effects of nature to create the land forms." The NPS has not supported the planting of marsh and maritime forest vegetation to date, but has supported the planting of dune vegetation species in association with Ship Island restoration. 41

Appendix H Page 1, Background and General Information, Lines 45-46

The text states that "...the project will be subject to an 11 year monitoring program described in Chapter 7." It appears in Section 7.5 Long Term Monitoring (Page 75) that obtaining orthophotography of the barrier islands (to determine shoreline position change) is the only monitoring task that will continue for 11 years, and that this will occur on an annual basis for only 5 years post-project, and thereafter every 2 years for 3 events. Mapping of the bathymetry around the barrier islands will occur during pre- and post-project, 1 year after project completion, 5 years after project completion, and following passage of a tropical storm or hurricane. Two of the tasks, including water quality monitoring, have no description of the length of time that these will continue. 42

Appendix H Page 48, line 17; Page 58, line 28; Page 65, line 6; and Page 73, line 3

Figures cited for the volume of sand needed to fill Camille Cut vary from 7 to 8 to 13 million cubic yards at these text locations. To avoid confusion, a single figure should be determined and used consistently throughout the DEIS. 43

Appendix H Page 58, Section 5.1.6.8, LOD-1, Option G, Line 28

The amount of sand to fill the breach between East and West Ship Islands (Camille Cut) is estimated here as 8 million cubic yards. This estimate is not consistent with the revised estimate of 13 million cubic yards (see Section 5.1.1, pg. 48), and the inconsistency may be misleading and confusing to the public and other reviewers of the document. 44

Appendix H Page 65, Section 6.4.2, Emergency Actions, Line 6

The amount of sand estimated to fill Camille Cut and restore the 1916-1917 geomorphic condition of Ship Island is here estimated to be only 7 million cubic yards. This estimate is not consistent with the revised estimate of 13 million cubic yards (see Section 5.1.1, pg. 48), and the inconsistency may be misleading and confusing to the public and other reviewers of the document. 45

Appendix H Page 73, Section 7.3, Camille Cut and Barrier Island Restoration, Line 31-32

The document states "(t)he presence of these historic sites led to the inclusion of the barrier islands off the coast of Mississippi as a National Seashore." While this statement is partially correct, it should be revised to state ""(t)he presence of these historic sites, in addition to the nationally significant natural resources, led to the inclusion of the barrier islands off the coast of Mississippi within Gulf Islands National Seashore." 46

Appendix H Page 74, Section 7.3, Camille Cut and Barrier Island Restoration, Line 38-41

The text states "This decision was based on an agreement with the NPS that allows them to mitigate any damage from man's activities or to perform necessary means to preserve historic sites. This agreement has a positive aspect to MsCIP with the replacement of sand that has been lost from the littoral system." The NPS recommends replacing these statements with the following more accurate text: "NPS Management Policies (2006) allows restoration of lands disturbed by human activities, and protection of significant cultural resources in NPS units. Addition of sediment to the littoral system will help restore its function, which modeling indicates is necessary for the long-term preservation of the barrier islands." 47

Appendix H Page 75, Section 7.5, Long Term Monitoring Program

This section on monitoring does not include recommendations to monitor other key elements of the ecosystem such as benthic biota and other species that might be affected by the project, Mississippi Sound salinity, etc. See comments presented above under Monitoring and Adaptive Management - Barrier Island Ecosystem Restoration. 48

Editorial & Procedural Comments

NPS Wetland and Floodplain Compliance Requirements

NPS wetland protection procedures, which include content requirements for WSOFs, can be found at www.nature.nps.gov/water/wetlands/Wetlands_Protection_Manuals.cfm. NPS floodplain procedures are found at http://www.nature.nps.gov/rm77/floodplain.cfm. As the process of preparing a supplemental EIS for barrier island restorations moves forward, we strongly recommend that USACE staff should review these documents so that NPS wetland definitions (Cowardin et al. 1979), wetland/floodplain procedures and SOF content requirements are fully understood and so that the required data, maps, assessments and analyses can be prepared. For example, unvegetated intertidal beaches are considered wetlands under the Cowardin system and, therefore, must be addressed under NPS wetland procedures.

The following excerpt from NPS Procedural Manual #77-1, Section 5.3.5 summarizes content requirements for Wetland Statements of Findings. Example floodplain and wetland Statements of Findings are available from the NPS upon request. The Statement of Findings for wetlands must contain:

- A map at sufficiently large scale to show the locations, boundaries, and types of wetlands at the project site and the aspects of the preferred alternative that would have adverse impacts on them. Wetland mapping must be consistent with wetland definitions and delineation instructions in Sections 4.1.1 and 4.1.2 of this manual. 49

- Verification that wetland delineation/mapping work has been performed by a qualified wetland professional. This must include the qualifications of the wetland delineators, their affiliations, and a citation for the wetland delineation product or report. WRD strongly recommends the following minimum delineator qualifications: 1) has current "Professional Wetland Scientist" certification through the Society of Wetland Scientists Certification Program, Inc.; or 2) has a certificate of training from a recognized wetland delineation training provider and at least 5 years of experience in wetland delineation. Upon request, WRD staff can review scopes of work for wetland delineation contracts, help evaluate proposals, and review draft products/reports to confirm technical adequacy.

- Detailed descriptions of the affected wetlands (i.e., plant species and communities, hydrologic characteristics, wetland classifications, and so on). Abundance of these wetland types in the NPS unit/area/region must be included in this analysis.

- Detailed functional assessments of the affected wetlands, including evaluation of the biological, chemical, hydrologic, geomorphological, recreational, cultural, aesthetic, and other functions and values listed in Section 5.3.3 of these procedures.

- Full disclosure of the adverse impacts on the wetland habitats, processes, functions, and values at the site (see examples to be considered in Section 5.3.3), and acreages affected, by wetland type.

- A description of alternatives considered in addition to the preferred alternative.

- The reasons why the preferred alternative must be located and designed such that it has adverse impacts on wetlands, and why no non-wetland alternatives or those with fewer wetland impacts were chosen. A discussion of the various factors and trade-offs considered in arriving at this decision must be included.

- A description of how the preferred alternative was designed to minimize wetland impacts to the greatest extent practicable.

- A description of the proposed wetland compensation. What wetland area(s) will be restored to compensate for this loss or degradation and maintain consistency with the NPS "no net loss of wetlands" goal found in D.O. #77-1. The first paragraph of this section should state the total acreage of wetland impact, by type, and the total acreage of restored wetlands, by type, proposed as compensation. This portion of the WSOF must include:
    - a large scale map that clearly identifies the location and boundaries of the compensation site
    - a description of wetland types and wetland functions to be restored at the compensation site, and the degree to which they replace the types and functions lost at the project site
    - a description of the restoration process (e.g., hydrologic restoration, excavation, grading, structure removal, plantings, etc.)
    - the anticipated schedule for project completion
    - the anticipated time-frame for full functioning of the compensation wetlands
    - monitoring and maintenance requirements and schedule
    - the funding source for the project consistent with the funding source restrictions listed in Section 5.2.3 of these procedures.

<u>Page 1-10, Line 34</u>

Substitute appropriate word for "aairly." 50

<u>Page 1-16, Line 18</u>

Change "studies particular" to "studies, particularly." 51

<u>Page 1-16, Line 20-21</u>

Text requests that Tom add a short paragraph relative to coordination, but paragraph not added. 52

<u>Page 2-12, Section 2.2.6.3, Federal T&E Species and Their Critical Habitats, Line 24</u>

The title of this section implies presentation of information regarding "critical habitats" of known threatened and endangered species in the project area. However, designated critical habitats are not discussed in the section text or in Table 2.1. The NPS suggests either deleting "Critical" from the section title, or including text to describe such critical habitats, or perhaps adding a column to Table 2.1 to define designated critical habitat in the project area. 53

Page 2-12, Line 26

Insert, "are shown on Table 2-1 and in Environmental Appendix A in Table 1.4.1-1" to let the reader know that there are two identical tables in the two sections of the EIS.

Page 2-12, Line 29

Sei in "sei whale" is not capitalized, as it comes from the Norwegian word sei for pollock, also referred to as coalfish, a close relative of codfish.

Page 2-12, Section 2.2.6.3, Federal T&E Species and Their Critical Habitats, Line 29-30

The specific epithet for sperm whale is "catodon." Use of "macrocephalus" is a synonym and is an earlier epithet that is no longer used when citing the scientific name for sperm whale.

Page 2-12, Section 2.2.6.3, Federal T&E Species and Their Critical Habitats, Line 33

Table 2.1 is entitled "Federally Listed Rare T&E Species." Since T&E species are by definition "rare," the NPS recommends deleting the word for the table title.`

Page 2-13, Table 2.1

The "heelsplitter" in Inflated heelsplitter is not capitalized, "ridley" in Kemp's ridley sea turtle is not capitalized, and "plover" in Piping plover is not capitalized. In addition, "Piping" is capitalized only if it is at the beginning of a sentence or in a table as a common name. Other occurrences of these issues occur throughout the document.

Page 3-13, Line 37

Add "at the" between "present" and "site."

Page 3-47, Line17 – 27

The same text is repeated at the bottom of page 3-47, line 31-36 extending to the top of page 3-48, line 1-4.

Page 4-38, Line 34

Add "the southern boundary of" after "form."

Page 4-38, Line 43-44

The text should be changed as follows: "The proposed action consists of placement of 22 million cubic yards of sand, 9 million cubic yards within the littoral zone and 13 million cubic yards to be directly placed for restoration of the breach at Ship Island."

Page 4-39, Line 16

The text should be changed as follows: "impacts to vegetation because the site would be identified to minimize impacts."

Page 4-45, Tables 4-5 and 4-6

Need captions and explanations of their divergent values.

Page 5-29, Line 31

Capitalize the "a" of "and"

Page 5-30, Line 3

Change "Geologic" to "Geological."

Page 5-30, Line 14

Change "maintain" to "maintained."

Appendix A Section 1.1 Coastal Mississippi – The Ecosystem Pre- and Post-Hurricanes & Recovery Analyses, Page 7, Section 1.1.3, Impacts From Hurricanes of 2005, Line 9

The text states, "(t)hreatened birds in the area include a rare Sandhill Crane subspecies. The Mississippi sandhill crane is listed as an endangered species." So as not to confuse the reader, perhaps the text should be revised to state "Threatened birds in the area include the endangered Mississippi sandhill crane."

Appendix A Section 1.1 Coastal Mississippi – The Ecosystem Pre- and Post-Hurricanes & Recovery Analyses, Page 37, Section 1.4.1, Baseline Conditions

The first paragraph begins by stating "Coastal Mississippi is home to 20 federally listed T&E, or candidate species. Federally listed species known to occur within the project area are shown on Table 1.4.1-1." However, Table 1.4.1-1 lists only 19 species. In addition, see comments presented above under Main Report, Page 2-12, concerning the specific epithet for sperm whale.

Appendix A Section 1.1 Coastal Mississippi – The Ecosystem Pre- and Post-Hurricanes & Recovery Analyses, Page 38, Section 1.4.1, Baseline Conditions, Table 1.4.1-1

See above comments for applicability to Main Report, Page 2-12, Section 2.2.6.3, Federal T&E Species and Their Critical Habitats, Table 2.1.

Appendix A Section 1.1 Coastal Mississippi – The Ecosystem Pre- and Post-Hurricanes & Recovery Analyses, Page 155, Line 12-19

Several occurrences where capitalization should be changed: American chaffseed, Venus flytrap, Mississippi sandhill crane, and Mississippi gopher frog. Common names are not capitalized unless it is a proper or place name.

Appendix E Page 45, Section 1.5.7, Inland River System Sand (Dredged Material), Lines 46-48

Referring to Figure 1.5-8, the text states "(n)ote the similarities in color of the Apalachicola River (fourth from left), the Black Warrior (third from left and marked BWT North Star), and the Lower Princess (second from left, Lower Tombigee River)." Thc sentence should read "Note the similarities in color of the Apalachicola River (second from left), the Black Warrior (third from left and marked BWT North Star), and the Lower Princess (fourth from left, Lower Tombigee River)."

Appendix H Page iii, Executive Summary, Line 18

Remove the apostrophe from "it's"

Appendix H Page iii, Executive Summary, Line 19

Change "he" to "the"

Appendix H Page 1, Line 15

Delete "that"

Appendix H Page 39, Section 4.3, Additional Studies, Lines 2-4

Referring to Figure 4-4, the text states, "(n)ote the similarities in color of the Apalachicola River (fourth from left), the Black Warrior (third from left and marked BWT North Star), and the Lower Princess (second from left, Lower Tombigee River)." The sentence should read, "Note the similarities in color of the Apalachicola River (second from left), the Black Warrior (third from left and marked BWT North Star), and the Lower Princess (fourth from left, Lower Tombigee River)."

Appendix H Page 72, Line 17

Change "on" to "of"

Appendix H Page 72, Line 26

Change "does" to "do"

Appendix H Page 74, Line 5

Delete the apostrophe from "it's."

Appendix H Page 74, Line 38

Change "mans past" to "past human"

Appendix H Page 75, Line 19

Change "deposing" to "disposing"

Appendix H Page 76, Line 4

Change "This sand placements is" to "These sand placements are"

U.S. Fish and Wildlife Service

The Service has been a full and cooperating member of the MsCIP planning team. Their comments and recommendations have been fully considered during the advanced planning stages of the project. 55

In addition, the DEIS supports a Service recommendation for initiating studies for additional MsCIP Comprehensive Plan elements including a Freshwater Diversion at Violet, Louisiana, a long-term high hazard risk reduction plan, and a Escatawpa River freshwater diversion. The Service will provide additional comments related to potential impacts to fish and wildlife resources once supplemental environmental documentation is developed for these project components.

Thank you for the opportunity to review and comment on this DEIS. The efforts of the USACE in early coordination with the Department are greatly appreciated. If you have questions or need additional information I can be reached on 404-331-4524 or by email at gregory_hogue@ios.doi.gov.

Sincerely,

Gregory Hogue
Regional Environmental Officer

cc:
FWS, Region 4
NPS, Southeast Regional Office
USGS, Environmental Affairs Program, Reston
OEPC, Washington

Responses to the Department of Interior Letter dated 02 April 2009

Response Comment 1: Concur – Should additional studies be initiated these concepts will be included.

Response Comment 2: Concur with need for long term monitoring / data collection. Due to scale would need to be multi-agency. USACE will be glad to coordinate & participate to maximum extent possible. The Gulf of Mexico Alliance Governor's Action Plan calls for many of these same issues to be addressed. We will investigate this becoming a specific action item.

Response Comment 3: Numerical modeling to aid in the design alternatives for restoration of the barrier islands will be conducted for both short-term (episodic storms) and long-term evolution, including an assessment of likely relative sea level rise scenarios and possible change in storm frequency and severity.

Response Comment 4: Comment noted. The Corps, Mobile District will ask the NPS to be a cooperating agency in developing the SEIS which will be tiered off from this DEIS and requirements in the NPS Director's Order 12, Conservation Planning, Environmental Impact Analysis and Decision Making will be incorporated.

Response Comment 5: Comment noted.

Response Comment 6: See comment above.

Response Comment 7: Text will be added to emphasize items noted above.

Response Comment 8: The activities described above can be incorporated into the quality assurance program developed by the Corps' Construction Management program. Based on a construction management cost of 6%, ample funds should be available to implement these recommendations.

Response Comment 9: Due to the limited amount data available at Cat Island, it was specifically mentioned in Section 7.2 of the Barrier Island Appendix. This additional study will include bathymetric data, sediment budget and transport, and ecological processes. This additional work is important to identify possible areas for littoral zone sand placements that might benefit Cat Island.

Response Comment 10: This document is a Feasibility Report and integrated EIS. As such it contains info relative to all options evaluated whether recommended or not. As you move thru the discussion – options may be eliminated from further analysis. In the Main Report, Chapter 3 and specifically in the system of accounts tables (Table 3-11) all plans evaluated, the tentatively selected plan identified as Plan H is highlighted. Under NEPA, all alternatives must be evaluated and identified as found in Chapter 4 – Environmental Effects. In Chapter 5: Description of Tentatively Selected

Comprehensive Plan Components, specifically Section 5.18.10, Barrier Island Ecosystem Restoration Alternatives the plan selection is described. (Plan H).

Response Comment 11: Concur

Response Comment 12: Comment noted and procedures will be incorporated into the Supplemental EIS as necessary. If there is any discernable effect, it is likely that sand replenishment of the barrier islands would only reduce wetland losses on the mainland coast, because the restored islands would be more likely to diminish wave erosion on the mainland. The change in wave climate as a function of restoration alternatives will be calculated as part of the numerical modeling study.

Response Comment 13: Comment noted. These issues and others have been identified by the joint team working on freshwater diversion and will be addressed during the formulation and evaluation of alternatives for that project.

Response Comment 14: The future effects of sea level rise was an overriding consideration in the Barrier Island Plan since the intent of the plan was to replace sand that may have been lost from the barrier island littoral system over the last 50 years or so. Replacement of this sand into the system as a one-time project, then allowing existing currents to provide sand migration among the islands is the basis of the plan. The next phase of the study will evaluate long-term evolution of proposed restoration alternatives, including changes due to a potential range in relative sea level rise.

Response Comment 15: Comment noted and procedures will be incorporated into the Supplemental EIS as necessary.

Response Comment 16: Non-concur. The impact analysis is specific to those resources discussed in chapter 2, specifically 2.2.1 for Geology. The positive impacts of barrier island restoration is discussed in a number of other areas, e.g. soils, land use, threatened and endangered species, etc.

Response Comment 17: Do not agree that these are "engineering" definitions, however for the sake of comprehensiveness we have included Gunderson's definition.

Response Comment 18: Concur.

Response Comment 19: Concur.

Response Comment 20: Non-concur. As stated in Section 3.3.3.3 of the Main Report, Corps regulations require a 50-year period of analysis for the economic evaluation of projects recommended for construction. For sensitivity of analysis, a 100 year period was utilized to investigate the significance of sea level rise. This was then converted to a 50- year period of analysis as required. A detailed discussion of this can be found in Section 5.3.1 of the Economic Appendix (Appendix B).

Response Comment 21: The seven T&E marine species as noted on Lines 27-31 are protected by NOAA, PRD while those in Table 2-1 are protected under USFWS. This is a typical way the Corps, Mobile District documents the differences between the agencies' regulation. We have clarified the text to remove any confusion. West Indian will be placed in front of manatee. "PE" will be deleted from table. The bald eagle is specifically addressed in the Environmental Appendix to show its significance. It is no longer listed under T&E which is what this table depicts.

Response Comment 22: Comment noted and this statement will be qualified as requested.

Response Comment 23: Non-concur. This is strictly a goal established to enhance oyster productivity. Additional info at this point is unnecessary.

Response Comment 24: Non-concur. Information presented is specific to SAV decline in costal Mississippi and includes anthropogenic impacts.

Response Comment 25: Yes. It is estimated that synergistic efficiencies and economies of scale provide the same level of benefits for Plan H as for Plan A for the categories cited, at a substantially reduced cost.

Response Comment 26: Non-concur. The islands are not critical habitat for Gulf sturgeon; however concur Gulf Sturgeon important so will reword to say these coastal systems in lieu of islands.

Response Comment 27: Non-concur. See response to comment 16 above.

Response Comment 28: Of the barrier island restoration tentatively selected plan, the above components are not included. The sentence. ..Planting of marshes.. will be removed. However as we progress with implementation and a need for such vegetative features is identified it could be addressed at that time.

Response Comment 29: Concur. We will revise to only state limited dune re-vegetation would occur.

Response Comment 30: Statement is accurate. The Corps has coordinated with the USFWS and NOAA, PRD in the past on all of its projects – new work and operations and maintenance – and this routinely occurs. In addition, in many biological opinions from both agencies, it has been noted that the species avoids the disturbances.

Response Comment 31: The Corps believes that this statement is accurate and it is a positive benefit to land use.

Response Comment 32: The beneficial use of the sand in inland, disposal areas was initially considered, but it was found to be significantly more expensive during cost estimating and was therefore dropped as a source due to cost. This sentence will be deleted.

Response Comment 33: See response to comment 32 above.

Response Comment 34: The Corps evaluated potential impacts to critical habitat of the Gulf sturgeon. Dr. Heard said the ghost shrimp- polychaete community can recover "but they have to have a place to recover to." The placement of sandy material within the system will create other sites similar to what is existing; therefore, those sites lost would likely recover in adjacent areas to the barrier islands. This area within Ship Island would be converted to upland habitat but it would help maintain the integrity of one of Mississippi Sound's primary constituent elements for the Gulf sturgeon (i.e. water quality.) Additional evaluation will be conducted in the Supplemental EIS.

Response Comment 35: The statement in the main report refers to the ecosystem restoration only. The barrier islands will be monitored for 11 years as described in Appendix H.

Response Comment 36: The quantity of sandy material for the barrier island restoration is 22 million cubic yards (i.e. 13 million of that would be to fill the Ship Island breach and 9 million cubic yards would be for placement in the littoral zone.) Correction will be made in the documentation.

Response Comment 37: This section was prepared by the USFWS rather than the Corps. Information has been forwarded to USFWS for their consideration.

Response Comment 38: The table provides the responsible agency that ensures compliance of the law.

Response Comment 39: Corrected to 13 million

Response Comment 40: See response to comment 39.

Response Comment 41: Forming "new land mass that would be shaped into dunes and marshes and planted with native marsh, maritime forest and dune vegetation or simply planted with these types of vegetation and allowing the effects of nature to create the land forms" was a bullet helped describe the basis of formulating the options described in the Engineering Appendix and Barrier Island Appendix. While some options were studied and screened out during the plan formulation process, others were adopted and recommended for implementation.

Response Comment 42: Task 3 under Section 7.5 indicates that CHARTS system will be used annually which will continue for the entire monitoring program of eleven years. Task 4 will be modified to indicate that water quality sampling will be conducted quarterly for 5 years, then quarterly every other year for the remaining 6 years.

Response Comment 43: See response to comment 39.

Response Comment 44: See response to comment 39.

Response Comment 45: See response to comment 39.

Response Comment 46: Will change text as recommended.

Response Comment 47: Will change text as recommended

Response Comment 48: Comment noted. Additionally as stated in the response to the earlier comment, monitoring and adaptive management – barrier island ecosystem restoration, these activities described can be incorporated into the quality assurance program developed by the Corps' Construction Management program. Ample funds should be available to implement these recommendations. Also, as discussed in our previous multiagency meetings, this monitoring program will be developed during development of supplemental EIS upon receipt of funding.

Response Comment 49: Comment noted. During our continuing partnership, these requirements will be incorporated to ensure compliance will be met.

Response Comment 50: Corrected as noted

Response Comment 51: Corrected as noted

Response Comment 52: Text was inadvertently omitted. Following is inserted. Natural Resource Conservation Service (NRCS) Continuous coordination has occurred between the NRCS and the MsCIP team. This includes the NRCS' ongoing project to restore the Forrest Heights Levee to pre Katrina (original design) condition where the MsCIP team was invited to participate in the design review process and in public meetings. In addition, the NRCS has participated in MsCIP risk education workshops and public meetings regarding MsCIP's consideration of enhancements to the levee (see description, section 5). With this and continued coordination, future projects to be planned and implemented by either agency would be executed more effectively and efficiently.

Response Comment 53: Concur. We have changed heading to read Habitat Requirement.

Except as noted, the following comments are noted and appropriate corrections made.

Response Comment 54: The Corps does not believe this confuses the reader due to the statement reading that these birds are threatened due to various influences in the area. This statement does not refer to the T&E status.

Response Comment 55: The Corps appreciates your participation and assistance throughout the entire MsCIP process. The Corps looks forward for your agency's continued support and assistance.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

March 27, 2009

Dr. Susan I. Rees
Project Manager
U.S. Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, AL 36628-0001

Subject: EPA's NEPA Review of the COE's Draft Programmatic Environmental Impact Statement (DPEIS) for the "Mississippi Coastal Improvements Program (MsCIP)" Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (February 2009); Hancock, Harrison, and Jackson Co, MS; CEQ# 20090034; ERP# COE-E39075-MS

Dear Dr. Rees:

Pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the U.S. Army Corps of Engineers' (COE: Mobile District) Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (DPEIS = Draft Comprehensive Plan). The DPEIS consists of a main document and eleven appendices (A-K).[1] As a Cooperating Agency, EPA has participated in various meetings and site visits preceding the issuance of this DPEIS. These included Regional Coordination Meetings for scoping in 2006, Risk Analysis Workshops in 2007, a web-based feedback and participation forum in 2007, and wetland field reconnaissance site visits and interagency project deliberations. These meetings and site visits were attended by our Water Protection Division (WPD) and NEPA Program Office.

We commend the COE for their extensive scoping, planning and coordination of this project with federal, state and local agencies as well as non-governmental organizations (NGOs), universities, stakeholders and the general public. Moreover, we also appreciate the project status briefings presented by the COE's South Atlantic Division (SAD) and the coordination provided by EPA's Office of Water in Washington, DC and our Gulf of Mexico Program (GMP) in Mississippi.

Project Overview

The Draft Comprehensive Plan addresses recent (2005-2006) hurricane and storm damage (Katrina, Rita and Cindy) in Hancock, Harrison, and Jackson Counties through

[1] Unless otherwise noted, references in this letter to page numbers, figures and tables are from the MsCIP main document as opposed to its appendices.

the implementation of several projects and the further study and NEPA review of others. Specifically, we note the study of ecosystem restoration of wetlands, fish and wildlife preservation, eroded coastlines and saltwater intrusion; the purchase or flood-proofing of properties in high hazard zones to change their land use; the overall reduction of "...the vulnerability of the region to a recurrence of similar natural disasters" (pg. S-2); and the policy that reduction measures for hurricane/storm damage were provided "...without encouraging re-development in high-risk areas" (pg. S-3). EPA supports the restoration goals of the MsCIP and the overall approach to achieve them taken by the Mobile District. Although we understand that the purpose and need of the MsCIP is not limited to post-hurricane restoration, it is those restoration project components of the MsCIP that we principally support.

The Draft Comprehensive Plan recommends several projects for advanced design and implementation for the COE's "Record of Decision (ROD) for construction". The NEPA requirements for these MsCIP projects are to be met by the PEIS and ROD documents. Page S-3 lists these projects as:

- Coastal Wetland and Forest Restoration (Turkey Creek, Bayou Cumbest, Dantzler, Admiral Island, Franklin Creek)
- Submerged Aquatic Vegetation (SAV) Pilot Project
- Coast-wide Beach and Dune Restoration on Mainland Beaches
- Moss Point Municipal Structure Relocation
- Waveland Flood Proofing Pilot Project
- Forrest (or Forest) Heights Hurricane and Storm Damage Reduction.

In addition to these projects, the restoration of Deer Island may also be ready for construction, although additional NEPA documentation tiering from this PEIS may be needed. The Draft Comprehensive Plan also supports two other projects for construction, subject to additional site-specific study and supplemental NEPA review. These are the 1) High Hazard Area Risk Reduction Plan (near-term HARP) and the 2) Barrier Islands Restoration Plan. HARP entails the land purchase of vulnerable storm-prone coastlands to restrict their redevelopment while the Barrier Islands Restoration Plan involves sand renourishment of the Mississippi barrier islands as a first line of defense to the coastal mainland. We strongly agree that these plans would benefit from additional study of societal issues and sand migration. Beyond these additional studies, the MsCIP also supports the construction of a freshwater diversion project at Violet, Louisiana (per the Water Resources Development Act (WRDA) of 2007), which would provide additional freshwater inflows to the Mississippi Sound for the support of healthy oyster reefs. Finally, there are also other system-wide elements of the Draft Comprehensive Plan proposing the additional long-term HARP land purchases over the next 20-40 years, additional damage reduction alternatives, the coastal Mississippi ecosystem reduction program, and the Escatawpa River freshwater diversion project. Although these projects are currently not being presented for construction by the MsCIP, the PDEIS considers them as reasonably foreseeable in the cumulative effects analysis. Since hurricane damage was not limited to Mississippi, the MsCIP is being conducted concurrently with the Louisiana Coastal Protection and Restoration (LaCPR), which primarily addresses damage to the Louisiana coast. The MsCIP and LaCPR are separate but coordinated EIS projects.

The Mississippi coastline was divided into five logical lines of defense (Chap. 3) that were considered for armoring (hardening), with each line being considered for a different structural component. The first line of defense was the outer edge of the barrier islands (which would be renourished); the second was the mainland berm and dune system (which would also be restored); the third was an elevated seawall; the fourth was an inland barrier with surge gates; and the fifth was the existing railroad along the coastline which was expected to be the limits of a hurricane surge (the railroad bed would be raised). Although considered, these structural components were not implemented with three exceptions: barrier island renourishment, beach sand dune restoration, and limited ring levee application.

Although we support with the use of structural components where necessary for public safety and for the proposed island and dune restorations, EPA prefers non-structural projects designed to develop a coastline that is more resilient to future storm events. For the MsCIP, these included proposed or future floodplain management of high-risk areas in various coastal zones (i.e., from the coastline to higher elevations) including the generation of a risk zones map of the Mississippi coastline, land purchases of high-risk areas, and relocations from high-risk areas to higher elevations, building and zoning codes, and hurricane evacuation planning (pg. 5-1). To complement these, we suggest adding the conversion of high-risk areas to more storm-compatible land uses such as coastal greenspace areas (e.g., greenways/parks), and the ecosystem restoration of coastal areas to wetlands and other coastal ecotones resembling the historic (e.g., pre-Hurricane Camille) Mississippi coastline.

COE Scoping & Planning

The Mobile District should be commended for their scoping and planning process to address the Congressional mandate (Department of Defense Appropriations Act of 2006).. The scoping allowed the development of sustainable coastal improvement elements that were visionary. The planning process allowed for a true integration of the natural ecosystems and the services they provide along with man's alterations of the landscape resulting from habitation adjacent to the Gulf of Mexico.

This scoping framework embraced non-structural, local-decisional considerations for planning land uses, and structural alternatives which were then evaluated on an even basis. The collected coastal improvement elements were continuously shared with the stakeholders resulting in the identification of improvements and collection of the more effective and efficient elements. A fundamental precept of this method embraced the long term commitment of resources that would be required for the operation and maintenance of the various elements evaluated. The majority of the final selected coastal improvement elements were those that were self sustaining, required the least amount of resources, and had limited "side effects" (i.e., those secondary actions that are interrelated or interdependent to the original element and usually require further resources necessary for operation and maintenance).

The MsCIP is an exemplary case where the Mobile District fully embraced and implemented the U.S. Army's *Environmental Operating Principles* (EOP). The EOP's keys were integrated from conception to completion through the BALANCE process, i.e., Building and sharing knowledge, Accepting corporate responsibility, Listening to and learning from the stakeholders, Assessing and mitigating the impacts, Negotiating environmental and economic solutions, Considering the consequences, and Encouraging environmental sustainability.

Project Impacts

The damage from the series of hurricanes/storms in coastal Mississippi and adjacent areas was significant due to increased frequency and intensity of wind and tidal action. Ecosystem impact areas included bird populations (e.g., barrier island nesting habitat), shrimp and fish stocks (Mississippi Sound), shorelands (beaches and dune habitat), saltwater and freshwater wetlands (e.g., wet pine savannah), water quality (estuarine and riverine), and terrestrial habitats (e.g., coastal forests). Destruction of homes and infrastructure was also extensive. From an environmental perspective, EPA is primarily concerned about water quality issues such as spill contamination (surge) and turbidity/sedimentation, loss of wetlands and saltwater contamination (surge and salt spray) of shoreland freshwater wetlands, barrier island and mainland beach erosion (surge over-wash and scour), overall loss of habitat (significant wind and tidal action), and the risk to public health and safety.

The present DPEIS is primarily a restoration EIS to repair some of these impacts and help prevent future hurricane/storm damage. Given these positive restoration impacts, the DPEIS principally differs from conventional EISs with negative impacts that require mitigation. Accordingly, most of the effects of the MsCIP projects are restoration benefits rather than impacts. A compilation of EPA's comments and suggestions to further improve the proposed projects during the COE's development of the Final PEIS (FPEIS) and the Final Comprehensive Plan is included in our enclosed *Detailed Comments*. We also offer the following EPA conclusions and recommendations for the MsCIP.

EPA Conclusions & Recommendations

EPA supports the restoration goals of the MsCIP and overall innovative approach taken by the Mobile COE to achieve them. Our conclusions and recommendations for the proposed MsCIP projects are summarized as follows:

- **Overview** – ***The COE should be commended for its consideration and tentative selection (Chap. 5) of several non-structural alternatives for the restoration of coastal Mississippi.*** EPA finds that the MsCIP NEPA document considered more 1 non-structural alternatives than perhaps any other COE document Region 4 has reviewed.

- **Purpose & Need** – ***EPA recommends that the focus of the MsCIP remain on the post-hurricane restoration of the Mississippi coastline with a significant non-structural component.*** Although the FPEIS should clarify this, we understand that the purpose and need of the MsCIP is not limited to hurricane/storm restorations (e.g., WRDA freshwater diversion study at Violet, LA). Nevertheless, because of the broad scope/expense of hurricane/storm restoration in Mississippi – and because project funding has not yet been secured and may be competitive – we recommend that the focus of the MsCIP remain on the post-hurricane restoration of the Mississippi coastline more so than other regional ecosystem projects that are not the direct result of damage from Hurricanes Katrina, Rita and Cindy. 2

- **Non-Structural Alternatives** – ***EPA recommends that non-structural alternatives be implemented along the Mississippi coastline (as well as other Gulf of Mexico state coastlines) where appropriate to avoid additional hurricane/storm damage.*** We particularly support floodplain management to delineate the mapped locations of high-, moderate- and low-risk zones (Fig. 5-1), land purchases in high-risk areas (HARP) to convert their land use to be more compatible with areas vulnerable to storms, the creation of coastal greenways/parks and areas of coastal ecosystem restoration to resemble their historic ecotones, the relocation of people and their homes/communities to higher elevations to achieve a lower storm risk, and the rezoning of high-risk areas. To a lesser degree, we also support measures such as home elevations and flood insurance; however, these options encourage redevelopment in high-risk areas and may foster a potential false sense of security. 3

- **Structural Alternatives** – ***Although there may be exceptions, EPA does not recommend the construction of ring levees.*** EPA recognizes that certain structural alternatives can improve protection against hurricane/storm damage and are advisable. However, the heights of future storm surges are difficult to predict so that the actual security of such armoring structures remains uncertain. Accordingly, EPA typically recommends relocations (buyouts) rather than construction of structural ring levees (ring levees are costly to build/maintain and may fill wetlands, must be serviced by an elevated access road, and do not eliminate the need for evacuation) to relocate people to higher elevations on the COE's risk zones map (Fig. 5-1) and to discourage redevelopment in high-risk areas. EPA does not recommend the construction of ring levees, including those listed in Table 5-2. However, Forest Heights may be an exception, given the fact that the levee already exists there and the residents would like for it to remain in place. Also, for unwilling sellers, horseshoe levees would be more preferable than ring levees because they are located at higher elevations and evacuations to higher ground roadways exist. 4

- **COE Project Decisions** – ***Although EPA typically recommends non-structural over structural alternatives, we also defer to the COE and local governments***

relative to the overall benefits and safety of restoration projects in the context of 5
the local setting. As a cooperating agency to the COE for this PEIS, we request that the COE consider our general preference for non-structural options during their finalization of their FPEIS and Final Comprehensive Plan. At the same time, however, we also give deference to the COE and local governments for the site-specific implementation of restoration projects. For example, a combination of non-structural and structural alternatives could be meaningful on a case-by-case basis. Also on a case-by-case basis, the Clean Water Act (CWA) 404(b)(1) Guidelines (Guidelines) are expected to be very meaningful with specific focus on the project alternatives analysis (which may include the non-structural alternatives) and in the avoidance, minimization and compensatory mitigation process. EPA strongly encourages the Mobile District to evaluate compensatory wetland mitigation within the watershed, especially when the project is within the watershed of an existing impaired water body.

- <u>**COE Section 404 Permit Decisions for High-Risk Areas**</u> – ***The COE's*** 6
CWA section 404 permit program should be coordinated to be consistent with the COE's recommendations in this DPEIS. EPA recommends that the COE use the maximum flexibility within the CWA Guidelines to restrict approvals of CWA section 404 permits in designated high-risk areas for life and structure, especially for non-water-dependent project purposes. Such strict adherence to the Guideline's full application of alternatives analysis, optimized avoidance and minimization applied, and compensatory mitigation that replaces the ecosystem services in the watershed impacted, together with the COE's risk zone map (pg. 5-5) and zoning codes (pg. 5-6), could discourage the development or redevelopment of these vulnerable areas. To address permitting for high-risk areas, we recommend that new sections be added to the main document (5.17.8) as well as in the Environmental Appendix A (ES-2.1) in the FPEIS.

- <u>**Barrier Islands Restoration**</u> – ***We believe that restoring the chain of four Gulf Islands National Seashore barrier islands (Cat, Ship, Horn and Petit Bois Island) in the Mississippi Sound has considerable merit from both a storm protection and Gulf Sound/Barrier Islands ecosystem perspective.*** We also strongly support that additional study be conducted as planned. These studies should finalize the sediment (sand) source, volume and quality needed to efficiently "feed" the islands to achieve the appropriate renourishment to optimize ecological features and mainland protection. Modeling for the offshore sediment mining sites and disposal sites (plume and water quality) should also be finalized. Moreover, from a regional perspective, it should be emphasized that dredging and sediment removal projects upstream of these islands could reduce the volume of sediment available in the system (littoral drift zone) that naturally renourishes the islands. As such, the
approval and management of such dredging projects would appear to be critical to 7
future island maintenance. The COE should first consider sands from "new work" dredging for use on the renourishment of the Barrier Islands, as opposed to offshore disposal of sands at an Ocean Dredged Material Disposal Site (ODMDS) or other

options. EPA also supports the restoration of Deer Island, a nearshore barrier island.

- **Draft Comprehensive Plan Projects** – ***Given EPA's full involvement during project scoping, analysis and interagency deliberation, we generally find the MsCIP projects ready for construction to be acceptable as proposed for the restoration of coastal Mississippi.*** Nevertheless, the comments and recommendations offered in this NEPA comment letter should be applied where appropriate. 8

- **Turkey Creek** – ***EPA recommends that the COE expand the proposed restoration at Turkey Creek.*** Specifically, the four objectives listed on the second un-numbered page (or page 345 of 420 for a CD Adobe Reader) in Section 1.4.5 (*Turkey Creek Restoration Benefits*) of the Environmental Appendix (A) should include a fifth objective: *5. Restore and maintain State water quality.* Since Turkey Creek is listed as an impaired water body on the State of Mississippi's 303(d) list for fecal, pH and biology parameters of concern, we recommend that the maximum restoration activities for this project emphasize assistance in restoring the biological impact areas while maintaining water quality parameters. Also, recent mitigation efforts for a Mississippi Department of Transportation (MDOT) project are underway in the Turkey Creek watershed that significantly encompasses the area considered within the MsCIP project. EPA recommends that the Mobile District coordinate efforts with the Mississippi Department of Marine Resources (MDMR) Coastal Preserve Program and the Land Trust for the Mississippi Coastal Plain (Land Trust) to enhance restoration efforts in Turkey Creek. Preliminary maps of areas proposed for MDOT mitigation and community greenways as well as other comments related to Turkey Creek are included in the *Detailed Comments.* 9

- **Saltwater Intrusion** – ***EPA offers that the study of the saltwater intrusion component could be somewhat de-emphasized for MsCIP projects in favor of other more significant impacted areas.*** Unlike the well-documented issues with saltwater intrusion in Louisiana (LaCPR), EPA believes that there are no projects in Mississippi that warrant action primarily due to saltwater intrusion – when traditionally defined as the migration of saltwater upstream in coastal rivers and upgradient in groundwater. However, we agree that hurricane surges raised the salinity of Mississippi Sound and storm surges and salt sprays resulted in some coastal freshwater wetlands becoming brackish. 10

- **Long-Term HARP** – ***Although long-term HARP may not be implemented due to extensive buyout costs and disruptive relocations, EPA recommends to nevertheless consider land acquisitions and buyouts in areas of high-risk.*** That is, even though such wholesale community relocations are likely disruptive, hurricane damage to such vulnerable areas is also (if not more) disruptive to the same community. As previously discussed, the option of a ring levee construction would also be expensive to build/maintain and would not eliminate the need for 11
evacuation. The proposal for additional study and supplemental NEPA review

might compare such costs. However, if such massive relocations of communities or towns do eventuate, we recommend that the buyouts encompass whole communities to limit their segmentation and societal disruption. We also believe that the proposed further study of near- and long-term HARP projects has merit from a societal impact perspective.

- **Implementation & Additional NEPA** – ***In order to avoid/minimize additional harm to the Mississippi coastlands from potential future storm events, we encourage the expedited but sound implementation of the MsCIP projects nearing construction from a design and NEPA perspective.*** We also encourage the completion of the additional NEPA reviews tiering from this PEIS for the other restoration projects (e.g., Barrier Islands Restoration Plan) considered in the MsCIP – to the extent those reviews determine which of these projects merit implementation. Project monitoring and use of adaptive management practices is advised to help insure success. 12

- Final Comprehensive Plan Application – ***The "lessons learned" from the Final Comprehensive Plan should be broadly applied to other local federal projects as well as the Gulf of Mexico coastline in general.*** Interagency coordination of the Plan should be conducted with the sponsors of other federally-funded and/or federally-permitted projects in Mississippi that may be proposed for high-risk areas so that they may be relocated, if possible, to areas of lower risk. Plan application with the federal, state and local governments of other states along the Gulf of Mexico is also recommended. 13

Summary & Rating

EPA rates this DPEIS as "LO" (Lack of Objections), although we request that our comments and recommendations on this DPEIS be addressed in the development of the FPEIS, Final Comprehensive Plan and ROD. Overall, we support the objectives of the MsCIP's Draft Comprehensive Plan and the Mobile District's tentative selection of non-structural alternatives and certain structural alternatives. We particularly support the non-structural components of floodplain management (coastal risk zones map) and the prospective HARP purchase of lands in high-risk areas, as well as the structural components of renourishing the barrier islands and the mainland beach dunes. However, additional HARP societal studies and barrier island renourishment modeling are advised. We also encourage the District's continued selection of appropriate non-structural components in the FPEIS and Final Comprehensive Plan. In addition, we wish to emphasize the following: 14

- Greenspace – To help protect life and structure, high-risk areas should be converted to more storm-compatible land uses such as coastal greenways/parks, and the ecosystem restoration of coastal areas to wetlands and other coastal ecotones resembling the historic Mississippi coastline.

- Section 404 Permitting – The COE's Section 404 permitting process should be coordinated to be consistent with the objectives of this PEIS by discouraging redevelopment or development in designated high-risk areas.

- Final Comprehensive Plan Application – The "lessons learned" from the Final Comprehensive Plan should be broadly applied to other local federal projects in Mississippi as well as other states along the Gulf of Mexico coastline through interagency coordination in order to share "best practices".

- Implementation & Management – The planned additional studies, NEPA reviews and actual improvement plans/projects should be expeditiously implemented, followed by monitoring and adaptive management to help ensure success.

EPA appreciates the opportunity to review the DPEIS and the Mobile COE's coordination with us. Where appropriate, we wish to offer our assistance for the expeditious implementation and application of the Final Comprehensive Plan. Should you have any questions, feel free to contact Ntale Kajumba at 404/562-9620 (kajumba.ntale@epa.gov) or Chris Hoberg at 404/562-9619 (hoberg.Chris@epa.gov) of my staff and Duncan Powell at 404/562-9258 (powell.duncan@epa.gov) in the Region 4 Water Protection Division for wetland issues.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

Enclosure: *Detailed Comments* (including Figures 1-3)
Fig. 1: *Land (1,625 ac) Proposed for Acquisition and Mitigation in Turkey Creek by MDOT.*
Fig. 2: *Land identified for a Proposed Greenway Initiative in the Turkey Creek Watershed (Land Trust and Turkey Creek Community).*
Fig. 3: *Land Already Purchased by Land Trust within the Turkey Creek Watershed.*

cc: Mr. Claiborne Barnwell – MDOT: Jackson, MS
Mr. Jeff Clark – MDMR: Biloxi, MS
Mr. David Felder – USFWS: Daphne, AL
Brig. Gen. Joseph Schroedel – COE/SAD: Atlanta, GA
Ms. Judy Steckler – Land Trust: Biloxi, MS
Mr. Dickie Walters – FHWA: Jackson, MS

DETAILED COMMENTS

MAIN DOCUMENT

* **Table S-2 (pg. S-6)** – Project effects information for the proposed MsCIP projects are tabularized in Table S-2. Although we recognize that Table S-2 is intended as a summary table while tables in Chapter 3 are more expanded versions, we note that a "Category of Effects" for wetlands was not provided in Table S-2. Because of the significance of wetland restoration to the MsCIP, we suggest a footnote for Table S-2 and/or discussion in the text clarifying that restoration of various wetland types are discussed under specific listed projects (e.g., Dantzler and Turkey Creek ecosystem restorations). 15

* **Purpose & Need (pg. 1-1)** – MsCIP would implement a freshwater diversion project at Violet, Louisiana per the intent of Section 3083 of the Water Resources Development Act (WRDA) of 2007. This project would provide adequate inflows to the Mississippi Sound for healthy oyster reefs. This WRDA project appears somewhat out of place for a restoration project for hurricane/storm damage; however, we understand that not all of the MsCIP projects are limited to hurricane/storm restoration. Nevertheless, in the FPEIS, the purpose and need section should clarify this and discuss the rationale for including other projects within MsCIP that are not reactive to Hurricanes Katrina, Rita and Cindy damage. 16

* **New FPEIS Section 5.17.8 (pg. 5-7)** – Under Section 5, *Description of Tentatively Selected Comprehensive Plan Components*, we suggest that a new Section 5.17.8 could be added to discuss the section 404 permit program. This new section could make the following recommendations: 1) that the federal permitting program use the flexibility within the CWA section Guidelines to their fullest extent, using the information found within this document, the references within, and Environmental Appendix A to ensure that only water-dependent projects be located in the high-risk zones, 2) that these projects go through the maximum review allowed by law to ensure that there are no other upland alternatives, 3) that the waters of the United States within the high-risk areas be avoided to the maximum allowed by law, 4) that the project minimize to the greatest extent allowed by law for impacts to waters of the United States within the high-risk areas, and 5) that any compensatory mitigation replace the ecological services that protect humans from flooding and storm surges. In essence, this new section in the FPEIS would be an analysis of the permits issued by the Mobile District that were in the high-risk areas, identify where the mitigation areas for these permits were located, and recommend that essentially only water dependent projects would be permitted in these high-risk areas. 17

▸ ENVIRONMENTAL APPENDIX A

* **Saltwater Intrusion** – Saltwater intrusion is traditionally defined as the migration of saltwater upstream in coastal rivers and upgradient in groundwater. Accordingly, EPA currently believes that there are no projects in Mississippi which warrant action primarily due to saltwater intrusion, although we agree that hurricane surges raised the salinity of Mississippi Sound and storm surges and salt sprays resulted in some coastal freshwater wetlands becoming brackish. Saltwater intrusion could be a significant issue if freshwater diversions occur on the mainland or there is a significant change to the barrier islands. Unlike the well-documented issues with saltwater intrusion in Louisiana, this particular component is not as important in Mississippi. Therefore, at this time, we do not agree with the importance of the sixth bullet on page ES-5 (or page 14 of 420 for a CD Adobe Reader) under Section ES-4.1.1.1 in the Environmental Appendix (A) which states: "Recommend implementable projects directed at either the stabilization or retreat of saltwater intrusion in the coastal zone exacerbated by the hurricanes, and to examine opportunities for minimization of saltwater intrusion during future events." We base our concern on the fact that hurricanes are natural events, minimal diversions of freshwater have been documented in Mississippi causing saltwater intrusion; no drinking water wells have shown increased conductivity, no freshwater systems have been replaced by saltwater vegetated systems, and the creation and maintenance of drainage channels along the coast decrease the resistance of saltwater intrusion during storm surges (i.e., the channels flow both ways). There has been no identifiable location where treated sewage effluent would benefit the freshwater head during the last four years of the "wastewater to wetlands" coordinated efforts between EPA Region 4 and Mississippi Department of Environmental Quality (MS DEQ). Relative to saltwater intrusion, we also note the following: 18

+ Mississippi Sound: Saltwater increased salinity has been linked in this document with saltwater intrusion. Significant changes in the hydrology between the Gulf of Mexico and the Mississippi Sound would change the salinity gradient within the sound and may cause ecological changes within the Sound as expressed on page 45, but the link to saltwater intrusion on the mainland is unclear.

+ Pearl River: Page 21 (or page 50 of 420 for a CD Adobe Reader) in Section 1.2.2.4 in the Environmental Appendix (A) links the loss of sediment with freshwater flows coming from the Pearl River in western Hancock County. When EPA and MS DEQ evaluated these areas, there may have been edges of major intertidal channels recovering from the temporary saltwater flooding and scouring resulting from the surge, but no large landscape-sized areas for projects of concern at this time.

+ Hancock County Marsh: We find that Katrina's impact is accurately described for this project (page 24, or page 50 of 420 for a CD Adobe Reader, in Section 1.2.2.4.2 of the Environmental Appendix A). The physical barrier (sand dune) that allowed freshwater marsh to exist was breached by Katrina, the freshwater marsh was significantly impacted by saltwater intrusion and the breach shows no sign of natural closure.

* **Wetland Restoration** – We strongly support lines 13 and 14 on page 162 (or page 191 of 420 for a CD Adobe Reader) in the category entitled *Advanced Design Studies for Innovative Concepts* in Section 5.6.5 of the Environmental Appendix (A), which state: *Wetland Restoration along main drainage systems to increase capacity of flood storage during rainfall and storm events.* However, we strongly disagree with lines 13-15 on page 18 (or page 291 of 420 for a CD Adobe Reader) in Section 3.1 *Environmental Effects* which states: *Public Safety – It is anticipated there would be minimal positive effects to public safety by implementation of this measure as wetland restoration would benefit water quality, wildlife habitat, and various natural resource functions.* Because we believe there would be public safety benefits, this paragraph should be replaced with: (19)

> *Public Safety – It is anticipated there would be intrinsically significant positive effects to public safety by implementation of this measure as wetland restoration would displace humans and capital improvements preventing loss of life and allowing "attractive nuisances" from luring people into high-risk areas and increasing the economic loss of capital improvements within high-risk areas. Wetland restoration would also benefit water quality, wildlife habitat, and various natural resource functions.*

* **Section 404 Permitting Decisions for High-Risk Areas** – To complement the prospective permitting recommendations in new Section 5.17.8, a reference to the COE's permitting decisions for high-risk areas could also be added in Appendix A. This discussion might also be included in Section ES-2.1 (*Problems and Opportunities*) on page ES-1 (or page 10 for a CD Adobe Reader) of the Environmental Appendix (A) addressing problems and opportunities to underscore the CWA Section 404 Permitting Program. Specifically, we recommend an expansion of the final paragraph on page ES-2, i.e., adding the following second sentence: (20)

> *The Federal government should to its fullest extent support the Governor's guidance with the CWA section 404 permitting program by fully integrating to the maximum extent of the CWA 404(b)(1) to support this direction, especially in high-risk areas.*

* **Turkey Creek Ecosystem Restoration (Sec. 5.18.6.1)** – Turkey Creek is located in north Gulfport within the impaired Turkey Creek Watershed. This watershed is classified as a priority watershed by the State of Mississippi and EPA. According to the DPEIS, the area is "becoming increasingly urbanized and development pressures are resulting in increased wetland degradation and loss by direct filling with the incumbent decrease in flood storage capacity." The area proposed for restoration is an 880-acre site of primarily undeveloped land. It contains a railroad berm that runs east-west, dirt road paths, and several miles of drainage ditches. The Draft Comprehensive Plan indicates that 689 acres are south and 190 acres are north of the existing railway. The area is made up primarily of pine savannah wetlands. The recommended plan includes the restoration of 689 acres of undeveloped land south of the railroad berm. The restoration will include filling the previously drained ditches, excavating and removing existing roadbeds and associated fill, and maintaining vegetative growth by burning the project area (mow and burn). (21)

In an unrelated project within the Turkey Creek Watershed, MDOT recently agreed to purchase approximately 1,625 acres within the Turkey Creek Watershed as part of a mitigation package for impacts related to the proposed Interstate 10 connector. Much of the area proposed for MsCIP restoration may be included within this mitigation area. We have enclosed a copy of a preliminary map overlaying the areas proposed for MDOT purchase for the COE's consideration (Fig. 1). The entire area will be managed by the MDMR in their Coastal Preserves Program and the Land Trust will maintain the right to manage and coordinate the conservation and management of a portion of the property. While MDOT will purchase the property, additional funding and support will be needed to help restore the functions of the wetland. EPA recommends that the MsCIP coordinate with the MDMR Coastal Preserve Program and the Land Trust on this restoration effort.

In addition, EPA suggests that the MsCIP use this as an opportunity to expand the restoration effort in this area (i.e., eastward) given that MDOT has already agreed to purchase some of the acreage proposed in this plan. As the Draft Comprehensive Plan clearly notes, Turkey Creek and its communities are facing ongoing development pressure and have experienced severe storm and hurricane damage in the recent past. The MsCIP Draft Comprehensive Plan, communities of Turkey Creek and the Land Trust have identified areas within the Turkey Creek Watershed for restoration to further reduce future flood and hurricane damage. We have enclosed a map of the proposed greenway (Fig. 2) and the already purchased portion of the greenway (Fig. 3) for your consideration.

* **<u>Forest (Forrest) Heights Alternative (Sec. 4.15 and 5.184)</u>** – The community of Forest (Forrest) Heights, a historical African-American community located within the Turkey Creek floodplain, experienced flood and hurricane damage during Hurricane Katrina. The community currently has an existing earthen levee (6 ft wide and 16.5 ft high, NGVD) that was damaged during Hurricane Katrina and does not meet current standards for certification based on FEMA flood profiles. The Draft Comprehensive Plan proposes to reduce future storm damage to Forest (Forrest) Heights by elevating the levee to 17 feet or 21 feet. EPA does not support levee construction as a viable means of reducing the risk to public health. However Forest (Forrest) Heights maybe an exception, given the fact that the levee already exists and the residents would like it to remain in place. The community should be clear that while this alternative reduces the magnitude of storm and hurricane damage to property, the levees are not intended to be health protective. Therefore, during major hurricane events, there should be a hurricane evacuation strategy in place with which the community is familiar. The proposed 17-foot levee elevation project will impact approximately 19.85 acres of non-tidal wetlands and 23 acres will be impacted by the preferred 21-foot levee. According to the Draft Comprehensive Plan, these impacts will be mitigated within the Turkey Creek Watershed. EPA notes that the Mississippi Land Trust has worked with a number of federal and state resource agencies and communities within Turkey Creek to identify potential mitigation areas, and would therefore be a valuable resource. 22

(23)

* **<u>High Risk Hazard Area Risk Reduction Plan (Sec. 5.17.4)</u>** – The Draft Comprehensive Plan recommends implementing phase 1 of HARP in the most critical areas. EPA supports the use of the maps to identify the risk zones and maximum probable intensity surge (MPI). We also support the necessity for these products for use in federal, state, local and community decision-making and planning. The plan proposes to relocate approximately 2,000 structures or communities within the high-risk areas where owners have not rebuilt. EPA agrees with the COE's assessment that there are numerous advantages to such a program including improved public health and safety (pg. 5-8). Nevertheless, concerns were expressed at public meetings regarding mass community relocation. To alleviate these concerns, opportunities should be created for ongoing communication and meaningful public involvement regarding the recommended proposal. The Long-Term HARP recommendation targets structural acquisition and relocation over the next 20-40 years for the benefit of reducing future storm and hurricane damage. EPA supports measures to study these alternatives further. In addition, it would be helpful to incorporate maps of the demographics within the project area (i.e., income, racial composition, etc.) as an additional tool of comparison. These maps should be related to the recommendations proposed and can be incorporated under the sections that relate to risk reduction or environmental justice.

* **<u>Moss Point Municipal Relocation (Sec. 4.13 and 5.18.2)</u>** – The city of Moss Point is located next to the Escatawpa River shoreline in a low-lying, flood-prone area. The city facilities were seriously damaged and municipal services were affected for a significant period of time. Consequently, the Draft Comprehensive Plan proposes to relocate the municipal facilities (i.e., city hall, police station, fire station, community services) to a lower risk site to minimize the potential for future flood damage. It is anticipated that these relocations will occur in largely developed areas. Therefore, minor vegetative, fish and wildlife impacts are anticipated. The current site will be converted to a community greenspace that would buffer the City from the Escatawpa River. According to the Draft Comprehensive Plan, four relocation sites are shown on the Moss Point Relocations Pilot Map (elevation 12.0: Section 5.18.2). The FPEIS (Section 5.18.2) should indicate where this map is located within the document. (24)

- **RISK APPENDIX G**

The MsCIP used a risk-based planning approach to assess and characterize the public and stakeholder's risks related to existing and future without-project conditions, the potential risks, uncertainties and consequences associated with proposed or recommended measures. The COE used a "Risk-Informed Decision Framework" (RIDF) to request and capture information (environmental, societal, economic, etc) from various stakeholders and the public regarding the risks, costs and consequences of flood control, coastal restoration and hurricane protection. EPA participated in the process with various other federal and state agencies. The framework also involved weighting or ranking of our respective priorities. The COE was then able to provide quick interagency feedback regarding our preferences on specific environmental, social, economic and public health metrics. This information was then used collectively in the analysis, evaluation, comparison of alternatives, and the selection of final project recommendations. EPA (25) commends the COE on its ability to integrate sound science, state of the art technology, and stakeholder involvement in a relatively seamless and transparent process designed to find solutions to reduce the potential for continued residual risk from flood and storm surge inundation, coastal wetlands loss and degradation, erosion and saltwater intrusion, in ways that would promote greater resiliency in the future.

- **BARRIER ISLANDS APPENDIX H**

The Barrier Island Appendix H should discuss the COE's "Best Use of Dredged Material" with emphasis that clean sands from "new work" (e.g., deepening), as opposed to fines from "maintenance work", be considered first for use on the renourishment of the Barrier Islands. For example, newly exposed sands associated with the Gulfport expansion permit (out on public notice since 2007), which identified upland or an offshore ODMDS for disposal, might be suitable sands for island renourishment. Increased coordination between the Mobile District Planning, Operations, and Maintenance Divisions should help efficiently and effectively find ways of maximizing the best use of dredged material. 26

FIGURE 1:
Proposed MDOT Lands (1,625 ac) in Turkey Crk.

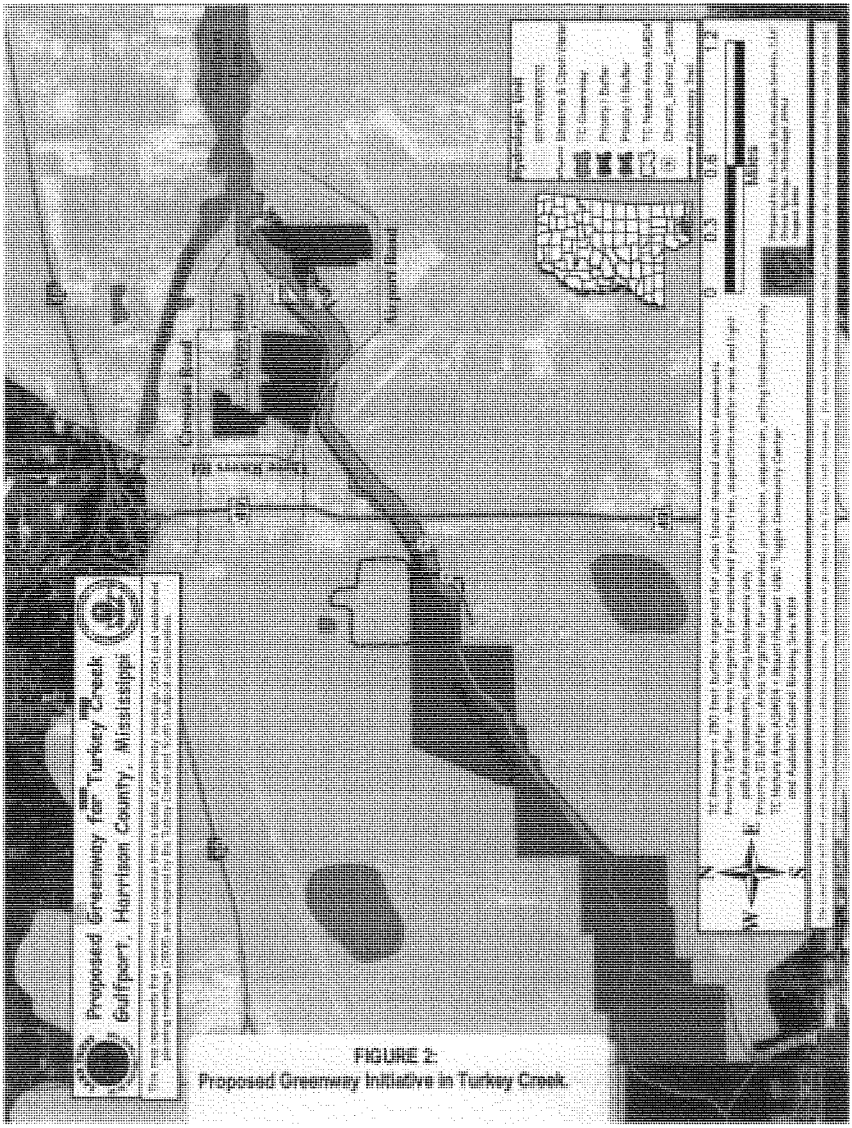


FIGURE 2:
Proposed Greenway Initiative in Turkey Creek

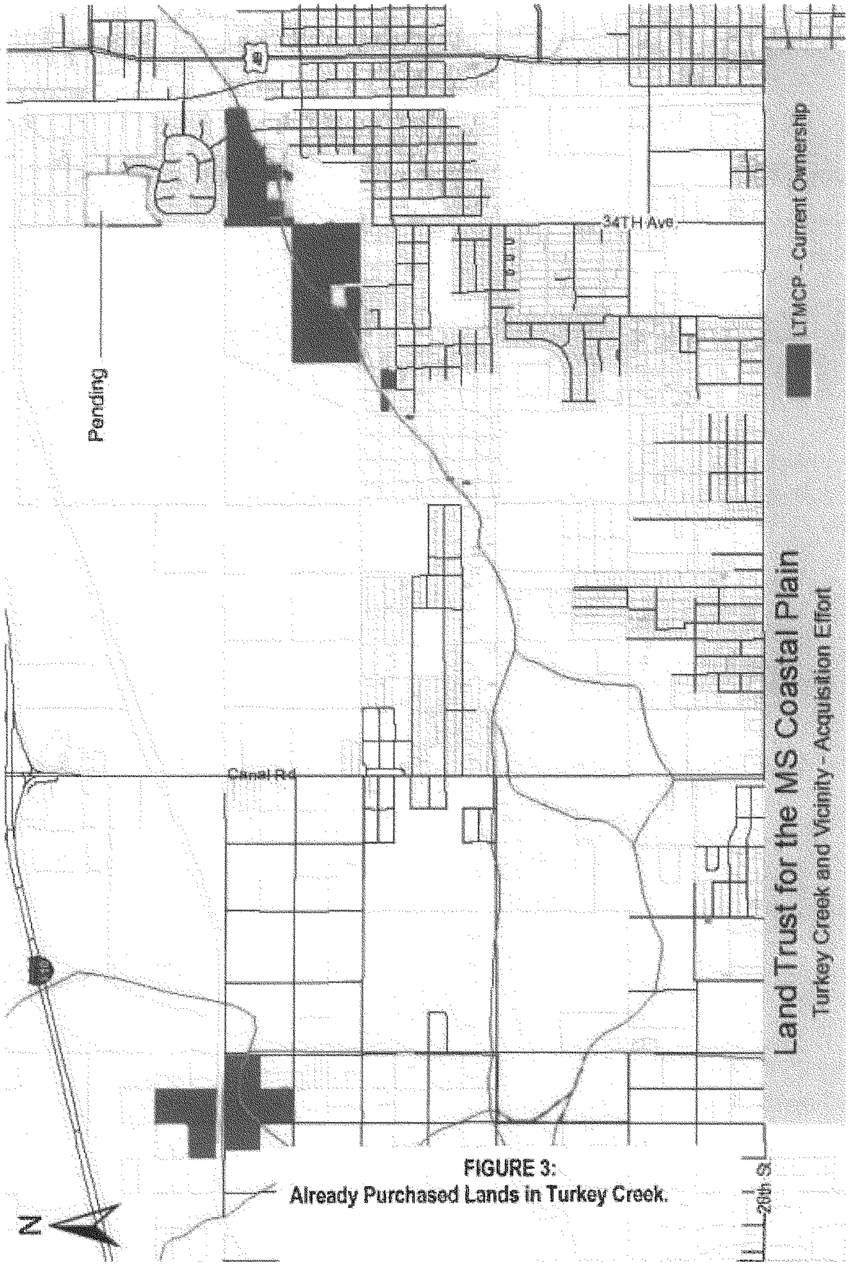


FIGURE 3:
Already Purchased Lands in Turkey Creek.

Response to U.S. Environmental Protection Agency, Letter dated March 27, 2009

Comment Response 1: Thank you for your continued support on the MsCIP effort.

Comment Response 2: Non-concur. In response to major damages on the coast of Mississippi as a result of Hurricane Katrina, Congress directed the U.S. Army Corps of Engineers (Corps) to conduct an analysis and design for comprehensive modifications and improvements in the Mississippi coastal area for the purposes of hurricane damage reduction, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and other related water resources purposes. This authorizing language specifically identifies saltwater intrusion.
Repo

Comment Response 3: Comment noted.

Comment Response 4: The MsCIP team has evaluated all feasible means of providing risk reduction in coastal Mississippi. In some cases, ring levees type structures may be acceptable means of reducing risk. We have identified 7 areas which may be appropriate for further study. As discussed in the report risk education is an important component of any structural feature. At Forrest Heights, the levee currently exists but not at an elevation or design configure that can be certified. Our proposal would result in such a certifiable structure and compaptiable with the National Flood Insurance Program.

Comment Response 5: Comment noted.

Comment Response 6: Non-concur due to ongoing coordination internally within the Corps. Regulatory activities in coastal Mississippi are closely coordinated with the MsCIP team to ensure the avoidance of conflict to the maximum extent practical. We do not believe it is appropriate to add information permitting in this report.

Comment Response 7: The additional studies described above are contained in the Barrier Island Appendix, Chapter 7. In accordance with the Regional Sediment Management Practices, all sediments, both from new and maintenance work, is being put to beneficial use. Much of the new work materials contains an over-abundance of fines and thus may make it unsuitable for placement on the barrier islands, but it may be suitable for littoral zone placement.

Comment Response 8: Comment noted.

Comment Response 9: Comment noted and the text reading as the following will be added to the document, "5. Restore and maintain State water quality." The MsCIP team and Regulatory Division within the Corps, Mobile District continues to coordinate efforts jointly. In addition, the Corps, Mobile District has been coordinating with MDMR to enhance restoration opportunities in the State of Mississippi.

Comment Response 10: Non-concur. Refer to Comment response 2. The State of Mississippi has been coordinating with the State of Louisiana for over twenty years to redirect freshwater flows from the State of Louisiana back into Mississippi Sound. Saltwater intrusion in the MsCIP report is focused upon changing salinities in Mississippi Sound and salinities have been heighted greatly by the loss of the barrier islands. In addition, diversion structures on numerous riverine systems have also greatly reduced freshwater input into Mississippi Sound.

Comment Response 11: Comment noted. The HARP has been designed to be a flexible willing seller program to ensure implementation and reduce community/societal impacts.

Comment Response 12: Comment noted.

Comment Response 13: Comment noted.

Comment Response 14: Comment noted.

Comment Response 15: Concur. We have added a specific category for wetlands.

Comment Response 16: Comment noted – See response to comment 2.

Comment Response 17: Comment noted – See response to comment 6.

Comment Response 18: Non-concur. The State of Mississippi has been coordinating with the State of Louisiana for over twenty years to redirect historic freshwater flows from the State of Louisiana back into Mississippi Sound. Historical flows were diverted by man-made structures built in the State of Louisiana. MDMR has been coordinating with the State of Louisiana to reroute these historic flows, which have been documented in the Corps, New Orleans District's 1984 Feasibility Study for Bonne Carre. This study considered alternatives for a diversion structure at Bonne Carre and Violet. Saltwater intrusion in the MsCIP report is focused upon changing salinities in Mississippi Sound and salinities have been heighted greatly by the loss of the barrier islands.

Comment Response 19: Comment noted and text will be updated.

Comment Response 20: See response to comment 6.

Comment Response 21: We appreciate the provided information by your agency. The MsCIP team and Regulatory Division within the Corps, Mobile District continues to coordinate efforts jointly in coastal Mississippi, and more specifically in the Turkey Creek watershed. In addition, MsCIP team members have been coordinating with Regulatory Division and participated in meetings with MDOT. These recent developments of MDOT purchasing 1,625 acres within the watershed have just happened within the last month during the public comment period of the DEIS. We are aware of the ongoing proposed mitigation effort and will work jointly with all involved entities to maximize our restoration efforts. The intent of restoration of this coastal land would be to relinquish title and provide to the State of Mississippi, Coastal Preserves.

Comment Response 22: Comment noted. Please note that the impacted acreages were reassessed due the levee realignment following publication of the report and were found to not reflect the most current area of impact. The acreages have changed from 19.85 acres and 23 acres of non-tidal wetlands for the 17-foot and 21-foot levee, respectively, to 1.47 and 3.62 acres. A correction in the report will be made to reflect the change. Mitigation would be accomplished within the watershed following preparation of detailed plans and specifications and the refinement of impacts.

Comment Response 23: The high hazard area is defined by FEMA flood insurance

Comment Response 24: Concur. Maps are included in non-structural appendix.

Comment Response 25: Comment noted.

Comment Response 26: Comment noted.

Comment Response 27: The Corps currently utilizes all suitable sands into littoral zone placements under the practices of the Regional Sediment Management working group. New work in the area of Mississippi Sound and the Barrier Islands typically contains excessive amounts of dark colored, fine grained material that render it unsuitable for use at the Mississippi Barrier Islands, but is being proposed for use at the Chandeleur Islands along the Louisiana coast.

Minerals Management Service

From: Merritt, Stacie [Stacie.Merritt@mms.gov]
Sent: Monday, March 30, 2009 2:13 PM
To: Rees, Susan I SAM
Cc: Wikel, Geoffrey L
Subject: Subject: Draft Supplemental Environmental Assessment (EA) for the Missippi Coastal Improvement Porgram (MsCIP)

March 30, 2009

Hello Dr. Rees,

The Minerals Management Service has reviewed the February 2009 draft Supplemental Environmental Assessment (EA) for the proposed Mississippi Coastal Improvement Program. We appreciate the opportunity to review the draft EA and are pleased to provide the following comments for your use as you prepare the final document.

After reviewing the draft EIS, more information is needed regarding the potential impacts involved with the identification, extraction, and use of sediment resources. While site-specific analysis for marsh creation and beach restoration projects will address the use of specific borrow areas, the programmatic document should consider relevant offshore resources over the appropriate spatial domain and reasonably foreseeable impacts to those resources that may result from the proposed action. For example, the EIS should discuss conflict of use, possible archeological stipulations, oil and gas infrastructure, and method of extraction of sand/sediment.

The document was thoroughly reviewed by our subject matter experts in Headquarters and our regional office. If you have any questions, please feel free to contact me. Also, if you would like our comments in paper form and on letterhead, we could provide them.

Thanks,

Stacie M. Merritt

Physical Scientist

Minerals Management Service

Coastal Program Section - Sand & Gravel

504-736-3276

Response to Minerals Management Service, Email dated March 30, 2009

Comment Response: Additional details will be provided in the tiered environmental documentation, such as the Supplemental Environmental Impact Statement (SEIS), to be prepared for the barrier island restoration efforts. Sites have been identified in only general terms (i.e. St. Bernard Shoal) in this Programmatic Integrated Environmental Impact Statement and will possibly be eliminated due to closer sand sources being identified. Thus, additional details concerning potential impacts involved with identification, extraction, and use of sediment resources will be provided in the tiered NEPA environmental documentation.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505

March 30, 2009   F/SER46:MT

Colonel Byron G. Jorns
District Engineer, Mobile District
Planning and Environmental Division
Department of the Army, Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Jorns:

NOAA's National Marine Fisheries Service's (NMFS), Southeast Region, Habitat Conservation Division, has reviewed the Draft Programmatic Environmental Impact Statement (DPEIS) dated February 2009 regarding the Mississippi Coastal Improvement Program (MsCIP) proposed plan for Hancock, Harrison and Jackson Counties, Mississippi.

Federal agencies that have jurisdiction by law or special expertise with respect to any environmental impact resulting from an agency action are required to comment on draft environmental impact statements (*See* 40 C.F.R. §1503.2). NOAA maintains expertise and jurisdiction by law over the nation's marine resources and offers the following comments and recommendations on the DPEIS.

Description of the Proposed Action

The DPEIS analyzes the potential environmental consequences of implementing a comprehensive plan in the interests of hurricane/storm damage reduction, ecosystem restoration, erosion control, and saltwater intrusion prevention. The Corps of Engineers recommended plan consists of system-wide and site specific structural and non-structural solutions that would aid in the recovery of coastal Mississippi from damages caused by Hurricanes Katrina, Rita, and Cindy that occurred in 2005. The NMFS has participated in the development of the plan and finds the DPEIS adequate in identifying and addressing those projects that are acceptable for advanced design and implementation.

The following components of the plan are presented in support of a Record of Decision: Coastal Wetland and Forest Restoration at Turkey Creek, Bayou Cumbest, Dantzler, Admiral Island and Franklin Creek; Submerged Aquatic Vegetation (SAV) restoration; Coast-wide Beach and Dune

Restoration; Waveland Flood Proofing; and Forrest (Forest) Heights Hurricane and Storm Damage Reduction. The DPEIS does address other components of the plan, such as Deer Island restoration, barrier island restoration, freshwater diversion at Violet, Louisiana, and others, but they are not presented in support of a Record of Decision at this time.

Magnuson-Stevens Fishery Conservation and Management Act (16 U. S. C. SS 1801 et seq.) and Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-667e)

The Coastal Wetland and Forest Restoration component will potentially involve 1,494 acres for restoration of coastal habitats by: 1) acquisition; 2) removing debris and exotic vegetation; 3) filling of the ditches; 4) excavating and removing existing roadbeds and any additional fill; and 5) maintaining the area as necessary. The NMFS supports this component and believes that it will result in a positive impact to essential fish habitats (EFH) and associated living marine resources.

The SAV pilot project will provide important information that also has the potential to result in positive impacts to EFH and associated living marine resources. The NMFS supports this component as well. The decline in SAV in the Mississippi Sound since the late 1960's appears to be a result of various factors, both natural and anthropogenic. The basic restoration principle for the SAV restoration project is to locate an area that historically supported SAV, determine what factors contributed to its demise, and abate these factors. Some of the factors that should be individually and cumulatively considered in the pilot project include: light limitation; nutrient loading; freshwater inflows; and mechanical disturbances such as uncontained open water disposal of dredged material, shrimping, and recreational boating activities. We refer you to *Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters*[1] to assist in developing the pilot project.

The Coast-wide Beach and Dune Restoration; Waveland Flood Proofing; and Forrest (Forest) Heights Hurricane and Storm Damage Reduction components are expected to have no or minimal effects on EFH and living marine resources. For the components of the plan, such as Deer Island restoration, barrier island restoration, freshwater diversion at Violet, Louisiana, and others, that are not presented in support of a Record of Decision at this time, an EFH Assessment will need to be prepared and coordinated with NMFS as required by the Magnuson-Stevens Fishery Conservation and Management Act, once the plans are more fully developed.

The NMFS commends the Corps on this comprehensive approach for providing protection to the citizens of Mississippi from many of the potential effects of future hurricane or severe storm events. The NMFS looks forward to continuing our collaborative working relationship with the Corps on the implementation of this recommended plan and in the further consideration of the other components currently being considered by the MsCIP. Please direct related habitat questions to the attention of Mr. Mark Thompson at the Panama City, Florida Office. He may be

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1 Fonseca, M.S., et al. 1998. Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters. NOAA Coastal Ocean Program Decision Analysis Series No. 12

reached at 3500 Delwood Beach Road, Panama City, Florida 32408-7403, by telephone at (850) 234-5061, or by email at Mark.Thompson@noaa.gov.

Sincerely,

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

Response to National Marine Fisheries Service, Letter dated March 30, 2009

Comment Response 1: Comment noted.

Comment Response 2: Comment noted.

Comment Response 3: Comment noted.

Comment Response 4: Comment noted and additional coordination will be conducted by the Corps, Mobile District with the NMFS-HCD for EFH assessments on projects, such as Deer Island restoration, barrier island restoration, freshwater diversion at Violet. Louisiana.

MISSISSIPPI DEPARTMENT *of* ARCHIVES AND HISTORY

MDAH

HISTORIC PRESERVATION
Ken P'Pool, director • Jim Woodrick, acting director
PO Box 571, Jackson, MS 39205-0571
601-576-6940 • Fax 601-576-6955
mdah.state.ms.us

March 5, 2009

Dr. Susan I. Rees
Program Manager, Mississippi Coastal
Improvement Program
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628-0001

RE: Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (EIS) for the Mississippi Coastal Improvements Program (MsCIP), MDAH Project Log #02-069-09, Hancock, Harrison and Jackson Counties

Dear Dr. Rees:

We have reviewed the Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (EIS) for the Mississippi Coastal Improvements Program (MsCIP), received on February 9, 2009, in accordance with our responsibilities under Section 106 of the National Historic Preservation Act and 36 CFR Part 800. After review, there is certainly the potential to affect cultural resources. As such, we look forward to working with the Mobile COE to develop an overall process through which potential impacts would be addressed for specific project development, as indicated on page 4-32 of the document.

If you have any questions, please call me at 601-576-6940.

Sincerely,

Jim Woodrick
Review and Compliance Officer

FOR: H.T. Holmes
State Historic Preservation Officer

c: Clearinghouse for Federal Programs

Response to Mississippi Department of Archives and History, Letter dated March 5, 2009

Comment Response: Comment noted.

STATE OF MISSISSIPPI
HALEY BARBOUR
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TRUDY D. FISHER, EXECUTIVE DIRECTOR

March 31, 2009

Ms. Susan I. Rees, Ph.D.
Program Manager
Mississippi Coastal Improvement Program
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628-0001

Re: Draft Comprehensive Plan and
Integrated Programmatic EIS
For the Mississippi Coastal
Improvements Program
Jackson, Harrison, and Hancock
Counties, Mississippi

Dear Dr. Rees:

We have reviewed the Draft Comprehensive Plan and Integrated Programmatic EIS for the MS Coastal Improvements Program. The plan proposes a number of activities including rebuilding the barrier islands, wetland restoration, levees and real estate acquisition and relocation. We support the goals of the Mississippi Coastal Improvements Program as outlined in the Plan. As per our discussion, I understand that the Corps is not requesting a Water Quality Certification for the entire suite of projects at this time, but will bring the projects forward individually as they are designed. We expect to handle the projects in our normal review process as they are submitted for Water Quality Certification or other environmental approvals.

Thank you for the opportunity to review this document. We look forward to working with you on this effort.

Sincerely,

Robert H. Seyfarth, P.E., DEE
Chief, Water Quality Certification Branch
Environmental Permits Division

Response to Mississippi Department of Environmental Quality, Letter dated March 31, 2009

Comment Response: Comment noted and concur with statement.

MISSISSIPPI
DEPARTMENT OF WILDLIFE, FISHERIES, AND PARKS

Sam Polles, Ph.D.
Executive Director

May 4, 2009

U.S. Army Corp of Engineers
Mobile District
P.O. Box 109 St. Joseph Street
Mobile, AL 36602

To Dr. Susan I. Rees:

The Mississippi Department of Wildlife Fisheries and Parks would like to formally withdraw comments provided by the Mississippi Natural Heritage Program concerning the Mississippi Coastal Improvements Program (dated March 31, 2009). Please find attached a revised response letter (dated May 4, 2009) submitted in place of the previous (March 31, 2009) comments. We regret any inconvience this withdrawl process may cause you.

Sincerely,

Dr. Sam Polles
Executive Director
Mississippi Department of Wildlife, Fisheries and Parks
P.O. Box 451
Jackson, MS 39211
(601) 432-2400

MISSISSIPPI
DEPARTMENT OF WILDLIFE, FISHERIES, AND PARKS

Sam Polles, Ph.D.
Executive Director

May 4, 2009

U.S. Army Corp of Engineers
Mobile District
P.O. Box 109 ST. Joseph Street
Mobile, AL 36602

To Susan I. Rees:

The Mississippi Natural Heritage Program on behalf of the Mississippi Department of Wildlife, Fisheries and Parks has reviewed the Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement for the Mississippi Coastal Improvements Program (MsCIP) Hancock, Harrison, and Jackson Counties, MS. We concur with all information directly related to Sections 4.1.11 Comprehensive Plan Threatened and Endangered Species Impact and 4.2.10 HARP Threatened and Endangered Species Impact provided within this document.

Should further biological consultation be needed in regards to threatened and endangered species and/or their required habitats, we welcome the opportunity to work with you further. Please find the contact information listed below for MDWFP biologists that can be contacted for additional information about the specific T&E species listed in Table 2-1 of the MsCIP.

Species	Contacts
Alabama red-bellied Turtle (*Pseudemys alabamensis*) Black pine snake (*Pituophis melanoleucus* spp. *iodingi*) Eastern indigo snake (*Drymarchon corais couperi*) Gopher tortoise (*Gopherus polyphemus*) Green sea turtle (*Chelonia mydas*) Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) Inflated heelsplitter (*Potamilus inflatus*) Kemp's ridley sea turtle (*Lepidochelys kempii*) Loggerhead sea turtle (*Caretta caretta*)	Dr. Bob Jones, MDWFP-MMNS 2148 Riverside Drive Jackson, MS 39202 (601) 354-7303 Bob.jones@mmns.state.ms.us

Manatee (*Trichechus manatus*) Mississippi gopher frog (*Rana capito sevosa*) Yellow-blotched map turtle (*Graptemys flavimaculata*) Pearl darter (Pascagoulas River System)	
Brown pelican (*Pelecanus occidentalis*) Mississippi sandhill crane (*Grus canadensis pulla*) Piping plover (*Charadrius melodus*) Red-cockaded woodpecker (*Picoides borealis*)	Nick Winstead, MDWFP-MMNS 2148 Riverside Drive Jackson, MS 39202 (601) 354-7303 Nick.winstead@mmns.state.ms.us
Louisiana black bear (*Ursus americanus luteolus*)	Brad Young, MDWFP 1505 Eastover Drive Jackson, MS 39211 (601) 432-2400
Louisiana quillwort (*Isoetes louisianensis*)	Heather Sullivan, MDWFP-MMNS 2148 Riverside Drive Jackson, MS 39202 (601) 354-7303 Heather.sullivan@mmns.state.ms.us

Please feel free to contact us if we can provide any additional information, resources, or assistance that will help minimize negative impacts to threatened and endangered species and/or ecological communities. We are happy to work with you to ensure that our state's precious natural heritage is conserved and preserved for future Mississippians.

Sincerely,

Libby Hartfield

Libby Hartfield
Museum Director
Mississippi Museum of Natural Science
2148 Riverside Drive
Jackson, MS 39202
(601) 354-7303
Libby.hartfield@mmns.state.ms.us

Response to Mississippi Department of Wildlife, Fisheries, and Parks

1. Thank you for your comments.

2. We will continue to work with the Mississippi Museum of Natural Science as we move through implementation of the comprehensive plan.

City of Long Beach

WILLIAM SKELLIE, JR.
MAYOR

March 23, 2009

Dr. Susan I Rees
MsCIP Program Manager
Mobile District, U.S.
Army Corps of Engineers
P.O. Box 2288
Mobile, Al 36628

Re: Draft Comprehensive Plan and for the Mississippi Coastal Improvements Program (MsCIP)

Dear Dr. Recs:

On behalf of the citizens of Long Beach, Mississippi, I am writing to object to the exclusion of Cat Island from the initial restoration funding request described in Appendix H of the referenced report. From my constituent's perspective, Cat Island, which lies directly between the City of Long Beach and the Gulf of Mexico, is the most important of Mississippi's barrier islands as it protects our citizens and their property. Your draft report calls for additional study for Cat Island with no specific restoration funding included in table 8.1 "Summary of Costs for the Comprehensive Barrier Island Restoration Plan." In light of the current strain on the federal budget, it is imperative that the Corps pursue the restoration of Cat Island with the same sense of urgency and to the same degree as the barrier islands that protect our neighboring cities to the east.

As someone who grew up on the Mississippi Coast fishing and boating around Cat Island, it is obvious that the island needs additional sediment. According to a 2007 U. S. Geological Service Report, island land losses can be attributed to intense storm events, sea level rise, and the reduction in sand supply related to dredging navigation channels through the outer bars of tidal inlets. The report states: "Sand supply is the only factor contributing to barrier island land loss that can be managed directly to mitigate the losses by placement of dredged material so that the adjacent barrier island shores receive it for island nourishment and rebuilding."

We urge the Corps of Engineers and the State of Mississippi to revise the current draft plan and to prioritize the restoration of Cat Island by including it in the initial funding request along with Mississippi's other barrier islands.

Thank your for considering my comments.

Sincerely,

William Skellie, Jr.

cc: Congressman Gene Taylor
Dr. William Walker
George Boddie

Response to Mayor William Skellie, Jr., dated 23 March 2009

1. Thank you for your interest in the Mississippi Coastal Improvements Program and specifically the barrier island comprehensive restoration feature of the Comprehensive Plan.

2. Cat Island was never intended to be excluded from the barrier island comprehensive plan however, as described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies seem to indicate that littoral currents do not move sediments across the area known as Ship Island Pass. . Nourishment of Cat Island is not dependent upon a direct link with the other barrier islands, as it by itself if a critical component of the entire Mississippi Sound ecosystem. These and other issues, notably the private ownership of much of the island, will be addressed during the first year following authorization and funding and would be concurrent with other required studies for the remainder of the islands. We have indicated a requirement to perform additional studies to finalize the sediment budget and sediment transport processes and gain a full understanding of the nourishment needs of Cat Island.

In response to your and other concerns, we have revised the Barrier Island Appendix, specifically Chapters 3 and 7, to provide more detail for proposed studies at and immediately around Cat Island. In addition, the Summary of Costs, Table 8-1, will be amended to detail the $1 million dedicated for additional studies at Cat Island and a figure will be inserted in Section 7.3 that's shows a potential location for littoral zone placement east of Cat Island. The estimated cost of implementation of the comprehensive restoration plan feature contains funding for placement at Cat Island once the specific plan is designed.

NORTH GULFPORT COMMUNITY LAND TRUST *The Mission of the North Gulfport Community Land Trust is to protect the land, preserve t African American cultural heritage, and honor the ancestors of the North Gulfport Commun: through the creation of permanently affordable housing, community advocacy and reinvestme*

March 31, 2009

Army Corps of Engineer
District, Mobile
Dr. Susan I. Reese
Program Manager, Ms CIP
P.O. BOX 2288
Mobile, AL

Dear Dr. Reese

We are writing to express concerns with the plan to construct a levee in the Forest Heights subdivision as part of the Mississippi Coastal Improvement Program.

It is important to first state for the record that we strongly support the need for flood protection for the residents of Forest Heights. However, we feel that flood protection should be part of a larger plan to protect and restore the wetlands of the Turkey Creek watershed.

The current plan to build the levee fails to adequately consider the negative effects that it would have on wetlands, nearby homes, and the North Gulfport neighborhood. Due to poor drainage and clogged ditches, water cannot flow freely in the North Gulfport Community. While the Corps appears to believe that clearing and snagging of Turkey Creek will alleviate this problem, we believe that much of the problem is currently being caused by ditches that have been filled with sediment due to causes such as sediment pollution from construction sites. Much of this problem would be alleviated if the Corps did not issue a large number of section 404 permits to fill wetlands within the Turkey Creek watershed.

We are also concerned that this project will require operation and maintenance by a non-federal sponsor. The levee that currently surrounds Forest Heights is in a state of disrepair. The ditches in the North Gulfport Community are clogged from sediment runoff. If this infrastructure cannot be maintained currently, how are we to expect proper operation and maintenance of a larger levee system?

While it is true that there is a flooding problem within the Forest Heights subdivision, we have witnessed just as much flooding in North Gulfport after two days of heavy rainfall. We believe that this project would exacerbate flooding in the North Gulfport community. Water that once occupied the floodplain will now be blocked by this levee, worsening flooding in other areas of the community. In addition, this project will result in the loss of 19.85 acres of wetlands, an amount that the community cannot afford to lose. While the Corps has estimated the loss due to construction, there are no detailed plans of how

8208 Ohio Avenue, Gulfport, MS 39501
tel. 228-868-0250 / fax: 228-868-0701 / www.ngclt.org / nglandtrust@gmail.com

NORTH GULFPORT COMMUNITY LAND TRUST *The Mission of the North Gulfport Community Land Trust is to protect the land, preserve th African American cultural heritage, and honor the ancestors of the North Gulfport Communit through the creation of permanently affordable housing, community advocacy and reinvestment*

the Corps will mitigate for this loss within the watershed. We believe that a detailed mitigation plan should be included in this plan.
We recognize the need to protect all the communities in the Turkey Creek watershed and request that before this project is begun that the ditches in the community are unclogged and that the Corps wetland regulatory division halt future development in the wetlands of Turkey Creek. We strongly feel that the only way to prevent these communities from flooding is to stop the filling of wetlands in the Turkey Creek watershed and begin to restore what has been lost.

Sincerely,

Rose Johnson
Board President

Veronica Mulazeem
Veronica Mulazeem
Executive Director

8208 Ohio Avenue, Gulfport, MS 39501
tel. 228-868-0250 / fax: 228-868-0701 / www.ngclt.org / nglandtrust@gmail.com

Response to North Gulfport Community Land Trust, dated 31 March 2009

Response: The Mississippi Coastal Improvement Comprehensive Plan (MsCIP) feature at Forrest Heights includes the improvement of an already existing levee that would allow the residents of the community to be in compliance with the National Flood Insurance Program. This plan element is included specifically at the request of the Forrest Heights community and includes the provision for handling the interior drainage within the levee system. The wetland loss documented in the draft report was in error. Approximately 4 acres of nontidal wetlands would be impacted with the improvements. These wetlands will be mitigated within the Turkey Creek watershed. In addition we have included limited clearing and snagging of the Turkey Creek to facilitate the flow of rainwater into Bernard Bayou. Other activities in the Turkey Creek Watershed include the acquisition and restoration of over 600 acres of wet pine savannah habitat through the restoration of the hydrology and removal of exotic species.

We currently coordinate permitting activities in the Turkey Creek watershed between Regulatory Division and the MsCIP team to ensure that additional flooding would not result from permitted activities. We have investigated flooding in the North Gulfport area for a number of years but have not been able to develop a feasible solution. Although some of the problems are due to the permitted loss of wetlands a large amount of the flooding is due to development which falls outside of the USACE regulatory arena. For example, the issue of local drainage, which you mention as being of prime concern, is not a mission of the USACE but rather of local government. We will work with the residents of the area, to the maximum extent possible, to resolve thee issues.

John Thomas Longo, Mayor

March 25, 2009

Dr. Susan I. Rees
Program Manager, MsCIP
Mobile District USACE
P.O. Box 2288
Mobile, AL 36628

Dear Ms. Rees,

Please consider comment to the Corps on their draft MsCIP program.

The Corps is proposing to nourish all of the islands east of the ship channel with no definitive nourishment activities planned for Cat Island. Actually, they have produced a new study that contradicts every written study and report about coastal processes in Mississippi, now claiming that Cat Island is not part of the same littoral system.

Points to consider including comments:

Coastal processes included in the draft document are contrary to almost all previous coastal studies and documents ever written by coastal scientist, academia, and even the Corps of Engineers.

Cat Island lies between the western half of the Mississippi mainland and the Gulf of Mexico and it should be give equal importance, as it protects the western half of our state from storm events.

This includes the cities of Waveland, Bay St. Louis, Pass Christian, Long Beach and the western half of Gulfport.

The NPS owns approximately 40% of Cat Island, and discussions are under way with the State of Mississippi and NPS to purchase most of the remainder. A 20-year implementation plan absent more definite restoration plans for Cat Island is short sided.

The Draft Mississippi Coastal Improvements Program (MsCIP) doesn't include any definitive restoration items to be implemented for Cat Island.

Goose Point on the southern most end of the island should be restored as one of the early features of the plan.

Lili Stahler, Alderman Ward #1 • Ricky Geoffrey, Alderman Ward #2 • Brian Schmitt, Alderman Ward #3
Charles Piazza, Alderman Ward #4 • Robyn C. Gavagnie, City Secretary • Zach Butterwoth, City Attorney
Post Office Box 539 • Waveland, Mississippi 39576 • 228-467-4134 • Fax 228-467-3177
mayorsoffice@mchsi.com / w.cityhall@mchsi.com

A littoral zone disposal area west of the Gulfport Ship Channel and southeast of Cat Island should be included in the plan similar to the disposal zones identified for the eastern half of the coast.

Costs for this nourishment site for Cat Island should be included in Table 8-1 of the document.

All material from the ship channel maintenance and improvements should be pumped westward to the Cat Island littoral zone.

The refurbishment of Cat Island is extremely important to the future protection and quality of life in the City of Waveland. Thank you for your consideration of this much-needed project.

Sincerely,

John T. Longo

Mayor John Thomas Longo

Response to Mayor John Longo, dated 25 March 2009

1. Thank you for your interest in the Mississippi Coastal Improvements Program and specifically the barrier island comprehensive restoration feature of the Comprehensive Plan.

2. Cat Island was never intended to be excluded from the barrier island comprehensive plan however, as described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies seem to indicate that littoral currents do not move sediments across the area known as Ship Island Pass. . Nourishment of Cat Island is not dependent upon a direct link with the other barrier islands, as it by itself if a critical component of the entire Mississippi Sound ecosystem. These and other issues, notably the private ownership of much of the island, will be addressed during the first year following authorization and funding and would be concurrent with other required studies for the remainder of the islands. We have indicated a requirement to perform additional studies to finalize the sediment budget and sediment transport processes and gain a full understanding of the nourishment needs of Cat Island.

In response to your and other concerns, we have revised the Barrier Island Appendix, specifically Chapters 3 and 7, to provide more detail for proposed studies at and immediately around Cat Island. In addition, the Summary of Costs, Table 8-1, will be amended to detail the $1 million dedicated for additional studies at Cat Island and a figure will be inserted in Section 7.3 that's shows a potential location for littoral zone placement east of Cat Island. The estimated cost of implementation of the comprehensive restoration plan feature contains funding for placement at Cat Island once the specific plan is designed.

Barri Shirley

From: Smith, Thomas E SAM
Sent: Monday, March 23, 2009 7:48 AM
To: Rees, Susan I SAM; King, Ruda L SAM
Subject: Fw: Willing Seller Henderson Point Property Mississippi Baptist Convention Board

Attachments: ALTA SURVEY DATED 06-28-07.pdf; GBA Certificate of Title.pdf

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Message sent via my BlackBerry Wireless Device

From: Barri Shirley
To: Smith, Thomas E SAM
Sent: Fri Mar 20 16:38:36 2009
Subject: Henderson Point Property Mississippi Baptist Convention Board

Mr. Smith,

It was a pleasure meeting you this past Monday evening. You and your staff provided a well-organized and informative setting for the public hearing. That type of straight-forward approach is greatly appreciated.

Please officially add the Mississippi Baptist Convention Board as a "potential seller" to your property acquisition list for the first phase of the High Hazard Area Risk Reduction Program.

I will serve as the primary contact:

Mr. Barri A. Shirley

Associate Executive Director, Business Services

Mississippi Baptist Convention Board

P.O. Box 530

Jackson, MS 39205

601-292-3240

bshirley@mbcb.org

Attached you should find a description of the MS Baptist Convention-owned property at Henderson Point. Please let me know if/when additional information is needed.

Also, as discussed, if the Corp is interested in the concrete of the remaining buildings at our Henderson Point property, kindly connect me with the appropriate personnel to explore that option.

Again, thank you for your assistance in this matter.

In His service,

Barri A. Shirley

Response to Barri Shirley, dated 23 March 2009

Response: Thank you for your support of the Mississippi Coastal Improvements Program. We will keep you informed of the program progress.

MsCIP

Mississippi Coastal Improvements Program

US Army Corps of Engineers
Mobile District

A partnership of the Mobile District, U.S. Army Corps of Engineers and Local, State and Federal Agencies

Name: Aneice R Liddell Address: 4519 Jefferson Ave

City: Moss Point State: MS Zip: 39563 Email: ar.liddell@gmail.com

Primarily Participating as a...

- ○ Local Resident
- ● Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
- ○ Nongovernmental Organization
- ○ Academic Institution
- ○ Local Gov't Agency
- ○ State Gov't Agency
- ○ Federal Gov't Agency
- ○ Other ______

Please Check an Environmental Tentatively Selected Plan Element

Island and Beach Restoration
- ○ Barrier Island Restoration
- ○ Mainland Beach Restoration

Nonstructural Solutions
- ○ High Hazard Risk Reduction (HARP) Phase 1 Property Acquisition
- ● Pilot Projects: Moss Point Municipal Facility Relocation
- ○ Pilot Projects: Waveland Flood Proofing

Environmental Restoration
- ○ Coastal Wetland and Forest Restoration
- ○ Deer Island Ecosystem Restoration

Studies
- ○ Violet Freshwater Diversion
- ○ Submerged Aquatic Vegetation

- ○ Ecosystem Restoration Studies
- ○ Local Flood Risk Management Projects (Barriers and Levees)

Structural Projects
- ○ Forrest (Forest) Heights Levee

○ **Other** ______

Comments

This is a vital project for the City of Moss Point. All of our City facilities (first response entergy) must be relocated to better serve the citizens of Moss Point. This effort would take 20 yrs are more yrs without the help of the Corps of Engineers.

Following tonight's meeting you may continue to submit comments via our web portal at:

http://meetingroom.groupsolutions.us/

Comments will be collected for the U.S. Army Corps of Engineers, Mobile District through ***March 31, 2009.***

Mississippi Coastal Improvements Program

MsCIP

US Army Corps of Engineers
Mobile District

A partnership of the Mobile District, U.S. Army Corps of Engineers and Local, State and Federal Agencies

Name: Betty Wilson Address: 4200 Joseph St.
City: Moss Point State: MS Zip: 39563 Email: wilsonbetty42@yahoo.com

Primarily Participating as a...

- ● Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
- ○ Nongovernmental Organization
- ○ Academic Institution
- ○ Local Gov't Agency
- ○ State Gov't Agency
- ○ Federal Gov't Agency
- ○ Other ______________

==

Please Check an Environmental Tentatively Selected Plan Element

Island and Beach Restoration
- ○ Barrier Island Restoration
- ○ Mainland Beach Restoration

Nonstructural Solutions
- ○ High Hazard Risk Reduction (HARP) Phase 1 Property Acquisition
- ● Pilot Projects: Moss Point Municipal Facility Relocation
- ○ Pilot Projects: Waveland Flood Proofing

Environmental Restoration
- ○ Coastal Wetland and Forest Restoration
- ○ Deer Island Ecosystem Restoration

Studies
- ○ Violet Freshwater Diversion
- ○ Submerged Aquatic Vegetation

- ○ Ecosystem Restoration Studies
- ○ Local Flood Risk Management Projects (Barriers and Levees)

○ **Structural Projects**
- ○ Forrest (Forest) Heights Levee

○ **Other** ______________

==

Comments

I whole heartily support the plans for Moss Point.

Following tonight's meeting you may continue to submit comments via our web portal at:

http://meetingroom.groupsolutions.us/

Comments will be collected for the U.S. Army Corps of Engineers, Mobile District through ***March 31, 2009.***

Mississippi Coastal Improvements Program

MsCIP

US Army Corps of Engineers
Mobile District

A partnership of the Mobile District, U.S. Army Corps of Engineers and Local, State and Federal Agencies

Name: Bobby Johnson Address: 4329 McInnis Ave
City: Moss Point State: MS Zip: 39563 Email:

Primarily Participating as a...

- Local Resident
- Elected Official
- Industry/Commercial
- Native American Tribe
- Nongovernmental Organization
- Academic Institution
- Local Gov't Agency
- State Gov't Agency
- Federal Gov't Agency
- Other Deputy Chief of Police

Please Check an Environmental Tentatively Selected Plan Element

Island and Beach Restoration
- Barrier Island Restoration
- Mainland Beach Restoration

Nonstructural Solutions
- High Hazard Risk Reduction (HARP) Phase 1 Property Acquisition
- Pilot Projects: Moss Point Municipal Facility Relocation
- Pilot Projects: Waveland Flood Proofing

Environmental Restoration
- Coastal Wetland and Forest Restoration
- Deer Island Ecosystem Restoration

Studies
- Violet Freshwater Diversion
- Submerged Aquatic Vegetation

- Ecosystem Restoration Studies
- Local Flood Risk Management Projects (Barriers and Levees)

Structural Projects
- Forrest (Forest) Heights Levee

Other________

Comments

The Moss Point Police Dept building has been a corner stone in the city of Moss Point for many years. During these years this building has endured hurricanes + other related storms. This building is sitting in a flood zone and should be relocated to better serve the citizens of Moss Point.

Following tonight's meeting you may continue to submit comments via our web portal at:

http://meetingroom.groupsolutions.us/

*Comments will be collected for the U.S. Army Corps of Engineers, Mobile District through **March 31, 2009.***

Mississippi Coastal Improvements Program

A partnership of the Mobile District, U.S. Army Corps of Engineers and Local, State and Federal Agencies

Name: BRENDA KAY RAMM Address: 5107 GRIFFIN ST
City: Moss Point State: MS Zip: 39563 Email: Bkramm@cbcworldwide.com

Primarily Participating as a...

- X Local Resident
- o Elected Official
- X Industry/Commercial
- o Native American Tribe
- o Nongovernmental Organization
- o Academic Institution
- o Local Gov't Agency
- o State Gov't Agency
- o Federal Gov't Agency
- o Other ____________

Please Check an Environmental Tentatively Selected Plan Element

Island and Beach Restoration
- o Barrier Island Restoration
- o Mainland Beach Restoration

Nonstructural Solutions
- o High Hazard Risk Reduction (HARP) Phase 1 Property Acquisition
- X Pilot Projects: Moss Point Municipal Facility Relocation
- o Pilot Projects: Waveland Flood Proofing

Environmental Restoration
- o Coastal Wetland and Forest Restoration
- o Deer Island Ecosystem Restoration

Studies
- o Violet Freshwater Diversion
- o Submerged Aquatic Vegetation

- o Ecosystem Restoration Studies
- o Local Flood Risk Management Projects (Barriers and Levees)

- o **Structural Projects**
- o Forrest (Forest) Heights Levee

- o **Other** ____________

Comments

Please consider Moss Point for funding. We have great Resources and high potential.

Thank you
Brenda Kay Ramm
228 327 1669

Following tonight's meeting you may continue to submit comments via our web portal at:

http://meetingroom.groupsolutions.us/

*Comments will be collected for the U.S. Army Corps of Engineers, Mobile District through **March 31, 2009.***

Mississippi Coastal Improvements Program

MsCIP

US Army Corps of Engineers
Mobile District

A partnership of the Mobile District, U.S. Army Corps of Engineers and Local, State and Federal Agencies

Name: CHARLES L. MOBEN Address: 6332 MOSS POINT AVE.
City: MOSS POINT State: MS Zip: 39563 Email: ______________

Primarily Participating as a...

- Local Resident
- ✓ Elected Official
- Industry/Commercial
- Native American Tribe
- Nongovernmental Organization
- Academic Institution
- Local Gov't Agency
- State Gov't Agency
- Federal Gov't Agency
- Other ______________

Please Check an Environmental Tentatively Selected Plan Element

Island and Beach Restoration
- Barrier Island Restoration
- Mainland Beach Restoration

Nonstructural Solutions
- High Hazard Risk Reduction (HARP) Phase 1 Property Acquisition
- • Pilot Projects: Moss Point Municipal Facility Relocation
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- Ecosystem Restoration Studies
- Local Flood Risk Management Projects (Barriers and Levees)

Structural Projects
- Forrest (Forest) Heights Levee

Other ______________

Comments

I AM IN FAVOR OF THE NEED FOR THE PILOT PROJECT: MOSS POINT MUNICIPAL FACILITY RELOCATION

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Mississippi Coastal Improvements Program

MsCIP

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Name: Donna Joseph Address: 4400 Denny Ave

City: Moss Point State: MS Zip: 39563 Email: mossptf@bellsouth.net

Primarily Participating as a...

- ○ Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
- ○ Nongovernmental Organization
- ○ Academic Institution
- ● Local Gov't Agency
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Please Check an Environmental Tentatively Selected Plan Element

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Structural Projects
- ○ Forrest (Forest) Heights Levee

○ **Other** ____________

Comments

I am very much in support of the plans for Moss Point

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Mississippi Coastal Improvements Program

MsCIP

US Army Corps of Engineers
Mobile District

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Name: Jackie Webb Address: 4400 Denny St.

City: Moss Point State: MS Zip: 39563 Email: jwebb65@yahoo.com

***Primarily** Participating as a...*

- ○ *Local Resident*
- ○ *Elected Official*
- ○ *Industry/Commercial*
- ○ *Native American Tribe*
- ○ *Nongovernmental Organization*
- ○ *Academic Institution*
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- ○ *Federal Gov't Agency*
- ○ *Other* ____________

Please Check an Environmental Tentatively Selected Plan Element

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- ○ *Barrier Island Restoration*
- ○ *Mainland Beach Restoration*

Nonstructural Solutions
- ○ *High Hazard Risk Reduction (HARP) Phase 1 Property Acquisition*
- ● *Pilot Projects: Moss Point Municipal Facility Relocation*
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Environmental Restoration
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- ○ *Submerged Aquatic Vegetation*

- ○ *Ecosystem Restoration Studies*
- ○ *Local Flood Risk Management Projects (Barriers and Levees)*
- ○ ***Structural Projects***
- ○ *Forrest (Forest) Heights Levee*
- ○ ***Other*** ____________

Comments

I'm excited about plans for Moss Point.

Following tonight's meeting you may continue to submit comments via our web portal at:

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MsCIP

Mississippi Coastal Improvements Program

US Army Corps of Engineers
Mobile District

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Name: Michael A. Middleton Address: 4730 Gen Ike
City: Moss Point State: MS Zip: 3956 Email: Michael Middleton SR @ hotmail .com

Primarily Participating as a...

- Local Resident
- X Elected Official
- Industry/Commercial
- Native American Tribe
- Nongovernmental Organization
- Academic Institution
- Local Gov't Agency
- State Gov't Agency
- Federal Gov't Agency
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Please Check an Environmental Tentatively Selected Plan Element

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Structural Projects
- Forrest (Forest) Heights Levee

Other ______

Comments

I AM IN SUPPORT OF Moss Point MUNCIPAL Facility Relocation

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Mississippi Coastal Improvements Program

MsCIP

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Name: MICHAEL DALE Address: 4323 MCINNIS

City: MOSS POINT State: MS Zip: 39563 Email: ____________

Primarily Participating as a...

- ○ Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
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Please Check an Environmental Tentatively Selected Plan Element

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○ **Structural Projects**
- ○ Forrest (Forest) Heights Levee

○ **Other** ____________

Comments

THESE PROJECTS ARE IMPORTANT FOR OUR RECOVERY HERE MOSS POINT

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Mississippi Coastal Improvements Program

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Name: Robert Lawnghouse Address: 4323 McInnis Ave
City: Moss Point State: MS Zip: 39563 Email: fireeater1951

Primarily Participating as a...

- ○ Local Resident
- ○ Elected Official
- ○ Industry/Commercial
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- ○ **Structural Projects**
- ○ Forrast (Forest) Heights Levee

- ○ **Other** ____________

Comments

These projects are needed in order to revitalize the area and bring it to its pre-Katrina status. To continue our progress to normal living and working conditions all along the coast

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Mississippi Coastal Improvements Program

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Mobile District

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Name: [illegible] Address: [illegible]

City: [illegible] State: [illegible] Zip: [illegible] Email: [illegible]

Primarily Participating as a...

- Local Resident
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- Forrest (Forest) Heights Levee

Other ______

Comments

I support this project.

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Mississippi Coastal Improvements Program

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Name: Sheila Smallman Address: 4339 McInnis Ave
City: Moss Point State: MS Zip: 39563 Email: chiefsmallman@cableone.net

***Primarily* Participating as a...**

- ○ Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
- ○ Nongovernmental Organization
- ○ Academic Institution
- ○ Local Gov't Agency
- ○ State Gov't Agency
- ○ Federal Gov't Agency
- ● Other Chief of Police

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○ **Other**________

Comments

This is the best news I've received in months. In moving forward with my Department, a new building is a must. The current building's exterior is somewhat of an eye sore. The interior is small and cluttered, and the lobby & briefing room are only two of the areas I wish I could refrain from the public. I'm excited about a new building and know that my staff will be grateful as well. THANKS

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Mississippi Coastal Improvements Program

MsCIP

US Army Corps of Engineers Mobile District

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Name: Tabbitha S. Mosely Address: 3617 Hazelwood Dr.

City: Moss Point State: MS Zip: 39563 Email: tabbithamosely@yahoo.com

Primarily Participating as a...

- ● Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
- ● Nongovernmental Organization
- ○ Academic Institution
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Comments

Please consider Moss Point for funding. Moss Point have great resources and high potential.

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Mississippi Coastal Improvements Program

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Name: Tayna L. Franklin Address: 4412 Denny Street (Mailing Address)
City: Moss Point State: MS Zip: 39563 Email: taynafranklin@yahoo.com

***Primarily* Participating as a...**

- ○ Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
- ○ Nongovernmental Organization
- ○ Academic Institution
- X Local Gov't Agency
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- ○ Forrest (Forest) Heights Levee

○ **Other** ________

Comments

Please consider The City of Moss Point, MS for funding on The Community Center, Central Fire Station, City Hall & Police Station Projects as Facility Relocation Pilot Projects. Our city has a great need for these public facility buildings for services our → citizens as first responders.

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Mississippi Coastal Improvements Program

US Army Corps of Engineers
Mobile District

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Name: Virginia Jackson Address: 3607 Sherwood DR

City: Moss Point State: MS Zip: 39563 Email: vcsmosspoint@yahoo.co

Primarily Participating as a...

- ○ Local Resident
- ○ Elected Official
- ○ Industry/Commercial
- ○ Native American Tribe
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Comments

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Response is applicable to the following 15 commenters from the Moss Point area:

Anise Liddell
Betty Wilson
Bobby Johnson
Brenda Kay Ramm
Charles Molden
Donna Joseph
Jackie Webb
Michael Middleton
Michael Jace
Robert Lavinghouse
Roland Mims
Shelia Smallman
Tabbitha Mosely
Tayna Franklin
Virginia Jackson

1. Response. Comment noted. Thank you for your interest in the Mississippi Coastal Improvements Program.

MAR-19-2009 01:43P FROM: TO:2516902704 P.1/1

23098 Freddie Frank Rd.
Pass Christian, MS 39571

Five Star Assoc.

Fax

To: DR. Susan | From: Andrew Park (91742)
Fax: 601-914-2907 | Pages: 1
Phone: 228-324-3063 | Date: 3/19-09
Re: Land meeting | CC:

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply

• Comments: Enjoyed the meeting/Company with Everyone. I agreed with all issues they are long over due

Sincerlly
Andrew

Response to Andrew Park dated 19 March 2009

Response: Thank you for comment and support of the Mississippi Coastal Improvements Program.

Bill Stone_10

From: BStone001@aol.com
Sent: Monday, March 30, 2009 3:47 PM
To: Rees, Susan I SAM
Subject: MSCIP Main Report, general comments

Overall, I think that USACE did a good job on The Plan. It really represents lots of hard work by lots of people !!!

This Plan is very complex, technical, lengthy (nearly 2800 pages), and difficult to read for the general public and/or non-technical persons. Whenever I review such a document, I try to read it from the viewpoint of the general reader (not technical, engineer, environmentalist, etc.). Consequently, I concentrated on the Main Report & especially the Summary.

Suggest that a "Roadmap" be included somewhere in the Main Report prior to where the main text starts (Introduction page 1-1). This "Roadmap" will provide a cross-reference where the reader can locate all the information on a particular project, topic, or major subject. It is usually a table or spreadsheet relating for each salient item (project, topic, subject) where all the related information is located (which document, section and/or page number). Some Document software does this automatically. This really assists the reader to locate all the info or an item of interest & really saves the reader valuable time.

Oh sorry. I just realized that I forgot to include my name/contact on some of my previous e-mails.

Again, I greatly appreciate all USACE's efforts. Hopefully, Congress will approve & fund many of MSCIP plans for implementation.

THANX,
Bill Stone
Director, Pineville Community Assoc.
home (228)863-9703, cell (228)342-2969
bstone001@aol.com

Bill Stone_9

From: BStone001@aol.com
Sent: Monday, March 30, 2009 1:54 PM
To: Rees, Susan I SAM
Subject: MsCIP Main Report, 8 Glossary of Terms

This Glossary of Terms is really just an Acronym list. A glossary should really include a list of difficult or technical terms with definitions and/or brief description. This would really be helpful in addition to the acronyms.

Bill Stone
Director, Pineville Community Assoc.
home (228)863-9703, cell (228)342-2969
bstone001@aol.com

From: BStone001@aol.com
Sent: Monday, March 30, 2009 1:36 PM
To: Rees, Susan I SAM
Subject: MsCIP Main Report, Summary, Public Involvement...,page S-9

Overall I do not think that enough public involvement was nearly enough for such a vast, complex, costly & controversial project. It even seemed that USACE did not desire any public input or just ignored the public's comments/concerns.

During my 30 years of managing & working on many federal programs & projects for NASA, DoD, DoI, USAF, NOAA, USGS, etc., whenever applicable we really encouraged public input throughout the project. Since Hurricane Katrina the public has had way too many problems resulting from government agencies (e.g., FEMA, New Orleans levees, Mr. GO, etc.) trying to help but only creating more problems and generating way too much bureaucracy & paper work. We need immediate help to protect us from future storms !!!

I think that Congress would have a better Plan if the public was much more involved such as:

- Have more than a couple of public meetings where USACE presented very high level plans & limited public input.
- Suggest that USACE have several 1 or 2 day public workshops throughout the Plan development.
- My experience indicates having public representation as actual team members really improves the product.
- Suggest 1-2 day Final Review Workshops be held in various communities to obtain public support.

By getting much more Public involvement along with other federal/state/local agencies, Congress will be better assured of a much better Plan that is really representative of the Ms Coastal communities. The Public would be more likely to voice support for MsCIP to Congress. Currently, very little of the community is even aware of MSCIP.

Bill Stone
Director, Pineville Community Assoc.
home (228)863-9703, cell (228)342-2969
bstone001@aol.com

Bill Stone_7

From: BStone001@aol.com
Sent: Monday, March 30, 2009 12:44 PM
To: Rees, Susan I SAM
Subject: MsCIP Main Report, Summary, page S-3

It seems like the text at top of page S-5 should not be included under "Tentatively Selected Plan Features".

• Suggest adding a new title for clarity such as : "Water Resource Development Projects".

• Suggest adding an estimate of the costs to perform these studies.

Page S-5, line 20: Suggest adding a new title "Environmental Considerations and Analyses".

From: BStone001@aol.com
Sent: Monday, March 30, 2009 12:38 PM
To: Rees, Susan I SAM
Subject: MSCIP Main Report, Summary, Tenatively Selected Plan Features, pg S-3

Tentatively Selected Plan Features

• "These Projects are presented in support of a Record of Decision for construction:" What does "Record of Decision for construction" mean? Suggest a brief definition.

• Why are the "bullet" topics not even discussed? Suggest a very brief description of each "bullet" be added.

• Why are Deer Island, HARP & Barrier Islands discussed but are not included in the bullets?

• Under HARP no mention is made of the Pilot Project to purchase of a few (30?) properties in Hancock County. Also need to include cost.

• Table S-1: Suggest adding approximate Total Cost, so reader can see the total estimated costs that USACE is recommending for approval.

Bill Stone_5

From: BStone001@aol.com
Sent: Monday, March 30, 2009 11:52 AM
To: Rees, Susan I SAM
Subject: MsCIP Main Report, Summary, page S-1

paragraph titled "Planning & NEPA Process"

• NEPA is not defined. Assume it is National Environmental Policy Act. What is it? Suggest adding a brief description. NEPA is not mentioned or discussed in this section.

Bill Stone_4

From: BStone001@aol.com
Sent: Monday, March 30, 2009 11:19 AM
To: Rees, Susan I SAM
Subject: MsCIP Main Report, Summary - general comments

I assume that members of Congress will not attempt to read this very complex Report of nearly 2800 pages. Congress recently passed an extensive Stimulus Bill without even reading it !!!

So, the Summary is very important as this may be the only text read by some of Congress. Suggest that the Summary be written with less complex, engineering acronyms, language, and terms; so that is more "readable & understandable" by the majority of Congress who lack such engineering expertise.

From: BStone001@aol.com
Sent: Thursday, March 26, 2009 2:57 PM
To: Rees, Susan I SAM
Subject: MsCIP Main Report, sections 3.17.5.x & 3.17.6.x

The numbered subparagraphs under section 3.17.5 are miss numbered 3.15.5.x. These subparagraphs should be numbered 3.17.5.x. Same for section 3.17.6.x

Bill Stone
Director, Pineville Community Assoc.
bstone001@aol.com

From: BStone001@aol.com
Sent: Wednesday, March 25, 2009 2:44 PM
To: Rees, Susan I SAM
Subject: MSCIP: Harrison Co. Inland Barrier

Building 20 to 40 foot levees along the railroad is absurd !!!

This will cause the coastal cities which will be on the waterside of the levees to disappear !!!

It will eliminate any coastal commercial/residential development, as insurance will be impossible to obtain.

Most of the most valuable real estate in the coastal counties will be made worthless or greatly reduced in value. The only somewhat appropriate solution is for the Corps to propose to purchase all structures & property (municipal, commercial & private) at today's fair market value, which would greatly increase the cost of building such levees.

Am not sure why the Menge Ave. levees are even an option. As by far most of Menge Ave. did not even flood in Hurricane Katrina. So why even consider Menge Ave. levees?

I really think that the Corps understands the economic impact this will cause coastal community.

Bill Stone
Director, Pineville Community Assoc.
bstone001@aol.com

Bill Stone_1

From: BStone001@aol.com
Sent: Wednesday, March 25, 2009 2:22 PM
To: Rees, Susan I SAM
Subject: MsCIP: Surge Barriers

Has the Corps ever designed/built Surge Barriers? I think not, so why even propose such a high risk & costly project? This surely does not represent very sound engineering principles.

Will submerged Barriers restrict the tidal flow in the bay?

Hopefully, Congress will not fund this. But the current Congress is out of control in spending so who knows, as this will stimulate the economy & create jobs.

Bill Stone
Director, Pineville Community Assoc.
bstone001@aol.com

Rees, Susan I SAM

From: BStone001@aol.com
Sent: Wednesday, March 25, 2009 2:10 PM
To: Rees, Susan I SAM
Subject: MsCIP Harrison Co. Public Meeting

Dr. Rees,
I was very disappointed with the Harrison County Public Meeting !!!

Very little of the nearly 2800 page document was presented. I learned more at the workshop, but got different answers from the Corps representatives. The Corps representatives need to give the correct or at least the same answers.

Really disappointed that no Q&As were allowed !!! How can we really understand what this complex Plan encompasses when we cannot ask questions. No one can take the time to read 2800 pages & submit numerous written questions. If we were told in advance that no Q&As were permitted and that only public comments would be allowed, we could have prepared in advance !!!

Most of the public that was present were ecologists & environmentalists who do not really represent the concerned silent majority.

I got the feeling that the Corps really does not want public input & are just going to do what the Corps desires !!!

Finally, most of the presentation was on Jackson & Hanoock County. I got the feeling that the Corps is not doing much for Harrison Co., by far the most populated of the 3 counties.

Bill Stone
Director, Pineville Community Assoc.
bstone001@aol.com

Response to Bill Stone, e-mails dated 25 – 30 March

1. Thank you for your interest in the Mississippi Coastal Improvement Program (MsCIP) comprehensive planning effort.

2. Response to comment 1. Section 10 of the Main Report provides an index for the reader to facilitate the ease of use of the documents. In addition, we have provided reference in the Main Report to the various appendices so that the reader will be able to learn more detail on a specific topic.

3. Response to comment 2. We have attempted to define all terms at the appropriate point in the discussion so that the reader does not have to refer elsewhere in the document for the definition. We will change the title of Chapter 8 of the Main Report to clearly reflect what is contained.

4. Response to Comment 3. We concur wholeheartedly with the need for public involvement but we must disagree with your statement that there was a lack of public involvement during the development of the MsCIP. There were over 50 public meetings, workshops, small group presentations that occurred between March 2006 and the last meetings held in March 2009. In most instances we held specific meetings in each of the counties and in some cases in each of the towns and cities. We had several multi-day workshops at which the public was encouraged to participate. In addition, we utilized the web as an avenue for public involvement through public auditoria at which the public could interact electronically with the team. The web site also had an active e-mail which was updated on a regular basis and served as an avenue for individuals to provide comment as the planning progressed.

5. Response to Comment 4. We do not understand the basis for your comments. This section is a very general summarization discussion of all those features that are being recommended for construction, advanced engineering and design, and additional study and the basis for those recommendations. The costs of any future studies are detailed in Chapter 5.

6. Response to Comment 5. We have revised the summary to make it easier to understand. Additional details are not provided for some of the 'bullet' topics as these are recommended for construction without any caveat for the need for additional documentation.

There is no pilot project in Hancock County to purchase property. The HARP is comprehensive plan feature that recommends the acquisition of 2000 parcels across all three coastal counties. There is a pilot program recommended for Waveland (Waveland Floodproofing Pilot Project) that would result in the elevation of 25 existing homes in this area to demonstrate the different requirements associated with floodproofing in the coastal area.

Corps decision documents present both 'First Cost' (today's dollars) and 'Fully Funded Costs' (including escalation to the midpoint of construction). Both of these costs are included in the report in order to aid in the decision making process. Fully funded costs are presented in Chapter 5.

7. Response to Comment 6. NEPA has been spelled out. It is the National Environmental Policy Act. Discussion of the requirements of the act are addressed elsewhere in Chapter 1.

8. Response to Comment 7. Comments noted.

9. Response to Comment 8. This was a formatting error which has been corrected in the final report.

10. Response to Comment 9. As directed by Congress the Corps has investigated all engineeringly feasible options for hurricane and storm damage reduction. These options include both structural measures such as levees and nonstructural measures such as floodproofing and acquisition. Due to the costs and environmental impacts a number of these options were dropped from further consideration during the planning process. There are no recommendations for the construction or further study of long linear levee systems across the coast. Rather the report has identified one levee project, Forrest Heights, for construction which calls for the enhancement of an existing levee. In addition 7 areas have been identified which might benefit from the construction of levee however the detailed analysis of these was not possible at this time. We have indicated these locations and the costs of further study in Chapter 5. Should the local community decide to want to participate in further evaluation of these structures they can request this from Congress. The economic impacts to the community, both positive and negative, with and without a proposed project are fully evaluated in the economic appendix.

11. Response to Comment 10. Surge barriers are routinely used in Europe to ameliorate the impacts of flooding, e.g. Netherlands and Great Britain. The Corps is currently constructing surge barriers as part of the hurricane recovery efforts in Louisiana. They are technically feasible means of achieving the desired solution of preventing flooding and therefore were evaluated by the MsCIP. As a part of the long linear levee systems they are not recommended due to increase cost over other applicable nonstructural measures. These barriers are specifically designed to not impact tidal flow when they are not operational (i.e. times when storm surge is not an issue).

12 Response to Comment 11. Following standard procedure only comments are received by the Corps of Engineers during a Public Hearing on a Draft Environmental Impact Statement. To facilitate public input we also scheduled a workshop prior to the hearing to allow for discussion and question and answers. The public notices that were released for the March meetings clearly stated this process. The general presentation was the same for each of the three meetings that were held, one in each of the coastal counties, and only presented examples of the types of comprehensive plan elements that were being considered. The comprehensive restoration of the barrier islands, beach and

dune restoration, Turkey Creek Restoration project, Forrest Heights levee, and the High Hazard Area Risk Reduction Program are all applicable to Harrison County and were discussed in detail at each of the meetings. We apologize that you felt you got different answers from the subject matter experts that were at the meeting and will take actions in the future to ensure the same information is presented to all.

Charles Gallagher_1

From: Charles Gallagher [charlesgallagher@bellsouth.net]
Sent: Saturday, March 28, 2009 12:24 PM
To: Rees, Susan I SAM
Subject: Draft Comprehensive plan and Integrated programmatic Environmental Impact statement - Cost comment 1

Dr Rees

The Waveland project is estimated at $4,425,000 on pages 5-10 and S-4. It is quoted at $4,611,000. The latter value is based on August 2008. I could not determine the date for the former. I suggest that all cost estimates be adjusted for escalation to the same date in order to permit different parts of the report to be more easily comparable.

Thank you

Charles Gallagher

Charles Gallagher_2

From: Rees, Susan I SAM
Sent: Saturday, March 28, 2009 1:22 PM
To: Rees, Susan I SAM
Subject: Fw: Draft Copmprehensive plan and Integrated Programmatic Environmental Impact Statement - Comment

----
Sent from my BlackBerry Wireless Handheld

From: Charles Gallagher
To: Rees, Susan I SAM
Sent: Sat Mar 28 12:07:44 2009
Subject: Draft Copmprehensive plan and Integrated Programmatic Environmental Impact Statement - Comment

Dr Rees 2

I suggest that the reporting of the population racial makeup should not be included in the plan.

Sincerely

Charles Gallagher

From: Rees, Susan I SAM
Sent: Saturday, March 28, 2009 1:22 PM
To: 'charlesgallagher@bellsouth.net'
Cc: Rees, Susan I SAM
Subject: Re: Draft Comprehensive Plan and Integrated Programatic Environmental Impact Statement - Waveland Question

Team members were not assigned to individual municipalities. If you have a specific question let me know and I will facilitate an answer.
Susan Rees

Sent from my BlackBerry Wireless Handheld

From: Charles Gallagher
To: Rees, Susan I SAM
Sent: Sat Mar 28 12:04:42 2009
Subject: Draft Comprehensive Plan and Integrated Programatic Environmental Impact Statement - Waveland Question

Dr Rees

Who represented Waveland on your team?

Thank you

Charles Gallagher

Responses to Charles Gallagher, e-mail dated 28 March 2009

1. Response to comment 1. Comment noted. The two costs described are indeed different and are called 'First Cost' (today's dollars) and 'Fully Funded' (including escalation to the midpoint of construction). Both of these costs are included in the report in order to aid in the decision making process.

2. Response to comment 2. Non-concur. The use of socio-economic data, one such being population racial makeup, is required for Corps studies. US Army Corps of Engineer policy, specifically Engineering Regulation (ER) 1105-2-100 referred to as the 'Planning and Guidance Notebook', requires the considerations of Other Social Effects as one of four economic benefit accounts. Further, Executive Order 12898 dated February 11, 1994 requires agencies under the Executive Branch of the President to consider as part of any action the impacts on minority and low-income populations.

City of Pass Christian
PO Drawer 368
Pass Christian, MS 39571
Phone (228) 452-3310
Fax (228) 452-5435

Louis Rizzardi, Alderman Ward 1
Joseph Piernas, Alderman Ward 2
Anthony Hall, Alderman Ward 3
Huey Bang, Alderman Ward 4
Philip Wittmann, Alderman-at-Large

Leo "Chipper" McDermott, Mayor

March 23, 2009

Dr. Susan I. Rees
Program Manager, MsCIP
Mobile, District USACE
P.O. Box 2288
Mobile, AL 36628

Dear Dr. Rees,

It has come to my attention that the US Corp has no definite nourishment plans for Cat Island under your MsCIP program. Although I am glad that all of the islands east of the ship channel are to be nourished, I am concerned for not just Pass Christian and Long Beach, but all of the areas west of the ship channel. Cat Island with all of its trees and vast size is the main protector of direct storms from West Gulfport to the state line. As a person that goes to Cat Island to enjoy its beauty, I have been concerned about the erosion of Goose Point and the east and west ends of this natural barrier since Katrina, and have wondered if anything was going to be done to save this protector island. Having heard you and Dr. Walker speak about restoration of the barrier islands I was encouraged that this would take place in the near future, therefore, this news that Cat Island is not slated for nourishment has concerned me and our citizens greatly.

Dr. Rees, please have Cat Island added to the restoration Littoral System that the other islands are slated to receive. As we all know, the west received the highest storm water and the most damage from Katrina and our future depends on this project.

Thank you,

Chipper McDermott, Mayor

Response to Mayor Leo "Chipper" McDermott, dated 23 March 2009

1. Thank you for your interest in the Mississippi Coastal Improvements Program and specifically the barrier island comprehensive restoration feature of the Comprehensive Plan.

2. Cat Island was never intended to be excluded from the barrier island comprehensive plan however, as described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies seem to indicate that littoral currents do not move sediments across the area known as Ship Island Pass. . Nourishment of Cat Island is not dependent upon a direct link with the other barrier islands, as it by itself if a critical component of the entire Mississippi Sound ecosystem. These and other issues, notably the private ownership of much of the island, will be addressed during the first year following authorization and funding and would be concurrent with other required studies for the remainder of the islands. We have indicated a requirement to perform additional studies to finalize the sediment budget and sediment transport processes and gain a full understanding of the nourishment needs of Cat Island.

In response to your and other concerns, we have revised the Barrier Island Appendix, specifically Chapters 3 and 7, to provide more detail for proposed studies at and immediately around Cat Island. In addition, the Summary of Costs, Table 8-1, will be amended to detail the $1 million dedicated for additional studies at Cat Island and a figure will be inserted in Section 7.3 that's shows a potential location for littoral zone placement east of Cat Island. The estimated cost of implementation of the comprehensive restoration plan feature contains funding for placement at Cat Island once the specific plan is designed.

To: Army Corp of Engineers District Mobile
Atten: Dr Susan I. Rees

March 29, 2009

From: Doug Seal, City Councilman Bay St. Louis

Dear Dr. Rees,

Let me start by thanking you for all the work you and your group has devoted to helping the citizens of the Mississippi Gulf Coast with your Mississippi Coastal Improvements Program, I do understand you got your marching orders from the United States congress to conduct this study. I have read thru both the Comprehensive Plan and also the Appendix C Real Estate and agree that a lot of time and effort went into the study. I only have a few points that I would like to address.

(1) **Resiliency (i.e., ability to withstand / survive) to storm events equaling or exceeding the 2005 hurricanes was also an evaluation criteria that was applied to the formulation of projects recommended as part of the Comprehensive Plan. In response to the Federal Goal, as established by Congress, the following goals were established (S-2 39-41)** 1

During Hurricane Katrina coastal Mississippi was the point of impact of the greatest tidal surge that has hit the mainland of the U.S. in its recorded history. (Page 1-1)

Response: Why would any study that was to be completed on a disaster be based on a one-time event versus an average of events over some time period? In my current professional role it is my job to conduct Hazard and Operability (HAZOP) studies for a World wide Chemical company, in the private sector we base our risk on the frequency and severity of an incidents, not a one-time incident. It appears now that the Corp of Engineers is using this as their STANDARD, so each time a river overflows it banks the Corp of Engineers should embark on a BUYOUT of ever town located on any river as the probability is there that ONE DAY there will be another flood. As a taxpayer I see this as a waste of my tax dollars and the destruction of a way of life for people who live on any river or coastal community.

(2) **The HARP provides for purchase of properties located in the high hazard zones of the three coastal counties of Mississippi (S-3 38-39)**
Response: FEMA did a detailed study of the 3 Coastal counties after Hurricane Katrina, this study produced new elevation requirements and Velocity zones for each county and city. These new elevations are what FEMA says will MITIGATE losses in the future due to the new HIGHER elevation. My contention is that if there is NO structure on a vacant lot, then what is being MITIAGATED ?, the MITIGATION comes in when the property owner builds to the NEW elevation, therefore the buying of VACANT land is not necessary as there is no hazard on that property. Also if there was a Repetitive Loss structure on the property, that Repetitive loss status was erased when the structure was destroyed during Hurricane Katrina, when a new structure is built it will conform to the NEW FEMA elevations, therefore the hazard has been MITIGATED. 2

1.7.3.5 Federal Emergency Management Agency, Region 4
All hydrodynamic modeling and the development of stage-frequency curves for coastal flooding were closely coordinated with the FEMA. The numerical modeling methodologies were similar and both teams used consistent grids. Results from the FEMA and Corps modeling efforts were generally consistent, with 90% of all results being within +/- 1.0 feet of each other. Final stage frequency values were established by taking an ensemble average of the Corps and FEMA results, to ensure consistency of end results. 3
Response: The City of Bay St. Louis was successful in its appeal of the new DFIRM maps that FEMA spent 3 years trying to get right. As a result of the appeal by the city 12 preliminary FIRM panels changed, it appears that the Corp of Engineers study was based on those errors for the City of Bay St Louis in defining the Coast Mississippi Risk zones, Figure 5-1. As a result of this major change in the DFIRM maps it could be concluded that the Corp of Engineers study is flawed when it comes to the number of affected properties in the city of Bay St Louis. How will this study be updated so that the information that is presented to Congress is not inflated?

5.18.1.1 Phase I HARP
Limited rebuilding is occurring within the surge-plain, at a variety of elevations. Those that are rebuilding at former elevations are largely self-insured (or un-insured), while those rebuilt prior to approval of the revised FIRMs at higher elevations are doing so with an assumption as to what the Base Flood Elevations (BFE) may be for their area. Regardless, most of those that would need flood insurance have not rebuilt at the time of this report, due to changes in National Flood Insurance Program (NFIP) requirements relative to BFE or lack of available and affordable hazard insurance. 4
Response: The study is correct that affordable hazard insurance is creating a problem but the National Flood Insurance program is still writing policies using the 1984 FIRM maps. The 1984 maps are currently still in affect for the city of Bay St. Louis, and will be until the city adopts the new DFIRM maps. It is my understanding that property owners can still build to the 1984 FIRM elevations and STILL will be able to get flood insurance based off those maps. The rebuilding has been STOP over and over by unwarranted BUYOUT scares.

Appendix C Real Estate

1. STUDY Authority/Background

The nonstructural component of the comprehensive plan is to acquire or flood proof all properties within the 1 percent annual chance inundation zone commonly referred to as the '100-yr' floodplain. This equates to an estimated 58,000 parcels of which an estimated 15,000 parcels are within the high hazard zone. Obviously it is not realistic to consider that this action could be undertaken within a short timeframe due to impacts on local tax base, ability to acquire etc. It is more realistic to consider that the component could be phased in over an extended multi-year period. For this reason phased implementation was developed including a flood proofing demonstration, a municipal acquisition and relocation project, a high hazard area risk reduction plan or HARP, and a comprehensive long-term risk reduction plan coordinated between HUD, FEMA and the Corps. The HARP would address approximately 2,000 parcels in the highest risk areas that are not suitable for flood proofing that could be implemented over a five-year period. The long-term risk reduction plan is envisioned as a coordinated effort between HUD, FEMA, and the Corps to be applied over a Much longer period and would include acquisition of additional parcels, flood proofing of existing structures and designated elevation requirements for new 5

structures. In order to maximize benefits under the HARP, the plan would be implemented in the most high-risk areas first and, initially, with owners who are still displaced and willing to sell. However, eminent domain may be used when warranted
Response: The Roadway protection project slated for downtown Bay St. Louis is considered a LOD project, the Corp of Engineers have stated that EMINET DOMAIN could not be used, as a result this project has been held up due to property issues. Why can EMINENT DOMAIN be used here but not on an existing Corp project, there appears to be a double standard.

In closing these are issues that I have pulled out of the 2 reports that I have read, I'm sure with more time there would be more questionable issues that should be addressed. The responses above are my own views and not that of the City of Bay St. Louis or the people I represent as a city councilman. Again thank you for your time and I would like a response to the above issues so that I may continue spread the correct information.

Sincerely,

Doug Seal,

(228) 222-0097 (c)
(228) 467-0561 (h)

Responses to Doug Seal, City Councilman Bay St. Louis dated 29 March 2009

1. Response to Comment 1. Nonconcur. The formulation of the Mississippi Coastal Improvements Program Comprehensive Plan is not based on a one-time event but rather on the full suite of storm events that may impact on the Mississippi coast. One of the specific system-wide goals as stated on S-3 is to "Identify measures to minimize risk to loss of life and safety caused by hurricane and storm surge". This is a general goal. While it is true that we considered Katrina and Katrina-like events in the evaluation the comprehensive plan is not formulated specifically in response to the 2005 storms. These storms were merely the impetus for the development of a comprehensive plan. The approach taken in formulation involved a series of 'lines of defense' (LODs) beginning with the offshore barrier islands and moving inland with progressive levels of risk reduction. Only LOD 5, the farthest inland, would offer significant risk reduction from a Katrina-like storm. A full discussion of the line of defense approach and the surge modeling in presented in Appendix E, Engineering Appendix.

The formulation of nonstructural measures for the MsCIP was based upon the Congressional authorization language, the project goals and objectives developed by the MsCIP team, the damage data developed by the USACE, FEMA and the State of Mississippi and the combined experience of the NS team in addressing flood and surge damages through nonstructural (NS) measures. The NS team determined early in the planning process that the appropriate minimum level of protection for the MS coast would be the FEMA mapped 1% annual chance zone that included the V and VE zones and various A zones included in local Flood Insurance Rate Maps (FIRM). The 1% annual chance event (a.k.a. the 100 year flood and the Base Flood Elevation) formed the basis of the local floodplain management ordinances and hundreds of flood insurance policies in affect at the time that Katrina made landfall. Although eligibility for receiving assistance from the NS program would be based upon surge inundation and wave damages brought on by Katrina, the minimum level of protection for the project area was established as the 1% annual chance event. To select a lesser level of protection defied the local floodplain management ordinance requirements already in affect and to go much higher (even when the damages wrought by Katrina may have dictated a need for a higher level of protection) would have economically and socially gutted all of the coastal communities.

When the NS planning process started, FEMA had already issued the Advisory Base Flood Elevations (ABFE) for those wishing to rebuild along the coast. Based upon FEMA published information, each community and county within the project area had either adopted the new ABFE levels or just added 4 feet of freeboard to the existing BFE in their ordinances for the purposes of new construction. The NS team used the new ABFE (with a reduction (2 feet) in its elevation based upon USACE hydrologic data) as the basis for formulating the NS measures based upon FEMA's published new mapping. So, in fact, the NS measures described in the Main Report and Real Estate Appendix aren't based upon a single event, but on FEMA's analysis of the previous 25 years of hurricanes including Katrina that resulted in the interim ABFE mapping and surge profiles.

Prior to formulating the NS measures, the NS team reviewed all of the damage data generated by USACE, FEMA and the State of MS and spent several days looking at the surge and wave damages between Pascagoula and Waveland. A multitude of residential and commercial structures elevated in accordance with the original local NFIP ordinances were swept away by Katrina's surge and waves resulting in total loss of the structures and in some cases loss of life for those who chose to "ride-out" Katrina. This high-energy surge/wave zone appeared to closely follow the designated V and VE zones mapped by FEMA and the zone designated by FEMA following Katrina as the "catastrophic damages zone" in which insured structures suffered damages estimated by FEMA to be more than 50% of the structures' value. In truth, most of the structures in the catastrophic damages zone were completely demolished by Katrina's surge and waves. The NS team determined that such a high-hazard zone was not a wise place to elevate structures due to the uncertainties of securing solid foundations under the supporting posts, uncertainties about surge and wave heights and the potential for occupants to attempt to "ride-out" the storm in elevated structures. Should a structure fail under those extreme conditions there would be little chance for survival of any occupants and too much risk for emergency responders to attempt a rescue.

In addition, the Digital Flood Rate Maps (DFIRMS), prepared by FEMA, that were used as part of the study were based on the best available data on the hazards of flooding and wave action modeling. The process for map modernization for the Mississippi Coastal counties was begun prior to Hurricane Katrina using existing technology. Hurricane Katrina showed the urgency for providing the new maps sooner rather than later. While Hurricane Katrina may have been a catalyst for expediting map production for the lower 3 coastal counties, it did not set the standard used to associate risk. While Katrina damages may have played a role in evaluation of risk, risk was determined largely by using data provided by LIDAR, bathymetric data, wave modeling, topography and other associated factors normally developed in producing maps.

2. Response to Comment 2. Non-concur. Building to the new higher elevations as stipulated on the DFIRMS is one method of mitigating future flood losses in the Special Flood Hazard Areas (SFHA). While elevation is one method of mitigation it is not the only method of mitigation available. If a parcel of land that at one time had a structure and it was substantially damaged or destroyed is purchased and reserved in perpetuity as facilitating open space use then that property is also mitigated seeing that there will no longer be any flood losses associated with that particular parcel (no structures, no losses). The same would hold true for repetitive loss properties regardless of whether they reside within or outside of the SFHA. As stated in response to question 1, design elevations were not based on storm surge levels seen during Hurricane Katrina, but by the risk associated to that zone during the map modernization. These levels establish the 1% chance of flooding in any given year (100 year flood) and anything above that level could possibly produce flood losses on these properties.

The MsCIP plan is based upon a planning period of analysis that extends for the next 100 years to account for such possible long-term events as sea-level rise in the project formulation. The basic redevelopment assumption over those 100 years is that all properties along the coast have the potential for being redeveloped during that period of time. Regardless of their current real estate or ownership situation, during that 100 year time period, conditions of ownership can change sufficiently to lead to new development of property (heretofore undeveloped) that has been determined through the NS formulation process (see the answer to question # 1 above) to be within the high-hazard zone. Although there may not be a structure on the property at this time, the potential future hazard posed by hurricane surge and waves still remains a threat; purchasing the vacant property now without a structure present eliminates that potential future loss (over the 100 year period of analysis) at a reduced cost to the taxpayers.

It has been determined by the NS team that although the new FEMA DFIRMs may have provided a higher level of protection than that in affect during Katrina, the new DFIRM does not sufficiently account for the level of damages witnessed during Katrina and still allows landowners to elevate structures within the expanded V/VE zones. Acquiring vacant properties under the MSCIP NS program would forego any future redevelopment in high-hazard zones where new construction may or may not be accomplished in compliance with the new DFIRM or existing building codes (as many being rebuilt now indicate) and would be subject to future loss. In addition, the USACE will not spend Federal funds to elevate structures (using the current guidelines and ordinances) in areas where future storms could destroy the structure and potentially lead to loss of life during the event.

3. Response to comment 3. Non-concur. While portions of the City of Bay St Louis were upheld and several map panels were revised the only noticeable change to these maps was the removal of velocity zones within the 603 corridor, replacing them with AE zones. The revised panels have been reissued to the Cities of Bay St Louis, Waveland and Hancock County. Once the Letter of Final Determination (LFD) is issued for Hancock County these maps will the official Flood Insurance Rate Maps (FIRMS) six months from the date of LFD issuance. Because of the revisions that were supported by the appeal these revised maps are the best available data and shall be used for any decisions regarding mitigation within the FEMA community.

The plan formulation process used by the NS team used the best data and information available at that time. The NS plan formulation process used the FEMA published ABFE (Advisory Base Flood Elevation) mapping and surge profile data as the basis for determining what types of NS measures would be applicable in the different designated flood zones. The ABFE mapping was generated by FEMA based upon 25 years of storm records along the Gulf Coast, not just Katrina. The NS team lowered the FEMA published ABFE elevations by 2 feet to reflect surge profile data generated by Corps hydrologists and to better estimate what the new BFE's published by FEMA in 2008 may reflect. FEMA published information shows that Bay St. Louis modified the required freeboard heights for elevating structures within its own floodplain management ordinances to account for the increased heights of the FEMA ABFE. Unless Bay St. Louis has modified their ordinances since that change, the existing ordinance still maintains that increased freeboard requirement for new development.

At the time when the NS plan was being formulated, FEMA had not modified the existing V/VE zones to reflect the damages seen in Katrina, but had identified the "catastrophic damages zone" based upon damages to insured structures across the MS coast. The modified V/VE zones published in the new FEMA DFIRMS are a close rendition of the combination of the original V/VE zone and the FEMA identified "catastrophic damages zone". Rather than being considered to be "inflated", the numbers of structures affected by Katrina and any future storms of that magnitude that would be eligible for some form of damage reduction through the USACE nonstructural plan measures is very understated by using the ABFE surge profiles. Actual Katrina storm surge profiles are much more extensive and show deeper flooding depths than the ABFE. Using the 1% annual chance flood profile based upon the FEMA ABFE (slightly reduced) for NS plan formulation is fully in keeping with what local ordinances already require.

As a part of the MsCIP plan recommendations, the Corps has requested authority and funding to purchase 2,000 properties within the designated "high-hazard" zone (the original FEMA V/VE zone and FEMA designated "catastrophic damages zone"), to elevate 25 structures in the Waveland, MS area and to formulate protection measures for the municipal structures in Moss Point that may include replacement of that municipal complex at another flood safe location. The MsCIP plan recommendations also request authority and funding to develop more detailed plans for reducing future surge and wave damages along the MS coast through a long-range planning process with the municipalities and counties as well as FEMA and HUD and other state agencies involved. Those more detailed plans for future high-hazard zone acquisitions, floodproofing and relocations within the 1% annual chance surge inundation zone will use whatever Base Flood Elevations and V/VE zones are included within the locally adopted floodplain management ordinances at the time of the planning effort.

4. Response to Comment 4. Comment noted. The City of Bay St Louis adopted 4 feet of freeboard into their Flood Damage Prevention Ordinance (FDPO) following Hurricane Katrina in lieu of adopting the Advisory Base Flood Elevation Maps (ABFE's). Adoption of the ABFE's would have qualified homeowners who had flood insurance, were substantially damaged (greater than 50%) and subject to a higher elevation, up to $30,000 through the Increased Cost of Compliance (ICC) clause within their flood insurance. The 1984 maps are still in effect for insurance rating purposes until the new DFIRM maps go effective. Flood insurance is still available to all residents of the City of Bay St Louis and policies purchased prior to the new maps going effective will be rated in the current zone as long as there is nogaps in coverage. A gap in coverage may place the policy holder with a new zone as defined by the DFIRM maps. Individuals wishing to rebuild prior to the DFIRMS becoming effective must comply with elevations as shown on the current effective FIRM maps as well as the City of Bay St Louis FDPO which required 4 feet of freeboard. The construction of new structures in compliance with the new DFIRM elevations should be encouraged to assist in mitigating future losses.

5. Response to Comment 5. Comment noted. During the development of the Mississippi Coastal Improvements Program Interim Report we evaluated a number of possible projects for interim recommendation that would aide in the recovery of the coast. The reconstruction of the Bay St. Louis seawall was identified as a critical project in that it was necessary for the reduction of possible damages to Beach Boulevard which was going to be reconstructed. To qualify as an interim, projects had to meet several criteria including: no adverse environmental impacts, no need to detailed engineering studies to design the solution, no public controversy, and support of the state and community for construction of the project. During the initial planning, the team was led to understand that the community would totally support this project and provide necessary easements to facilitate construction. In general the Right of Eminent Domain is a necessary requirement for cost share projects and the exercise of such is considered on a case by case basis and may or may not be exercised depending on project specific factors and circumstances. Specifically for the Bay St. Louis seawall, the construction was authorized as 100% Federal and we chose not to exercise Federal use of eminent domain based on our initial selection criteria. To facilitate construction of this critically important project to Hancock County, the County has graciously stepped in to assist with the acquisition of rights over those property owners who choose not to voluntary provide easements.

The HARP is to be implemented on a willing seller basis first and we do not plan to routinely exercise eminent domain during the implementation. However, we reserve the right to exercise such in special circumstances, if necessary. Any decision to apply eminent domain proceedings would emanate from a joint decision-making process between the State and the Corps of Engineers.

CITY *of* GULFPORT

Ella Holmes-Hines
Councilwoman, Ward Three

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ehines@ci.gulfport.ms.us

2309 15th Street
Gulfport, Mississippi 39501

P.O. Box 1780
Gulfport, Mississippi 39502

Mayor-Council Form of Government

March 31, 2009

Delivery: Via Facsimile

Dr. Susan L Rees
Department of the Army
U.S. Army Corps of Engineers, Mobile District
P.O. Box 2288
Mobile, AL 36628-0001

Re: Public Comment for MsCIP and Forrest Heights Levee

Dear Dr. Rees:

Please accept the following public comments as a comprehensive plan for the Turkey Creek artery and basin:

1. Forrest Height Community consented to the 21-feet Levee around their homes for removal from the Flood Way.
2. Pastor George Rouse of the Forrest Height Missionary Baptist Church, 5215 Ohio Avenue, Gulfport, MS (228-864-7112) would like a protection Levee around his church.
3. The Turkey Creek Community Homeowners and North Gulfport community residents will not accept any additional storm water runoff into their neighborhoods and would like support to eliminate the storm water off into the neighborhoods.
4. Moratorium on impacted wetlands in the Turkey Creek basin.
5. Desnag, debris removal, clearing, planting vegetation in the Turkey Creek basin.
6. Support to Long Beach, Mississippi, Turkey Creek artery and feeder ditches.
7. Purchase more wetlands in Turkey Creek basin.
8. Feeder ditches in Floral Estates, Rolling Meadows, East North Gulfport and West North Gulfport, Turkey Creek community and the business district are in need of support to drain properly.
9. Support to all drainage ditches within the Turkey Creek basin.
10. Support of the maintenance to the Turkey Creek basin.

Thank you for your consideration,

Ella Holmes-Hines
Councilwoman, Ward 3

Response to Ella Holmes-Hines, Councilwoman City of Gulfport, dated 31 March 2009

1. Response: We look forward to working with the City and local leaders in providing risk reduction to the Forrest Heights community and in support of activities in the Turkey Creek watershed.

March 25, 2009

Dr. Susan I. Rees
MsCIP Program Manager
Mobile District,
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, AL 36628

Re: US Corps of Engineers Coastal Improvement Program (MsCIP, Feb., 2009).
Protection issues; vulnerability and restoration needs; The case for Cat Island.

Dr. Dr. Rees:

Please allow me to share my thoughts with you regarding certain important aspects of the program you are presently managing. My comment mainly involve the role of Cat Island in the planned island nourishment projects.

Introduction

A recent Draft Program by the Mobile District, US Corps of Engineers (2009) proposes very substantial nourishment efforts in island restoration to combat erosion problems exacerbated by land loss to catastrophic recent Hurricanes Camille and Katrina. I take exception to some of the statements made regarding the natural littoral/longshore sand supply that reaches Cat Island. This also included the easily challenged claim voiced in the present Corps Draft Program (2009) regarding alleged total absence of sand transport from Ship and Cat as the result of changed positions of the eastern part of the Mississippi River Delta.

Littoral sand transport from Ship Island to Cat Island and points to the west was the process that enabled formation of the western members of the Alabama-Louisiana (New Orleans) islands. There is no reason to doubt that sand transport, driven by the dominantly westward-directed waves from the Gulf does carry sand across the bottom of Ship Island Pass to reach the east shore of Cat Island. This highlights the need for a sediment bypass of the Ship Channel that avoids permanent sediment loss from dredging to its transport to Cat Island. To facilitate the sand reaching Cat Island, as done downdrift from Petit Bois Pass, sediment dredged from the channel should be deposited in a spoil pile on the western (downdrift) side of the channel. 1

The thrust of the Corps recommendations essentially favors partial restoration of Ship Island only. However, I would argue that a more even-handed restoration strategy may benefit Cat Island's protection and its long term survival chances with well-planned placement of sand resources along its eastern and northern shore sector. 2

Sand transport issues in island chain; subaqueous sand transport from West Ship to Cat Island

It has been well established that littoral drift along the island beaches and the nearshore littoral current plays an overwhelming role in east-west sand transport along the Alabama-Mississippi barrier island chain. This transport at present involves the entire barrier chain, starting in Dauphin Island, Alabama and continuing along the shores of Petit Bois, Horn, East and West Ship Islands, finally reaching Cat Island. As the sand-transmitting role and capacity of shallow ebb tidal deltas between the islands clerarly indicates, transport processes do not stop, only slow when they encounter passes and man-made, regularly dredged deep ship channels. Examples include the role of the giant Mobile Pass ebb tidal delta and of the smaller ebb-deltas off Horn Island and Dog Island Passes. Ship Island ship channel also acts as a "temporary sediment sink" in slowing but not entirely stopping the westward-directed littoral sand transport. By removing spoil 3
material from shore-parallel downdrift sand transport, the regular dredging of the Ship Island navigation channel certainly diminishes the volume of sand that traveling along the Ship island shore, eventually reaches Cat Island in the west.

In recent geological history (Otvos and Giardino, 2004) Cat Island has been the offshore transmitting point of sand from Ship Island toward the south Hancock County, Mississippi - New Orleans Pine Island barrier chains that existed until growth of Mississippi River's St. Bernard delta lobes surrounded and partially buried these barriers and stopped littoral drift but *only west of Cat Island* more than 2000 years ago. While subsequent further growth and partial blocking Ship Island Pass probably diminished westward transport from Ship to Cat, the subsequent disintegration of easternmost St. Bernard Delta that previously has partially obstructed Ship Island Pass, now allowed the resumption of sand transport to Cat Island. The claim (USCE Draft 4
Program, 2009, p.74) of "termination of littoral current transport due to the southward extension of the Mississippi Delta" is, as the Program Statement itself admits in a separate passage, not very well substantiated and therefore rather questionable. According to another far less than accurate statement, "portions of the barriers rolled over 5
towards the Sound"; p.27).

Causes for land losses in Cat and Ship islands. Contrast between island elevation and morphology and its impact on island reduction and area reduction

Between 1848 and 2005, the total area of the two Ship islands has been reduced from ~600 ha to 204 ha, while Cat Island shrunk from ~1200 to 743 ha (Otvos and Carter, 2008; with similar values in Morton, 2007). A major reason for the historically steadily increasing, by now catastrophic shrinkage of Ship island may be its generally low surface elevation and exposed position. Most of Ship, especially its former central and eastern sectors consist of low sand flats that are reduced quickly to underwater shoals during major storms only to recover relatively slowly thereafter. In contrast, only very

minor areas in Cat Island (located exclusively in the SE spit area) are represented by shallow subtidal and low supratidal sand flats.

As historical data shows, recovery of the sand flat sectors remains incomplete even after several years of relative calm following a storm. It is reversed suddenly by the passage of a new hurricane. The much higher ground in West Ship proved to be more resistant to storm effects but even the relatively high relict beach ridges of East Ship, due to their unprotected setting were almost completely wiped out by Hurricane Katrina. Restoration of the low Ship island sectors by sand nourishment may bring only a very temporary 6
respite at an unreasonably high cost.

Cat Island has been much better protected in the past. It is shielded from the Gulf by a pair of north-south-oriented wide, although steadily narrowing sand spits. Surface elevations especially in the higher dunes- covered northern spit and the E-W trending central strandplain-"shank" of the island are relatively high. Slow subsidence effects mostly a small NE sector of the island west of and in the protection of the northern spit. Most of the island's area loss took place by recession of the southern spit that recovers quickly each time after hurrieane passage. The new shoreline usually forms somewhat west of the pre-storm shoreline. It is these spit areas that receive the westward transported sand that crosses Ship Island Pass from West Ship Island. Without the protection of the still relatively wide eastern spit belt the central and western areas of Cat Island would relatively quickly waste away under the recurring major hurricanes that regularly strike it from the Gulf.

Littoral drift, aided by wave refraction at this critical site constantly moves sand from this location both toward the northern and southern spit areas. Stockpiling would augment sand supplies that reach the island from West Ship via westward wave 7
transport over the bottom of shallow Ship Island Pass. This natural transport process probably plays a significant role in keeping the spits relatively well supplied with sand and thus bolsters the island's defenses.

The spit zone is a major protection for the rest of the island that, because sheltered by the eastern spit belt suffered remarkably little overall erosion during the past 160 years. While central and eastern Ship Island, with or without massive nourishment efforts will inevitably waste away, *Cat Island would be more efficiently and effectively protected by* 8
regular nourishment. Repeatedly applied sand stockpiles may significantly lengthen the island's life. Deposition of significant sand volumes at the central sector of the eastern island shore thus could play a crucial role by mitigating the long-term effect of island erosion due to hurricane strikes.

Recommendations

I recommend the regular placement of dredged and other sand resources along the central sector of Cat Island eastern shore to augment the northeastern and southeastern island spit. The two wide spit sectors undoubtedly play a crucial role in slowing the slow westward retreat of the eastern island shoreline, thereby diminishing and delaying steady destruction of the entire island. In view of the contrast between the two islands' geological framework and development history, sand nourishment at critical Cat island sites appear to be incomparably more cost-effective, of more enduring impact, and therefore more rewarding than sand placement on Ship Island sites would be. Therefore, at least some of the sand resources intended for Ship should be diverted to protect Cat Island. The transport scheme should also include sand bypassing around the Ship Island (Gulfport) Ship Channel. The establishment of a dredge spoil pile west (downdrift) of the ship channel. as engineered also at the west tip of Petit Bois Island. This would increase sand volumes that reach Cat Island by natural wave transport across Ship Island Pass. 9

Key References

Morton, R. A., 2007, Historical changes in the Mississippi-Alabama barrier islands and the roles of extreme storms, sea level, and human activities. US Geological Survey Open-File Report No. 2007-1161.

Otvos, E. G. and Carter, G. A., 2008, Hurricane degradation- barrier development cycles, NE Gulf of Mexico: Landform evolution ands island chain history. Journal of Coastal Research, v. 24, p. 463-478.

Otvos, E. G. and Giardino, M. J., 2005, Interlinked barrier chain and delta lobe development, northern Gulf of Mexico. Sedimentary Geology, v. 169, p. 47-73.

US Corps of Engineers Mobile District, 2009, Mississippi Coastal Improvement Program (MsCIP), Hancock, Harrison and Jackson Counties, Mississippi. Appendix H. Barrier Islands, 80 p.

Respectfully submitted:

Ervin G. Otvos, Ph.D.
Professor Emeritus, USM
336 Oakridge Circle
Biloxi, MS 39531-2027

cc. Dr. William Walker, Mississippi Department of Marine Resources
Mr. George Boddie, Pass Christian, MS

Response:
Thank you for your letter dated March 25, 2009 in which you identified concerns with the Draft Mississippi Coastal Improvement Project report. We have listed each of your concerns, below, and explain how each of these was addressed in the report.

Response to comment 1.

As discussed in the MsCIP sediment budget report, analysis of bathymetric and shoreline position data from 1917/20 to 1960/71 indicated an absence of morphologic change west of Ship Island Pass over to Cat Island (see Figure 16, reproduced below). Note that the red and blue bathymetric change (indicated erosion and accretion, respectively) occurring at Dog Keys Pass, between Horn and Ship Islands, is absent west of Ship Island Pass over to Cat Island. This absence of any morphologic signature indicates that there was not a pathway of sediment transport from Ship Island to Cat Island, nor from the Ship Island disposal sites (shown as light green areas to the west of the Ship Channel) to Cat Island during this time period. It may be that this pathway would be evident in the recent 2008 data set. Before beach nourishment is designed for the Mississippi barrier islands, we will analyze the most recent data and conduct numerical modeling studies to determine the best areas for placement of sand. The report has been modified to more completely detail these plans.

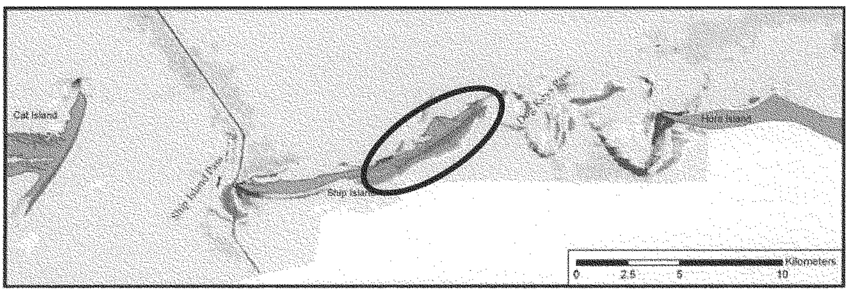

Figure 16. Bathymetric change (1917/20 to 1960/71) for the Mississippi Sound study area - Cat Island to Horn Island (from Byrnes and Griffee 2007)

Response to comment 2.

Your suggestion will be evaluated when we conduct the numerical modeling simulations that will evaluate various placement locations east of Cat Island. The report discusses these future plans.

Response to comment 3.

Please refer to the discussion pertaining to 1, above. These data indicate that there was not significant westward-directed littoral sand transport west of Ship Island from 1917/20 to 1960/71. More recent data will be analyzed to determine if westward transport between the Ship Channel and Cat Island is occurring now.

Response to comment 4.

The report says: "Formation of the St. Bernard deltaic complex and reworking of this delta to form the Chandeleur Islands reduced wave energy and transport of littoral sediments reaching Cat Island." The word "reduced" is used in the report, not "termination." We believe this is a reasonable statement.

Response to comment 5.

This statement refers to Figures 15 (reproduced below) and 16 (shown previously). Notice the circled areas on the figures, which show how the islands eroded (red areas) and reformed further into the Sound. This morphologic change is the "rollover" process.

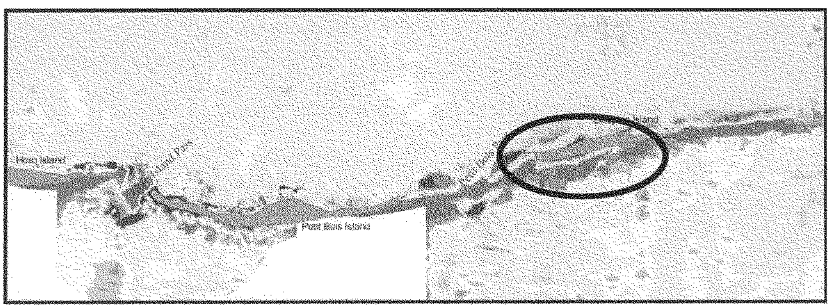

Figure 15. *Bathymetric change (1847/52 to 1917/20) for the Mississippi Sound study area - Horn Island to Dauphin Island (from Byrnes and Griffee 2007)*

Response to comment 6.

The primary benefits provided by closure of Camille Cut and the addition of sand into the littoral system that feeds sand to Ship Island are mostly environmental in nature. The additional salinity levels in Mississippi Sound that are occurring due to the presence of Camille Cut and the gradual loss of the islands are having an effect on the local *ecosystem. While our modeling has indicated that the restoration at Ship Island will only provide limited storm surge benefits, the presence of the island chain will provide sea-wave protection for the mainland coast. Also, the National Park Service has a vested interest and mission in preserving cultural artifacts on Ship Island (Fort Massachusetts and the French Warehouse). The NPS has deemed that restoration of Ship Island is necessary for maintaining these cultural resources.*

Response to comment 7.

This may be a very good location for dredged material placement, one we will evaluate with numerical modeling as we design alternatives for the barrier islands.

Response to comment 8.

Once again, we will evaluate this placement option with numerical modeling in the next phase of the study.

Response to comment 9.

All viable placement locations, including those on Cat Island, will be evaluated with the most recent bathymetric and shoreline data with a system of numerical models. These models will evaluate episodic and long-term evolution of the islands and dredged material placement sites. The sites most critical to maintaining integrity of the islands will be selected for full design.

From: George Crozier [gcrozier@disl.org]
Sent: Wednesday, April 01, 2009 11:51 AM
To: Rees, Susan I SAM
Subject: MS Coastal Improvement Comment

Susan - Thanks for sending me the CD. I hope that you will add this e-mail to the comments re the draft plan. Foremost in my mind is the logic that would extend the planning process to include all of Mississippi Sound. You and I know better than most just how integral Dauphin Island is to the barrier island chain that literally defines the Sound so I'm not going to waste our time expanding on that.

I was on the Environmental Advisory Board long enough that I obviously understand the language that defined the Corps' authorization for the initial study and that it could only be modified by Congress at this point - but the science and logic of such a recommendation is not beyond
your authority at this point and I would hope that it could be included in the final report as the system moves slowly toward implementation.

If you find that I can assist that process in any way, please contact me.

George Crozier
Executive Director
Dauphin Island Sea Lab

Response to George Crozier, Dauphin Island Sea Lab, e-mail dated 1 April 2009

1. Response: Thank you for your comment. As you mention the Congressional authorization for the Mississippi Coastal Improvements Program was specific to the coastal area of Mississippi and as such the MsCIP focus on the three coastal counties and those waters defined by the State boundaries. To the maximum extent possible we have utilized data covering the entire northern Gulf of Mexico coast in the formulation of the comprehensive plan. In addition, we have evaluated all the proposed plan features to ensure that no negative or unintended impacts would occur in neighboring areas, e.g. Alabama and Louisiana. All of our recommendations, however, are specific to coastal Mississippi due to the authorizing language.

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RECEIVED 30 Mar 09

March 24, 2009

407 Diard Circle
Dauphin Island, Alabama 36528

COL Byron Jorns, District Engineering Commanding
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628

Dear COL Jorns:

I am writing to provide my comments on the Draft Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (EIS). Although the Corps has done its usual commendable job, a critical defect of the report is its failure to include Dauphin Island in the Comprehensive Barrier Island Restoration Plan.

The Draft Report states that the primary purpose of the Comprehensive Barrier Island Restoration Plan is to create a "First Line of Defense" to protect the mainland Mississippi Coast and the estuarine resources of Mississippi Sound. Even before Hurricane Katrina, all of the Mississippi Sound barrier islands, including Dauphin Island, were suffering from varying degrees of coastal erosion. Without assigning specific blame, the Draft Report lists storms, sea level rise, and anthropogenic forces as being the causative factors for the erosion problems. The report further states that there is a progressive reduction in sand supply across the islands and an overall regional shortage of littoral sand for barrier island maintenance.

While the sand shortages are manifested throughout the barrier island chain in Mississippi, the sand shortage actually begins on Dauphin Island in Alabama. However, the report does not clearly address this crucial fact, failing almost entirely to acknowledge that Dauphin Island is a critical component of the barrier island chain. Although the significant coastal erosion problems that are being experienced by Dauphin Island are well known and have been recently investigated in other documents, the Draft Report makes no mention of Dauphin Island in its treatment of the Mississippi Sound barrier island chain or what the long-term consequences will be to the down-drift Mississippi barrier islands if Dauphin Island's shoreline erosion problems are not addressed.

Without explicitly addressing the importance of Dauphin Island as the lead island in the Mississippi Sound barrier island chain, the MsCIP study process gives implicit understanding to the important role that Dauphin Island plays in the formation and maintenance of the Mississippi barrier islands by including Dauphin Island in the sediment transport modeling and sediment budget investigations that were performed to develop the Comprehensive Barrier Island Restoration Plan. The report's findings would be greatly enhanced if it openly addressed the critical importance of Dauphin Island as the lead island in the Mississippi Sound barrier island chain and as the original source of sand from which all of the down-drift Mississippi barrier islands were formed. The report should also point out that the Mississippi islands continue to owe their existence to the sand transported from Dauphin Island via the natural east-to-west littoral drift processes. Lastly, the report should acknowledge that without a viable and robust Dauphin Island, the continued existence of the Mississippi barrier islands will remain in jeopardy.

Evidence of the significant effects that Dauphin Island's coastal erosion problems are having on the down-drift Mississippi barrier islands is reflected in the Comprehensive Barrier Island Restoration Plan recommendation to place 4,000,000 cubic yards of sand on Petit Bois Island. Petit Bois Island is a mere three miles to the west of Dauphin Island. The necessity of placing sand on Petit Bois Island is a direct result of the shortage of sand that is being transported from an ever-diminishing Dauphin Island, the shortage of which is having adverse consequences for the entire Mississippi Sound barrier island chain. Unless actions are taken to include Dauphin Island in the Comprehensive Barrier Island Restoration Plan, the recommended work on Petit Bois Island can only be considered to be a "stop-gap" measure since after the placed sand is transported to the west by littoral drift, additional sand will have to be artificially placed again at Petit Bois Island at some point in the future. Until Dauphin Island, as the lead island in the barrier island chain, is included in the Comprehensive Barrier Island Restoration Plan and addressed in a holistic fashion with the Mississippi islands, the plan cannot in fact be viewed as truly being a "comprehensive" approach to restoring the Mississippi Sound barrier islands.

It is interesting to note that the sand identified for placement at Petit Bois Island is targeted to come from one of two sources in Alabama (i.e., from the shallow waters surrounding the western end of Dauphin Island's or from the lower Tombigbee River disposal sites). I have trouble with the logic of the approach that would use sands taken from Alabama sources to satisfy the sand shortage needs of Mississippi's barrier islands while ignoring even the existence of the equally serious coastal erosion problems affecting Dauphin Island.

In summary, Dauphin Island is experiencing significant coastal erosion problems, a fact with which no one disagrees. If Dauphin Island's erosion problems are not addressed, the long-term consequences for the Mississippi barrier islands, Mississippi Sound and the Mobile County mainland will be catastrophic. For the first time, the MsCIP provides the comprehensive mechanism needed to address the coastal erosion problems affecting all of the Mississippi Sound barrier islands, including Dauphin Island. Continuing to ignore Dauphin Island's erosion problems will not contribute to the much needed stability of the down-drift barrier islands in Mississippi.

I fully understand that the Congressional authority that called for the MsCIP Study to be conducted established the present limits of the study area as the three coastal counties of Mississippi. However, after working for the Corps for over 31 years in Planning and Project Management I also know that, when appropriate, the Corps can elect to seek permission to expand the geographic limits of a study area if such an expansion will improve the resulting study recommendations. During my career, I have seen that approach used on more than one occasion, with the result being that a superior end product was eventually produced. The point being, the Corps can, if it so chooses, initiate a request to expand the MsCIP Study Area to include Dauphin Island, the Mobile County mainland, and the Alabama portion of Mississippi Sound. I think there is a compelling justification to pursue an expansion of the present MsCIP study area so that a comprehensive solution to the Mississippi Sound barrier island erosion problems can in fact be developed – Dauphin Island must be included in the study if that is to occur. In conclusion, I request the Corps to take the necessary steps to expand the study area.

I appreciate your consideration of my comments.

Sincerely,

Glen Coffee

Response to Glen Coffee dated 24 March 2009

Response: Thank you for your comments. We do not concur that the report should be revised to include Dauphin Island as part of the plan formulation effort. The decision to not include Dauphin Island as part of the Mississippi Coastal Improvements Program (MsCIP) was not an arbitrary decision of the USACE but rather in response to the authorizing language which states in part "*the Secretary shall conduct an analysis and design for comprehensive improvements or modifications to existing improvements in the coastal area of Mississippi in the interest of hurricane and storm damage reduction, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and other related water resource purposes at full Federal expense*". The Congressional authorization is specific to the coastal area of Mississippi and as such the MsCIP focus on the three coastal counties and those waters defined by the State boundaries. To the maximum extent possible we have utilized data covering the larger region of the northern Gulf of Mexico in the formulation of the comprehensive plan. In addition, we have evaluated all the proposed plan features on a regional basis to ensure that no negative or unintended impacts would occur in neighboring areas, e.g. Alabama and Louisiana. All of our recommendations, however, are specific to coastal Mississippi due to the authorizing language.

There is no doubt that Dauphin Island suffered damages as a result of Hurricane Katrina but as stated above the authorizing language was directed to the coastal area of Mississippi and therefore did not include the coastal area of Alabama. We included discussion of the Louisiana area because Congress authorized a similar study for this area, the Louisiana Area Coastal Protection and Restoration Study, as a result of Hurricane Katrina, and we were directed to ensure that the two studies were closely coordinated through their development. In addition, there is concern on the part of many Mississippi stakeholders that existing and future hurricane protection efforts in eastern Louisiana would have significant negative impacts due to induced flooding in western Mississippi.

That Dauphin Island is part of the barrier island chain of the northern Gulf of Mexico and that is a part of the sand budget of the northern Gulf is not in dispute. It is well known that the origination of the sand transport system which supports the northern Gulf shoreline originates in the Apalachicola Bay area with sediments of an Appalachian origin. The Florida panhandle shoreline, Fort Morgan, the Mobile ebb tidal delta, Dauphin Island, and the Mississippi islands are all part of this system. It is not accurate to say that the Mississippi island chain owes its existence to Dauphin Island.

The comprehensive barrier island plan is not being recommended to protect the Mississippi mainland. The main purpose of proposing to restore these National Park Service Gulf Islands National Seashore barrier islands is to maintain the integrity of the Mississippi Sound ecosystem and the ecosystems of the Mississippi mainland. Granted there are incidental benefits which may accrue to the Mississippi mainland due to the reduction of wave generated erosion specifically from everyday climatic events and possibly low level tropical storms. Restoration of the islands will not provide significant risk reduction to higher energy hurricane events. The major risk reduction feature of the MsCIP is the High Hazard Area Risk Reduction Program which will initially acquire approximately 2000 parcels along the mainland Mississippi coast. This represents approximately 13 percent of the mainland coast. Over the long term over 15000 parcels could be acquired in the high hazard area.

As part of the plan formulation, we considered all appropriate sources of sand to fill the need required by the barrier island restoration, including offshore and inland. As part of this effort we evaluated the transport of sand stored in upland navigation dredged material disposal sites on the inland waterway system of Alabama. The challenges with utilizing this sand included the physical characteristics of color and grain size as well as the economic cost of transporting the material. For these reasons the use of 'river sand' was eliminated from consideration.

In conclusion, we believe we have fulfilled the intent of Congress as expressed in the authorizing language. The Mississippi Coastal Improvements Program Comprehensive Plan makes recommendations for projects within the political boundary of Mississippi while considering the positive and/or negative impacts that may occur outside this boundary if the plan is implemented.

Again thank you for your comments.

Rees, Susan I SAM

From: Smith, Thomas E SAM
Sent: Monday, March 30, 2009 12:39 PM
To: Rees, Susan I SAM
Subject: FW: MsCIP Question

Attachments: Graveline at Bayou Lamotte.pdf

Graveline at Bayou Lamotte.pdf...

FYI

TOm Smith
Project Manager, Mississippi Coastal Team Corps of Engineers, Mobile District
251.690.3270 (Cell)251.605.0637

-----Original Message-----
From: GORDON QUESENBERRY [mailto:gquesenberry@mcwinc.com]
Sent: Friday, March 27, 2009 2:29 PM
To: Smith, Thomas E SAM
Subject: MsCIP Question

Tom,

Earlier today, someone in Gautier approached me regarding an extreme-high-tide roadway flooding problem. The flooding location is Graveline Road at Bayou Lamotte. I have noted the location on the attached map.

This Bayou never came up in past discussions regarding restoration of natural drainage ways because the Bayou is mostly encompassed within Shepherd State Park and would not benefit from dredging.

Solution to the flooding is fairly straightforward, raise the road. But, this is one time when raising the road via a bridge (probably less than 100 feet total span length) would provide much more than improved public safety. Specifically, it would open up the man-made constriction of the Bayou (culverts under the roadway) and permit better exchange of fresh and salt waters targeting natural restoration of the marine ecosystem within the park. The project would be a mini-example of the one jointly constructed by the Mississippi State Port Authority and Jackson County for Fountainbleu Road at Graveline Bayou back in maybe 2003. That project replaced an earth-filled causeway with a bridge about 1/2 mile long.

Not sure why this idea was not mentioned back when the MsCIP was taking shape. Guess I was more fully using my BS in Civil Engineering degree than my ME in Environmental Engineering Sciences degrees. If it is not too late in the game, I would ask that the District give this project a once over. If it seems to have value and a possible place in your list of doables for the next round of construction, I am certain Gautier will do whatever is needed to assist the District in getting the project added.

Thanks for your support. Should you need anything else at this time, please let me know.

Gordon

Gordon S. Quesenberry, P.E.
Gautier City Engineer
McCrory & Williams, Inc.
(251) 476-4720

Response to Gordon Quesenberry, e-mail dated 30 March 2009

Response: Thank you for your comment. This area was not identified in any of our sessions on problems to be addressed by the Mississippi Coastal Improvements Program. Based on the description provided it does not appear that this project would fall under hurricane storm surge risk reduction and without much additional study we would not be able to determine the degree of environmental restoration. We suggest you contact the Natural Resource Conservation Service as they may be able to assist you with this roadway.

97444 Diamondhead Drive West
Diamondhead, MS 39525

3-17-09

Dr. Susan Rees
Program Manager, MsCIP
Corps of Engineers
Mobile, AL

Dear Susan:

President Obama has repeatedly called on citizens to send their concerns to him. Accordingly, I have sent the attached letter to him.

I look forward to hearing you speak Wednesday in Bay St. Louis.

Thank you,

Harold Dawley

Harold Dawley
228 437 4210

97444 Diamondhead Drive West
Diamondhead, MS 39525

3-17-09

Dear President Obama:
The White House
Washington, D.C.

I have a question about financial loss experienced by businesses that rebuilt/reinvested in Gulf Coast communities hard hit by Katrina who are now un-expectantly being adversely affected by US government policies.

My specific question relates to businesses in these communities who used SBA commercial disaster loans to rebuild/reinvest. When these loans were made, most businesses making them assumed that their communities would more or less return to their pre-Katrina population levels. But the pre-Katrina residents of many hard hit communities have not returned. In some communities less than one-third of the pre-Katrina residents have returned and less than 25% of the businesses have returned. There are a number of factors related to this problem with one being the increased flood elevation requirements that make it more difficult and expensive to rebuild and another being the significant increase in the cost of insurance. Since the success or failure of many small businesses can be related to the number of local residents living nearby, US government polices that have discouraged local residents to return to these communities are making it more difficult for these businesses to survive.

The potentially most significant adverse factor for SBA commercial disaster loan funded businesses survival is the proposed Corps of Engineers buy out along the Mississippi Gulf Coast. While the merits of this proposal are clearly evident, one adverse consequence that may not be readily evident is the increased likelihood of many residents opting to sell there land and either move out or not rebuild. This presents an added burden for SBA commercial disaster loan funded businesses whose viability is closely related to the size of the local population.

I would like to suggest that consideration be given to forgiving SBA commercial disaster loans for businesses struggling to survive in areas hard hit by Katrina where the Corps of Engineers buy out is being proposed. Since there is still a shortage of housing along the Mississippi Gulf Coast, to facilitate the development of new housing, forgiveness of the SBA commercial disaster loan could even be in the form of a credit to be used to build housing in designated areas.

I would appreciate an opportunity for input into whatever policy is adopted to address the issue I raise above. I have sent copies of this letter to the Director of the SBA Regional Office in Birmingham, the Corps of Engineers person handling the proposed buy-out along the Mississippi Gulf Coast, among others.

Thank you.

Harold Dawley

Harold H. Dawley, Jr.

Cc; SBA Administrator
SBA Regional Office, Birmingham, AL
Congressman Gene Taylor
Dr. Susan Reese, US Corps of Engineers

Response to Harold Dawley, 17 March 2009

Response: Thank you for comment and support of the Mississippi Coastal Improvements Program. We have taken into account both the negative and positive impacts to regional businesses, including small businesses, in our evaluation of the High Hazard Area Risk Reduction Program. Although there may be negative impacts to some existing businesses we believe that the additional opportunities for business associated with the need for new housing, infrastructure, and changed land use would offset any negatives. We will keep your concerns in mind as we move forward toward authorization and implementation.

Town of Dauphin Island

1011 Bienville Blvd. • Dauphin Island, Alabama 36528
Phone: (251) 861-5525 • Fax: (251) 861-2154 • Email: dialgovmt@townofdauphinisland.org

March 13, 2009

U.S. Army Corps of Engineers
ATT: Dr. Susan I. Rees (CESAM-PD)
P.O. Box 2288
Mobile, AL 36628

Dear Dr. Rees:

The Town of Dauphin Island respectfully submits the following comments on the Draft Mississippi Coastal Improvements Program (MsCIP) Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (EIS). While our immediate concerns are obviously related to the long term stability of Dauphin Island's shoreline and the viability of our community, our comments are also provided in the broader context of protecting Alabama's portion of the Mississippi Sound ecosystem, the Mobile County mainland shoreline, and our sister coastal communities of Bayou La Batre, Coden, and Alabama Port.

The central theme of our comments is that Dauphin Island, the Alabama portion of the Mississippi Sound, and Mobile County shoreline should also be included within the Coastal Improvements Program in a similar manner as Mississippi's three coastal counties. As we make our case for expanding the geographic scope of the study, we understand that the Corps has been constrained up to now from doing so because of the present Congressional language that limits the study to conducting "...an analysis and design for comprehensive improvements or modifications to existing improvements in the coastal area of Mississippi".

However, the arbitrary decision to define the eastern limit of the study area as the political boundary separating Alabama and Mississippi ignores the ecosystem approach that should be pursued to thoroughly address the Hurricane Katrina related problems that affect the entire

Mississippi Sound barrier island chain, including Dauphin Island, and the significant estuarine resources that occur within the eastern portion of the Sound.

Comment 1 – The Adverse Effects of Hurricane Katrina on Dauphin Island, the Mobile County Coastline, and the Estuarine Resources of Alabama's portion of the Mississippi Sound Should be Addressed in the Report. The report should be revised to clearly state that Dauphin Island and the Mobile County shoreline was also significantly impacted by Hurricane Katrina. The report makes no mention of those impacts which are essentially the same as those experienced by the three coastal Mississippi counties. The breach in Dauphin Island created by Hurricane Ivan in 2004 was enlarged by Katrina in 2005, allowing the intrusion of higher salinity waters from the Gulf of Mexico into Mississippi Sound which has eliminated production from Alabama's principal oyster reefs. Significant quantities of sand were eroded from Dauphin Island as the island was shifted to the north and its western end completely denuded of vegetation and substantially lowered in elevation. The present conditions now expose the Mobile County mainland natural and man-made environment to the risk of higher wave heights from future storm events in a manner similar to that of the Mississippi coastal counties to the west. In addition, though never explicitly stated in the Draft Report, the adverse effects of a diminished Dauphin Island will pose severe long-term negative consequences for the Mississippi barrier islands of Petit Bois, Horn, East Ship, and West Ship Islands.

We believe these significant impacts must be addressed in an equal manner to the discussion devoted to the Mississippi study area since Dauphin Island is the lead island in the chain of barrier islands that forms the entirety of Mississippi Sound. Dauphin Island's importance is related to the littoral drift processes by which sands are transported to the west – the process by which the Mississippi barrier islands were originally constructed and continue to be maintained. A substantial Dauphin Island is critical to maintaining the long-term integrity of the entire barrier island chain. The fact that a diminished Dauphin Island will have dramatic adverse consequences for Mississippi's barrier islands can be interpreted from the reference to Dauphin Island in the National Park Service's (NPS) Vision Statement contained in Appendix H to the report. The NPS Vision Statement states that:

"...by 'capturing' the sand that arrived from the Alabama mainland shore [i.e., the Fort Morgan Peninsula] through current and drift processes via the Mobile Bay ebb-tidal delta and steering it westward along its south shore, eastern Dauphin Island probably played an important role in originally determining the offshore position of the whole barrier island chain which extended well into southeastern Louisiana".

The Vision Statement also clearly states that Petit Bois Island was once connected to Dauphin Island in the days of the early French explorers until it was severed from Dauphin Island by a powerful historic hurricane. In short, the entire Mississippi Sound barrier island chain, of which Dauphin Island is the lead island, owes its very existence over geologic time to Dauphin Island. Despite the information provided by the NPS, the Draft Report ignores both the fact that Dauphin Island was equally affected by Hurricane Katrina and that those effects can seriously jeopardize the long-term recovery of the down-drift barrier islands located in Mississippi. As a result, the Draft Report fails to address measures to restore Dauphin Island.

Further evidence of the Draft Report's failure to recognize the importance of Dauphin Island to the barrier island chain and the damages created by Hurricane Katrina is provided in lines 35-38 on page 1-7 which state that:

"...in addition to the regional impacts of the Hurricanes of 2005, the two states [i.e., Louisiana and Mississippi] share key resource issues including shoreline erosion and barrier island loss, wetlands loss, salinity intrusion, and storm surge and waves. The barrier islands reduce wave energy and help significantly in reducing erosion to the mainland."

This discussion represents a succinct description of the same Hurricane Katrina impacts that also affected Dauphin Island, the Mobile County shoreline, and the estuarine resources within the eastern portion of Mississippi Sound. However, the Draft Report ignores the impacts that occurred in Alabama's coastal environment while addressing the very same effects in Louisiana. Even with the restrictive nature of the present authorizing language, we contend that the Corps should not be constrained from identifying the Alabama impacts, and in the interest of presenting an ecosystem based approached to fully address the impacts on the Mississippi Sound barrier island ecosystem, the Corps is duty bound to do so. This is particularly true since the shoreline damages and sand losses experienced by Dauphin Island are of more critical importance to the future of the barrier islands located in Mississippi and the consequences on the estuarine resources within Mississippi Sound if they cease to exist than any of the hurricane impacts that occurred in Louisiana.

In this connection, lines 17 through 20 on page 1-8 state that "...all potential impacts, both adverse and beneficial impacts, are being considered without regard to geographic boundaries... and that several measures have beneficial impacts outside specific study boundaries". While the context of these referenced lines deals with the effects of the considered measures on areas within Louisiana to the west of Mississippi Sound, we again express our disappointment that the Draft Report is silent on the substantial damages that occurred from Hurricane Katrina in Alabama's portion of Mississippi Sound to the east. At a minimum, the Draft Report should be revised to describe the shoreline changes and sand losses experienced by Dauphin Island and the associated impacts on the Mobile County coastline and eastern portion of Mississippi Sound since these areas constitute a major component of the Sound's entire ecosystem.

Comment 2 – The Lines of Defense Concept Should Also be Applied to Dauphin Island. Section 2 explains that in formulating storm protection plans for the Mississippi mainland "...a Lines of Defense (LOD) concept was developed based on existing natural and manmade coastal features...Barrier islands are the first LOD and the first natural barrier against future storms". We completely support the fundamental nature of the LOD concept in guiding the development of corrective measures since this approach recognizes the importance of stable and healthy barrier islands in reducing wave heights on the mainland coastline during storm events. Accordingly, we again contend that the damages from Hurricane Katrina to Dauphin Island should also be addressed in the study. Further, the long-term viability of the down-drift barrier islands in Mississippi are being, and will continue to be, adversely impacted by the sand erosion losses experienced by Dauphin Island that are directly attributable to Hurricane Katrina.

We understand that the federal government's (i.e., the NPS) ownership of most of the barrier islands in Mississippi was a factor considered in developing the scope of the $477,200,000 Comprehensive Barrier Island Restoration Plan. We are also familiar with the established Corps policy espoused in ER 1165-2-130 which states that "...all costs assigned to the protection of Federally-owned shores [i.e., Gulf Islands National Seashore] are Federal, and the Federal agency benefiting from the project is responsible for these costs". However, the Executive Summary contained in Appendix H clearly states that restoration of the Mississippi barrier islands is being recommended principally to protect the Mississippi mainland which is privately owned, and not solely to protect the Gulf Islands National Seashore. This is again borne out by lines 12-14 on page 71 which specifically state that:

"...stabilizing the outermost barrier islands appears to be the best way to ensure the Mississippi Sound and coastal shoreline ecosystems remain intact. These islands also are the first natural features that protect the coastal counties of the State of Mississippi [sic]".

Thus, it is clear that ownership of the islands on which the restoration work will be performed is actually irrelevant to the primary purpose for which restoration of the barrier islands is being recommended – that is "...to protect the Mississippi mainland and to maintain Mississippi Sound as an estuary formed by the barrier islands". This represents a desirable deviation from established Corps policy regarding land ownership issues, similar to the non-traditional nature of the authorizing language that states the Coastal Improvements Program is to be pursued "...at full Federal expense..." instead of under a cost-shared arrangement as is typically the case for traditional Federal shore protection projects.

Extending this logic as exemplified in the work performed to date in Mississippi, restoration of Dauphin Island should also be viewed in a similar manner with the primary objective being to protect the Mobile County mainland shoreline. In our view, the primary objective of restoring the damaged shoreline of Dauphin Island should be focused on protecting the Mobile County mainland and Mississippi Sound as is being done with the Mississippi barrier islands and not on the manner in which the land is owned on Dauphin Island. Once an island restoration measure is developed for recommendation, the appropriate institutional arrangements, including those based on the private vs. public sector land ownership issue, can be explored and resolved to allow the measure to be implemented. From our review of the Draft Report, that appears to be the approach that is being pursued for the barrier islands in Mississippi.

Comment 3 – Dauphin Island Should be Added to the Comprehensive Barrier Island Restoration Plan. In reviewing Appendix H which presents the results of the Comprehensive Barrier Island Restoration Plan, we are pleased to note that the engineering investigations performed for the Study did not recognize the political boundaries that prevented restoration measures from being recommended for Dauphin Island. For example, the sediment transport modeling and sediment budget analyses correctly established the Mobile Pass region as the eastern boundary of the study area. By doing so, these investigations recognized the critical importance of Dauphin Island to the down-drift Mississippi barrier islands and the integral nature of the Alabama and Mississippi islands as a system. Lines 14-18 on page 33 point out that:

"...the net longshore sand transport rate for the barrier islands is from east-to-west. The barrier islands are migrating towards the west and, as they move west, also move the Passes between the islands in a westerly direction. The source of sand for this region is the Mobile Pass ebb tidal shoal and the sandy shelf and shoreline to the east of Mobile Pass."

Figure 3.4-7 on page 32 also portrays the hypothetical present-day sediment budget and macrobudget for Dauphin Island and Petit Bois Pass.

These investigations revealed a progressive reduction in sand supply and an overall regional shortage of littoral sand for barrier island maintenance. While these problems are manifested throughout the barrier island chain in Mississippi, the sand shortage actually begins on Dauphin Island, with the shortage being significantly intensified in the aftermath of Hurricane Katrina. Despite the findings of the engineering investigations that demonstrate the adverse effects of Katrina on the littoral drift process and the long-term consequences to the down-drift barrier islands in Mississippi, Dauphin Island was excluded from being considered for restoration. As a result, the present reference to the plan as the "Comprehensive Barrier Island Restoration Plan" is actually a misnomer. Until Dauphin Island, as the lead island in the barrier island chain, is included in the plan and addressed in an equal fashion to the barrier islands in Mississippi, the plan cannot in fact be viewed as truly being a "comprehensive" approach to restoring the Mississippi Sound barrier island chain.

Lines 4-9 on page 60 of Appendix A summarized the collective conclusion of the Corps, NPS, US Geological Survey, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, and the Mississippi Department of Marine Resources that "...specific emergency actions and long-term restoration of the sediment transport system and budget are crucial and necessary for preserving and protecting the Mississippi barrier islands' natural and cultural resources". This is followed by the following statement on lines 38-44 on page 63 that the:

"...overarching goal [of the Comprehensive Barrier Island Restoration Plan] is to restore the crucial sediment transport system and budget, including littoral zone geologic processes around the Mississippi barrier islands, to a natural state as much as possible given the realities of navigation channel dredging, climate change (sea level rise, increased frequency of storms, etc.) and other anthropogenic activities. Restoring the sediment transport processes of the Mississippi barrier islands to a condition similar to the natural system that functioned before human intervention offers the best opportunity to ensure the long-term viability of these islands."

We concur with the above stated conclusion and goal. However, we also maintain that the present restoration plan represents an incomplete approach to restoring the entire Mississippi Sound barrier island chain if Dauphin Island, as the critical lead island in the chain, continues to be excluded from the restoration strategy.

Based on our review of Appendix H, we maintain that it is not too late to add Dauphin Island to the Program. Since the sediment transport modeling and sediment budget investigations include Dauphin Island, these essential engineering investigations have already laid the foundation that should make it relatively easy to add Dauphin Island to future Study efforts without adversely affecting the pace of work within Mississippi. Further, since a Programmatic EIS has been prepared at this point in the Study to address the environmental effects associated with the recommended restoration measures, this approach also makes it easy to expand the geographic scope of the study area to include Dauphin Island and the Alabama portion of Mississippi Sound. As you well know, the programmatic approach to analyzing environmental effects was advocated by the Council on Environmental Quality to add flexibility in project planning when all information is not available to construct a final analysis of the potential impacts associated with considered Federal actions.

Comment 4 – Sand Originating from Sources within Alabama Should be Used to Also Restore Dauphin Island. Appendix H states that additional study is required before the Comprehensive Barrier Island Restoration Plan can be implemented. Specifically, the additional investigations will be aimed at (1) confirming the quantity and quality of sand in offshore borrow areas near the barrier islands identified in the initial studies; and (2) determining the optimal locations to place both littoral zone additions of sand and the locations for disposal of material from future maintenance dredging.

Of particular interest to us is the source of the 4,000,000 cubic yards of sand proposed to be placed in the littoral zone east of Petit Bois Island. Appendix H states that two potential sources will be considered to provide the needed sand for Petit Bois Island. Figure 6.5-4 on page 70 shows that one potential "sand resource target" source to be investigated includes the offshore areas surrounding the western tip of Dauphin Island. The second source under consideration is the Alabama inland river system that flows into Mobile Bay, provided additional testing demonstrates that sand source is compatible with the sand within the barrier island chain's littoral system. The river sand would be excavated from the numerous upland disposal sites located along the lower Tombigbee River and transported by barge to Petit Bois Island for placement.

We find it ironic that the Comprehensive Barrier Island Restoration Plan is proposing to use sand obtained from sources within Alabama for placement on Petit Bois Island to protect Mississippi's estuarine resources and coastline, while ignoring the similar and equally damaging Hurricane Katrina created shoreline erosion problems that significantly eroded Dauphin Island, now threaten the estuarine resources of the Alabama portion of the Mississippi Sound, and have exposed Alabama's coastline to increased risk from future storm events. There is an inherent disconnect in the study's logic that ignores the shoreline erosion problems of Dauphin Island as the lead island in the barrier island chain which happens to be located within Alabama, while proposing to take sand from locations within Alabama to use in restoring the barrier islands in Mississippi.

Comment 5 – Sand Could be Placed in Dauphin Island's Nearshore Littoral Zone to Avoid Land Ownership Issues. At numerous locations within Appendix H, reference is made to the restoration strategy that will place sand within the littoral zone in water depths affected by normal to moderate wave action and no deeper than 15 feet. This strategy avoids the direct placement of sand on the Mississippi barrier island beaches and takes advantage of the natural littoral drift processes to transport the sand along the chain of barrier islands. We contend that this same method of placement could be employed on Dauphin Island to restore its highly eroded shoreline. By not placing the sand directly on Dauphin Island, it should be possible to avoid the land ownership issues that are often associated with traditional Federal shore protection projects. We contend this approach also warrants evaluation for Dauphin Island.

Comment 6 – Report Should Identify Navigation Channels Located to the East of Petit Bois Island. Our final comment seeks clarification of the intent of specific language on line 17 on page 66 in Appendix H that discusses Long-term Restoration Actions. The entire paragraph within which the statement occurs is repeated in the following so as to assure that our review does not take the meaning of the statement out of context:

"Restoring and replicating the sediment transport processes and budget of the Mississippi barrier islands to a condition similar to the natural system that functioned before human intervention offers the best opportunity to ensure the long-term viability of these islands. Therefore, the best long-term restoration solution is to plan for the bypassing of compatible sand routinely dredged *from navigation channels in the area that are located east of Petit Bois* [emphasis added] and Horn Islands. Appropriate volumes of sediment would then be available in the littoral zone transport system to replenish sand lost from all of the Mississippi barrier islands due to natural geologic processes. Any long-term planning to achieve this objective must be based on sound scientific information and understanding of the barrier island sediment budget and transport system, and must be consistent with NPS mandates."

The only navigation channel that we are aware of to the east of Petit Bois Island that crosses the littoral zone of the barrier island chain is the Mobile Harbor Ship Channel, with Dauphin Island being located in the intervening distance between that navigation channel and Petit Bois Island. We recommend the statement be clarified to identify the specific navigation channel that is located to the east of Petit Bois Island to which reference is made.

We believe the above comments make a compelling case as to why Mobile County should also be included in the Coastal Improvements Program. Accordingly, the Town of Dauphin Island strongly requests that the Corps utilize its considerable influences to seek Congressional support to expand the present authorizing language to add Mobile County to the three Mississippi coastal counties already included in the Program. Failure to address the Hurricane Katrina related damages to Dauphin Island will make it impossible to develop a comprehensive and environmentally sustainable barrier island restoration strategy for the complete chain of barrier islands that form the entire Mississippi Sound.

Sincerely,

Honorable Jeff Collier,
Town of Dauphin Island

Response to Jeff Collier, Mayor Dauphin Island dated 13 March 2009

Response: Thank you for your comments. We do not concur that the report should be revised to include Dauphin Island as part of the plan formulation effort. The decision to not include Dauphin Island as part of the Mississippi Coastal Improvements Program (MsCIP) was not an arbitrary decision of the USACE but rather in response to the authorizing language which states in part "*the Secretary shall conduct an analysis and design for comprehensive improvements or modifications to existing improvements in the coastal area of Mississippi in the interest of hurricane and storm damage reduction, prevention of saltwater intrusion, preservation offish and wildlife, prevention of erosion, and other related water resource purposes at full Federal expense*". The Congressional authorization is specific to the coastal area of Mississippi and as such the MsCIP focus on the three coastal counties and those waters defined by the State boundaries. To the maximum extent possible we have utilized data covering the larger region of the northern Gulf of Mexico in the formulation of the comprehensive plan. In addition, we have evaluated all the proposed plan features on a regional basis to ensure that no negative or unintended impacts would occur in neighboring areas, e.g. Alabama and Louisiana. All of our recommendations, however, are specific to coastal Mississippi due to the authorizing language.

There is no doubt that Dauphin Island suffered damages as a result of Hurricane Katrina but as stated above the authorizing language was directed to the coastal area of Mississippi and therefore did not include the coastal area of Alabama. We included discussion of the Louisiana area because Congress authorized a similar study for this area, the Louisiana Area Coastal Protection and Restoration Study, as a result of Hurricane Katrina, and we were directed to ensure that the two studies were closely coordinated through their development. In addition, there is concern on the part of many Mississippi stakeholders that existing and future hurricane protection efforts in eastern Louisiana would have significant negative impacts due to induced flooding in western Mississippi.

That Dauphin Island is part of the barrier island chain of the northern Gulf of Mexico and that is a part of the sand budget of the northern Gulf is not in dispute. It is well known that the origination of the sand transport system which supports the northern Gulf shoreline originates in the Apalachicola Bay area with sediments of an Appalachian origin. The Florida panhandle shoreline, Fort Morgan, the Mobile ebb tidal delta, Dauphin Island, and the Mississippi islands are all part of this system. It is not accurate to say that the Mississippi island chain owes its existence to Dauphin Island.

The comprehensive barrier island plan is not being recommended to protect the Mississippi mainland. The main purpose of proposing to restore these National Park Service Gulf Islands National Seashore barrier islands is to maintain the integrity of the Mississippi Sound ecosystem and the ecosystems of the Mississippi mainland. Granted there are incidental benefits which may accrue to the Mississippi mainland due to the reduction of wave generated erosion specifically from everyday climatic events and possibly low level tropical storms. Restoration of the islands will not provide significant risk reduction to higher energy hurricane events. The major risk reduction feature of the MsCIP is the High Hazard Area Risk Reduction Program which will initially acquire approximately 2000 parcels along the mainland Mississippi coast. This represents approximately 13 percent of the mainland coast. Over the long term over 15000 parcels could be acquired in the high hazard area.

As part of the plan formulation, we considered all appropriate sources of sand to fill the need required by the barrier island restoration, including offshore and inland. As part of this effort we evaluated the transport of sand stored in upland navigation dredged material disposal sites on the inland waterway system of Alabama. The challenges with utilizing this sand included the physical characteristics of color and grain size as well as the economic cost of transporting the material. For these reasons the use of 'river sand' was eliminated from consideration.

Based on your last comment we have made minor changes to the Barrier Island appendix to qualify our discussion on placement of suitable sandy materials dredged from USACE navigation channels in the area and have specifically referenced the continuing use of the Sand Island beneficial use area as well as other littoral zone disposal sites.

In conclusion, we believe we have fulfilled the intent of Congress as expressed in the authorizing language. The Mississippi Coastal Improvements Program Comprehensive Plan makes recommendations for projects within the political boundary of Mississippi while considering the positive and/or negative impacts that may occur outside this boundary if the plan is implemented.

Again thank you for your comments.

March 25, 2009

Susan.I.Rees@usace.army.mil

Dr. Rees:

Please accept my comments on the MSCIP.

1. Massive earth moving projects such as those proposed have huge impacts on folks like me who live in their path.

2. I'm not totally blaming COE since Congress directs your work, but there is a dismal history of unintended consequences resulting from COE projects, perhaps best exemplified by MRGO.

3. Such massive earthworks contribute to climate disruption. I ask you to provide estimates of the carbon footprints of these projects and also estimates of the carbon reductions that could be achieved if these funds went into energy efficiency projects instead.

4. As yet-to-be-controlled greenhouse gasses careen us toward an ice free planet http://www.climatesciencewatch.org/index.php/csw/details/hansen_et_al_whats_needed/ please include plans for dealing with the likely 200 feet of sea level rise. Please note that anything short of that will be of only temporary value. Please estimate the useful lifetime.

5. If the trackhoe crazies have their way and these construction projects go forward then please work with the NPS (http://sites.google.com/site/gulfcoasttrails/) and put a recreation trail along any levees or canals that are modified in any form.

Thank you for taking my comments and best of luck getting this right.

PS: I have 40 acres of waterfront property I'd like to sell you…

Jerry Landrum
5278 Menge Ave
Pass Christian, MS 39571

228-669-9446

Response to Jerry Landrum, e-mail dated 25 March 2009

Response: Thank you for your comments. With the exception of the improvement to the existing levee at Forrest Heights we are not recommending the projects suggested by your comment.

From: King, Ruda L SAM
Sent: Monday, March 23, 2009 8:34 AM
To: Rees, Susan I SAM; Smith, Thomas E SAM
Subject: FW: MsCIP Pascagoula Property Question

Forwarded from the MsCIP mailbox. This one looks like it needs a reply.

-----Original Message-----
From: jpgrissom@yahoo.com [mailto:jpgrissom@yahoo.com]
Sent: Sunday, March 22, 2009 5:04 PM
To: MsCIP
Subject: MsCIP Pascagoula Property Question

Dear Crops,
We own Pascagoula property (1115 Farnsworth Ave, Pascagoula, MS) located east of Pascagoula Street and south of Washington Ave, north of Beach Blvd and have many questions concern Ms(S)CIP's impact on our property. If Option A or B proposal is approved for the Pascagoula Moss Point levee system how much property will be affected north of Beach Blvd, present southern most seawall street in Pascagoula, to Washington Ave? The height of the levee system proposals is in question or is unclear. Will the levees Option A or B, be constructed to 20 ft or 30 ft. above sea level or above elevation at the designed locations as per the specific option designs? Our Farnsworth property has been surveyed to be at 14' 1" above sea level falling into FEMA flood zone "B." If fact we were not even required to purchase flood insurance by our mortgage holder, even though we did have flood coverage before Katrina. I can't imaging the scope of a level system at 20-30 ft. above the present site elevations for those points within the proposed Pascagoula-Moss Point Levee system. The Corps' design for a 20-30 ft. above sea level levee system appears to us as a more appropriate long term flooding control solution. Katrina's storm surge crested, according to FEMA/ SBA, at 18 ft. for the Pascagoula St-Washington Ave intersection. This PS-WA intersection is one city lot from our Farnsworth Ave property. A 30 ft. levee, Option B ringing P-MP, would serve as the best flood protection for our property. If Option C is selected what will become of the property between Washington Ave Alternate Alignment and the MS Gulf, all property south of Washington Ave? Would properties south of Washington Ave be considered "buffer zone lands?'" A 30 ft. high levee at Washington Ave would seemingly require a large "footprint" of land to construct. Will the roads, such as Washington Ave or Beach Blvd.,be relocated within the toe of the levees? Many questions remain but please respond to these questions and future questions will be based on the Corps response. We currently live in Ridgeland, MS as indicated in our return address and would like a response to this mail and would like to kept abreast of the Ms(S)CIP events and decisions.

Jim & Sandra Grissom
419 Berkshire Dr. Ridgeland, MS 39157
(601)790-4034 (Home) (601)862-8105 (Cell)

Response to Jim Grissom, e-mail dated 23 March 2009

Response: At this time the only structural element that is recommended for implementation is the Forrest Heights levee in Gulfport. We have identified a number of areas in which a structural levee system could provide substantial risk reduction, however these are not recommended for implementation. These areas are identified for further feasibility study in the event that the local governmental agencies request additional efforts. At this time, the detailed information necessary to answer your questions would be available. We will keep you on the MsCIP mailing list for future information.

From: King, Ruda L SAM
Sent: Monday, March 23, 2009 12:42 PM
To: Smith, Thomas E SAM; Rees, Susan I SAM
Subject: FW: Island Restoration and High Hazzard Risk Reduction

Forwarded from the MSCIP mailbox.

-----Original Message-----
From: SANTOBIANCO@bellsouth.net [mailto:SANTOBIANCO@bellsouth.net]
Sent: Monday, March 23, 2009 12:34 PM
To: MSCIP
Cc: //cochran.senate.gov/email.html; //wicker.senate.gov/public/index.cfm?FuseAction=Contact.EMailSenatorWicker; //forms.house.gov/childers/webforms/contact.htm; //forms.house.gov/bennie thompson/contact-form.shtml; //harper.house.gov/contact/; //forms.house.gov/genetaylor/webforms/zipauth.htm
Subject: Island Restoration and High Hazzard Risk Reduction

To whom it may concern:

Name: John G. Santobianco

Address: 4957 East Belle Fontaine Road
Ocean Springs, MS 39564

email: Santobianco@bellsouth.net

Primarily participating as a resident of Mississippi.

Also Barrier Island restoration and high Hazard Risk Reduction (Phase 1).

I attended the March 2009 meeting in Gautier that was held in the Jr. College lunchroom. I believe that the land should be appraised and the owner should be paid fair market value. No previous insurance or grant money should be backed out. This would encourage more people to participate in the program and would save money in the long run because the homeowners would sell their land to the government. If the land is sold to the government, we would not have repeated flood claims.

I would also like to add that the Mississippi BMR and the Army Corps of Engineers have preformed a great service to our community. I support their efforts.

Please let me know if I can be of any additional assistance

Thank you and kindest regards,

John G. Santobianco

4947 East Belle Fontaine Road

Ocean Springs, MS 39564

John G. Santobianco

Response to John Santobianco, e-mail dated 23 March 2009

Response: Thant you for your support of the Mississippi Coastal Improvements Program. We will take your suggestions into consideration should we begin implementation of the High Hazard Risk Reduction plan element.

STONE PIGMAN WALTHER WITTMANN L.L.C.
COUNSELLORS AT LAW

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E-Mail: jcolbert@stonepigman.com

60,143

March 30, 2009

VIA E-MAIL and U.S. MAIL

Dr. Susan I. Rees
Program Manager, MsCIP
U.S. Army Corps of Engineers
Mobile District
MsCIP Team
P.O. Box 2288
Mobile, Alabama 36628-0001

RE: Comments to Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement for Mississippi Coastal Improvements Program

Dear Dr. Rees:

This letter is submitted on behalf of members of the Nathan V. Boddie family (the "Boddie Family" or "Family") and provides comments to the Draft Comprehensive Plan and Integrated Programmatic Environmental Impact Statement (the "Draft Plan") for the Mississippi Coastal Improvements Program ("MsCIP"), noticed in the Federal Register, Vol. 74, No. 26, page 6603, February 10, 2009, Notices. The Family appreciates the recent opportunity for George Boddie to meet with you and other representatives of the U.S. Army Corps of Engineers ("USACE") to discuss the Draft Plan. Based on those discussions and your follow-up e-mails, the Family is hopeful that the issues addressed in these comments will be resolved in the USACE's revisions to the Draft Plan. It is requested that the Boddie Family's comments be filed into the official record.

The Boddie Family currently owns approximately one-half (1/2) of Cat Island, Mississippi, including most of the Island's east facing beach, and previously owned the portion of Cat Island that is now included in the Gulf Islands National Seashore ("GINS"). Members of the Boddie Family have lived on the Gulf Coast and have had an ownership interest in Cat Island for more than 100 years. The three Boddie siblings were born and raised in Gulfport, and George Boddie and his family now live in Pass Christian. The Boddie Family's interest in the Draft Plan stems from both their ownership interest in Cat Island and their desire that the physical integrity of Cat Island be maintained in order to protect the Gulf Coast and its residents from hurricanes and tropical storms.

1. **Overview.**

The Draft Plan recommends that Congress allocate $516,000,000 (Table 6-1) for the restoration of Ship, Horn, and Petit Bois Islands, but does not recommend that Congress allocate any funds for the restoration of Cat Island, instead recommending "further study." This failure to recommend that Congress allocate funds to restore Cat Island is apparently based on the false proposition that Cat Island is not part of the same littoral system as the other Mississippi barrier islands and a National Park Service ("NPS") policy that is irrelevant to Cat Island. The NPS policy, which would generally prohibit the restoration of islands in GINS unless "human activities have altered or interfered with natural conditions or processes of the Mississippi barrier islands, such as the natural sediment supply and transport rate and direction," has no bearing on Cat Island because human activities have dramatically impacted the littoral process at Cat Island. As discussed in detail below: 1

a. Cat Island is in fact part of the same littoral system as Dauphin, Petit Bois, Horn and Ship Islands;

b. The natural east-to-west littoral flow of sand from Dauphin, Petit Bois, Horn and Ship Islands to Cat Island has been blocked by "human activity," i.e., the Mobile Ship Channel dredging, the Horn Island Pass dredging and, in particular, the continuous dredging of the Gulfport Ship channel for over 100 years; and

c. The Cat Island littoral zone in which restoration materials would be placed is not part of the GINS; at Cat Island, the GINS boundaries stop at the mean high water mark and do not extend for one mile seaward, as they do at Mississippi's other barrier islands.

Cat Island protects a substantial part of the Mississippi Gulf Coast, and it should be treated consistently with Mississippi's other barrier islands in the coastal restoration process. Cat Island should be restored to the same degree and with the same sense of urgency as Mississippi's other barrier islands. Additionally, following initial restoration, materials from future dredging of the Gulfport Ship Channel should, on an ongoing basis, be strategically placed on the western side of the Ship Channel to reintroduce material into the westward littoral flow of sand to provide nourishment to Cat Island.

2. **Premise of Draft Plan is Contrary to Accepted Authority.**

The entire premise of the Draft Plan with regard to Cat Island, as set forth in the Comprehensive Barrier Island Restoration Plan Appendix (Appendix H) to the Draft Plan (the "Island Restoration Appendix"), is apparently based on a single draft modeling report that concludes that Cat Island is not part of the east/west littoral sediment drift of Mississippi's barrier islands. The Island Restoration Appendix's conclusion that Cat Island is not part of the natural east-west littoral system is directly contrary to the widely accepted coastal processes of the Dauphin Island and Mississippi barrier island system. Although numerical models are a tool for prediction, we question the accuracy of this model and the wisdom of completely reversing the Corps' historical approach to Cat Island based on a draft report of a model developed with boundary conditions premised on very limited and possibly erroneous historical bathometric information. The conclusions in the Draft Plan are of particular concern in light of the fact that, as more fully discussed below, the Gulfport Ship Channel/Ship Island Pass system has been continuously deepened, widened and dredged for the last 110 years. The summary conclusions of the Draft Plan are directly contrary to, and rebutted by other studies, including the authoritative 2007 U.S. Geological Service (USGS) Report, "Historical Changes in the Mississippi-Alabama Barrier Island and the Roles of Extreme Storms, Sea Level and Human Activities" (the "USGS Report") authored by Dr. Robert A. Morton and comments to the Draft Plan submitted by Dr. Ervin G. Otvos, a copy of which is attached to this letter. Drs. Morton and Otvos are two of the most well respected authorities on the Mississippi barrier island system and are cited extensively in the Island Restoration Appendix. 2

a. **Inconsistencies with the USGS Report.**

The Island Restoration Appendix at 6.3.2 correctly quotes Morton from the USGS Report as follows: "The principle causes of Mississippi barrier island erosion and land loss are frequent intense storms, a relative rise in sea level, and a deficit in the sediment budget." Section 6.3.2 continues by paraphrasing Morton as follows: "Of these causes, the one that experienced the greatest change over the last 100+ years is the reduction in sand supply related to dredging of navigation channels through the outer bars of the tidal inlets near islands." (Morton 2007). The Island Restoration Appendix neglects to include Morton's actual conclusion that, of the three factors contributing to island erosion, "the only factor that has a historical trend that coincides with the progressive increase in rates of land loss is the progressive reduction in sand supply associated with nearly simultaneous deepening of channels dredged across the outer bars of the three tidal inlets [Mobile Bay, Horn Island Pass and **Ship Island Pass directly east of Cat Island**] maintained for deep-draft shipping." USGS Report, 1; *see also Id.* at 27.

According to the USGS Report, the cumulative effect of continuous dredging and deepening, from the late 1880s to the present, of the navigation channels through the outer bars at Mobile Bay, Horn Island Pass, and Ship Island Pass "eventually prevent[ed] the sediment transport system from transferring sand to the downdrift barrier" and "disrupted the littoral system," rendering it "incapable of transferring sand across the ebb tide deltas" and "essentially [trapping in the navigation channels] all of the sand in transport along the Gulf shores of the barriers." USGS Report, 24. During this same period, "each island [Dauphin Island, Petit Bois Island, Horn Island, Ship Island and **Cat Island**] has been reduced in area to the size of the next smallest island." USGS Report, 24.

The direct correlation between dredging of the bar channels to increased depths and rapid increases in the rate of land loss suffered by all of the Mississippi-Alabama barrier islands is shown in the table at Figure 7 of the USGS Report. Interestingly, and directly contrary to the Island Restoration Appendix's assertion that Cat Island is not a part of the Mississippi-Alabama barrier island littoral system, the USGS Report includes Cat Island in the system, and Figure 7 shows the same increased rates of land loss at Cat Island in response to deeper bar channel dredging as at the other barrier islands. The USGS Report notes a "remarkable temporal similarity of generally accelerated rates of land loss for each of the MS-AL barrier islands [Dauphin Island, Petit Bois Island, Horn Island, Ship Island, and **Cat Island**]" and concludes that the documented "historical rates of land loss of the MS-AL barriers greatly exceed the geological rates of land loss." USGS Report, 23-24; *see also Id.* at 26.

With regard to Cat Island in particular, the USGS Report states that the MS-AL "navigation channels [have acted] as sediment sinks, removing sand that otherwise would have been available for beaches immediately downdrift of the channel if the ebb tidal delta had not been modified (east Dauphin Island, east Horn Island, **Cat Island spits**)." USGS Report, 24 (emphasis added). The USGS Report concludes that "**[t]he long-term prediction for Cat Island is uncertain because it is far out of equilibrium with the extant coastal processes and sediment supply. Continued erosion of the island perimeter and severe reduction in sand supply related to disruption of the alongshore transport system at Ship Island Pass could eventually cause Cat Island to be reduced to a shoal.**" USGS Report, 25 (emphasis added).

b. **<u>Inconsistencies with Other Authorities</u>.**

Dr. Otvos also takes exception to the Island Restoration Appendix's conclusion that there is an absence of sand transport from Ship Island to Cat Island. Otvos' comments to the Draft Plan, dated March 25, 2009 (attached). Dr. Otvos states that the east-west littoral drift involves the "entire barrier chain," from Dauphin Island to Cat Island. *Id.* at 2. Cat Island's north-south and east-west oriented spits, and in particular the southern-most spit, are nourished by the westward drift of sand across Ship Island Pass from West Ship Island. *Id.* at 3. The Ship Island channel acts as a "temporary sediment sink" that slows but does not stop the western drift of littoral material; however, "by removing spoil material from shore-parallel downdrift sand 3 transport, the regular dredging of the Ship Island navigation channel certainly diminishes the volume of sand that traveling along the Ship Island shore, eventually reaches Cat Island in the west." *Id.* at 2.

Dr. Otvos concludes in his comment letter that, while Ship Island will require "massive nourishment efforts" that may ultimately be unsuccessful, Cat Island can be "efficiently and effectively protected by regular nourishment. Repeatedly applied sand stockpiles may significantly lengthen the island's life. Deposition of significant sand volumes at the central sector of the eastern island shore thus could play a crucial role by mitigating the long-term effect of island erosion due to hurricane strikes." *Id.* at 3.

The Abstract of the February 1989 Knowles-Rosati study discusses the alternate alignments for the channel at Ship Island stating: "Alternate channel alignments were studied as potential solutions to the shoaling problems caused by the island migration. An alignment passing 1,900 feet west of the island would allow approximately 50 years before the island tip reaches the channel edge based on the 38-ft./year migration rate." Mississippi's barrier island system, including Cat Island, would be very different than it is today if Ship Island Pass, absent the 110-year old Gulfport Channel, had been allowed to receive the volume of material removed from the passes at Horn and at Ship Islands.

The 1950 Ship Quadrangle map shows a -18-ft. contour, 2400-ft. due west of the original location of the Gulfport Ship Channel at Ship Island. The contour is labeled SE Spit and is just west of the realigned ship channel. According to the migration rates (38-ft./yr) of the Knowles-Rosati study, and absent channel maintenance and dredging activities, Ship Island would be approaching this shoal today. Additionally, the USACE's 1990 General Design Memorandum (Plate 3) shows the northern end of the realigned bar channel reach within one mile of the -12-ft. contour of Cat Island shoals. If the sediment eliminated from the littoral system as a result of the Mobile Bay dredging and Horn Island dredging had been contemporaneously re-introduced into the system to offset these activities of man, it is clear that the migration rate of Ship Island would have been much greater than 38 ft./year during the last century and, absent the Gulfport Ship Channel, Ship Island would currently be located much farther to the west and much closer to Cat Island.

While numerical models are prediction tools, there is no way to know what Cat and Ship Islands would look like today or how far west Ship Island would have migrated were it not for the continuous dredging of the Gulfport Ship Channel and the other channels to the east. The fact that the MS-AL barrier island littoral system has been severely and continually altered for over a century makes definitive conclusions based on a numerical model with very limited historical bathometric information questionable. The continued migration of Ship Island to the west, even with the diminished supply of littoral flow sand which it receives, is clear evidence that the littoral flow continues to the west of Ship Island.

3. **Gulfport Ship Channel Maintenance Issues.**

Table A3 of the MsCIP draft report, "Regional Sediment Budget for the Mississippi Mainland and Barrier Island Coast," prepared by the Engineering Research and Development Center, Coastal Hydraulic Lab (the "Draft Sediment Budget Report") shows a total of 13,538,433 cubic yards of new work and 28,683,888 cubic yards of maintenance material that has been dredged from the littoral system in the Ship Island Pass Bar Channel. These quantities of dredged material would certainly be much greater had not an additional 22,000,000 cubic yards been dredged from the updrift littoral system at Hom Island Pass as shown in Table A4 of the Draft Sediment Budget Report. According to the Draft Report, most of the maintenance material and approximately half of the new work material was removed from the bar channel by hopper dredge which when loaded can only dump in deepwater offshore disposal areas, effectively removing it from the littoral system.

The Draft Sediment Budget Report and other records indicate that if dredging activities for the Gulfport Ship Channel had been conducted in accordance with environmental documentation over the past twenty years, channel maintenance material would certainly have reached Cat Island. For example, Table A3 of the Draft Sediment Budget Report omits the fact that, in 1991, 650,000 cubic yards of material designated for the Cat Island littoral zone was dredged from within the limits of the Ship Island Bar channel and diverted to the expansion of the Port of Gulfport where it was placed under what is now the parking lot at the West Pier. (CESAM-PH-EC Public Notice No. FP91-GU05-4, a copy of which is attached). This diversion to the Port of Gulfport expansion was inconsistent with the USACE 1990 General Design Memorandum and Environmental Documentation for the Gulfport Ship Channel, which clearly states that **new work and maintenance material shall be placed in the littoral zone southeast of Cat Island so as to maintain the system.** Information in the description column of Table A3 of the Draft Sediment Budget Report suggests that the dredging methodology used precluded Cat Island littoral zone disposal, and it is undisputed that the Channel and Pass size have increased. The Boddie Family firmly believes that, if the USACE had conducted maintenance activities in strict accordance with its Environmental Impact Statement and associated environmental documentation, the littoral system effecting Cat Island would have been stabilized and would have continued to work as historically outlined in the numerous studies, models, and reports. The Family also questions whether the small amount of material that was designated as littoral zone disposal in Table A3 was actually pumped two miles west to the approved site as designated in the June 1989 Final Environmental Impact Statement (Figure EIS-4), or merely placed 2,000 feet west of the ship channel. 4

Modification of the Draft Plan is necessary to offset past, and prevent future, starvation of Cat Island resulting from more than 100 years of ever increasing expansion, deepening, and maintenance dredging of the Gulfport Ship Channel and the other Mississippi-Alabama bar channels and the removal to offshore deepwater disposal sites of dredged material that was trapped in the Gulfport Ship Channel during its natural flow westward toward Cat Island.

As was stated in the initial overview of these comments, it is the Boddie Family's desire to see all of Mississippi's islands restored and sustained with an equal sense of urgency and to ensure that all new work and maintenance material from the Gulfport Ship Channel improvement is beneficially placed in a manner that will nourish Cat Island. The Family appreciates the opportunity to comment on the Draft Plan and looks forward to seeing these comments, and necessary changes consistent with these comments, incorporated into the final plan.

Very truly yours,

John W. Colbert

John W. Colbert

JWC/esb
Enclosures
cc: Mr. George Boddie (w/encls.)
Mrs. Cala B. Colbert (w/encls.)
Mrs. Elizabeth B. Adair (w/encls.)

March 25, 2009

Dr. Susan I. Rees
MsCIP Program Manager
Mobile District,
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, AL 36628

Re: US Corps of Engineers Coastal Improvement Program (MsCIP, Feb., 2009). Protection issues; vulnerability and restoration needs; The case for Cat Island.

Dr. Dr. Rees:

Please allow me to share my thoughts with you regarding certain important aspects of the program you are presently managing. My comments mainly involve the role of Cat Island in the planned island nourishment projects.

Introduction

A recent Draft Program by the Mobile District, US Corps of Engineers (2009) proposes very substantial nourishment efforts in island restoration to combat erosion problems exacerbated by land loss to catastrophic recent Hurricanes Camille and Katrina. I take exception to some of the statements made regarding the natural littoral/longshore sand supply that reaches Cat Island. This also included the easily challenged claim voiced in the present Corps Draft Program (2009) regarding alleged total absence of sand transport from Ship and Cat as the result of changed positions of the eastern part of the Mississippi River Delta.

Littoral sand transport from Ship Island to Cat Island and points to the west was the process that enabled formation of the western members of the Alabama-Louisiana (New Orleans) islands. There is no reason to doubt that sand transport, driven by the dominantly westward-directed waves from the Gulf does carry sand across the bottom of Ship Island Pass to reach the east shore of Cat Island. This highlights the need for a sediment bypass of the Ship Channel that avoids permanent sediment loss from dredging to its transport to Cat Island . To facilitate the sand reaching Cat Island, as done downdrift from Petit Bois Pass, sediment dredged from the channel should be deposited in a spoil pile on the western (downdrift) side of the channel.

The thrust of the Corps recommendations essentially favors partial restoration of Ship Island only. However, I would argue that a more even-handed restoration strategy may benefit Cat Island's protection and its long term survival chances with well-planned placement of sand resources along its eastern and northern shore sector.

Sand transport issues in island chain; subaqueous sand transport from West Ship to Cat Island

It has been well established that littoral drift along the island beaches and the nearshore littoral current plays an overwhelming role in east-west sand transport along the Alabama-Mississippi barrier island chain. This transport at present involves the entire barrier chain, starting in Dauphin Island, Alabama and continuing along the shores of Petit Bois, Horn, East and West Ship Islands, finally reaching Cat Island. As the sand-transmitting role and capacity of shallow ebb tidal deltas between the islands clerarly indicates, transport processes do not stop, only slow when they encounter passes and man-made, regularly dredged deep ship channels. Examples include the role of the giant Mobile Pass ebb tidal delta and of the smaller ebb-deltas off Horn Island and Dog Island Passes. Ship Island ship channel also acts as a "temporary sediment sink" in slowing but not entirely stopping the westward-directed littoral sand transport. By removing spoil material from shore-parallel downdrift sand transport, the regular dredging of the Ship Island navigation channel certainly diminishes the volume of sand that traveling along the Ship island shore, eventually reaches Cat Island in the west.

In recent geological history (Otvos and Giardino, 2004) Cat Island has been the offshore transmitting point of sand from Ship Island toward the south Hancock County, Mississippi - New Orleans Pine Island barrier chains that existed until growth of Mississippi River's St. Bernard delta lobes surrounded and partially buried these barriers and stopped littoral drift but *only west of Cat Island* more than 2000 years ago. While subsequent further growth and partial blocking Ship Island Pass probably diminished westward transport from Ship to Cat, the subsequent disintegration of easternmost St. Bernard Delta that previously has partially obstructed Ship Island Pass, now allowed the resumption of sand transport to Cat Island. The claim (USCE Draft Program, 2009, p.74) of "termination of littoral current transport due to the southward extension of the Mississippi Delta" is, as the Program Statement itself admits in a separate passage, not very well substantiated and therefore rather questionable. According to another far less than accurate statement, "portions of the barriers rolled over towards the Sound"; p.27).

Causes for land losses in Cat and Ship islands. Contrast between island elevation and morphology and its impact on island reduction and area reduction

Between 1848 and 2005, the total area of the two Ship islands has been reduced from ~600 ha to 204 ha, while Cat Island shrunk from ~1200 to 743 ha (Otvös and Carter, 2008; with similar values in Morton, 2007). A major reason for the historically steadily increasing, by now catastrophic shrinkage of Ship island may be its generally low surface elevation and exposed position. Most of Ship, especially its former central and eastern sectors consist of low sand flats that are reduced quickly to underwater shoals during major storms only to recover relatively slowly thereafter. In contrast, only very

minor areas in Cat Island (located exclusively in the SE spit area) are represented by shallow subtidal and low supratidal sand flats.

As historical data shows, recovery of the sand flat sectors remains incomplete even after several years of relative calm following a storm. It is reversed suddenly by the passage of a new hurricane. The much higher ground in West Ship proved to be more resistant to storm effects but even the relatively high relict beach ridges of East Ship, due to their unprotected setting were almost completely wiped out by Hurricane Katrina. Restoration of the low Ship island sectors by sand nourishment may bring only a very temporary respite at an unreasonably high cost.

Cat Island has been much better protected in the past. It is shielded from the Gulf by a pair of north-south-oriented wide, although steadily narrowing sand spits. Surface elevations especially in the higher dunes- covered northern spit and the E-W trending central strandplain-"shank" of the island are relatively high. Slow subsidence effects mostly a small NE sector of the island west of and in the protection of the northern spit. Most of the island's area loss took place by recession of the southern spit that recovers quickly each time after hurricane passage. The new shoreline usually forms somewhat west of the pre-storm shoreline. It is these spit areas that receive the westward transported sand that crosses Ship Island Pass from West Ship Island. Without the protection of the still relatively wide eastern spit belt the central and western areas of Cat Island would relatively quickly waste away under the recurring major hurricanes that regularly strike it from the Gulf.

Littoral drift, aided by wave refraction at this critical site constantly moves sand from this location both toward the northern and southern spit areas. Stockpiling would augment sand supplies that reach the island from West Ship via westward wave transport over the bottom of shallow Ship Island Pass. This natural transport process probably plays a significant role in keeping the spits relatively well supplied with sand and thus bolsters the island's defenses.

The spit zone is a major protection for the rest of the island that, because sheltered by the eastern spit belt suffered remarkably little overall erosion during the past 160 years. While central and eastern Ship Island, with or without massive nourishment efforts will inevitably waste away, *Cat Island would be more efficiently and effectively protected by regular nourishment, Repeatedly applied sand stockpiles may significantly lengthen the island's life. Deposition of significant sand volumes at the central sector of the eastern island shore thus could play a crucial role by mitigating the long-term effect of island erosion due to hurricane strikes.*

Recommendations

I recommend the regular placement of dredged and other sand resources along the central sector of Cat Island eastern shore to augment the northeastern and southeastern island spit. The two wide spit sectors undoubtedly play a crucial role in slowing the slow westward retreat of the eastern island shoreline, thereby diminishing and delaying steady destruction of the entire island. In view of the contrast between the two islands' geological framework and development history, sand nourishment at critical Cat island sites appear to be incomparably more cost-effective, of more enduring impact, and therefore more rewarding than sand placement on Ship Island sites would be. Therefore, at least some of the sand resources intended for Ship should be diverted to protect Cat Island. The transport scheme should also include sand bypassing around the Ship Island (Gulfport) Ship Channel. The establishment of a dredge spoil pile west (downdrift) of the ship channel, as engineered also at the west tip of Petit Bois Island. This would increase sand volumes that reach Cat Island by natural wave transport across Ship Island Pass.

Key References

Morton, R. A., 2007, Historical changes in the Mississippi-Alabama barrier islands and the roles of extreme storms, sea level, and human activities. US Geological Survey Open-File Report No. 2007-1161.

Otvos, E. G. and Carter, G. A., 2008, Hurricane degradation- barrier development cycles, NE Gulf of Mexico: Landform evolution ands island chain history. Journal of Coastal Research, v. 24, p. 463-478.

Otvos, E. G. and Giardino, M. J., 2005, Interlinked barrier chain and delta lobe development, northern Gulf of Mexico. Sedimentary Geology, v. 169, p. 47-73.

US Corps of Engineers Mobile District, 2009, Mississippi Coastal Improvement Program (MsCIP), Hancock, Harrison and Jackson Counties, Mississippi. Appendix H. Barrier Islands, 80 p.

Respectfully submitted:

Ervin G. Otvos, Ph.D.
Professor Emeritus, USM
336 Oakridge Circle
Biloxi, MS 39531-2027

cc. Dr. William Walker, Mississippi Department of Marine Resources
Mr. George Boddie, Pass Christian, MS

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-PD-EC
PUBLIC NOTICE NO. FP91-GU05-4 ADDENDUM

September 13, 1991

JOINT PUBLIC NOTICE
U. S. ARMY CORPS OF ENGINEERS
AND
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
FOR THE
PROPOSED DREDGING AND PLACEMENT OF DREDGED MATERIAL
IN THE
ENVIRONMENTAL PROTECTION AGENCY (EPA) APPROVED
OCEAN DREDGED MATERIAL DISPOSAL SITES
ASSOCIATED WITH THE CONSTRUCTION AND MAINTENANCE
AND THIN LAYER NATIONAL DEMONSTRATION
OF THE
GULFPORT HARBOR PROJECT
HARRISON COUNTY, MISSISSIPPI

A FEDERALLY AUTHORIZED PROJECT

Interested persons are hereby notified that the U. S. Army Corps of Engineers, Mobile District, proposes to conduct construction and maintenance dredging activities in the Gulfport Harbor located in Gulfport, Mississippi as authorized and directed by the United States Congress.

This Public Notice is issued in accordance with the rules and regulations published in the Federal Register on April 26, 1988. These regulations provide for the review of dredging programs for Federally authorized projects under the Clean Water Act (33 U.S.C. 1344); the Marine Protection Research and Sanctuaries Act (33 U.S.C. 1413); and consistency with the requirements of the following related Federal laws and Executive Orders: Section 306 and 307(c) of the Coastal Zone Management Act of 1976 (16 U.S.C. 1456(c)); the National Environmental Policy Act (42 U.S.C. 4341 et seq.) as amended; the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) as amended; the Endangered Species Act (16 U.S.C. 1531 et seq.); the National Historic Preservation Act of 1966 (16 U.S.C. 407a et seq.), as amended; the Estuary Protection Act (16 U.S.C. 1221); the Wild and Scenic Rivers Act (16 U.S.C. 1271 et seq.), as amended; the Water Resources Development Act of 1976 (16 U.S.C. 1456(c)), as amended; Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971 (36 FR 8921, May 15, 1971); Executive Order 11988, Floodplain Management, May 24, 1977 (42 FR 26951, May 25, 1977); Executive

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Order 11990, Protection of Wetlands, May 24, 1977 (42 FR 26961, May 25, 1977); Executive Order 12372, Intergovernmental Review of Federal Programs, July 14, 1982, (47 FR 3959, July 16, 1982); and Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, January 4, 1979.

These laws are applied whenever dredge or fill materials may enter navigable waters. We also request the recipient of this notice to review the proposed action as it may impact on water quality, relative to the requirements of Section 404(b)(1) of the Clean Water Act and Section 103 of the Marine Protection, Research and Sanctuaries Act. We also ask your comment on any other potential impact.

WATERWAY AND LOCATION: Gulfport Harbor, Mississippi Sound, and the Gulf of Mexico.

DESCRIPTION OF ENTIRE AUTHORIZED PROJECT: The Water Resources Development Act (WRDA) of 1986 authorized improvements to the Federal navigational project at Gulfport. The proposed improvements are as follows: (a) Deepen the entrance and southern portion of the anchorage basin to 36 feet, (b) Deepen the northern portion of the anchorage basin to 32 feet, (c) Deepen the Mississippi Sound channel to 36 feet at the existing width of 220 feet, (d) Deepen the Ship Island Pass and Gulf channels to 38 feet at the existing width of 300 feet, (e) Realign the channel across the bar in Ship Island Pass approximately 1900 feet to the west to eliminate the existing doglegs and (f) Widen the channel at bends in the existing and new alignment. The Water Resources Development Act of 1988 authorized the Thin-Layer Disposal National Demonstration project (see Figure 1).

DESCRIPTION OF THE PROPOSED ACTION: The proposed action involves modifying the placement plan as described in Public Notice No. FP91-GU05-4 circulated on February 21, 1991 for the Gulfport Harbor Project. This modification, which is the result of changes in an ancillary activity by the State of Mississippi Port Authority located in Gulfport, consists of additional dredging and subsequent placement of 1.5 million cubic yards from the anchorage basin into EPA-designated Ocean Dredge Material Disposal Sites (ODMDS)(see Figure 2). Initially, this dredged material would have been used for the 29 acre Port Expansion Project (see Figure 3). However, supplementary geotechnical analysis by the Port Authority indicated that the material was marginally suitable for construction fill and maintenance of water quality standards during the filling operation would be difficult. Suitable material is located in the realignment channel and use of this material would not result in adverse impacts. As a result of these changes the 1.5 million cubic yards of predominately firm clays, clay-sands and sands dredged material will be dredged from the anchorage entrance of the channel and placed within the EPA-designated ODMDS at Gulfport, Mississippi. As an ancillary activity the State Port Authority at Gulfport proposes to excavate approximately 650,000 cubic yards of predominately sandy dredged material from the limits of the Ship Island Bar Channel and use the material for the construction of the 29 acre Port Expansion project (Note: This activity has been advertised by Joint Public Notice No. MS88-00954-O released 30 August 1991). This dredged material is part of the approximately 3 million cubic yards that was originally scheduled to be placed in the littoral zone from construction of the Federal project.

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WATER QUALITY CERTIFICATION: Pursuant to the Clean Water Act, state water quality certification is required for the proposed action described above. Water quality certification was obtained from the Mississippi Department of Environmental Quality, Office of Pollution Control on May 8, 1991 for the Gulfport project. This action has been coordinated with the Office of Pollution Control and a modification to the Water Quality Certification has been requested from the Office of Pollution Control.

COASTAL ZONE CONSISTENCY: The State of Mississippi Bureau of Marine Resources (BMR), Department of Wildlife Fisheries and Parks agreed with our findings of March 7, 1991 that the Gulfport Harbor Project was consistent with the Mississippi Coastal Program, pursuant to the Coastal Zone Management Act. Preliminary coordination with BMR indicates that the proposed action is consistent with the program to the maximum extent practicable. A final determination of consistency will be made after coordination of the public notice.

USE BY OTHERS: The proposed action for the Gulfport Harbor project will facilitate orderly completion of both the deepening of the project and the ancillary activities of the State Port Authority and is not expected to cause any significant land use changes in the adjacent areas.

NATIONAL ENVIRONMENTAL POLICY ACT CONSIDERATION: In accordance with the requirements of the National Environmental Policy Act, the entire Gulfport Harbor project was addressed in the Final Environmental Impact Statement (FEIS), which was filed with the Environmental Protection Agency in June 1989. A Record of Decision for the proposed Gulfport Harbor Project was signed 31 December 1990. An environmental assessment (EA) has been prepared to address the additional material to be placed in the EPA-designated ODMDS. It has been determined that a revised or supplemental environmental impact statement (EIS) is not required. These documents are on file at the Mobile District Office of the Corps of Engineers.

SECTION 404(b)(1) EVALUATION REPORT: An evaluation of water quality impacts associated with the proposed action has been prepared in accordance with guidelines promulgated by the Environmental Protection Agency (EPA) under Section 404(b)(1) of the Clean Water Act and is on file at the Mobile District Office for review. The report was signed by the District Engineer on 5 July 1989. Revision of the 404(b)(1) Evaluation is not required.

Should information be received during the coordination of this notice that would dictate the need to revise the Section 404(b)(1) evaluation, appropriate changes will be incorporated.

SECTION 103 OCEAN DISPOSAL EVALUATION REPORT: In accordance with Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA), a Revised Section 103 Evaluation Report addressing the transportation of the additional dredged material to be placed within the ocean sites has been prepared. This document is on file at the Mobile District Office of the Corps of Engineers for review. The resource issues discussed in the referenced Section 103 Evaluation Report include aesthetics, recreation resources, commercial marine resources, navigation, mineral resources and water quality. In accordance with the criteria contained in Section 227 of the EPA Ocean Dumping Regulations (40 CFR 227), the additional material from the project area has been determined to be environmentally acceptable for ocean disposal.

The proposed transportation of this dredged material for disposal in ocean waters has been evaluated to determine that the proposed disposal would not unreasonably degrade or endanger human health, welfare, or amenities or the marine environment, ecological systems, or economic potentialities. In making this determination, the criteria established by the Administrator, EPA pursuant to section 102(a) of the MPRSA were applied. In addition, based upon an evaluation of the potential effect which the failure to utilize this ocean disposal site would have on navigation, economic and industrial development, and foreign and domestic commerce of the United States, an independent determination was made of the need to dispose of the dredged material in ocean waters, other possible methods of disposal and other appropriate locations.

ENDANGERED/THREATENED SPECIES: On May 26, 1989, the National Marine Fisheries Service concurred that no species under their purview would be impacted by the proposed Gulfport deepening and approved ocean disposal project. The U.S. Department of Interior Fish and Wildlife Service, in the Final Fish and Wildlife Coordination Act Report dated November 1988 for the Gulfport project, indicated that no adverse effects on endangered species were expected. No endangered/threatened species should be affected from the additional dredged material placed within the approved ocean disposal sites.

CULTURAL RESOURCES CONSIDERATION: Coordination with the Mississippi State Historic Preservation Officer in May 1989 indicated that the proposed Gulfport Harbor Deepening Project would not affect any historical or cultural resources.

EVALUATION: The decision whether to proceed with the proposed action will be based on evaluating the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits which may be reasonably expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people. The proposed action will proceed unless it is found to be contrary to the overall public interest.

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Inasmuch as the proposed action involves the discharge of materials into navigable waters, designation of the proposed placement sites associated with this Federal project is being made under guidelines promulgated by the Administrator of the Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army. If these guidelines alone prohibit designating these proposed placement sites, any potential impairment of the maintenance of navigation, including any economic impact on navigation and anchorage which results from the failure to use this site will also be considered.

COORDINATION: Among the agencies receiving copies of this public notice are:

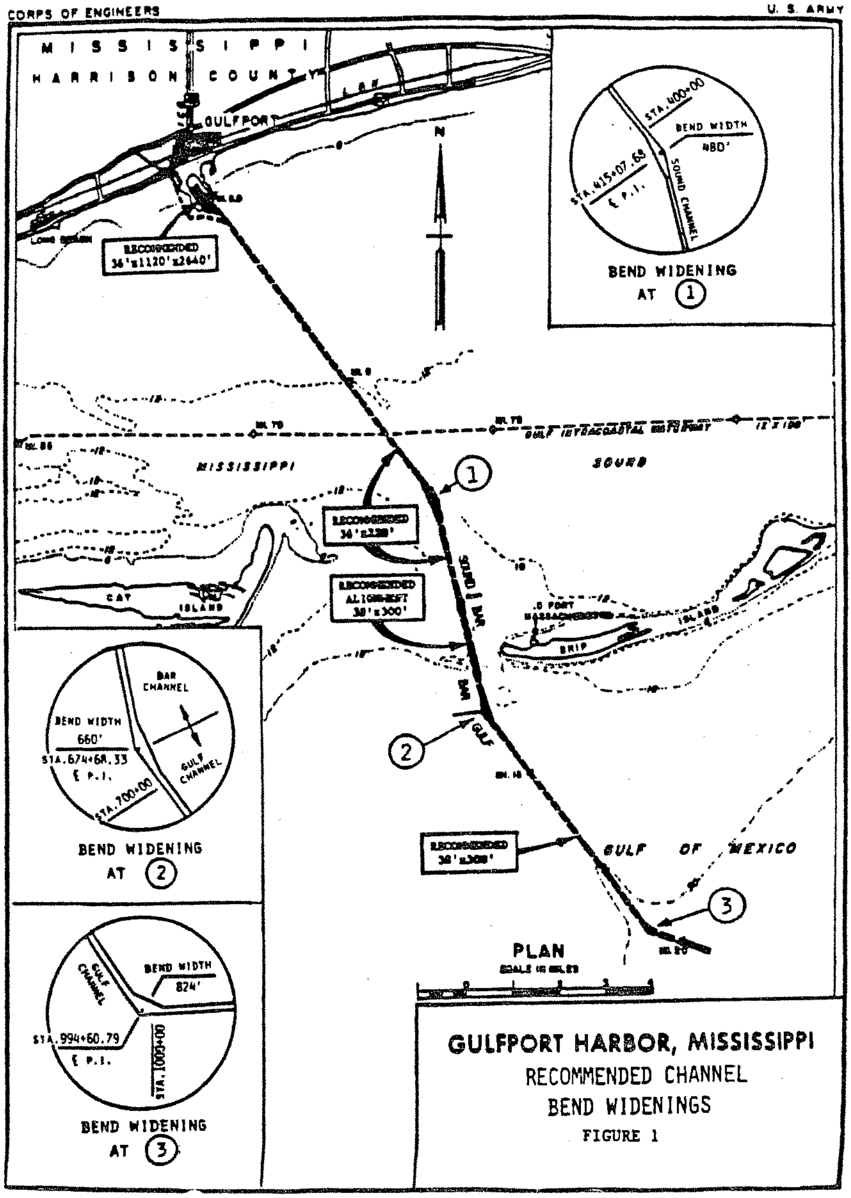
Region IV, Environmental Protection Agency
Field Representative of the Fish and Wildlife Service
Regional Director, National Park Service
Regional Director, National Marine Fisheries Service
Commander, Eighth Coast Guard District
Mississippi Department of Environmental Quality
Mississippi Bureau of Marine Resources
Mississippi State Historic Preservation Officer

Other Federal, State, and local organizations, and United States Senators and Representatives of Alabama are being sent copies of this notice and are asked to participate in coordinating this proposed action.

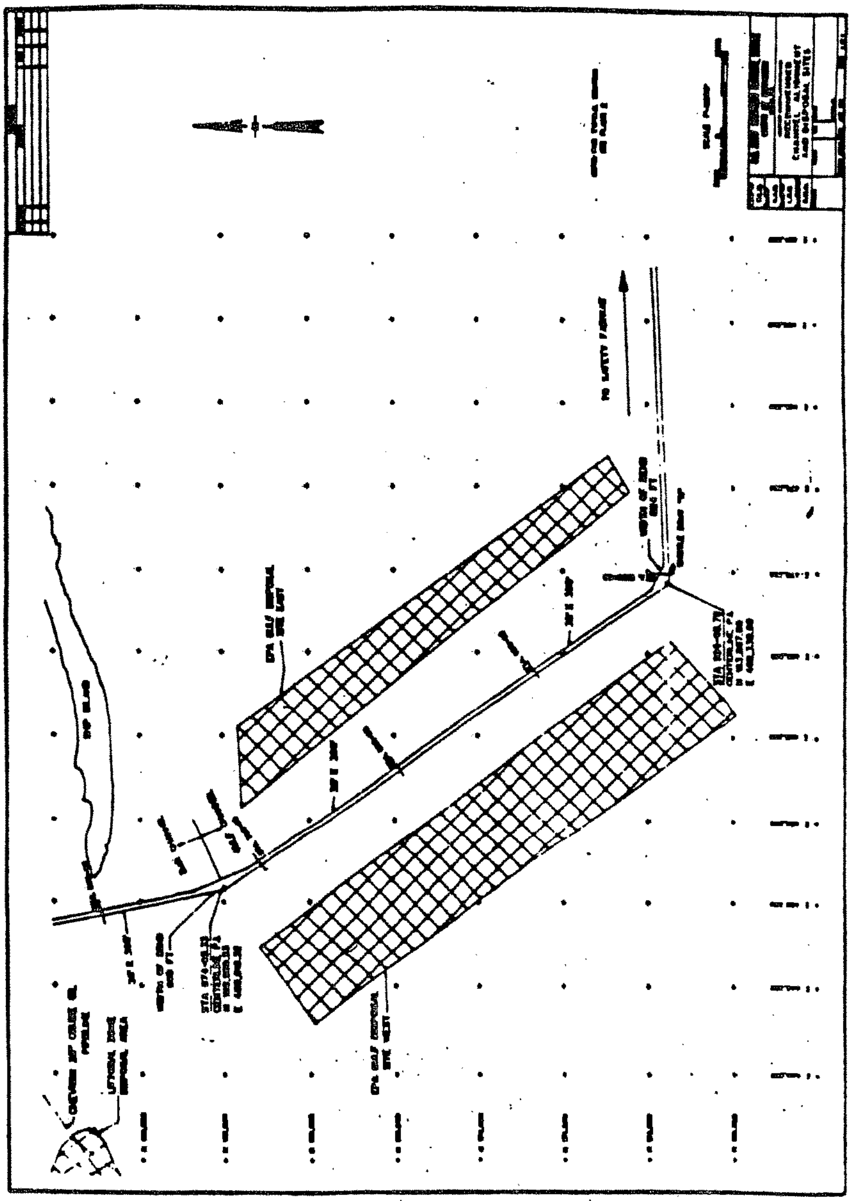
You are requested to communicate the information contained in this notice to any other parties who may have an interest in the proposed action.

CORRESPONDENCE: Any person who has an interest which may be affected by this proposed activity may request a public hearing. Any comments or request for hearing must clearly set forth the interests which may be affected and the manner in which the interest may be affected. Correspondence concerning this Public Notice should refer to Public Notice No. FP91-GU05-4 ADDENDUM and should be directed to the District Engineer, U.S. Army Engineer District, Mobile, P.O. Box 2288, Mobile, Alabama 36628-0001, ATTN: CESAM-PD-EC in time to be received prior to October 13, 1991. Ms. Alfedo Acoff, telephone number 205/694-3886, may be contacted for additional information.

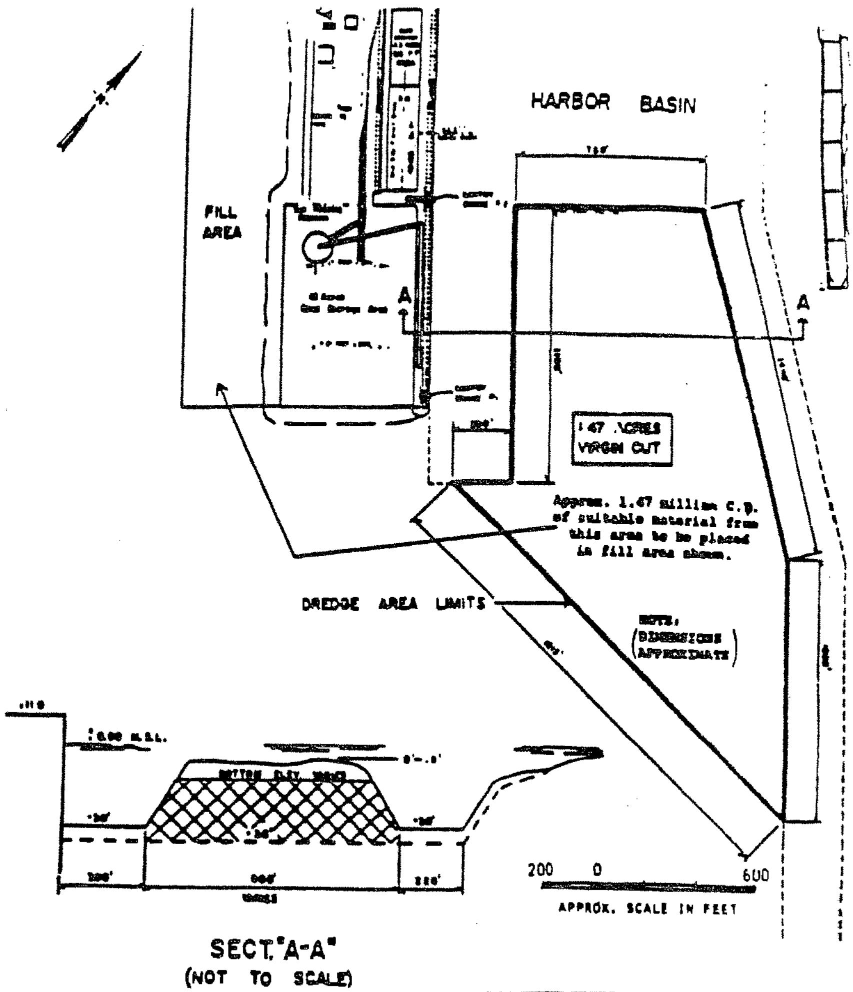
N. D. McCLURE IV
MOBILE DISTRICT
U.S. ARMY CORPS OF ENGINEERS



GULFPORT HARBOR, MISSISSIPPI
RECOMMENDED CHANNEL
BEND WIDENINGS
FIGURE 1



ENVIRONMENTAL PROTECTION AGENCY ODMDS
FIGURE 2



SOURCE:
PERMIT APPLICATION BY
MISSISSIPPI STATE PORT AUTHORITY.

GULFPORT HARBOR, MISSISSIPPI

PORT AUTHORITY'S PLAN
FOR PORT EXPANSION

FIGURE 3

Response to John W. Colbert, dated March 30, 2009

Response: Comment 1. As described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies based on data from 1917/20 to 1960/71 indicated that littoral zone sediments do not cross the area known as Ship Island Pass. Additional studies will evaluate recent (2008) bathymetric data and will provide a present-day assessment of sand transport patterns in the Alabama-Mississippi barrier island chain. This assessment will be completed prior to any sand placement. The intent of the littoral zone sand additions is to provide a sediment source for the currents to migrate the sand to nourish the existing islands. The protection afforded by the existing islands is critical to sustaining the Mississippi Sound Estuary and the Corps had no pre-conceived ideas to where to place sediments. The additional studies will provide the optimum location for these additions. The author of the Corps sediment budget report was among the previous authors that made the assumption that sediment was migrating to Cat Island.

Cat Island was indeed formed from the same littoral system as the other Mississippi barrier islands, but recent sediment budget studies do not indicate any sediment transport was occurring between Ship and Cat Islands, based on data from 1917/20 to 1960/71. As described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands.

Current dredging practices mandate that all sandy material dredged from the Ship Island Pass be placed in the Littoral Zone Disposal Area on the western side of the Pass.

Response: Comment 2. The sediment budget that was completed for the Mississippi Barrier Islands was the first detailed sediment budget of present-day coastal processes. While much has been written about the barrier islands, the work presented in this report is the only existing representation of sediment transport pathways and magnitudes for the present-day condition.

The available data at the time of the sediment budget report (1917/20 to 1960/71) did not show any patterns of morphologic change that indicated there was net sediment transport between Cat and Ship Islands.

The additional detailed work slated for Cat Island should this project be funded will determine if the littoral current system does indeed move westward to Cat Island or is forced southward at Ship Island Pass by the presence of the Mississippi River Delta.

Sand dredged from each channel has been placed in downdrift placement sites as frequently as possible. Any sand placed downdrift of the navigation channels was effectively bypassed, and available for natural coastal processes to transport the sand to the next island.

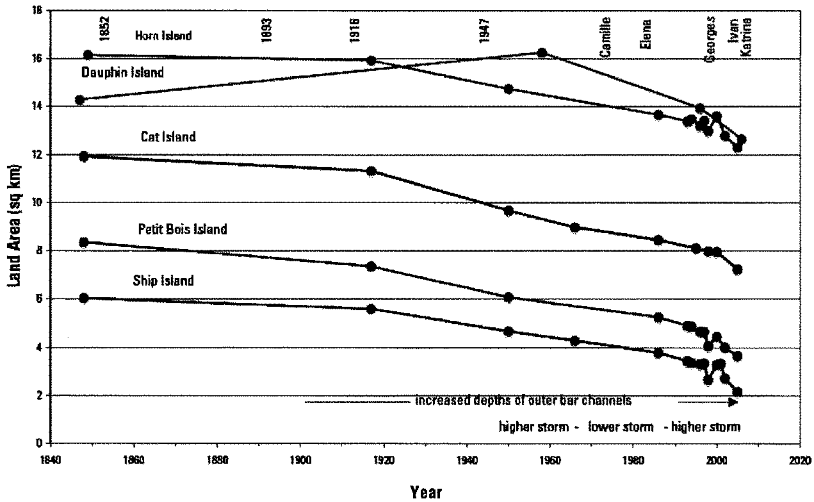
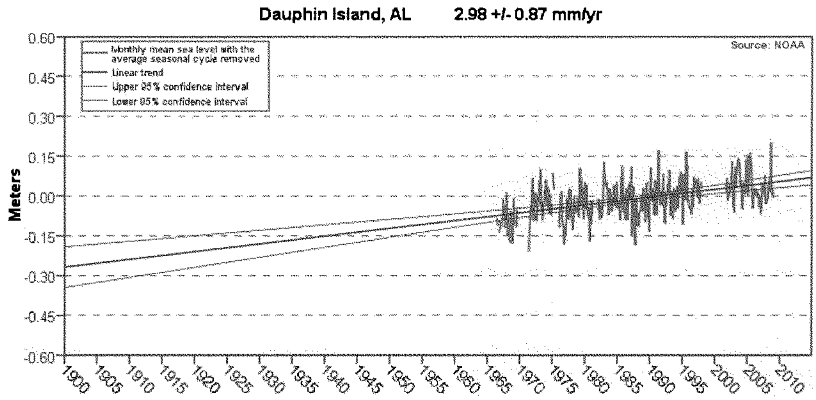


Figure 7. Historical land loss trends for the Mississippi-Alabama barrier islands relative to the timing of major hurricanes and human activities that impacted the islands.

Figure 7 from Morton's report is reproduced above. (Note that the line labeled "increased depths of outer bar channels" is misleading. Channel depths were 25 and 26 ft for Horn and Ship Island Passes, respectively, from 1900s to 1945. After 1945, these channels were deepened to between 32 and 44 ft.)

If the first data point taken in the 1840s (potentially questionable because of mapping and surveying capabilities in the mid-1800s) is not considered, the trend of change for the islands has been relatively constant since 1915 or so. Dredging of the channels between the 1900s and 1945 was only to a depth commensurate with the natural channel depths (25 and 26 ft for Horn and Ship Island Passes, respectively) and maintenance dredging rates were minimal up until 1945 (34,000 and 43,000 cu yd/year for Horn and Ship, respectively). Other changes to the regional system have occurred during this time represented by Morton's Figure 7, including relative sea level rise as shown below.



If we assume that relative sea level rise for the Mississippi Sound area has been approximately 3 mm/year since the 1900s, over the period 1900-2005, sea level has risen 105 years x 3 mm/yr = 1.1 ft. Morton's Figure 7 includes effects of 1 foot of sea level rise, storms, as well as operation & maintenance of the navigation channels. It is misleading to infer, based on a data point in the 1840s, that all of the islands have lost sediment because of dredging and placement practices. Certainly relative sea level rise and storm impacts have contributed to erosion of the Mississippi Barrier Island system.

Response: Comment 3. The additional studies should identify the presence or absence of the present day littoral system between Ship and Cat Island. Dr. Otvos himself states in a 2008 publication (Otvos and Carter, 2008) that "Intrusion of a major Mississippi River delta lobe had greatly reduced wave power in the western sound" and "this process diminished littoral sand transport and eventually terminated barrier island growth west of Ship Island".

The plan to place externally borrowed sand in Camille Cut and other littoral zones areas is only to add sand into the system and no additional placements are contemplated. The current practices of by-passing sand from dredging activities will continue.

While your postulation that had the ship channel not been maintained that Cat Island would have received all the volume removed from the channel could be true, no one can actually predict what could have occurred assuming that the additional studies will show the ship to Cat Island littoral connection. The presence of a southward flow to the littoral system along ship Island Pass could have altered the conceptual model. The presence of Ship Island Pass could be playing a role in how and where the migration is occurring. The additional studies will identify current conditions along the littoral system.

Response: Comment 4. Your concerns are so noted and as stated before, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies have indicated that littoral zone sediments do not cross this area known as Ship Island Pass, but the studies detailed below in the General Response should provide information on some of the additional work that will be accomplished prior to any sand placement.

General Response:
As described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies have indicated that littoral zone sediments do not cross this area known as Ship Island Pass, but the studies detailed below should provide information on some of the additional work that will be accomplished prior to any sand placement.

The second sentence in Section 7.3 will be amended to read that "*Initial studies have indicated that* the littoral zones currents that help replenish.......

The Barrier Island Appendix will be amended to provide more detail for proposed studies at and immediately around Cat Island. The following details will be amended into the Barrier Island Appendix at appropriate sections in Chapters 3 and 7. The Summary of Costs, Table 8-1, will be amended to detail the $1 million dedicated for additional studies at Cat Island and a figure will be inserted in Section 7.3 that's shows a potential location for littoral zone placement east of Cat Island.

Overview of Additional Studies for Cat Island

Additional studies are recommended to evaluate the possible influence the Operation & Maintenance practices for the navigation channels in Mississippi Sound, particularly Ship Island Pass, have had on Cat Island.

As discussed in the MsCIP sediment budget report, analysis of bathymetric and shoreline position data from 1917/20 to 1960/71 indicated an absence of morphologic change west of Ship Island Pass over to Cat Island (see Figure 16, reproduced below). This absence of any morphologic signature indicates that there was not a pathway of sediment transport from Ship Island to Cat Island, nor from the Ship Island disposal sites to Cat Island during this time period.

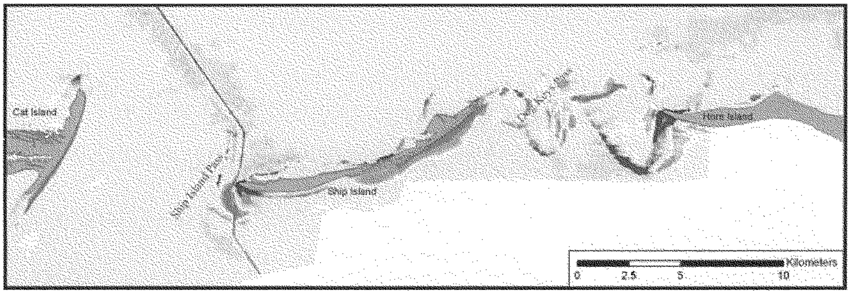


Figure 1. Bathymetric change (1917/20 to 1960/71) for the Mississippi Sound study area - Cat Island to Horn Island (from Byrnes and Griffee 2007)

Recommended Studies

1. Recent bathymetric data (~ 2008) are available and analysis of these data will help to determine if any morphologic connection has been established between Ship Island or dredged material placement sites and Cat Island since 1970. A comparison of the 1960/71 to 2008 data will also indicate whether the dredged material placement sites are stable or dispersive, and if dispersive, where the sediment is transported.

2. It is possible that the O&M dredging and placement practices at Ship Island Pass have reduced the amount of wave protection that Ship Island would have provided to Cat Island, if Ship Island were allowed to migrate to the west. An analysis is recommended with a hypothetical present-day position of Ship Island as if it had been allowed to migrate to the west, to evaluate the wave sheltering that Ship Island might have provided to Cat Island. Historical migration rates can be used to position Ship Island further west, and numerical models applied with wave forcing to calculate the existing and hypothetical wave forcing at Cat Island. A comparison of calculations will indicate the possible increase, decrease, or reversal in transport patterns because of a reduction in Ship Island's migration rate.

3. It is possible that, if Ship Island had been allowed to migrate west, it would have eventually provided sediment that would nourish Cat Island. This process would be much the same as is evident in the 1917/20 to 1960/71 bathymetric change for the passes between Dauphin, Petit Bois, Horn, and Ship Islands. Recommend a numerical study be conducted to evaluate whether the wave, tide, and circulation potential exists to transport sediment from a hypothetical future position of Ship Island to Cat Island. This exercise would be conducted with a coupled wave, current, and sediment transport model to evaluate whether the potential for sand transport exists in this region, given a hypothetical position of Ship Island (as if O&M and channel maintenance hadn't occurred) along with present-day sheltering provided by the Chandeleur Islands. It may be that wave, current, and tide conditions are not sufficient to transport sediment from east to west, given the sheltering and forcing in this area. On the other hand, it may be that a hypothetical future position of Ship Island, together with tide and wave forcing in that area, would be sufficient to create an ebb shoal that would bypass sand to Cat Island.

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The following figure will be inserted into Section 7.3 and Cat Island will be included in the appropriate paragraphs.

PROPOSED LITTORAL ZONE SAND PLACEMENT
MISSISSIPPI BARRIER ISLAND

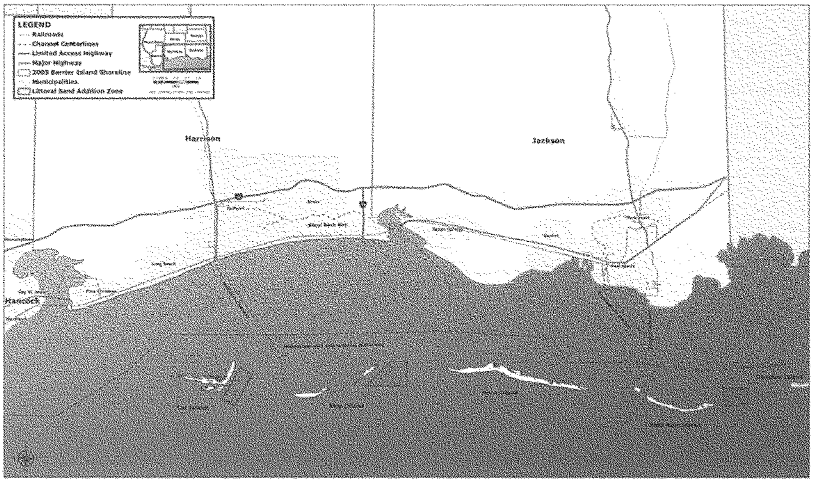

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Table 8-1.
Summary of Costs for the Comprehensive Barrier Island Restoration Plan

Project Sub-item	Costs
Sand Placement, Ship Island Breach and Littoral Zones	$516,000,000
Long Term Monitoring	$4,950,000
Cat Island Cat Coastal and Ecological Processes and Optimal Littoral Zone Placement	$1,000,000 (see note)
Regional Sediment Management Practice Revision	(see note)
Emergency Sand Placement, Fort Mass and French Warehouse	$3,000,000

Note 1: As described in Section 8.1 and shown in Table 8-2, this cost are included in the Engineering and Design costs ($17 million) for the "Sand Placement, Ship Island Breach and Littoral Zones"

March 25, 2009

Dr. Susan I. Rees
MsCIP Program Manager
Mobile District,
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, AL 36628

Re: US Corps of Engineers Coastal Improvement Program (MsCIP, Feb., 2009).
Protection issues; vulnerability and restoration needs; The case for Cat Island.

Dr. Dr. Rees:

Please allow me to share my thoughts with you regarding certain important aspects of the program you are presently managing. My comment mainly involve the role of Cat Island in the planned island nourishment projects.

Introduction

A recent Draft Program by the Mobile District, US Corps of Engineers (2009) proposes very substantial nourishment efforts in island restoration to combat erosion problems exacerbated by land loss to catastrophic recent Hurricanes Camille and Katrina. I take exception to some of the statements made regarding the natural littoral/longshore sand supply that reaches Cat Island. This also included the easily challenged claim voiced in the present Corps Draft Program (2009) regarding alleged total absence of sand transport from Ship and Cat as the result of changed positions of the eastern part of the Mississippi River Delta.

Littoral sand transport from Ship Island to Cat Island and points to the west was the process that enabled formation of the western members of the Alabama-Louisiana (New Orleans) islands. There is no reason to doubt that sand transport, driven by the dominantly westward-directed waves from the Gulf does carry sand across the bottom of Ship Island Pass to reach the east shore of Cat Island. This highlights the need for a sediment bypass of the Ship Channel that avoids permanent sediment loss from dredging to its transport to Cat Island . To facilitate the sand reaching Cat Island, as done downdrift from Petit Bois Pass, sediment dredged from the channel should be deposited in a spoil pile on the western (downdrift) side of the channel. 1

The thrust of the Corps recommendations essentially favors partial restoration of Ship Island only. However, I would argue that a more even-handed restoration strategy may benefit Cat Island's protection and its long term survival chances with well-planned placement of sand resources along its eastern and northern shore sector. 2

Sand transport issues in island chain; subaqueous sand transport from West Ship to Cat Island

It has been well established that littoral drift along the island beaches and the nearshore littoral current plays an overwhelming role in east-west sand transport along the Alabama-Mississippi barrier island chain. This transport at present involves the entire barrier chain, starting in Dauphin Island, Alabama and continuing along the shores of Petit Bois, Horn, East and West Ship Islands, finally reaching Cat Island. As the sand-transmitting role and capacity of shallow ebb tidal deltas between the islands clerarly indicates, transport processes do not stop, only slow when they encounter passes and man-made, regularly dredged deep ship channels. Examples include the role of the giant Mobile Pass ebb tidal delta and of the smaller ebb-deltas off Horn Island and Dog Island Passes. Ship Island ship channel also acts as a "temporary sediment sink" in slowing but not entirely stopping the westward-directed littoral sand transport. By removing spoil material from shore-parallel downdrift sand transport, the regular dredging of the Ship Island navigation channel certainly diminishes the volume of sand that traveling along the Ship island shore, eventually reaches Cat Island in the west. 3

In recent geological history (Otvos and Giardino, 2004) Cat Island has been the offshore transmitting point of sand from Ship Island toward the south Hancock County, Mississippi - New Orleans Pine Island barrier chains that existed until growth of Mississippi River's St. Bernard delta lobes surrounded and partially buried these barriers and stopped littoral drift but *only west of Cat Island* more than 2000 years ago. While subsequent further growth and partial blocking Ship Island Pass probably diminished westward transport from Ship to Cat, the subsequent disintegration of easternmost St. Bernard Delta that previously has partially obstructed Ship Island Pass, now allowed the resumption of sand transport to Cat Island. The claim (USCE Draft Program, 2009, p.74) of "termination of littoral current transport due to the southward extension of the Mississippi Delta" is, as the Program Statement itself admits in a separate passage, not very well substantiated and therefore rather questionable. According to another far less than accurate statement, "portions of the barriers rolled over towards the Sound"; p.27). 4 5

Causes for land losses in Cat and Ship islands. Contrast between island elevation and morphology and its impact on island reduction and area reduction

Between 1848 and 2005, the total area of the two Ship islands has been reduced from ~600 ha to 204 ha, while Cat Island shrunk from ~1200 to 743 ha (Otvos and Carter, 2008; with similar values in Morton, 2007). A major reason for the historically steadily increasing, by now catastrophic shrinkage of Ship island may be its generally low surface elevation and exposed position. Most of Ship, especially its former central and eastern sectors consist of low sand flats that are reduced quickly to underwater shoals during major storms only to recover relatively slowly thereafter. In contrast, only very

minor areas in Cat Island (located exclusively in the SE spit area) are represented by shallow subtidal and low supratidal sand flats.

As historical data shows, recovery of the sand flat sectors remains incomplete even after several years of relative calm following a storm. It is reversed suddenly by the passage of a new hurricane. The much higher ground in West Ship proved to be more resistant to storm effects but even the relatively high relict beach ridges of East Ship, due to their unprotected setting were almost completely wiped out by Hurricane Katrina. Restoration of the low Ship island sectors by sand nourishment may bring only a very temporary 6
respite at an unreasonably high cost.

Cat Island has been much better protected in the past. It is shielded from the Gulf by a pair of north-south-oriented wide, although steadily narrowing sand spits. Surface elevations especially in the higher dunes- covered northern spit and the E-W trending central strandplain-"shank" of the island are relatively high. Slow subsidence effects mostly a small NE sector of the island west of and in the protection of the northern spit. Most of the island's area loss took place by recession of the southern spit that recovers quickly each time after hurricane passage. The new shoreline usually forms somewhat west of the pre-storm shoreline. It is these spit areas that receive the westward transported sand that crosses Ship Island Pass from West Ship Island. Without the protection of the still relatively wide eastern spit belt the central and western areas of Cat Island would relatively quickly waste away under the recurring major hurricanes that regularly strike it from the Gulf.

Littoral drift, aided by wave refraction at this critical site constantly moves sand from this location both toward the northern and southern spit areas. Stockpiling would augment sand supplies that reach the island from West Ship via westward wave 7
transport over the bottom of shallow Ship Island Pass. This natural transport process probably plays a significant role in keeping the spits relatively well supplied with sand and thus bolsters the island's defenses.

The spit zone is a major protection for the rest of the island that, because sheltered by the eastern spit belt suffered remarkably little overall erosion during the past 160 years. While central and eastern Ship Island, with or without massive nourishment efforts will inevitably waste away, *Cat Island would be more efficiently and effectively protected by* 8
regular nourishment, Repeatedly applied sand stockpiles may significantly lengthen the island's life. Deposition of significant sand volumes at the central sector of the eastern island shore thus could play a crucial role by mitigating the long-term effect of island erosion due to hurricane strikes.

Recommendations

I recommend the regular placement of dredged and other sand resources along the central sector of Cat Island eastern shore to augment the northeastern and southeastern island spit. The two wide spit sectors undoubtedly play a crucial role in slowing the slow westward retreat of the eastern island shoreline, thereby diminishing and delaying steady 9
destruction of the entire island. In view of the contrast between the two islands' geological framework and development history, sand nourishment at critical Cat island sites appear to be incomparably more cost-effective, of more enduring impact, and therefore more rewarding than sand placement on Ship Island sites would be. Therefore, at least some of the sand resources intended for Ship should be diverted to protect Cat Island. The transport scheme should also include sand bypassing around the Ship Island (Gulfport) Ship Channel. The establishment of a dredge spoil pile west (downdrift) of the ship channel. as engineered also at the west tip of Petit Bois Island. This would increase sand volumes that reach Cat Island by natural wave transport across Ship Island Pass.

Key References

Morton, R. A., 2007, Historical changes in the Mississippi-Alabama barrier islands and the roles of extreme storms, sea level, and human activities. US Geological Survey Open-File Report No. 2007-1161.

Otvos, E. G. and Carter, G. A., 2008, Hurricane degradation- barrier development cycles, NE Gulf of Mexico: Landform evolution ands island chain history. Journal of Coastal Research, v. 24, p. 463-478.

Otvos, E. G. and Giardino, M. J., 2005, Interlinked barrier chain and delta lobe development, northern Gulf of Mexico. Sedimentary Geology, v. 169, p. 47-73.

US Corps of Engineers Mobile District, 2009, Mississippi Coastal Improvement Program (MsCIP), Hancock, Harrison and Jackson Counties, Mississippi. Appendix H. Barrier Islands, 80 p.

Respectfully submitted:

Ervin G. Otvos, Ph.D.
Professor Emeritus, USM
336 Oakridge Circle
Biloxi, MS 39531-2027

cc. Dr. William Walker, Mississippi Department of Marine Resources
Mr. George Boddie, Pass Christian, MS

Response:
Thank you for your letter dated March 25, 2009 in which you identified concerns with the Draft Mississippi Coastal Improvement Project report. We have listed each of your concerns, below, and explain how each of these was addressed in the report.

Response to comment 1.

As discussed in the MsCIP sediment budget report, analysis of bathymetric and shoreline position data from 1917/20 to 1960/71 indicated an absence of morphologic change west of Ship Island Pass over to Cat Island (see Figure 16, reproduced below). Note that the red and blue bathymetric change (indicated erosion and accretion, respectively) occurring at Dog Keys Pass, between Horn and Ship Islands, is absent west of Ship Island Pass over to Cat Island. This absence of any morphologic signature indicates that there was not a pathway of sediment transport from Ship Island to Cat Island, nor from the Ship Island disposal sites (shown as light green areas to the west of the Ship Channel) to Cat Island during this time period. It may be that this pathway would be evident in the recent 2008 data set. Before beach nourishment is designed for the Mississippi barrier islands, we will analyze the most recent data and conduct numerical modeling studies to determine the best areas for placement of sand. The report has been modified to more completely detail these plans.

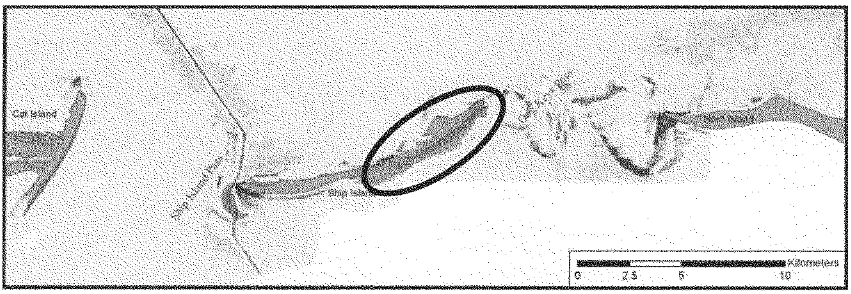

Figure 16. Bathymetric change (1917/20 to 1960/71) for the Mississippi Sound study area - Cat Island to Horn Island (from Byrnes and Griffee 2007)

Response to comment 2.

Your suggestion will be evaluated when we conduct the numerical modeling simulations that will evaluate various placement locations east of Cat Island. The report discusses these future plans.

Response to comment 3.

Please refer to the discussion pertaining to 1, above. These data indicate that there was not significant westward-directed littoral sand transport west of Ship Island from 1917/20 to 1960/71. More recent data will be analyzed to determine if westward transport between the Ship Channel and Cat Island is occurring now.

Response to comment 4.

The report says: "Formation of the St. Bernard deltaic complex and reworking of this delta to form the Chandeleur Islands reduced wave energy and transport of littoral sediments reaching Cat Island." The word "reduced" is used in the report, not "termination." We believe this is a reasonable statement.

Response to comment 5.

This statement refers to Figures 15 (reproduced below) and 16 (shown previously). Notice the circled areas on the figures, which show how the islands eroded (red areas) and reformed further into the Sound. This morphologic change is the "rollover" process.

Figure 15. *Bathymetric change (1847/52 to 1917/20) for the Mississippi Sound study area - Horn Island to Dauphin Island (from Byrnes and Griffee 2007)*

Response to comment 6.

The primary benefits provided by closure of Camille Cut and the addition of sand into the littoral system that feeds sand to Ship Island are mostly environmental in nature. The additional salinity levels in Mississippi Sound that are occurring due to the presence of Camille Cut and the gradual loss of the islands are having an effect on the local *ecosystem. While our modeling has indicated that the restoration at Ship Island will only provide limited storm surge benefits, the presence of the island chain will provide sea-wave protection for the mainland coast. Also, the National Park Service has a vested interest and mission in preserving cultural artifacts on Ship Island (Fort Massachusetts and the French Warehouse). The NPS has deemed that restoration of Ship Island is necessary for maintaining these cultural resources.*

Response to comment 7.

This may be a very good location for dredged material placement, one we will evaluate with numerical modeling as we design alternatives for the barrier islands.

Response to comment 8.

Once again, we will evaluate this placement option with numerical modeling in the next phase of the study.

Response to comment 9.

All viable placement locations, including those on Cat Island, will be evaluated with the most recent bathymetric and shoreline data with a system of numerical models. These models will evaluate episodic and long-term evolution of the islands and dredged material placement sites. The sites most critical to maintaining integrity of the islands will be selected for full design.

January 18, 2009

Mr. Bill Walker
Executive Director
Department of Marine Resources
1141 Bayview Avenue Suite 101
Biloxi, MS 39530

Ms. Susan Rees
U. S. Army Corps of Engineers
Mobile District, CESAM-PD
P. O. Box 2288
Mobile, AL 36628-0001

Ms. Liz Smith-Incer
National Park Service
River and Trails
3500 Park Road
Ocean Springs, MS

Ladies and Gentlemen:

By way of introduction, I am Judy J. Burnett formerly of DeLisle, Mississippi. My sister Kay J. Allen and I own 7.6 acres of waterfront property in the northeast corner of the Bay of St. Louis, Mississippi. This piece of property has been in our family for well over 100 years. It is located along the west side of Wittman Road and north shore of Bayou DeLisle in DeLisle, Mississippi.

The property is readily identified by a standard historical marker describing the founding of DeLisle and is surrounded by huge oak trees. The property is pristine with over 800 feet of waterfront and with several oak trees that an arborist has determined to be between 500 and 800 years old. These oaks are registered with the Garden Clubs of Mississippi, Inc. and have been declared to be a living natural asset of the state of Mississippi. It is a truly picturesque setting and would make a beautiful entrance to DeLisle and the surrounding areas and a wonderful park!

We are very interested in selling this property and hope that a federal or state agency would purchase the property as a park for all to use or for something that would benefit everyone. The citizens of DeLisle value the property as an historical site and would be in favor of this, I am sure, as they value the beauty and openness of the setting.

During Hurricane Camille, in August 1969, our parents' home on this property was completely destroyed. That home was rebuilt, and with the passing of my parents became the home of my sister and me. However, Hurricane Katrina in September 2005 completely destroyed this home again. The large oak trees, for the most part, remain and are now coming out. The entire southern part of the town of DeLisle flooded during Camille and Katrina and during another storm that hit in 1947.

We have been in discussions with Judy Steckler on this property and have hoped that she would be able to acquire the property for the Land Trust. Please feel free to contact Ms. Steckler to confirm the beauty and desirability of this property for some historical site, open green space or landmark. Representative Diane Peranich also values this property for its historical entrance to the town of DeLisle and its potential to serve the citizens as a park. We have also been in contact with her seeking funding to secure this property for DeLisle.

My sister and I are not planning to rebuild on this property; we have it for sale. We have read many articles in the Sun Herald outlining your visionary initiatives to acquire flood prone properties that could be used for purposes that would benefit the community other than for housing. That's why we decided to write each of you and your agencies and also the Honorable Delbert Hosemann asking you to fund the purchase of the property. Please, please visit DeLisle and visit this property. The actual address is 5607 W. Wittman Road.

One must actually see this property with its majestic oaks to appreciate its natural beauty and genteel setting overlooking the bayou, marshes, and Bay of St. Louis.

Should you be interested in discussing possible acquisition of this property, please contact me Judy at (904) 655-1322 or my sister Kay at (850) 939-9743.

Respectfully,

Judy J. Burnett

Copies:
The Honorable Delbert Hosemann
Representative Diane Peranich
Ms. Judy Steckler, Director
Mr. Marlin Ladner, Supervisor

Response to Judith Burnett, dated 18 January 2009

Response: Thank you for your support of the Mississippi Coastal Improvements Program. We will keep you informed of the program progress.

Rees, Susan I SAM

From: ed.cake@yahoo.com
Sent: Thursday, March 19, 2009 11:31 AM
To: Rees, Susan I SAM
Cc: Jacobson, Jennifer L SAM
Subject: MsCIP document improvements

Dr. Susan Rees
Mobile District
US Army Corps of Engineers
Post Office Box 2288
Mobile, AL 36628-0001
E-mail: susan.i.rees@usace.army.mil <http://us.mc1110.mail.yahoo.com/mc/compose?to=susan.i.rees@usace.army.mil>

Dear Susan,

Reference is made to the following document:

Mississippi Coastal Improvement Program (MsCIP) [for] Hancock, Harrison, and Jackson Coundies, Mississippi, Appendix G Risk Appendix

located at the following URL:

http://69.33.187.224/webcatalog/StoreBuilder/GroupSolutions/docfile/MSCIP%20Appendix%20G%20-%20Risk.pdf

In a cursory review of this document I noted the "common" misuse of the plural noun form "data" with the singular verb form "was" on lines 9 and 10 on page 13 of Part 3 - Education of Stakeholders. The collective noun "data" requires the use of the plural verb form "were." In addition, line 12 on that same page includes the phrase " . . . much of the data . . ." The correct phrase should be ". . . many of those data . . ."

I must conclude that many other examples of these misuses of the term "data" probably appear in the MsCIP documents. As an interested scientist, former scienrtific journal editor, and citizen of Coastal Mississippi, I respectfully request that all MsCIP documents be as technically correct as possible. If the staff has gramatical writing problems, what other conceptual problems might they also have. Please examine all draft MsCIP documents using the word-search feature on the word-processing software for the term "data" to ensure subject-verb agreement in all cases. Thank you.

Please provide me with a list of the Independent Technical Review participants as well as a list of the External Peer Review participants. I am particularly interested in the name or names of those individuals with expertise in coastal barriers and coastal barrier processes. It appears that the Coastal Barrier Resources System was inadequately considered in the review process and that the Coastal Barrier Improvement Act of 1990 which replaced and reauthorized the Coastal Barrier Resources Act of 1982 was not considered in the MsCIP documents that I reviewed. Thank you.

Please consider these comments as attemps on my part to improve the MsCIP documents being prepared under your guidance. They are not intended as criticisms at this stage in the review process.

Respectfully submitted,

Ed

Dr. Ed Cake
Gulf Environmental Associates
2510 Ridgewood Road
Ocean Springs, MS 39564

E-mail: ed.cake@yahoo.com <http://us.mc1110.mail.yahoo.com/mc/compose?
to=ed.cake@yahoo.com>
Cell: 228-324-9292

Rees, Susan I SAM

From: ed.cake@yahoo.com
Sent: Wednesday, March 18, 2009 2:02 PM
To: Jacobson, Jennifer L SAM
Cc: Rees, Susan I SAM
Subject: Deer Island & the MsCIP documents

Jenny Jacobson, Coastal Team Leader
U.S. Army Corps of Engineers, Mobile District Planning and Environmental Division, Coastal Environment Team
109 St. Joseph Street
Mobile, Alabama 36602
Phone: (251) 690-2724
E-mail: jennifer.l.jacobson@sam.usace.army.mil
<http://us.mc1110.mail.yahoo.com/mc/compose?to=jennifer.l.jacobson@sam.usace.army.mil>

RE: Deer Island plans & MsCIP documents

Dear Jenny,

Thank you for your telephone and e-mail responses this morning regarding Deer Island and the MsCIP documents.

I had found the 2-page "Functional Habitat Index" table earlier yesterday and copied same without really noting the "1.4..6" reference thereon. When scanning through a large *.pdf document, it is difficult to find items when the "contents" pages are unclear and/or out of place. Thank you for pointing out its location and for attempting to remedy these "content" page problems in the final MsCIP documents.

With regard to the statement in section 4.12 Deer Island Restoration, parts of lines 31 and 32 are inaccurate: "Deer island is considered a mainland remnant and is not a part of the coastal barrier system of islands along the Mississippi coast."

Please be advised that Deer Island was designated by Congress as Unit R02 of the Coastal Barrier Resources System in the Coastal Barrier Resources Act of 1982 and the Coastal Barrier Improvement Act of 1990. Please visit the following URL to authenticate this statement and denote that unit's designation under Harrison County as Unit R02:

http://www.fws.gov/habitatconservation/cbunits.pdf

Many coastal barriers were formed when shorelines were inundated by rising sea level. As in the case of Deer Island, they consist of consolidated, sandy sediments washed into the coastal zone by land runoff for nearby rivers and streams. Once those shoreline barriers come under the influence of littoral drift currents and other current and wave phenomena, they behave in much the same way as offshore coastal barriers: long-shore migration via littoral drift currents and landward migration via "rollover" following storm events and sea-level rise.

In the case of Deer Island sandy sediments were historically deposited on the eastern end of the island from the Belle Fountaine Beach area, but the presence of the federally-maintained East Biloxi Access Channel has interrupted and diverted those sandy sediments via maintenance dredging and other current phenomena. The effect of that sediment starvation and sea-level rise has been the loss of approximately one mile from the eastern tip of the island over the last 125+ years.

Deer Island continues to migrate down-drift, adding sandy sediments from the eroding eastern end to the southern shoreline and eventually to the western end where they wash into the West Biloxi Access Channel and are removed during maintenance dredging. Since little or no new sediments are deposited on to the eastern end of the island, its existence as a migrating coastal barrier is compromised. Until and unless a continuous supply of sandy sediments is used to repair and/or "feed" the eastern end of Deer Island, any thought of preserving and/or enhancing that island will eventually fail as it continues to erode into Mississippi Sound and Biloxi Bay with rising sea level and Katrina-category hurricanes.

On the matter of the Coastal Barrier Resources System (CBRS) that was established by Congress in the two acts mentioned above, the final MsCIP documents should contain text and references regarding these to acts, to the CBRS itself, and to the types of projects that can be authorized under the public laws that arose from those acts. My initial review of the *.pdf documents (Appendix A Environmental) shows a dearth of material on the protections provided to Mississippi's coastal barrier resources by those acts.

In addition, the Jackson, MS, office of the US Fish and Wildlife Service cited only the Coastal Barrier Resources Act of 1982 in its MsCIP documentation. Apparently, Sabrina Chandler is unaware that the CBRA was replaced and reauthorized by the Coastal Barrier Improvement Act of 1992. Please communicate that fact to Ms. Chandler for me. Thank you.

I look forward to discussing Deer Island and other barrier-island issues with you on Thursday evening in Biloxi. In the meantime, these comments are,

Respectfully submitted,

Ed

Dr. Ed Cake, Biological Oceanographer
And Oyster Biologist
Gulf Environmental Associates
2510 Ridgewood Road
Ocean Springs, MS 39564
Cell Phone: 228-324-9292
E-mail: ed.cake@yahoo.com <http://us.mc1110.mail.yahoo.com/mc/compose?to=ed.cake@yahoo.com>

Response to Gulf Environmental Associates, Emails dated March 18 and 19, 2009

Comment Response 1: Comment noted and a search of the document will be conducted.

Comment Response 2: Comment noted and additional text will be added in the Deer Island section in the Environmental Appendix.

Comment Response 3: Comment noted.

Comment Response 4: The statement as noted in the report, "Deer Island is considered a mainland remnant and is not a part of the coastal barrier system of islands along the Mississippi coast" was intended from a geological and a scientific standpoint. The report will be updated to include the designation as Unit R02 of the Coastal Barrier Resources System in the Coastal Barrier Resources Act of 1982 and the Coastal Barrier Improvement Act of 1990.

Smith, Thomas E SAM

From: Smith, Thomas E SAM
Sent: Tuesday, March 24, 2009 1:06 PM
To: Rees, Susan I SAM
Subject: FW: Escatawpa River reroute- Jackson County, Mississippi

FYI

TOm Smith
Project Manager, Mississippi Coastal Team Corps of Engineers, Mobile District
251.690.3270 (Cell)251.605.0637

-----Original Message-----
From: Smith, Thomas E SAM
Sent: Monday, March 23, 2009 11:43 AM
To: Mark Cumbest
Subject: RE: Escatawpa River reroute- Jackson County, Mississippi

Mark,
Good to see you as well.

Our proposal for the Grand Bay NERR area restoration recommends detailed study only (no implementation) of the impacts of diverting some flows from the Escatawpa. The MsCIP proposal does not involve implementing or constructing any plans that would reroute the Escatawpa river. Because we are presently at the pre study phase, there are not a lot of details regarding flow volumes or real estate impacts. These are things that would be determined during the study effort if congressional funding is provided.

TOm Smith
Project Manager, Mississippi Coastal Team Corps of Engineers, Mobile District
251.690.3270 (Cell)251.605.0637

-----Original Message-----
From: Mark Cumbest [mailto:mcumbest@cumbestrealty.com]
Sent: Sunday, March 22, 2009 12:46 AM
To: Smith, Thomas E SAM
Cc: Grove, Michael A SAM; Patterson, Willie L SAM; Dawn Long
Subject: Escatawpa River reroute- Jackson County, Mississippi

Mr. Smith-

It was good to see you again at the public meeting in Biloxi this past Thursday.

I was quite surprised to hear of the proposed reroute of the Escatawpa River in Jackson County. As a co-owner of approximately 460 acres on the river in southern Jackson County, I would appreciate any further information, maps, etc., that you could send me that would illustrate the proposed changes under consideration. It is my understanding that maps were not available at the meeting. I would appreciate getting this information to me as soon as possible for me to prepare a comment before the deadline to do so.

I also enjoyed meeting Mr. Grove and Mr. Patterson at the meeting, and I am copying them with this email.

Mark Cumbest

Broker-Owner

Cumbest Realty

17725 Highway 63

Moss Point, MS 39562

228-219-2376

HOUSE OF REPRESENTATIVES

RICHARD BENNETT
District 120
Harrison County
20108 Daugherty Road
Long Bech,MS 39560

Res (228) 863-6483
rbennett@house.ms.gov

STATE OF MISSISSIPPI

COMMITTEE ASSIGNMENTS:
Conservation and Water Resources
Ports, Harbors and Airports
Public Utilities
Tourism

March 25, 2009

Dr. Susan I Rees
MsCIP Program Manager
Mobile District, U.S.
Army Corps of Engineers
P.O. Box 2288
Mobile, Al 36628

Re: Draft Comprehensive Plan and for the Mississippi Coastal Improvements Program Appendix H (MsCIP)

Dear Dr. Rees:

On behalf of my constituents in District 120 of Harrison County, Mississippi, I request that the referenced draft plan be revised to include the restoration of Cat Island with the same urgency as Mississippi's other Barrier Islands. My district includes the City of Long Beach and the coastal areas of both Pass Christian and western Gulfport, which were all devastated by Hurricane Katrina in 2005. Cat Island lies approximately 7 miles south of my district and it is the only barrier between the Gulf of Mexico and my constituent's homes and businesses.

Although table 8-1 of the report budgets $516,000,000 to restore the islands east of the Gulfport Ship Channel, Appendix H of the report merely calls for additional study for Cat Island. The Corps has budgeted no money for Cat Island which protects the coastal communities west of the Gulfport Ship Channel. In light of the fact that additional restoration funds may not be forthcoming due to current strains on the federal budget, it is imperative that the Corps pursue the restoration of Cat Island with the same sense of urgency and to the same degree as Mississippi's other barrier islands. Please revise the draft report and give the restoration of Cat Island the same priority as our other islands to the east.

I urge the Corps of Engineers and the State of Mississippi to revise the current draft plan and to prioritize the restoration of Cat Island by including it in the initial funding request along with Mississippi's other barrier islands.

Thank your for considering my comments.

Sincerely,
Richard

cc: Dr. Bill Walker
George Boddie

Response to Richard Bennett, dated 25 March 2009

1. Thank you for your interest in the Mississippi Coastal Improvements Program and specifically the barrier island comprehensive restoration feature of the Comprehensive Plan.

2. Cat Island was never intended to be excluded from the barrier island comprehensive plan however, as described in Section 7.2 of the Barrier Island Appendix, additional studies are needed to better understand the coastal processes that occur between West Ship and Cat Islands. Initial sediment budget studies seem to indicate that littoral currents do not move sediments across the area known as Ship Island Pass. . Nourishment of Cat Island is not dependent upon a direct link with the other barrier islands, as it by itself if a critical component of the entire Mississippi Sound ecosystem. These and other issues, notably the private ownership of much of the island, will be addressed during the first year following authorization and funding and would be concurrent with other required studies for the remainder of the islands. We have indicated a requirement to perform additional studies to finalize the sediment budget and sediment transport processes and gain a full understanding of the nourishment needs of Cat Island.

In response to your and other concerns, we have revised the Barrier Island Appendix, specifically Chapters 3 and 7, to provide more detail for proposed studies at and immediately around Cat Island. In addition, the Summary of Costs, Table 8-1, will be amended to detail the $1 million dedicated for additional studies at Cat Island and a figure will be inserted in Section 7.3 that's shows a potential location for littoral zone placement east of Cat Island. The estimated cost of implementation of the comprehensive restoration plan feature contains funding for placement at Cat Island once the specific plan is designed.

From: Joanna W. Lobree [swlobree@msn.com]
Sent: Tuesday, March 31, 2009 4:38 PM
To: mscip@groupsolutions.us
Cc: Russ Barnett; Joanna Lobree
Subject: LOBREE - Draft MSCIP Comprehensive Report/Integrated EIS Comment
Importance: High
Attachments: MsCIP letter page 1.jpg; MsCIP letter page 2.jpg; MsCIP letter page 3.jpg; MsCIP letter page 4.jpg; MsCIP letter page 5.jpg

CAPT and Mrs. Shawn W. Lobree, USN
4325 Thoroughgood Drive
Virginia Beach, VA 23455
(757) 416-7887 (home)
(757) 672-0438/0439 (cell)
swlobree@msn.com

March 31, 2009

Dr. Susan Ivester Rees, Program Manager, MsCIP
US Army Corps of Engineers, Mobile District

Dear Dr. Rees,

We are writing about the MsCIP draft proposal. My wife, Joanna, along with many of our neighbors, was in attendance at the Jackson County MsCIP briefing two weeks ago. We are currently stationed in Norfolk, VA, and are nearly finished rebuilding our home on Belle Fontaine Drive in Ocean Springs. As you might imagine, we are rather disturbed about this proposal, and its impact on our property and our neighborhood. 1

Attached is a copy of a letter that was signed by twenty-five other residents on our street, after hearing rumor of the proposal in October, 2007. While we can't speak for every single signature on this letter or that they still feel the same way today, knowing them we are rather confident their views, like ours, haven't changed. The proposal in our letter is very reasonable, and it will eventually achieve your purpose without pushing anyone off of their property - especially after the hard work, emotional toil, and expense of rebuilding after Katrina. 2

We trust you will take our concerns into thoughtful consideration.

Respectfully,

Shawn W. Lobree
CAPT, USN

Joanna W. Lobree

Attachment: Five page letter dated October 25, 2007

October 25, 2007

Dear Senators Lott and Cochran,

As a neighborhood in recovery we are writing to express our grave concerns about the Mississippi Coastal Improvement Program (MsCIP). All of the parties to this letter lost their homes in Katrina.

We understand the proposed MsCIP program is well-intentioned and has been directed by Congress, but there are some serious conflicts and flaws in what has not been revealed about this proposed program.

As you are well aware many coastal property owners have worked tirelessly over the last 24 months planning and rebuilding their properties. These personal efforts have been generously supported and encouraged by numerous governmental agencies. Coastal Mississippi has received generous tax incentives, temporary housing assistance, SBA loans, Increased Cost of Compliance funding to raise our foundations and Mississippi Development Authority grants to offset escalating reconstruction costs. While building has been slower than expected-primarily due to insurance settlements and reinsurance issues- much progress has been made. Now with the proposed MsCIP program homeowners and businesses located in coastal areas have become paralyzed by rumor.

As we are all aware property ownership and land use issues are emotionally charged subjects, both because of their financial impact and the emotional ties we have with our homes and neighborhoods. While we understand the long term goals of moving families away from coastal areas we believe these policies must be consistent with the programs and commitments made in the two years following Katrina as well as what is fair and equitable. With these goals in mind and the need to assure hundreds of families that are in various stages of rebuilding that they will be able to obtain insurance at competitive rates we respectfully propose the following guidelines:

1. The McCIP would be a strictly voluntary program.

2. In the event a property owner did not wish to "sell out," their property would continue to be eligible for Federal Flood insurance and Wind pool coverage, at prevailing market rates. Prevailing market rates would be defined as the same rates available to property owners that have not been reclassified into an MsCIP zone.

3. Implement the "buy out" program as an ongoing long term program. This feature would allow families to remain in their properties until they elected to sell and would assure that eventually coastal insurance exposures would be significantly reduced.

While the voluntary aspect of the proposed MsCIP has been articulated, no one in the Corp of Engineers or the Mississippi Department of Marine Resources (the two agencies overseeing the program) has been willing to assure coastal property owners that their insurance status will not be affected by the creation of Ms CIP zones. Now, two years after Katrina struck, to be proposing that we give-up and sell-out our properties without equitable options is unconscionable and not the way we do things in this country. I am a dedicated member of the United States Navy and have served my country faithfully in six armed conflicts in the past two decades. I cannot help but feel somewhat betrayed by our government for the secrecy which has so far veiled the Army Corps MsCIP plan. I pride myself on being exceedingly well informed about local, state and national events, but did not learn of the McCIP initiative until last month when it became well publicized for the first time. Had we known about this plan in 2006, my wife Joanna and I would have probably thrown in the towel and elected not to rebuild our coastal home.

The guidelines I am proposing for the MsCIP program would achieve the goals of drastically reducing the occupation of flood-prone lands, both in the near-term and the long-term. It would be a WIN-WIN-WIN: A win for government, a win for those who are happy to sell and a win for those who wish to remain.

We sincerely believe that these guidelines would satisfy all parties and provide families that have undertaken the incredible effort to recover from Katrina the freedom to continue to enjoy the properties they have worked so hard to rebuild.

Most Sincerely,

Shawn W. Lobree

Shawn W. Lobree
CDR,USN

Copy to:
Governor Barbour
Representative Taylor
Lieutenant General Van Antwerp, USACE
Supervisor McKay

As neighbors of Mr. Lobree we share the concerns identified in the attached letter and fully support the adoption of the guidelines suggested.

NAME Richard + Cari Dickson

ADDRESS 7405 Belle Fontaine Dr.
PHONE 875-4392

NAME

ADDRESS
PHONE

NAME

ADDRESS
PHONE

NAME Harold P. Ponn

ADDRESS 7021 W. Belle Fontaine Dr
PHONE 324 01 86

NAME Lee Ponn

ADDRESS 7021 W. Belle Fontaine Dr.
PHONE 32[illegible]

NAME Diane Beebe Bill King
Diane Beebe and Bill King
ADDRESS 7813 Belle Fontaine Drive Ocean Springs MS
PHONE 401-331-0568

As neighbors of Mr. Lobree we share the concerns identified in the attached letter and fully support the adoption of the guidelines suggested.

NAME Michael Schmitt
ADDRESS 7109 Belle Fontaine Dr., OS, MS. 39564
PHONE

NAME Marsha Schmitt
ADDRESS 7109 Belle Fontaine Dr, Ocean Springs, Ms. 39564
PHONE

NAME [illegible]
ADDRESS 7319 Belle Fontaine Dr
Ocean Springs MS
PHONE 985-285-6025[illegible]

NAME John & Tytti Kooienga
ADDRESS Lot 111, Belle Fontaine Dr
Ocean Springs, MS
PHONE 228-872-9097

NAME ALICE & RANDEL JAMES
ADDRESS 7117 Belle FONTAINE DR
OCEAN SPRINGS MS
PHONE 228 860 2926

NAME Alicia McBlair
ADDRESS 6902 Belle Fontaine Dr
PHONE 228 909 3329

As neighbors of Mr. Lobree we share the concerns identified in the attached letter and fully support the adoption of the guidelines suggested.

NAME Elsie D. Goff
Bill M Barnett
ADDRESS 7805 Belle Fountain Dr. O.S. MS 39564
PHONE 283-5690

NAME Russell Barnett

ADDRESS 7709 Belle Fontaine Drive, OS, MS 39564
PHONE 228-818-9435

NAME Shaw Lang

ADDRESS 7709 Belle Fontaine Dr. Ocean Springs MS 39564
PHONE (228) 818-9935

NAME Charles P. Richardson

ADDRESS 8309 Belle Fontaine Dr Ocean Springs MS 39564
PHONE Cell 239-463-1875

NAME Audrey Richardson
8309 Belle Fontaine Dr
ADDRESS Ocean Springs, MS 39564
PHONE 239 463-1875

NAME Toni and Edwin Barne

ADDRESS 5719 Belle Fontaine Drive
PHONE Ocean Springs, MS 39564

Responses to Shawn and Joanna LoBree, e-mail dated 31 March 2009

1. Thank you for your interest in the Mississippi Coastal Improvements Program.

2. The following addresses the proposal contained in the letter dated 25 October 2007 to Senators Lott and Cochran.

The High Hazard Area Risk Reduction Program (HARP) is a nonstructural acquisition program aimed at reducing future risk to life and property within the highest hazard zones of coastal Mississippi. These zone encompass the FEMA defined 100-year floodplain which consists of approximately 59,000 parcels coastwide. The HARP phase one is aimed at acquiring properties within what FEMA designates the VE zone in which floodproofing (elevation) of properties is not recommended due to the additional damages caused by waves and surge velocity. This zone contains an estimated 15,000 parcels. As formulated acquisition of property in the HARP would be offered to eligible landowners as a opportunity to sell their property for the fair market value with relocations assistance depending upon their individual ownership and current occupancy situation. Any application of mandatory purchases would only come later in the acquisition program should there be remnant parcels that are determined by a joint agreement between the County/Municipality/Corps to be inefficient to service with public utilities and services.

The Corps of Engineers is not responsible for the availability or cost of flood insurance through the National Flood Insurance Program administered by FEMA. Any classification of the coastal areas affected by hurricane Katrina or other hurricanes being considered by the Corps in plan formulation of the MsCIP would not have any affect on the Flood Insurance Rate Maps being generated by FEMA for use by the local jurisdictions in floodplain management ordinances or insurance agents offering flood insurance.

The Corps of Engineers is recommending several short-term projects for authorization and funding that would affect properties in the 100-year floodplain delineated by FEMA. Those projects include the High Hazard Area Flood Risk Reduction Program (known as the HARP) that would include purchasing (willing seller basis) approximately 2,000 parcels within the Corps designated high-hazard area (approximately the new FEMA V-zone) across the entire MS coastline. In addition, the Corps is recommending a structure elevation project in Waveland, MS that would raise the first floors of 25 residences above the new FEMA base flood elevation (100-year flood elevation) and the floodproofing or relocation of the municipal buildings in Moss Point, MS to reduce future damages to those critical structures. Also the Corps is recommending approval of detailed planning studies to be conducted with the three counties affected by Katrina (Jackson, Harrison, and Hancock) and several municipalities as well as FEMA, HUD, and other Federal and State agencies that would look ay more long-term projects that would include additional land acquisition in the 100-year floodplain, additional structure elevation and floodproofing and possibly more relocations of public structures not already addressed by FEMA.

From: King, Ruda L SAM
Sent: Monday, March 23, 2009 8:31 AM
To: Rees, Susan I SAM; Smith, Thomas E SAM
Subject: FW: MSCIP Comment

Forward from MsCIP, I have printed and put in the folder. Will also add his name to willing to sell list.

-----Original Message-----
From: swl323@mchsi.com [mailto:swl323@mchsi.com]
Sent: Thursday, March 19, 2009 6:56 AM
To: MsCIP
Subject: MSCIP Comment

Stephen Landry

2025 Hollywood Dr.

Bay St. Louis, MS 39520

I went to the meeting last night and reviewed the available information along with talking to some of the people there and had to leave before I could comment. For the most part I agree with the program and feel at this point it appears to be the best thing to do. If asked to sell my property I would at this time. I was building prior to the storm but not living in the house when the storm hit; we were renting. Not having flood insurance on the property I received nothing but a little wind money, so I completed the house because like most we didn't have anything, no place to go and had to do something. We did not get state or FEMA money. Knowing what I know now I think I would have done things difference, if I could have. Last year, I had 18" on water under the house/in the shed and the second time I was surrounded by water. Both times my wife and I had to leave. Like most, I think we feel it is time to give the property back to nature. I'm ready when you are. Thanks for the good job, I know it has not been easy.

Steve

Response to Stephen Landry, e-mail dated 23 March 2009

Response: Thank you for your support of the Mississippi Coastal Improvements Program. We will keep you informed of the program progress.

Thank you very much for this presentation! I think I already asked you this, but will any of these plans affect East Biloxi residents? I looked through the presentation and I hardly saw any mention of East Biloxi, or Biloxi for that matter.

Trinh Le
Community Empowerment Coordinator
Hope CDA: Hope Community Development Agency formerly the East Biloxi Hope Coordination Center
email: tle@hopecda.org
phone: 228-383-0910

Response to Trinh Le, undated e-mail

Response: Thank you for your interest. Projects that will benefit the east Biloxi area include: Restoration of the Gulf barrier islands, restoration of Deer Island, diversion of freshwater, improvements to the beach-dune system of Harrison County and the High Hazard Area Risk Reduction Program (HARP).

Restoration of the barrier islands and Deer Island will offer some relief from the lower energy tropical storms that frequent the area. In addition restoration of the barrier islands will enhance the sustainability of the Mississippi Sound estuary through the reduction of salt water intrusion. Diversion of freshwater into the estuary will also restore the conditions necessary for the production of fish and shellfish.

Although not located within Biloxi, all residents of flood prone areas of the coast will benefit from the floodproofing demonstration project proposed for the Waveland area. This project will illustrate the requirements necessary to floodproof properties following the appropriate Federal guidelines and building codes.

The HARP is applicable to anyone within the three coastal counties living within the high hazard zone. We are not familiar with the specific location of the Hope Community but know that there are areas in east Biloxi that are located in this zone. Under the HARP we will work with willing sellers to purchase their property and relocate them as necessary to properties outside the flood zone.