MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, THE DEPARTMENT OF DEFENSE

TRANSMITTING

MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY

PART 5 OF 7



DECEMBER 19, 2013.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE

87–147 WASHINGTON : 2013

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

APPENDIX
U

MISSISSIPPI RIVER GULF OUTLET (MRGO)

ECOSYSTEM RESTORATION PLAN
FINAL FEASIBILITY STUDY

FINAL
ENGINEERING APPENDIX



U.S. Army Corps of Engineers
Mississippi Valley Division
New Orleans District
7400 Leake Avenue
New Orleans, Louisiana 70118

February 2012

MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN DRAFT FEASIBILITY STUDY DRAFT ENGINEERING APPENDIX

TABLE OF CONTENTS

1.0 PURPOSE 1-1
1.1 INTRODUCTION 1-1
1.2 ALTERNATIVES 1-2
1.3 TSP 1-6
1.4 VIOLET DIVERSION 1-9
2.0 HYRDOLOGY AND HYDRAULICS 2-1
2.1 INTRODUCTION 2-1
2.2 CLIMATOLOGY 2-1
2.2.1 Climate 2-1
2.2.2 Hurricanes and Tropical Storms 2-1
2.3 HYDROLOGY AND HYDRODYNAMICS – GENERAL INFORMAITON 2-2
2.3.1 Study Area 2-2
2.3.2 Lake Pontchartrain Basin 2-2
2.3.3 Hydrodynamics and the MRGO, GIWW, and IHNC 2-3
2.3.4 Canals 2-6
2.4 RELATIVE SEA LEVEL RISE DUE TO EUSTATIC SEA LEVEL RISE AND SUBSIDENCE 2-6
2.5 HYDRODYNAMIC MODELING 2-8
2.5.1 General 2-8
2.5.2 Methodology 2-9
2.5.3 UNO Mass Balance Model 2-10
2.5.4 Central Wetlands Area – Detailed Modeling 2-39
2.5.5 DETAILED MODELING – FVCOM 2-61
2.5.6 HYDRAULIC DESIGN FRESHWATER DIVERSION 2-73
2.5.7 SHORELINE PROTECTION DESIGN 2-91
2.5.8 SYNOPSIS OF RELAVANT HISTORICAL STUDIES 2-107
2.6 BORROW PIT IMPACTS ASSESSMENT 2-118
2.7 WATER QUALITY 2-119
3.0 SURVEYS 3-1
4.0 GEOTECHNICAL 4-1
4.1 GEOLOGY 4-1
4.1.1 Regional Geologic Setting 4-1
4.1.2 BORROW SOURCES 4-3
4.2 GEOTECHNICAL DESIGN 4-5
4.2.1 General 4-5
4.2.2 Design Reaches 4-6
4.2.3 Field Investigations 4-6

4.2.4 Laboratory Testing 4-6
4.2.5 Geology 4-7
4.2.6 Soil Design Parameters 4-8
4.2.7 Stability Analyses 4-8
4.2.8 Settlement 4-10
4.2.9 Pile Foundations 4-10

5.0 DESIGN 5-1

5.1 MARSH CREATION/NOURISHMENT, SWAMP CREATION AND RIDGE RESTORATION 5-1
5.1.1 General 5-1
5.2 MARSH CREATION/NOURISHMENT 5-1
5.2.1 General 5-1
5.2.2 Field Data and Design Assumptions 5-2
5.2.3 Borrow 5-4
5.2.4 EM 1 5-6
5.2.5 EM 2 5-7
5.2.6 EM 3 5-8
5.2.7 EM 4 5-9
5.2.8 BM 1 5-10
5.2.9 BR 1 5-11
5.2.10 CC 1 5-12
5.2.11 CC 2 5-13
5.2.12 CC 3 5-14
5.2.13 CC 4 – Site 1 5-15
5.2.14 CC 4 – Sites 2, 3 and 4 5-15
5.2.15 CC 5 5-16
5.2.16 CC 6 5-17
5.2.17 CM 1 and CM 5 5-18
5.2.18 CM 2 5-20
5.2.19 CM 3 5-21
5.2.20 CM 4 5-22
5.2.21 HM 1 5-23
5.2.22 TM 1 5-24
5.2.23 TM 2 5-26
5.2.24 TM 7 5-27
5.2.25 TM 8 5-28
5.2.26 LM 1 5-29
5.2.27 LM 2 5-30
5.2.28 LM 3 5-31
5.2.29 LM 4 5-32
5.2.30 Planting 5-33
5.3 SHORELINE PROTECTION 5-33
5.3.1 Lake Shoreline Protection 5-33
5.3.2 MRGO Bankline Restoration 5-44
5.4 DIVERSION CHANNEL EXCAVATION AND DISPOSAL 5-51
5.4.1 Project Description 5-51

5.4.2 Back Dike Canal 5-53
5.4.3 Detailed Design 5-53
6.0 RECREATION FEATURES 6-1
6.1 GENERAL 6-1
6.2 BIENVENUE TRIANGLE RECREATION FEATURE 6-1
6.3 SHELL BEACH RECREATION FEATURE 6-2
7.0 STRUCTURES 7-1
7.1 SCOPE 7-1
7.2 REFERENCES 7-1
7.2.1 USACE Publications 7-1
7.2.2 Technical Publications 7-2
7.2.3 Computer Programs 7-2
7.3 DESIGN CRITERIA 7-2
7.3.1 General 7-2
7.3.2 Material Weights 7-2
7.3.3 Design Stresses 7-3
7.4 GENERAL DESCRIPTION OF PROJECT FEATURES 7-5
7.4.1 Gated Diversion Structure at the Mississippi 7-5
7.4.2 Highway Crossing at West Judge Perez 7-6
7.4.3 Gated Structure at the 40 Arpent Canal 7-7
7.4.4 Gated Structure at the MRGO Outlet 7-8
7.5 LOADING CONDITIONS 7-9
7.5.1 Diversion Structure 7-9
8.0 RELOCATIONS 8-1
8.1 SUMMARY 8-1
8.1.1 Scope and Purpose 8-1
8.1.2 Estimated Relocation Cost 8-1
8.1.3 Authority for Accomplishing Relocations 8-1
8.2 DESCRIPTION OF AFFECTED FACILITIES, PROPOSED RELOCATION, AND COSTS 8-2
8.2.1 Roads 8-2
8.2.2 Railroads 8-2
8.2.3 Facilities 8-2
9.0 OPERATION, MAINTENANCE, REPAIR, REPLACEMENT AND REHABILITATION (OMRR&R) 9-1
9.1 SHORELINE PROTECTION 9-1
9.2 MARSH AND SWAMP CREATION AND NOURISHMENT 9-1
9.3 INVASIVE SPECIES CONTROL 9-2
10.0 COST ESTIMATES 10-1
10.1 ALTERNATIVE COST ESTIMATES 10-1
10.2 DETAILED COST ESTIMATES 10-3
10.2.1 Contingencies 10-5
10.2.2 Escalation 10-5
10.2.3 MCACES 10-5
10.2.4 Risk Analysis 10-5
11.0 DESIGN AND CONSTRUCTION SCHEDULE 11-1

11.1 CONSTRUCTION SEQUENCE 11-1
11.2 DESIGN AND CONSTRUCTION SCHEDULE 11-1
11.2.1 General 11-1
11.2.2 Revised Implementation 11-3

FIGURES

Figure 1- Study Area 1-2
Figure 2 – Alternative Measures Investigated 1-5
Figure 3 - TSP 1-8
Figure 4 Sea Level Rise Curves 2-8
Figure 5 Biloxi Marsh Salinity Targets 2-9
Figure 6. Location of J and L data points 2-13
Figure 7. Comparison of historic data with the Chatry limits 2-14
Figure 8 Salinity in zones J&L since 1990 2-14
Figure 9 Historical Pearl River flow rates 2-15
Figure 10. Example of poorly correlated data (1974) 2-15
Figure 11. Example of well correlated data (2002) 2-16
Figure 12. Tidal fluxes through the passes for calibration. PRIG is Rigolets, LM is the pass into Lake Maurepas 2-21
Figure 13 Model data vs. measured data for Grand Pass 2-22
Figure 14 Modeled data vs. measured data at the Rigolets 2-22
Figure 15 Plot of modeled data versus observed data 2-23
Figure 16 Locations of salinity data 2-24
Figure 17 Salinity targets and modeled results plotted as t-distributed about the mean values 2-26
Figure 18 Salinity targets and modeled results taken as cumulative frequencies about the mean values 2-27
Figure 19 Monthly averages of modeled historical data compared with historic data from zones J&L 2-29
Figure 20 Yearly averages of modeled historical and J&L data for the month of May 2-29
Figure 21. Comparison of alternatives versus % time the scenario meets the upper Chatry limit in Mays 2-35
Figure 22 Area of influence of the 7A2D diversion in May (7,000 cfs in April and May with the Gap at Lake Borgne closed and the 4500 cfs diversion at Blind/Convent River) 2-36
Figure 23 Changes in salinity along the Mississippi Coastal related to diversions near Violet Canal with an inset of the location of box 80 and box 14 2-37
Figure 24 Preliminary Salinity Responses to Relative Sea Level Rise 2-39

Figure 25 Discharge distribution over the Bayou Dupre and Bayou Bienvenue for the MB scenario 2-43
Figure 26 Average salinity in the MB scenario 2-45
Figure 27 Mean salinity during June 2009 for the MB1 scenario 2-47
Figure 28 Discharge (cfs) through the Bayou Dupre (Blue), Bayou Bienvenue (red) and new Diversion (green) gates for the MR1 scenario. Dashed line indicate the mean discharge through the gates 2-48
Figure 29 Mean salinity during June 2009 for the MR1 scenario 2-50
Figure 30 Discharge (cfs) through the Bayou Dupre (Blue), Bayou Bienvenue (red) and new Diversion (green) gates for the MR7 scenario. Dashed line indicate the mean discharge through the gates 2-51
Figure 31 Mean salinity during June 2009 for the MR7 scenario 2-52
Figure 32 Discharge (cfs) through the Bayou Dupre Structure (Blue), Bayou Bienvenue Structure (red) and new Diversion (green) gates for the MRS1 condition. Dashed line indicate the mean discharge through the gates 2-53
Figure 33 Mean salinity during June 2009, restored scenario with 1000 cfs including Sea level rise 2-55
Figure 34 Salinity during high water, 26th June 2009, 4h00 2-56
Figure 35 Salinity during low water, 17th June 2009, 8h00 2-56
Figure 36 Comparison of the MB1 and MB Scenarios for Peak Water Level 2-58
Figure 37 Comparison of MR1 with MB Scenarios for Peak Water Level 2-59
Figure 38 Comparison of MR7 with MB Scenarios for Peak Water Level 2-60
Figure 39 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt1; frontal wind) 2-63
Figure 40 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt2; no wind) 2-63
Figure 41. Model simulated depth-integrated standard deviation distribution for 5 days (case opt1; frontal wind) 2-64
Figure 42 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt1; frontal wind) 2-65
Figure 43 Model simulated depth-integrated standard deviation distribution for 5 days (case opt3; frontal wind) 2-65
Figure 44 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt5; frontal wind) 2-66
Figure 45 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt6; no wind) 2-67
Figure 46 Model simulated depth-integrated standard deviation distribution for 5 days (case opt6; frontal wind) 2-68
Figure 47 Model simulated depth-integrated standard deviation distribution for 5 days (case opt6; no wind) 2-68
Figure 48 Model simulated depth-integrated standard deviation distribution for 45 days (case opt7; no wind) 2-69
Figure 49 Model simulated depth-integrated standard deviation distribution for 45 days (case optf; no wind) 2-70

Figure 50 Model simulated depth-integrated standard deviation distribution for 45 days (case opt7; no wind) 2-71
Figure 51 Model simulated depth-integrated standard deviation distribution for 45 days (case optf; no wind) 2-71
Figure 52 Instantaneous surface salinity for simulation optf, showing the salinity in the central Biloxi Marsh)red line) and within the MRGO channel upstream of Bayou La Loutre (green solid line) 2-72
Figure 53 Alternative Diversion Locations 2-74
Figure 54 Diversions 1 & 2 Cross Sections 2-74
Figure 55 Diversion 3 Cross Section 2-75
Figure 56 Diversion 4 Cross Section 2-75
Figure 57 Continuous Diversion 2-78
Figure 58 Proposed Violet Diversion 2-79
Figure 60 Judge Perez Bridge Section 2-80
Figure 59 Channel Section 2-80
Figure 61 Culvert Specs 2-81
Figure 62 Channel Profile 2-82
Figure 63 Channel Section 2-82
Figure 64 Judge Perez Bridge Section 2-83
Figure 65 Channel Profile 2-84
Figure 66 Channel Section 2-84
Figure 67 Judge Perez Bridge Section 2-85
Figure 68 Channel Profile 2-86
Figure 69 Lateral Weir Locations 2-87
Figure 70 Shoreline Protection Reaches and Fetch Distances 2-91
Figure 71 Cross-Section for Segments LS1, ES3, ES1, BS1, ES2 2-92
Figure 72 Cross-Section for Segments JS1, and BS2 2-92
Figure 73 Model Grid 2-111
Figure 74 General Layout 2-113
Figure 75 Sampling Stations 2-114
Figure 76 Study Area 2-116
Figure 77 Guide Levee Design for Central Wetlands 5-52
Figure 78 Bienvenue Triangle Recreation Feature 6-2
Figure 79 Shell Beach Recreation Features 6-3
Figure 80 Design and Construction Schedule 11-2

TABLES

Table 1 Alternative Measures 1-3
Table 2 Tentatively Selected Plan 1-6
Table 3 Hurricane Data 2-2
Table 4 - Salinity Routes to Lake Pontchartrain; Cross Sectional Area 2-5
Table 5 Salinity Targets For The Biloxi Marshes 2-5

Table 6 Freshwater Input Data 2-19
Table 7 Pre-MRGO Closure (Historic) 2-28
Table 8 Post MRGO Closure (Baseline) 2-30
Table 9 Future Without Project (FWOP) 2-31
Table 10 Future Without Project Conditions (FWOP1D) 2-32
Table 11 Future With Project Alternatives 2-33
Table 12 – Results of Diversion Scenarios in Terms of % of Time Salinity Meets the Upper Chatry Salinity Limit 2-34
Table 13 Loction and Value of Flow for MB1 2-42
Table 14 Location and Value of Flow for MR7 2-42
Table 15 Discharge Distribution Summary. 2-57
Table 16 Water levels, current velocities and salinity results summary 2-57
Table 17. Case Name and Initial and Boundary Conditions for Each Simulation Performed 2-62
Table 18 Design Invert Elevations 2-75
Table 19 Culvert Dimensions 2-76
Table 20 Diversion Flows 2-77
Table 21 Culvert Data 2-81
Table 22 Culvert Data 2-83
Table 23 Culvert Data 2-85
Table 24 Mississippi River Structure Riprap 2-88
Table 25 40 Arpent Levee Structure Riprap 2-88
Table 26 MRGO Structure Riprap 2-88
Table 27 Placement Distance 2-89
Table 28 Judge Perez Bridge Riprap 2-89
Table 29 Stone Gradations for Areas LS1, ES3, BS1 and ES1 2-93
Table 30 Stone Gradation for Area ES2 2-93
Table 31 Stone Gradations for Areas JS1 and BS2 2-93
Table 32 Design Period and Breaker Heights for 90-percentile case 2-96
Table 33 Ru Exceedance Probability (%) 2-97
Table 34 Reduction Factor 2-98
Table 35 Rip Rap Calculations Using Hudson Eq. 2-99
Table 36 Hudson Formula-Wave Table 2-99
Table 37 Rip Rap Calculations 2-100
Table 38 Rip Rap Calculations Using van der Meer Equations 2-101
Table 39 Run-up Calculations 2-102
Table 40 Rip Rap Calculations Using Hudson Equation 2-103
Table 41 Rip Rap Calculations Using Hudson Equation 2-103
Table 42 Rip Rap Calculations Using van der Meer Equation 2-104
Table 43 Run-up Calculations 2-105
Table 44 Rip Rap Calcuations Using Hudson Equation 2-105
Table 45 Rip Rap Calculations Using Hudson Equation 2-106
Table 46 Rip Rap Calculations using van der Meer Equation 2-106

Table 47 Salinity at Node 1259 2-111
Table 48 Mean Salinities 2-115
Table 49 Mean Salinity Increases 2-117
Table 50 Borrow Pit Simulation Scenarios 2-118
Table 51 Undrained Conditions (Q-case) 4-10
Table 52 Drained Conditions (S-case) 4-11
Table 53 Potential Acres of Borrow Within Lake Borgne 5-5
Table 54 Shoreline Protection Maintenance Events 9-1
Table 55 OMRR&R Marsh and Swamp Creation and Restoration 9-2
Table 56 Preliminary Measure Estimates 10-1
Table 57 Baseline Project Cost Estimate 10-3
Table 58 October 2012 Project Cost Estimate 10-4
Table 59 Fully Funded Project Cost Estimate 10-4

GEOTECHNICAL FIGURES

ED-F-1 Sheet 1 Site Vicinity Map
ED-F-1 Sheet 2 Site Vicinity Map
ED-F-2 Sheet 1 Boring and CPT Location Map
ED-F-2 Sheet 2 Boring and CPT Location Map
ED-F-2 Sheet 3 Boring and CPT Location Map
ED-F-3 Sheet 1 Reach 1 Soil and Geologic Profile
ED-F-3 Sheet 2 Reach 8 Soil and Geologic Profile
ED-F-3 Sheet 3 Reach 9 Soil and Geologic Profile
ED-F-3 Sheet 4 IHNC to Chef Pass Walls (WALLS 1) Soil and Geologic Profile
Plate A Soil Boring Legend
ED-F-4 Sheet 1 Design Reach 1 Soil Design Parameters
ED-F-4 Sheet 2 Design Reach 8 Soil Design Parameters
ED-F-4 Sheet 3 Design Reach 9 Soil Design Parameters
ED-F-4 Sheet 4 IHNC to Chef Pass Walls (Walls 1) Soil Design Parameters
ED-F-4 Sheet 5 Bayou Dupre to Shell Beach Walls (Walls 2) Soil Design Parameters
ED-F-4 Sheet 6 Shell Beach to Bayou LaLoutre Walls (Walls 3) Soil Design Parameters
ED-F-5 Sheet 1 Design Reach 1 Typical Rock Dike Section
ED-F-5 Sheet 2 Violet Diversion Typical Channel Design
ED-F-5 Sheet 3 Violet Diversion Central Wetlands Typical Channel Design
ED-F-5 Sheet 4 Reaches 3 & 4 Typical Rock Dike Section
ED-F-5 Sheet 5 Design Reach 8 Typical Rock Dike Section
ED-F-5 Sheet 6 Design Reach 9 Typical Rock Dike Section
ED-F-6 Sheet 1 Design Reach 1 Normal Water
ED-F-6 Sheet 2 Design Reach 1
ED-F-6 Sheet 3 Design Reach 1 Low Water Level
ED-F-6 Sheet 4 Design Reach 1

ED-F-7 Sheet 1 Violet Diversion Channel High Water Level
ED-F-7 Sheet 2 Violet Diversion Channel (Reach 2) Channel and Berm Design
ED-F-7 Sheet 3 Violet Diversion Channel Low Water Level
ED-F-7 Sheet 4 Violet Diversion Channel (Reach 2) Channel and Berm Design
ED-F-7 Sheet 5 Violet Diversion Channel (Reach 2) Channel and Berm Design
ED-F-7 Sheet 6 Violet Diversion Channel (Reach 2) Central Wetlands Channel and Berm Design
ED-F-7 Sheet 7 Violet Diversion Channel (Reach 2) Central Wetlands Channel and Berm Design
ED-F-7 Sheet 8 Violet Diversion Channel (Reach 2) Central Wetlands Channel and Berm Design
ED-F-7 Sheet 9 Violet Diversion Channel (Reach 2) Central Wetlands Channel and Berm Design
ED-F-7 Sheet 10 Violet Diversion Channel (Reach 2) Central Wetlands Channel and Berm Design
ED-F-8 Sheet 1 Design Reach 8 Normal Water
ED-F-8 Sheet 2 Design Reach 8
ED-F-8 Sheet 3 Design Reach 8 Low Water Level
ED-F-8 Sheet 4 Design Reach 8
ED-F-9 Sheet 1 Design Reach 9 Normal Water
ED-F-9 Sheet 2 Design Reach 9
ED-F-9 Sheet 3 Design Reach 9 Low Water Level
ED-F-9 Sheet 4 Design Reach 9
ED-F-10 Sheet 1 Violet Diversion Structure Foundation Mississippi River Location Pile Capacity
ED-F-10 Sheet 2 Violet Diversion Structure Foundation 40 Arpent Location Pile Capacity
ED-F-10 Sheet 3 Violet Diversion Structure Foundation Mississippi River Gulf Outlet Location Pile Capacity
ED-F-10 Sheet 4 IHNC to Chef Pass Walls (Walls 1) Timber Pile Capacity
ED-F-10 Sheet 5 Bayou Dupre to Shell Beach Walls (Walls 2) Timber Pile Capacity
ED-F-11 Sheet 6 Shell Beach to Bayou Laloutre Walls (Walls 3) Timber Pile Capacity

PLATES

C-1 Borrow Plan
C-2 Feature EM1 Plan View
C-3 Feature EM2 Plan View Borrow and Access
C-4 Feature EM3 Plan View
C-4A Feature EM3 Borrow and Access
C-5 Feature EM4
C-5A Feature EM4 Borrow and Access
C-6 Element ES1 Plan View
C-7 Element ES2 Plan View
C-8 Element ES3 Plan View

C-9 Feature BM1 Plan View
C-10 Element BS1 Plan View
C-11 Element BS2 Plan View
C-12 Feature BR1 Plan and Section Views
C-12A Feature BR1 Borrow From Mississippi River
C-13 Feature CC1Plan View
C-13A Feature CC1 Borrow Plan
C-14 Feature CC2 Plan View
C-14A Feature CC2 Borrow Plan
C-15 Feature CC3 Plan View
C-15A Feature CC3 Borrow Plan
C-16 Feature CC4 Site 1 Plan View
C-16A Feature CC4 Site 1 Borrow From Mississippi River
C-17 Feature CC4 Sites 2, 3 and 4 Plan View
C-17A Feature CC4 Sties 2, 3 and 4 Borrow Plan
C-18 Feature CC5 Plan View
C-19 Feature CC6 Plan View
C-20 Feature CM5 Plan View
C-20A Feature CM1 Plan View
C-21 Feature CM2 Plan View
C-21A Feature CM2 Plan View
C-22 Feature CM3 Plan View
C-22A Feature CM3 Borrow Plan
C-23 Feature CM4 Plan View
C-23A Feature CM4 Borrow Plan
C-23B Element MRGO 1 Plan View
C-24 Element MRGO 2 Plan View
C-25 Element MRGO 3 Plan View
C-26 Element MRGO 4 Plan View
C-27 Element MRGO 5 Plan View
C-28 Element MRGO 6 Plan View
C-29 Element MRGO 7 Plan View
C-30 Element MRGO 8w Plan View
C-31 Element MRGO 8 Plan View
C-33 Feature HM1 Plan View
C-34 Feature TM1 Plan View
C-35 Feature TM2 Plan View
C-36 Feature TM7 Plan View
C-36A Feature TM7 Borrow Plan
C-37 Feature TM8 Plan View
C-37A Feature TM8 Borrow Plan
C-38 Feature LM1 Plan View

C-39 Feature LM2 Plan View
C-40 Feature LM3 Plan View
C-41 Feature LM4 Plan View
C-41A Feature LM4 Plan View
C-42 Element LS1 Plan View
C-43 Feature D1 Violet Diversion
RF-1 Bienvenue Triangle Preliminary Site Plan and Layout
RF-2 Bienvenue Triangle Preliminary Site Plan and Layout
RF-3 Bienvenue Triangle Preliminary Site Plan and Layout
RF-4 Shell Beach Preliminary Site Plan and Layout
RF-5 Shell Beach Preliminary Site Plan and Layout
RF-6 Shell Beach Preliminary Site Plan and Layout
RF-7 Shell Beach Preliminary Site Plan and Layout
RF-8 Shell Beach Preliminary Site Plan and Layout
S-1 Diversion Structure at Mississippi River
S-2 Plan and Section for Diversion Structure at Mississippi River
S-3 Bridge Structure at West Judge Perez
S-4 Section of West Judge Perez Bridge
S-5 Structure at the 40 Arpent Levee
S-6 Plan and Section at the 40 Arpent Levee
S-7 Structure at MRGO
S-8 Plan and Section of Structure at MRGO
S-9 MRGO Typical Wall

ANNEX 1 MODELING REPORT
ANNEX 2 BORROW PIT ASSESSMENT
ANNEX 3 WATER QUALTIY ANALYSIS
ANNEX 4 INDIVIDUAL SOIL BORING LOGS
ANNEX 5 CONE PENETROMETER LOGS AND SHEAR VANE TESTS
ANNEX 6 LABORATORY TEST RESULTS
ANNEX 7 SLOPE STABILITY INPUT-OUTPUT FILES
ANNEX 8 CWALSHT INPUT-OUTPUT FILES
ANNEX 9 PILE CAPACITY CALCULATIONS
ANNEX 10 COST ESTIMATES
ANNEX 11 CONSTRUCTION SCHEDULE

MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY
ENGINEERING APPENDIX

1.0 PURPOSE

This Engineering Appendix outlines the engineering and design work done to support the preparation of the MRGO Ecosystem Restoration Plan Feasibility Study. It includes geotechnical investigations, structural design, levee and channel design, shoreline protection design, marsh creation design and cost estimates.

1.1 INTRODUCTION

The study is authorized by the Water Resources Development Act of 2007 Section 7013 to develop a plan:

- to physically modify the MRGO and restore the areas affected by the navigation channel;
- to restore natural features of the ecosystem that will reduce or prevent damage from storm surge;
- to prevent the intrusion of saltwater into the waterway;
- that integrates the recommendations of the Louisiana Coastal Area Report and the Louisiana Coastal Protection and Restoration Technical Report
- that considers the use of native vegetation; and diversions of fresh water to restore the Lake Borgne ecosystem.

The study area includes portions of the Deltaic Plain within coastal southeast Louisiana and southwest Mississippi. The area encompasses approximately 3.86 million acres. In Louisiana, the study area includes the Upper, Middle and Lower Lake Pontchartrain Sub-basins (figure 1).

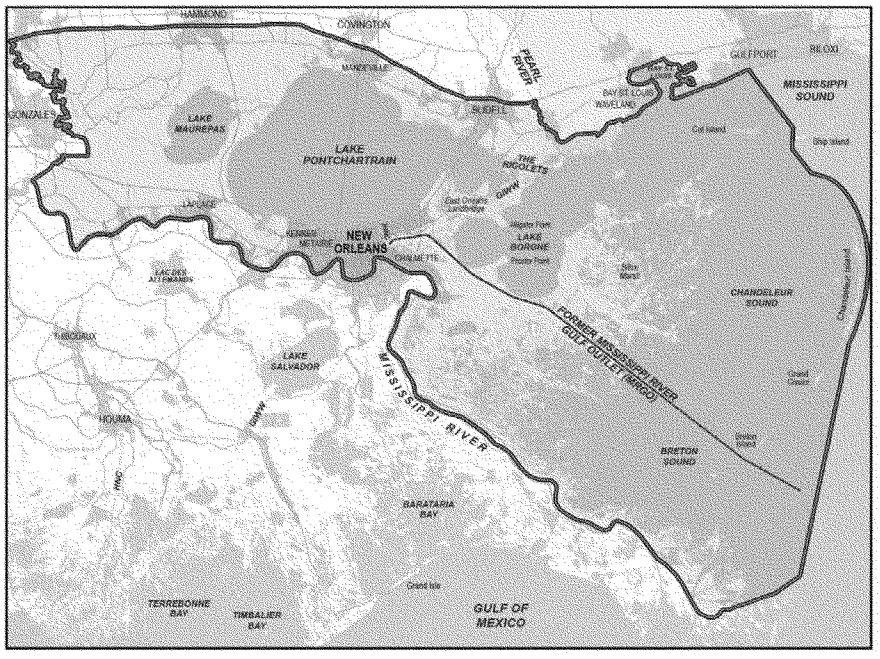


Figure 1- Study Area

1.2 ALTERNATIVES

Management measures were developed to address study area problems. A management measure is a feature (a structural element that requires construction or assembly on-site) or an activity (a nonstructural action) that can be combined with other management measures to form alternative plans. A detailed description of these measures is contained in the main report. After an initial screening, cost estimates were developed for the remaining features for use during higher level screening. Measures were combined in different to create alternatives and then alternatives were evaluated against each other. The screening/evaluation process is described in detail in the main report. Table 1 shows a list of the measures for which costs were developed. Estimated cost for each of these measures can be found in table 38. Figure 2 shows the location of these measures. The diversion at Violet was included in all alternatives evaluated.

Table 1 Alternative Measures		
Measure Label (Original)	Measure Label (New)[1]	Measure Type
005-sp	ES1	Shoreline Protection
006-sp	ES2	Shoreline Protection
007-sp	ES3	Shoreline Protection
007	EM5	Marsh Creation
009	EM1	Marsh Creation
090	EV1	Breakwater for SAV
010a	EM3	Marsh Creation
010b	EM4	Marsh Creation
011	EM2	Marsh Creation
028	LM4	Marsh Creation
014	LM1	Marsh Creation
015a	LM2	Marsh Creation
008sp	LS1	Shoreline Protection
015c	LM3	Marsh Creation
024		Marsh Creation
024	MRGO7	Channel Narrowing Marsh Creation
021	MRGO2	O&M Shoreline Protection
022	MRGO1	O&M Shoreline Protection
025	MRGO3	O&M Shoreline Protection
027	MRGO5	Channel Narrowing Shoreline Protection
026	MRGO8	Channel Narrowing Shoreline Protection
087	MRGO6	Shoreline Protection
104	MRGO4	O&M Shoreline Protection
		Violet Diversion
026e	CC4	Cypress Swamp Restoration
026c	CM2	Marsh Creation
026d	CM5	Marsh Creation
026b	CM1	Marsh Creation
026a	CC3	Cypress Swamp Restoration
025b	CC2	Cypress Swamp and Marsh Restoration
025a	CC1	Cypress Swamp Restoration

Table 1 Alternative Measures		
Measure Label (Original)	Measure Label (New)[1]	Measure Type
027a	CC5	Cypress Swamp Restoration
027b	CC6/CM4	Cypress and Marsh Restoration
030sp		Shoreline Protection
010sp		Shoreline Protection
011sp		Shoreline Protection
013sp	BS1	Shoreline Protection
014sp		Shoreline Protection
081	BM1	Marsh Creation
042		Marsh Creation
020		Marsh Creation
98asp		Shoreline Protection
98bsp		Shoreline Protection
111sp		Shoreline Protection
017sp		Shoreline Protection
107sp		Shoreline Protection
087	BM2	Marsh Nourishment
081sp	BS3	Shoreline Protection
029asp	BS2	Shoreline Protection
029bsp	JS1	Shoreline Protection
110		Shoreline Protection
133a	BR1	Ridge Restoration
133b		Ridge Restoration
028	JS1	Shoreline Protection
242	TM4	Marsh Creation
241	TM6	Marsh Creation
244	TM5	Marsh Creation
243	TM3	Marsh Creation
245	TM2	Marsh Creation
002a	TM1	Marsh Creation
002b	TM7	Marsh Creation
002c	TM8	Marsh Creation

Table 1 Alternative Measures		
Measure Label (Original)	Measure Label (New)[1]	Measure Type
190	HM1	Marsh Creation
004		Marsh Creation
013		Marsh Creation
022		Marsh Creation
023		Marsh Creation
78		Marsh Creation
191		Marsh Creation
240		Marsh Creation

[1] **New Measure Labels are Only For Measures In The Final Array Of Alternatives**

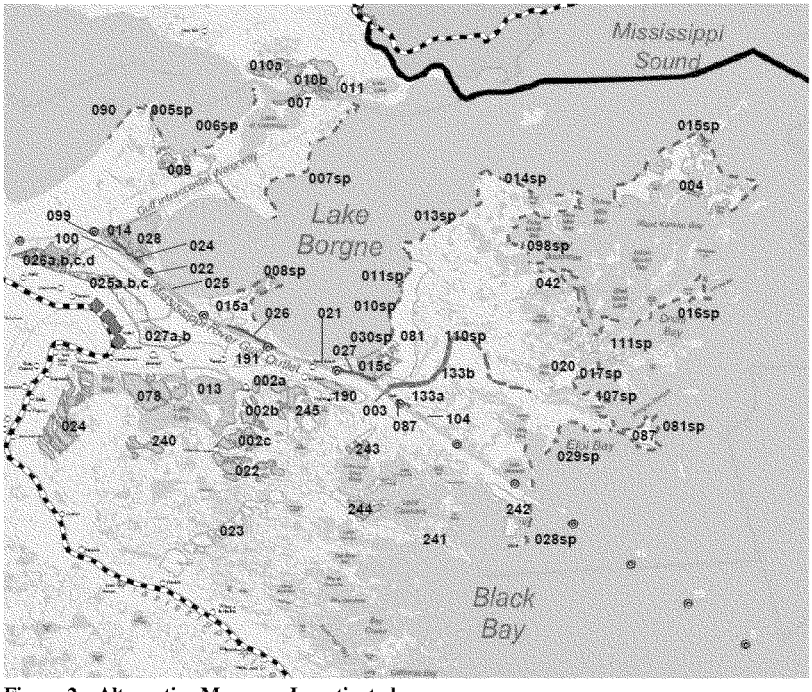


Figure 2 – Alternative Measures Investigated

1.3 TSP

Features included in the Tentatively Selected Plan (TSP) are listed in Table 2 below and shown in Figure 3.

Table 2 Tentatively Selected Plan

Area	Feature
Biloxi Marsh	BM1
	BS1
	BS2 (now oyster reef)
	BR1
Central Wetlands	CC1
	CC2
	CC3
	CC4
	CC5
	CC6
	CM1
	CM2
	CM3
	CM4
	CM5
MRGO	MRGO1
	MRGO2
	MRGO3
	MRGO4
	MRGO5
	MRGO6
	MRGO7
	MRGO8
East Orleans	EM1
	EM2
	EM3
	EM4

Table 2 Tentatively Selected Plan	
Area	**Feature**
	ES1
	ES2
	ES3
S. Lake Borgne	LM1
	LM2
	LM3
	LM4
	LS1
Terre aux Boeufs	TM1
	TM2
	TM7
	TM8
Hopedale	HM1
Diversion	D1

1st letter – area:

B – Biloxi Marsh
C – Central Wetlands
M – MRGO Channel
E – East Orleans
L – South Lake Borgne
T – Terre aux Boeufs
H - Hopedale
J – Jetty
I – Island (if needed)

2nd letter – measure type:

C – Cypress swamp restoration/nourishment
M – Marsh creation/nourishment
S – Shoreline protection
V – SAV restoration
R – Ridge restoration
B – Barrier island restoration (if needed)

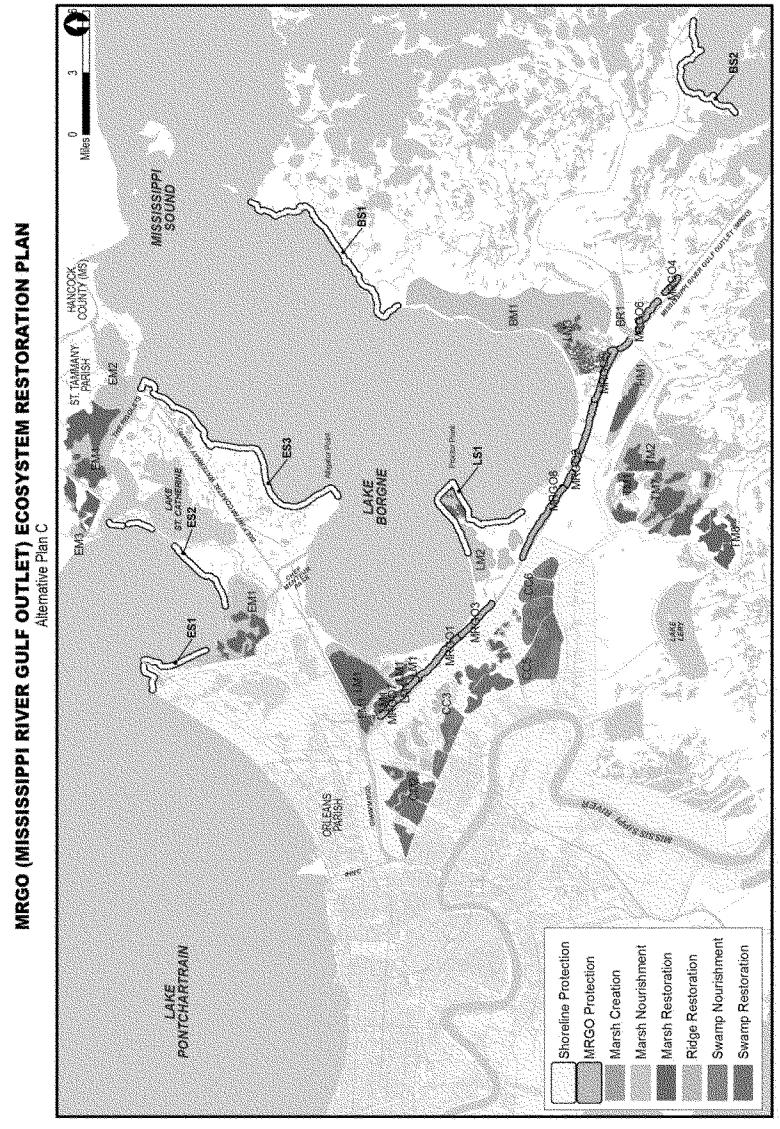

MRGO (MISSISSIPPI RIVER GULF OUTLET) ECOSYSTEM RESTORATION PLAN
Alternative Plan C
0
3
6
Miles
LAKE PONTCHARTRAIN
MISSISSIPPI SOUND
LAKE BORGNE
HANCOCK COUNTY (MS)
ST. TAMMANY PARISH
ORLEANS PARISH
MISSISSIPPI RIVER
ES1
ES2
ES3
BS1
BS2
LS1
EM1
EM2
EM3
BM1
BM2
BR1
CC3
CC6
MRGO1
MRGO2
MRGO3
MRGO4
MRGO5
MRGO6
MRGO7
MRGO8
Shoreline Protection
MRGO Protection
Marsh Creation
Marsh Nourishment
Marsh Restoration
Ridge Restoration
Swamp Nourishment
Swamp Restoration

Figure 3 - TSP

1.4 VIOLET DIVERSION

The freshwater diversion is a system driver to create conditions conducive to the full restoration of historic salinity levels in the vicinity of the MRGO. The Violet Freshwater Diversion would mimic natural river flooding processes and enhance the sustainability of the system through the input of freshwater, nutrients and sediment. The diversion would also help to restore historic salinity conditions and nourish existing and restored wetlands in the study area. However, additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083 which states "The Secretary shall design and implement a project for a diversion of freshwater at or near Violet, Louisiana...". The additional analysis for the diversion will be accomplished and documented under the separate study authorized under WRDA 2007 Section 3083.

The modeling and design work done for the Violet Diversion as a part of this study is included in this appendix to document the work completed to this point. Additional modeling and design done to confirm diversion size and location and provide feasibility level of design will be done as recommended and will be documented in a separate report done under a separate study authorization as stated above.

2.0 HYRDOLOGY AND HYDRAULICS

2.1 INTRODUCTION

The study area includes portions of the Deltaic Plain within coastal southeast Louisiana and southwest Mississippi. The area encompasses approximately 3.86 million acres. In Louisiana, the study area includes the Upper, Middle and Lower Lake Pontchartrain Sub-basins.

2.2 CLIMATOLOGY

2.2.1 Climate

The climate is warm and humid subtropical due to its latitude and proximity to the Gulf of Mexico. The area has mild winters, hot summers, heavy precipitation, and generally high humidity. Prevailing winds are southeasterly during the spring, southwesterly in the summer, and northeasterly in the fall and winter. In the coastal area, winds have a strong impact on coastal water levels. Winds from a southerly direction may push water into the bays and lakes, frequently raising water levels in the upper part of the estuarine zone. On the other hand, winds from a northerly direction may depress water levels.

The general circulation of air over the area follows the sweep of the western extension of the Bermuda High during the spring and summer months. High pressure systems over the North American continent modify the patterns for the remaining months. These high pressure systems and their associated extra tropical cyclones are responsible for the wide pressure ranges of winter. The Bermuda High has greater constancy than the continental high pressure systems and in late spring and summer maintains a rather steady flow of warm, moist air that, to a large degree, controls the climate over the area. Periods of good weather tend to be longer during late spring and summer than during late fall, winter, and early spring. The monthly mean pressures range from a maximum of 30.1 inches of mercury in December and January to a minimum of 29.97 in September.

Many polar air masses and associated frontal conditions penetrate to the Gulf of Mexico each winter. During the cooler season, about 15 to 20 of these systems bring strong northerly winds, cold temperatures, and adverse weather. These polar air masses ordinarily scour from November to March and last about a day and a half. Severe polar air masses usually occur from December to February and occasionally later, and may last for 3 to 4 days.

Monthly mean relative humidity is high throughout the year with negligible seasonal variation because of the influence of the gulf waters. Maximum values of the monthly means occur in spring, the time of greatest consistency of southeasterly winds. Minimum humidity generally occurs during the fall.

2.2.2 Hurricanes and Tropical Storms

Hurricanes or tropical storms originating in the North Atlantic and Caribbean Sea occasionally come into the study area during the hurricane season, June through October. These weather systems can

cause considerable property and environmental damage and loss of human life. Historical data from 1899 to 2007 indicate that 30 hurricanes and 41 tropical storms have made landfall along the Louisiana coastline (National Weather Service, http://www.srh.noaa.gov/lch/research/tropical5.php and National Hurricane Center, http://www.nhc.noaa.gov). Winds and waves generated by these storms have caused substantial damage to the marshes and have contributed to erosion and land loss. Table 3 presents a chronology of major hurricanes that have struck the study area.

Table 3 Hurricane Data

Storm	Date	Lowest Pressure	Sustained Winds
HILDA	10/3/1964	950 mb	115 mph
BETSY	9/19/1965	948 mb	125 mph
CAMILLE	8/17/1969	909 mb	190 mph
ANDREW	8/26/1992	956 mb	115 mph
KATRINA	8/29/2005	920 mb	125 mph

2.3 HYDROLOGY AND HYDRODYNAMICS – GENERAL INFORMAITON

2.3.1 Study Area

Most of the study area consists of the Lake Pontchartrain basin. The basin can further be divided into the Upper, Middle, and Lower sub-basins. In Mississippi, the study area includes the Western Mississippi Sound, its bordering wetlands, and Cat Island. These areas include portions of the Pearl River and the Coastal Streams hydrologic basins. The Lake Borgne ecosystem is also influenced by the Pearl River to the north and received hydrologic interchange from areas located as far south as the River Aux Chenes ridge. To the east, the Western Mississippi Sound is an extension of Lake Borgne. The Western Mississippi Sound, Chandeleur Sound, and Breton Sound form the eastern boundary of hydrologic influence into the Lake Borgne ecosystem.

2.3.2 Lake Pontchartrain Basin

The Lake Pontchartrain Basin consists of Lake Maurepas, Lake Pontchartrain, Lake Borgne, the Biloxi Marshes, Chandeleur Sound, plus associated marshlands and waterways. Lakes Maurepas, Pontchartrain, and Borgne cover 55 percent of the basin. Lakes Maurepas and Pontchartrain are hydrologically connected by Pass Manchac, separated only by land bridges of cypress swamp and fresh/intermediate marsh. Lake Borgne is hydrologically connected to Lake Pontchartrain through Chef Menteur and Rigolets. They are separated by a brackish marsh land bridge.

The basin contains approximately 483,400 acres of wetlands, consisting of nearly 38,500 acres of fresh marsh, 28,600 acres of intermediate marsh, 116,800 acres of brackish marsh, 83,900 acres of saline marsh, and 215,600 acres of cypress swamp. Since 1932, more than 66,000 acres of marsh have converted to water in the Pontchartrain Basin--over 22 percent of the marsh that existed in 1932.

The basin has several freshwater tributaries, which are the single most important factor affecting salinities in Lake Pontchartrain. The Blind, Amite, and Tickfaw Rivers flow into Lake Maurepas. The Tangipahoa and Tchefuncte Rivers, the Lascombe and Bonfouca Bayous enter from the north shore of Lake Pontchartrain. Bayou St. John, the Inner Harbor Navigation Canal (making a connection between the Mississippi River and the Basin), the Bonnet Carre Spillway, and several canals which discharge storm water runoff discharge into Lake Pontchartrain from the south shore. Over the long-term, flood releases from the Bonnet Carre Floodway are a poor predictor of salinity variation in Lake Pontchartrain. Large flood releases from Bonnet Carre in excess of the total volume may enter the Lake during a single flood event (Swenson 1981), which depresses salinities to 0% in the eastern region in a matter of days. However, once the spillway is closed, salinities in the western portion of Lake Pontchartrain take as long as two months to return to steady state values (Sikora, 1985). The annual freshwater flow into Lake Pontchartrain averages about 3,800 cfs. The largest tributary to the basin, Pearl River with its mean annual flow of about 10,000 cfs, discharges into Lake Borgne near the mouth of the Rigolets. Several smaller rivers, the largest of which are the Amite, Tickfaw, Tangipahoa, and Tchefuncte Rivers, flow into Lake Pontchartrain and Lake Maurepas. Lake Borgne is connected to the Mississippi River Gulf Outlet by several bayous; the principal ones being Bayous Bienvenue, Dupre, Ysclosky, LaLoutre, and St. Malo. There was once major freshwater (as well as sediment and nutrient) input into the basin as a result of seasonal flooding of the Mississippi River, however this has succumbed to saltwater intrusion as a result of the construction of levees, which confined the river to a channel.

Tides in the basin are principally diurnal, with mean ranges of 0.3 ft (Lake Maurepas) to 0.5 ft (Lake Pontchartrain) to 1.4 ft (Chandeleur Sound). Mean water levels are affected by winds, freshwater runoff, and seasonal trends in the Gulf of Mexico. Sustained winds can raise or lower peak astronomical tide levels by several feet for short periods. The mean water levels are lower in winter and midsummer while higher in spring and fall. Currents and circulation are controlled by tides, winds, freshwater discharges, and gulf currents (Tate, Carrillo, Berger, and Thibodeaux 2002).

2.3.3 Hydrodynamics and the MRGO, GIWW, and IHNC

Saltwater intrusion occurs when freshwater flows decrease in volume, allowing saltwater from the tidal body, which is heavier than freshwater, to move inland or "upstream". Saltwater can then infiltrate fresh groundwater and surface water supplies and damage freshwater ecosystems. Saltwater intrusion can result from natural causes as well as human induced activities. The rate of saltwater intrusion depends on the amount of freshwater flows traveling downstream and the water depth in the wetlands, channels, and/or canals. Generally, high-inflow/low-salinity periods occur from late winter to late spring and low inflow/high-salinity periods from late spring to fall. Saltwater intrusion is the principle factor in the conversion of freshwater habitats to saline habitats. Extreme salinity

changes can stress fresh and intermediate marshes to the point where vegetation dies and the wetlands convert into open water (Flynn et al. 1995).

A discussion of salinity within the Lake Pontchartrain Basin due to saltwater intrusion is discussed in relation to the construction and operation of the MRGO. Salinity within the basin can be chronologically divided into before and after construction. The channel directly and indirectly impacted the natural geomorphology of the St. Bernard deltaic complex. Construction and operation also affected the geomorphology and hydrodynamic regime of the Lake Pontchartrain Basin. A study across areas of the current channel was conducted from 1959 – 1961 to evaluate the major hydrodynamic parameters, including circulation and salinity, prior to opening the MRGO to marine traffic in 1963 (Rounsefell, 1964). These data indicated that the Bayou La Loutre ridge provided a boundary that limited the flow of saline water from the Breton Sound area into Lake Borgne. An analysis of typical tidal flow across the region also indicates that since construction of the MRGO, circulation patterns have been altered along its length in areas between Breton Sound and Lake Borgne (Wicker et al., 1982). Breaching the Bayou La Loutre ridge, which served as a hydrodynamic boundary, has altered circulation patterns in areas along the lower southeastern length of the channel and across areas between Breton Sound and Lake Borgne. Compounding the issue is the fact that relative sea level rise of up to 0.96 feet per century (3 mm per year) has given saltier waters greater access to basin wetlands. Additional areas that may have been impacted by the construction and operations of the MRGO include the Pass Manchac near Ponchatoula; Lake Pontchartrain including the North Shore and Little Woods; Chef Menteur Pass near Lake Borgne; Bayou LaLoutre near Alluvial City; Breton Sound and Gossier Barrier Island Chain. Monthly summaries of salinity for pre- and post- MRGO indicate that salinity has increased on the average by the following amounts (although in recent years, salinities have stabilized).

- 0.4 ppt at Pass Manchac near Pontchatoula.
- 1.1 ppt at Lake Pontchartrain, North Shore.
- 1.9 ppt at Lake Pontchartrain, Little Woods.
- 2.3 ppt at Chef Menteur Pass near Lake Borgne
- 4.5 ppt at Bayou LaLoutre, Alluvial City.

To facilitate navigation, three man-made waterways were constructed which may have modified the hydrologic regime of Lake Pontchartrain (Sikora, 1985). These are the MRGO, Inner Harbor Navigation Canal and Gulf Intracoastal Waterway (GIWW). Lake Pontchartrain has undergone numerous physical and chemical changes resulting from expansion and urbanization of the surrounding area including the city of New Orleans. The construction of the MRGO navigation channel contributed to the existing conditions of Lake Pontchartrain: High salinity water can enter Lake Pontchartrain via MRGO through two routes, Chef Menteur Pass and the IHNC. The IHNC is the more direct route via the GIWW. The cross-sectional areas at Lake Pontchartrain and percent of the total tidal flow in and out of the lagoon are shown in Table 4.

As shown in the table, the high salinity water generally enters the Lake via the Mississippi Sound and Lake Borgne through the Rigolets and Chef Menteur passes. However, flow from the Pearl River can block this route (Sikora, 1985).

Table 4 - Salinity Routes to Lake Pontchartrain; Cross Sectional Area and Percent of Tidal Flow in and out (Swenson and Chuang 1983).

Name of Pass	Cross-Sectional Area, m^2	Percent of Total Flow
Rigolets	6800	60
Chef Menteur	3200	30
IHNC	80	10

Increased salinity levels have negatively impacted the Louisiana oyster (*Crassostrea virginica*) fishery and its industry by shrinking the area within the seeding grounds that serve as ideal oyster habitat (Chatry et al., 1983). Chatry et al. (1983) developed an optimum salinity regime for oysters (see Table 5) by studying salinity, spatfall, and seed oyster production data from a 10-year time period. Meeting this established salinity regime at least 40 percent of the time has become a goal of the MRGO Ecosystem Restoration Plan.

Table 5 Salinity Targets For The Biloxi Marshes

Salinity Targets for the Biloxi Marshes, ppt							
Month	Chatry Average Target	Mean Ambient Salinity	Needed Reduction	Chatry Optimum Limits		Chatry Range Limits	
				Low	High	Lowest	Highest
Jan	16.5	19.5	3.0	15.5	17.5	15.0	19.0
Feb	14.5	16.5	2.0	13.5	15.0	11.0	17.0
Mar	11.5	15.0	3.5	10.5	12.5	7.5	15.0
Apr	8.0	14.0	6.0	7.0	9.5	2.0	13.0
May	7.0	15.0	8.0	6.0	8.0	4.5	11.5
Jun	12.5	17.0	4.5	12.0	13.5	9.0	6.0
Jul	13.0	20.5	7.5	12.5	13.0	10.5	15.0
Aug	16.0	22.0	6.0	15.0	16.5	13.0	17.5
Sep	17.0	23.0	6.0	16.0	18.0	15.0	24.0
Oct	17.0	24.0	7.0	16.0	18.0	13.0	18.5
Nov	16.0	24.0	8.0	15.0	17.0	11.5	18.5
Dec	16.0	23.0	7.0	15.5	16.5	13.0	17.0

Note: Salinity targets were estimated to the nearest 0.5 ppt using the graphical display in Chatry et at. (1983). Ambient salinities were rounded to the nearest 0.5 ppt using Pankow et al. (1989) Equation 10a and 50

2.3.4 Canals

A vast network of canals (mostly dredged between 1950 and 1980), pipelines, and production facilities has been created to service the oil industry. Canals that stretch from the Gulf of Mexico inland to freshwater areas allow saltwater to penetrate much farther inland, particularly during droughts and storms, which has had severe effects on freshwater wetlands. These canals have caused secondary indirect impacts by altering the natural hydrology of marshes and by accelerating erosion rates along the channel and canal banks. Dredged material banks, which are much higher than the natural marsh surface and the many smaller canals dredged for oil and gas exploration, alter the flow of water across wetlands. Hydrodynamic alteration changes important hydrogeomorphic, biogeochemical, and ecological processes, including chemical transformations, sediment transport, vegetation health, and migration of organisms. Because of the presence of dredged material banks, partially impounded areas have fewer but prolonged periods of flooding and reduced water exchange when compared to unimpounded marshes (Swenson and Turner 1987). This results in increased waterlogging and frequently in plant death. More importantly, dredged material banks also block the movement of sediment resuspended in storms, which play a major role in sustaining land elevations (Reed et al. 1997). These effects combine to eliminate soil-building processes necessary to counteract subsidence. Additionally, channels and canals provide avenues for higher salinity water to move into previously freshwater dominated marshes, which ultimately leads to degradation and land loss. Extreme salinity changes can stress fresh and intermediate marshes to the point where vegetation dies and the wetlands convert into open water (Flynn et al. 1995). Also, by altering salinity gradients and patterns of water and sediment flow through marshes, canal dredging not only directly changed land to open water, but also indirectly changed the processes essential to a healthy coastal ecosystem. Habitat switching is another impact caused by altering salinity gradients.

One advantage to the dredging of canals was that elevated dredged material embankments may provide important wildlife refuge during storm events and valuable habitat for neotropical migratory birds, and the value of this habitat should be considered as restoration of these areas occurs (LCA 2004).

2.4 RELATIVE SEA LEVEL RISE DUE TO EUSTATIC SEA LEVEL RISE AND SUBSIDENCE

Sea level rise in southern Louisiana is a combination of eustatic rise (due to global factors), general land settlement and other local factors which have an impact on sea level and is significantly higher than either the global or regional average sea level rise changes.

Historic rates of relative sea level rise vary across Louisiana and can also vary depending on the methods used to estimate those rates. The two most commonly cited methods of estimating historic relative sea level rise rates in Louisiana are radiometric dating of organic deposits (mostly peat) and

analysis of long-term tide gage data. Relative sea level rise rates are determined from tide gage data that are based on more recent (20th century) data than radiometric dating. The relative sea level rise rate determined from gage data is generally greater than the rates determined from radiometric dating.

Data from two local gages together with work from an earlier Louisiana Coastal Protection and Restoration (LACPR) technical report were reviewed as part of this study. The historic trend in sea level rise from the Shell Beach gage was adopted for this study. The historic trend was established as 10.2mm/year using a dataset of 42 years from 1961 to 2002.

The future rates of sea level rise were established in accordance with EC 1165-2-212 and produced three estimates into the future as detailed in Appendix B. The three estimates (low, intermediate, and high) are based on the following:

1. Low - continuation of the historic rate
2. Intermediate - accelerating rate of eustatic rise based on the National Research Council (NRC) Sea Level Curve I
3. High - accelerating rate of eustatic rise based on the NRC Sea Level Curve III

A global (eustatic) rate of 1.7mm/year was used, in accordance with the guidance, for the purpose of extracting the changes of regional origin from the total sea level rise.

When considering a study period from 2011 to 2065, the increases in sea level over this period were calculated as:

1. Low rate (based on a historic trend of 10.24 mm/yr) = 1.8ft (0.55m)
2. Intermediate rate (based on a NRC Curve I and 8.54mm/yr for land subsidence) = 2.2ft (0.69 19 m)
3. High rate (based on a NRC Curve III and 8.54 mm/yr for land subsidence) = 3.7ft (1.12 m)

A plot of the sea level rise over the period is shown in Figure 4.

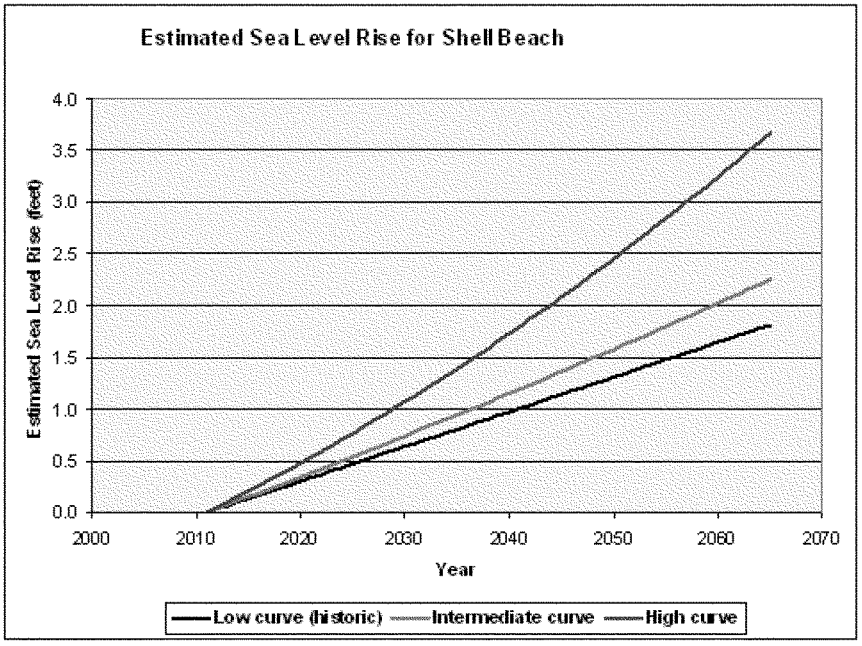


Figure 4 Sea Level Rise Curves

2.5 HYDRODYNAMIC MODELING

2.5.1 General

Computer model studies were conducted to determine if salinity targets set in the Biloxi Marsh set for the study can be met by diverting freshwater from the Mississippi River through a hydraulic structure and conveyance system near the Violet, Louisiana. The resultant flow regime would then be the basis of design for a new, or modification to an existing, hydraulic structure that would deliver fresh water to benefit the Biloxi Marsh. A secondary objective is the use of the proposed hydraulic modifications to introduce freshwater to the CWA in order to enhance cypress swamp and freshwater marsh restoration.

The required salinity targets for the Biloxi Marshes are shown in the Chatry report (reproduced in Figure 5) as monthly optimum salinity values, together with a standard error about the optimum value (+/- one standard deviation about the monthly mean). In addition, this graph depicts the range of values (denoted as range limits) analyzed to obtain the target value and standard error values (denoted as optimum limits). The graph was based on eight years of data which preceded years of good oyster production. The optimum salinity around the mean is a very narrow range, much smaller

than the daily variability in salinity due to tidal and other coastal forcing parameters such as river flow, winds, and atmospheric pressure. All of these parameters drive salinity values up or down by significant amounts, and depending on the specific conditions at a given time can have remarkable impacts on the salinity mean.

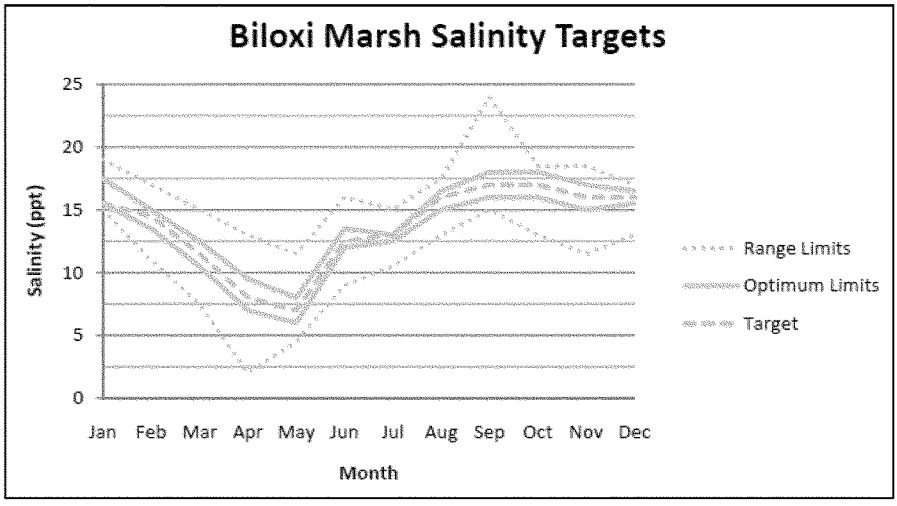


Figure 5 Biloxi Marsh Salinity Targets

A final design of the freshwater diversion will balance the efficiency of delivery of freshwater to the Biloxi Marsh region, and the ecological restoration goals to the CWA. Considerations in the design are the available head in the Mississippi River and the potential negative impacts to the CWA that could result from inundations due to increased water levels.

2.5.2 Methodology

To meet the objectives, a modeling initiative was developed to establish details of a diversion near Violet, La. This was undertaken as follows:

1. Collecting and collating data on flows, salinity, nutrients and future projects and evaluating their impact on the study area.
2. Modifying and re-calibrating the existing Pontchartrain Basin UNO Mass Balance model.
3. Undertaking a series of model runs to establish the feasibility of a diversion in the vicinity of the Violet Canal to meet Biloxi Marsh salinity targets and to determine flows and generalized flow regime details.

4. Developing a 2D detailed model of the CWA area using Mike21 to characterize the impacts of different alternative diversion locations on the area in terms of salinity, stage and flow.
5. Using UNO's FVCOM to consider the sensitivity of the UNO Mass Balance model results to wind shear and, if necessary, refine the error bands on selected alternatives from the model to reflect these results.
6. Running the UNO Mass Balance model with the final preferred alternative based on flow characterized in the detailed modeling to evaluate the effect on salinity in the Biloxi Marsh.

2.5.3 UNO Mass Balance Model

2.5.3.1 General Description

The UNO Mass Balance model is a mathematical tool that performs first-order approximations of mass transfer due to physical inputs like water level, flow, and salinity. The modeling approach is valid if the results are interpreted in the appropriate manner and at the appropriate temporal and spatial scale. The model is ideally used early in feasibility studies in order to look at large numbers of alternatives over long time frames. The model was selected for this planning study because it has been demonstrated to accurately characterize salinity variability on monthly time scales in the Lake Pontchartrain/Lake Borgne regions (McCorquodale, et. al., 2008). The model has a coarse resolution with grid cells sized on the order of 10 x 10 km., and makes volume and salinity calculations for each box. There is no vertical gradient defined and the model is only capable of predicting large-scale (>> 10km) gradients in the salinity pattern because of its resolution. The model provides a reasonable representation of the spatial distribution of salinity over large areas at these low (monthly) frequencies of interest. The facility of this model is that it is readily available for use, has the ability to make a significant number of operational runs over long time scales, and is easy to modify to include new changes to the system such as the MRGO barrier.

The following stipulations are acknowledged when using Mass Balance model:

- Study area is composed of well mixed cells and cannot represent stratified flows
- Flow in the channels depends on difference in water levels between cells and friction
- Tides are diurnal (one maximum per day) with a lunar cycle
- Short-term wind effects are not included; seasonal Gulf water level is included
- Coriolis force (earth's rotation) is neglected
- Based on the model calibration error of 17%, a standard error in the prediction of the salinity in any cell can be +/-17%.

2.5.3.2 Application to Study

For this study, the results of the model were used to define discharge rates at the diversion necessary to meet the salinity targets in the Biloxi Marsh/Lake Borgne regions. Accordingly, the model domain was modified to better represent the Biloxi Marsh and the Chandeleur Islands in order

to characterize the effects of a Violet Freshwater Diversion on salinity in the Biloxi Marsh/Lake Borgne area.

2.5.3.3 Data Collection-Collation

2.5.3.3.1 Freshwater Inflow

An extensive effort of data collection was needed to drive the hydrodynamic models used in the study. Freshwater inflows into Lakes Maurepas and Pontchartrain, Mississippi Sound, Mobile Bay and the passes of the Mississippi River were obtained to be used as boundary conditions for the models. Flow data for diversion structures such as Caernarvon, Blind River and Hope Canal, and flood control structures such as the Bonnet Carré Spillway were also used. Where gaged data was not available, the flow was established by considering the flow from a neighboring gaged area and assigning a flow based on the proportion of the two drainage areas, assuming similar rainfalls in the ungaged and gaged areas.

For the Lake Pontchartrain basin area, daily flow values from the USGS for the Amite, Tchefuncte, Tickfaw, Tangipahoa and Pearl Rivers were used.

For the Pearl River (which presents the largest percentage of freshwater flow into the Biloxi Marsh region), daily flows from 1990 through 2008 were used. The entire Pearl River record from 1938 through 2008 was analyzed to obtain monthly averages and statistics for the monthly averages.

The ungaged areas around Lake Maurepas and Lake Pontchartrain were grouped into the following areas: ungaged South Lake Maurepas, ungaged Southwest Lake Pontchartrain, ungaged South Central Lake Pontchartrain (Jefferson Parish), ungaged Southeast Lake Pontchartrain (Orleans Parish), ungaged Northeast Lake Pontchartrain (Bayous Lacombe and Bonfouca), and ungaged South Lake Borgne.

Daily flow values from the USGS were used for the Wolf, Biloxi and Pascagoula Rivers (areas around the Mississippi Coast). Flow for the Jourdan River was apportioned according to its drainage area. Daily freshwater flows into Mobile Bay were obtained from the USGS.

Daily flows for the Mississippi River were obtained from the USACE and were distributed into the various passes according to the average percentage of flow determined from more than two dozen surveys of discharges in the passes from 1970 through 2004.

Flow data for the Bonnet Carré Spillway was obtained for periods when the structure was being operated for flood control in 1997 and 2008. For other high Mississippi River conditions when the structure was not being operated for flood control, leakage through the needles of the structure was considered significant enough to be included as freshwater input. Leakage was calculated using a slot flow equation and was checked against USGS flow measurements and a leakage curve supplied by the USACE.

2.5.3.3.2 Salinity

There was no extensive continuous record of salinity data for the Lake Pontchartrain-Lake Borgne Basins. Conversely, many independent sets of data, obtained for various reasons, was available. This data was collected and sorted in a database by latitude, longitude, and date.

For the Mass Balance Model (which is based on a large-scale grid), to generate data sets appropriate for comparison with model results, the data was aggregated together based on their locations relative to the model grids. The aggregated cells were then averaged together over each month to generate monthly "mean" values in each year data was collected. If enough data was collected over each one month period then the average of all these data points over each aggregated grouping provides the best estimate of the average salinity for that month and year. A high number of data points will effectively filter out high frequency variability in the salinity data caused by winds and tides.

Salinity in the Biloxi Marsh can be represented by the aggregation of zones J and L (Figure 6) which represent the grouping of several monitoring stations that are in the vicinity of the Biloxi Marsh. Figure 7 shows the monthly average salinity for aggregated zones J and L against the Chatry limits. The historic salinity falls within or below Chatry's optimum upper limits during January, February, March, August, September, November and December. The average salinity falls just above Chatry's limits in June, July and October. In April and May, historic salinity levels are significantly higher than the target. An analysis of the relationship between the freshwater discharges from the Pearl River system and salinity values in Biloxi Marsh can be developed (Figures 8 and 9). If there is a direct relationship, higher river flows would correlate with lower salinity values. To test this hypothesis, salinity data from the Biloxi Marsh area was aggregated together as described above from zones J and L. The monthly salinity values were plotted directly against the monthly river flows. The results illustrate that prior to the mid 1980s there seems to be a poor relationship between the river and salinity as demonstrated by lack of the expected inverse correlation (Figure 10). This poor relationship is robably due to lack of enough salinity data being available prior to 1989 which will create a bias in the data sets. For the data set from 1989 to the present which is consistent with the data set used in the modeling effort, the anticipated inverse relationship is present (Figure 11).

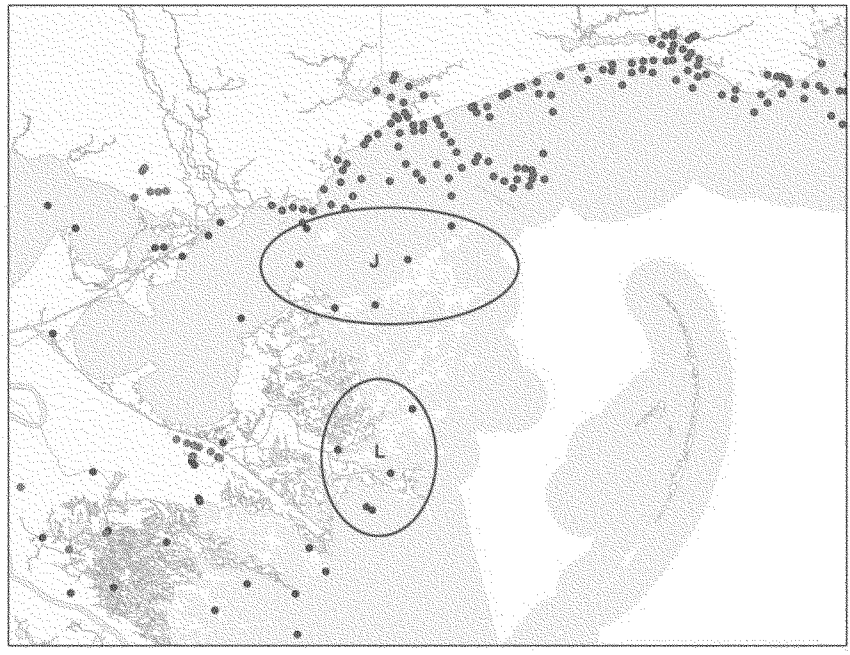


Figure 6. Location of J and L data points

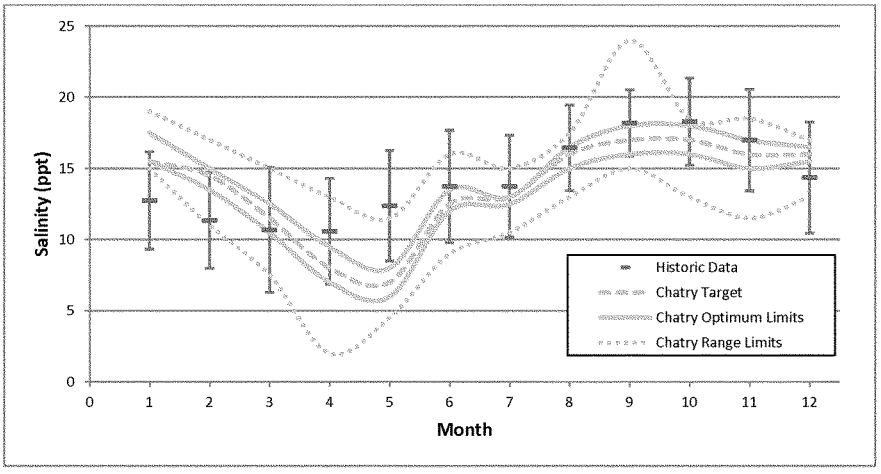


Figure 7. Comparison of historic data with the Chatry limits

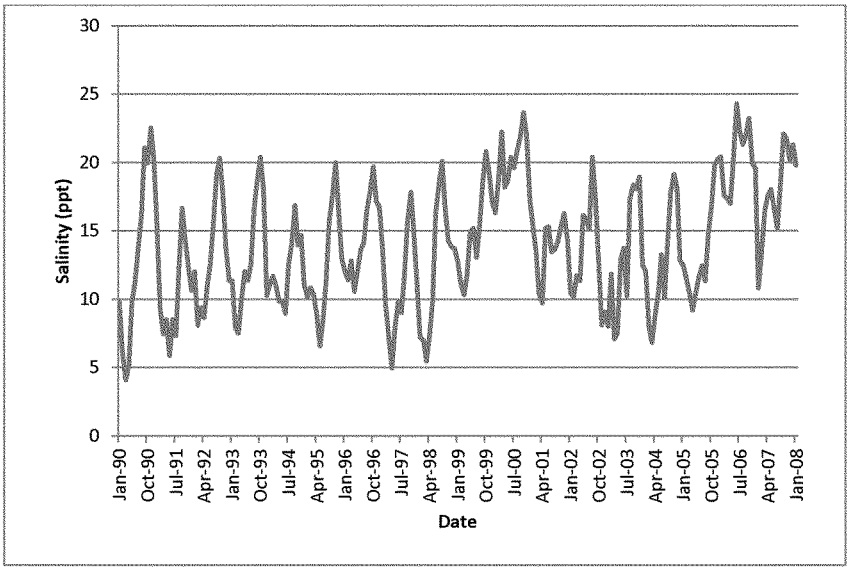


Figure 8 Salinity in zones J&L since 1990

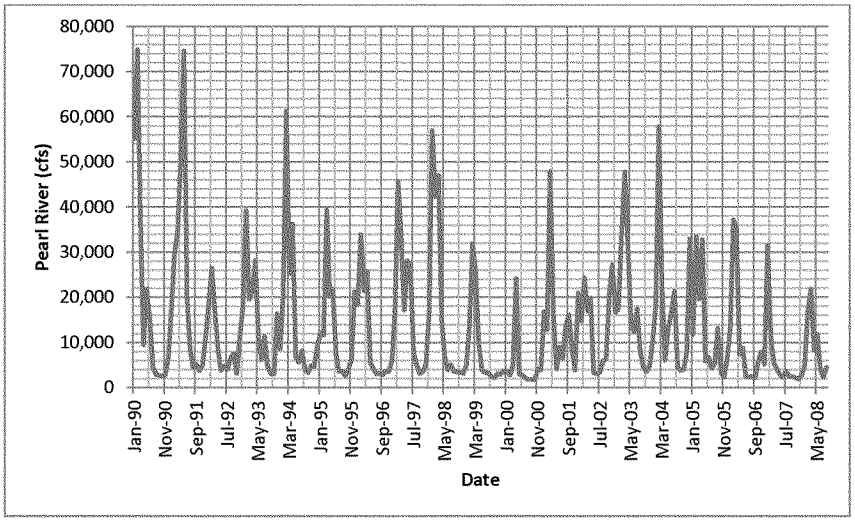


Figure 9 Historical Pearl River flow rates

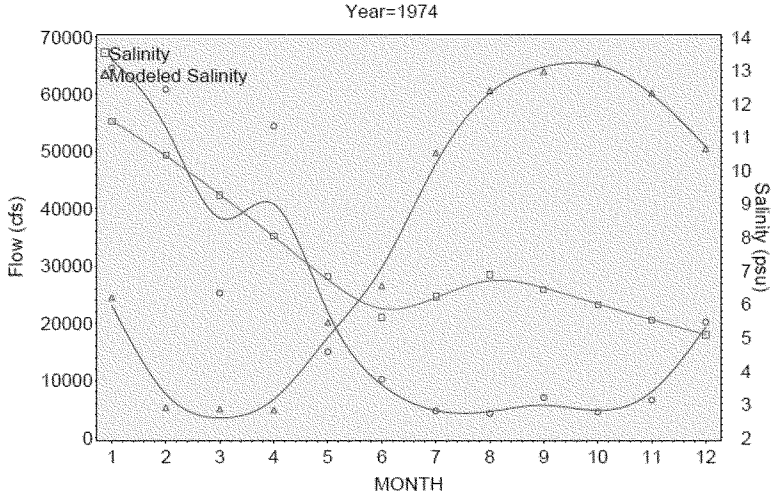


Figure 10. Example of poorly correlated data (1974)

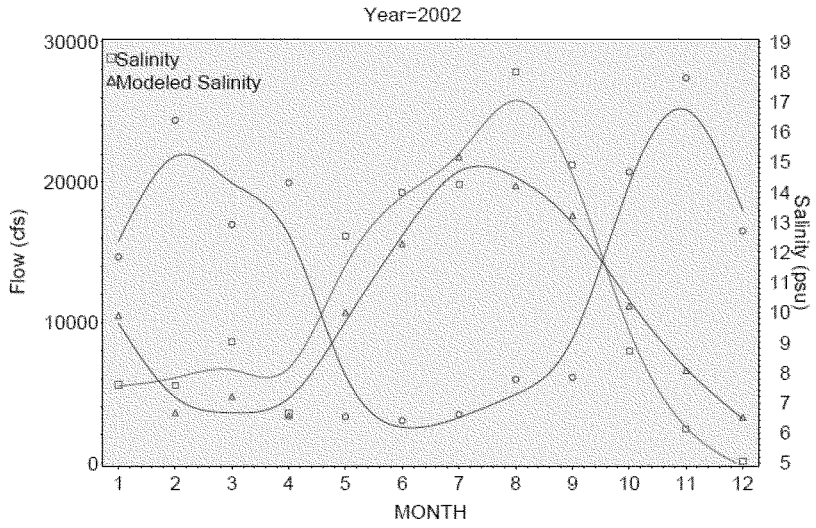


Figure 11. Example of well correlated data (2002)

A multiple linear regression model was developed to describe the relationship between salinity in the Biloxi Marsh and 3 independent variables related to flow in the Pearl River. The equation of the fitted 22 model is:

Monthly Mean Salinity = 53.0764 - 1.69051*logflow - 1.33071*loglf1 - 1.66414*loglf2

Where: logflow = log transformed mean flow for predicted month
loglf1= log transformed mean flow for month prior to predicted month
loglf2= log transformed mean flow for month two months prior to predicted month

The P-value from the analysis of variance (ANOVA) analysis is less than 0.05, indicating a

statistically significant relationship between the variables at the 95.0% confidence level. The R32 Squared statistic indicates that the model, as fitted, explains 69.09% of the variability in the salinity. The adjusted R-squared statistic, which is more suitable for comparing models with different numbers of independent variables, is 68.61%. The standard error of the estimate shows the standard deviation of the residuals to be 2.50. The mean absolute error of 1.98 is the average value of the residuals. The Durbin-Watson statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in the data file. Since the P-value is less than 0.05, there is an indication of possible serial correlation at the 95.0% confidence level.

In determining whether the model can be simplified, the highest P-value on the independent variables is 0.0001, belonging to loglf1. Since the P-value is less than 0.05, that term is statistically significant at the 95.0% confidence level. Consequently, all variables should remain in the equation of the fitted model.

The analysis demonstrates that gage data in the Pearl River can, within the errors demonstrated, predict salinity in the Biloxi Marsh. With this relationship operational models may be developed to help managers predict those times when diversions of Mississippi River water may be needed. The analysis only touches on the functional scheme framework that would be required for a diversion. The result provides an initial piece of the overall data requirements and methodology necessary to create this management framework.

2.5.3.4 General Description

The UNO Mass Balance model is a mathematical tool that performs first-order approximations of mass transfer due to physical inputs like water level, flow, and salinity. The modeling approach is valid if the results are interpreted in the appropriate manner and at the appropriate temporal and spatial scale. The model is ideally used early in feasibility studies in order to look at large numbers of alternatives over long time frames. The model was selected for this planning study because it has been demonstrated to accurately characterize salinity variability on monthly time scales in the Lake Pontchartrain/Lake Borgne regions (McCorquodale, et. al., 2008). The model has a coarse resolution with grid cells sized on the order of 10 x 10 km., and makes volume and salinity calculations for each box. There is no vertical gradient defined and the model is only capable of predicting large-scale (>> 10km) gradients in the salinity pattern because of its resolution. The model provides a reasonable representation of the spatial distribution of salinity over large areas at these low (monthly) frequencies of interest. The facility of this model is that it is readily available for use, has the ability to make a significant number of operational runs over long time scales, and is easy to modify to include new changes to the system such as the MRGO barrier.

The following stipulations are acknowledged when using Mass Balance model:

- Study area is composed of well mixed cells and cannot represent stratified flows
- Flow in the channels depends on difference in water levels between cells and friction
- Tides are diurnal (one maximum per day) with a lunar cycle
- Short-term wind effects are not included; seasonal Gulf water level is included
- Coriolis force (earth's rotation) is neglected
- Based on the model calibration error of 17%, a standard error in the prediction of the salinity in any cell can be +/-17%.

2.5.3.5 Application to Study

For this study, the results of the model were used to define discharge rates at the diversion necessary to meet the salinity targets in the Biloxi Marsh/Lake Borgne regions. Accordingly, the model domain was modified to better represent the Biloxi Marsh and the Chandeleur Islands in order

to characterize the effects of a Violet Freshwater Diversion on salinity in the Biloxi Marsh/Lake Borgne area.

2.5.3.6 Performing the Model Simulation

2.5.3.6.1 Input Parameters

The main (implying their dominance in determining the salinity distribution in the cells) inputs are:

- The freshwater budget (rainfall, evaporation, tributary flow and diversions)
- The open boundary conditions (tides and salinities)
- The cell and link bathymetry
- The link friction factors (Manning's n and eddy loss coefficients)
- The diffusivities for the links

2.5.3.6.2 Geometry

The model consists of boxes (cells) and links. Figures indicating the cells and cell-link configuration, the dimensios of each cell and link, and other geometry data are included in Appendix D of Annex 1.

2.5.3.6.3 Boundary Conditions

The open boundary was located in the Gulf of Mexico in order to minimize its influence on the area of interest. Diurnal tides were imposed with a spring range of 0.66 m. The salinities at the Gulf boundary vary from 34 to 36 ppt with surface values on average less than deeper values. The model used 34 ppt which is more representative of mean surface salinities.

The freshwater input data (depicted in Table 6) was comprised of daily flow data for rivers discharging into Lakes Maurepas and Pontchartrain, Mississippi Sound, Mobile Bay and the passes of the Mississippi River . A regression analysis with the USGS Bogalusa gage was completed to determine flow for the Pearl River. Flow data for diversion structures such as Caernarvon and flood control structures such as Bonnet Carré were also used as inputs into the model. Salinity of the freshwater inputs was set at 0.2 ppt.

Table 6 Freshwater Input Data

Location	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)
Amite River	2,005	132	79,600
Tangipahoa River	1,072	73	36,400
Tchefuncte River	137	25	4,667
Tickfaw River	493	55	20,760
Pearl River	10,277	1,140	97,400
South Lake Maurepas	1,042	69	35,980
Southwest Lake Pontchartrain	261	17	8,995
South Central Lake Pontchartrain (Jefferson Parish)	265	24	8,995
Southeast Lake Pontchartrain (Orleans Parish)	353	28	12,593
Northeast Lake Pontchartrain (Bayou LaCombe)	384	24	13,493
Northeast Lake Pontchartrain (Bayou Bonfouca)	385	26	13,493
Lake Borgne (Violet Wetlands)	82	6	841
Wolf River	542	12	19,448
Jourdan River	667	15	23,936
Biloxi River	156	4	5610
Pascagoula River	8,474	898	103,000
Mobile Bay	17,533	128	157,788
Southwest Mississippi River (Southwest Pass, Grand Pass and West Bay Diversion)	179,728	45,115	433,500
Central Passes Mississippi River (Pass a Loutre and South Pass)	250,302	62,831	603,723
East Passes Mississippi River (includes Main Pass to Bayou Lamoque and Bohemia Spillway)	107,124	26,890	258,380
Caernarvon Diversion	1,300	0	9,267
Bonnet Carre Diversion			240,000
Blind River and Hope Canal Diversion			4,500

2.5.3.6.4 Bathymetry

Model bathymetry was obtained from NOAA navigation charts, a previously compiled bathymetry mesh for ADCIRC model runs Barrett (1970).

2.5.3.6.5 Meteorological Inputs

Daily precipitation, evapotranspiration, air temperature, water temperature and daily wind speed were used as inputs for the entire simulation.

2.5.3.6.6 Salinity Calibration

Since the base Lake Pontchartrain model was originally developed, calibrated, and validated for Lake Pontchartrain/Lake Borgne area (McCorquodale, et. al., 2008), the model domain had to be extended to examine the Biloxi Marsh area. The extended model was calibrated using flow and salinity data for the period 1990 through 2008. It should be noted that the base and existing conditions are different, as existing conditions have changed with the closure of the MRGO at the Bayou La Loutre Ridge. Since the collected salinity data is from the period prior to the construction of the MRGO closure structure, the calibration effort was conducted using the conditions existing prior to the construction of the closure structure. Calibration values are included in Appendix 15 D of Annex 1. Tidal fluxes were compared with data from the UNO/USGS Synoptic Survey. For salinities, data from the LDWF and MS Division of Wildlife, Fisheries and Parks were supplemented with salinities from NOAA, USACE, USGS, LADEQ, LADNR, UNO and LSU.

The Caernarvon diversion freshwater flow into the area was set at an average flow of 1,300 cfs, a maximum flow of 9,267 cfs, and a minimum flow of 0 cfs. The Bonnet Carré Spillway Diversion was included also, its maximum flow set at 240,000 cfs, (which occurred during the 1997 operation of the structure).

Figure 12 shows the tidal fluxes through the passes into Lake Pontchartrain and Lake Maurepas. Table 4 compares the spring ebb tidal fluxes in the model with measured values. The values for Pass Manchac into Lake Maurepas are within one percent. The values for the IHNC through Seabrook are within five percent. The model under-computes the peak spring tide flow in the Chef Menteur Pass by 23 percent and over-computes the Rigolets by eight percent (8%). However, the combined ebb flux into Lake Pontchartrain through the IHNC, Chef Pass and the Rigolets in the model is within 2.3 percent of the observed value. The spring tidal range in Lake Pontchartrain is predicted within 4% of the observed range. Figure 13 is a plot of modeled data compared to collected data at Grand Pass, in the Biloxi Marsh area. This data represents the output from Box 14, which is in the western Mississippi Sound just north of the Biloxi Marsh area, over the time period shown. Box 14 is a "deeper" water region where a significant transfer of flow occurs along the Mississippi coast where water mixes with saltier gulf waters. The data sets show good agreement though the model does not agree with the extreme high and low salinity points probably due to the depth-averaged feature of the model and its weakness in calculating the higher frequency variability. The 14-day moving average provides a trendline of the measured data, which correlates well to the results.

Figure 14 is a plot of the modeled data compared to the measured data at Rigolets over the time period shown. The data is the output from cell 3, which is the area in east Lake Pontchartrain. Similar to the Grand Pass data, the model does not capture the high and low salinity values but is able to follow the trend of the data well. Figure 15 graphs the maximum and minimum salinity values for the areas shown in Figure 16 versus the mean salinity value of the nearest cell in the model. Linear curves are given for the maximum, minimum, and calculated mean of the salinity points. In general,

there is high confidence in the ability of the model to provide accurate estimates of average salinity values and thus to predict average salinity values due to any proposed diversions.

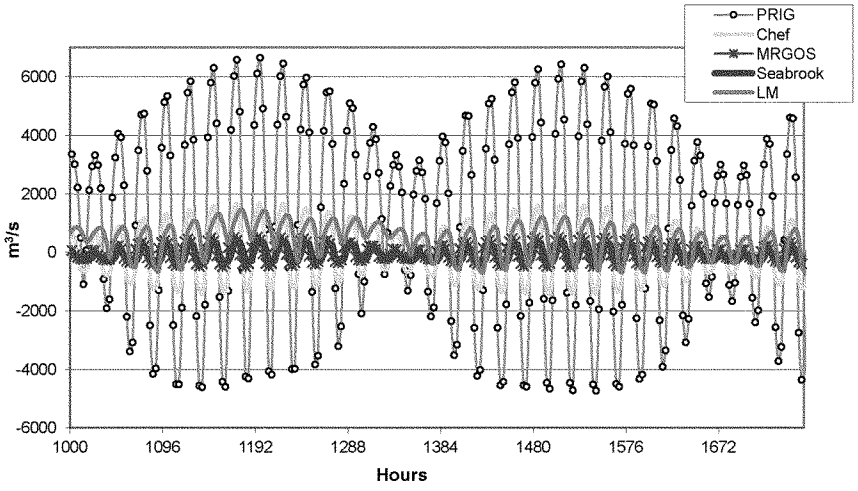


Figure 12. Tidal fluxes through the passes for calibration. PRIG is Rigolets, LM is the pass into Lake Maurepas.

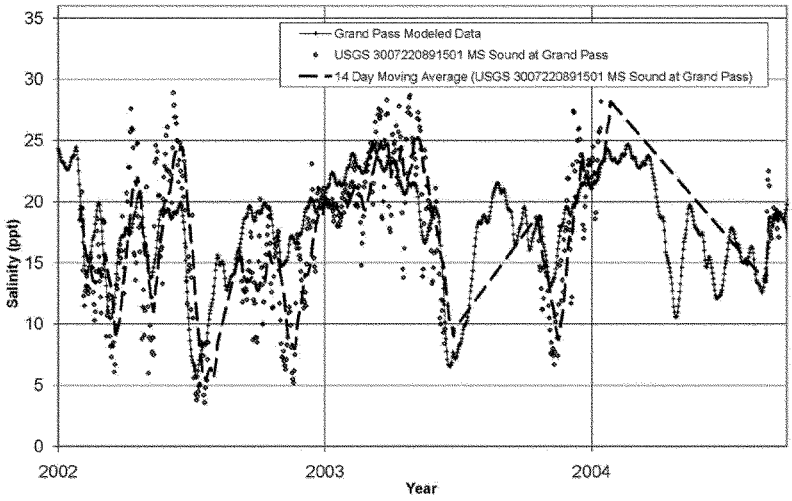


Figure 13 Model data vs. measured data for Grand Pass

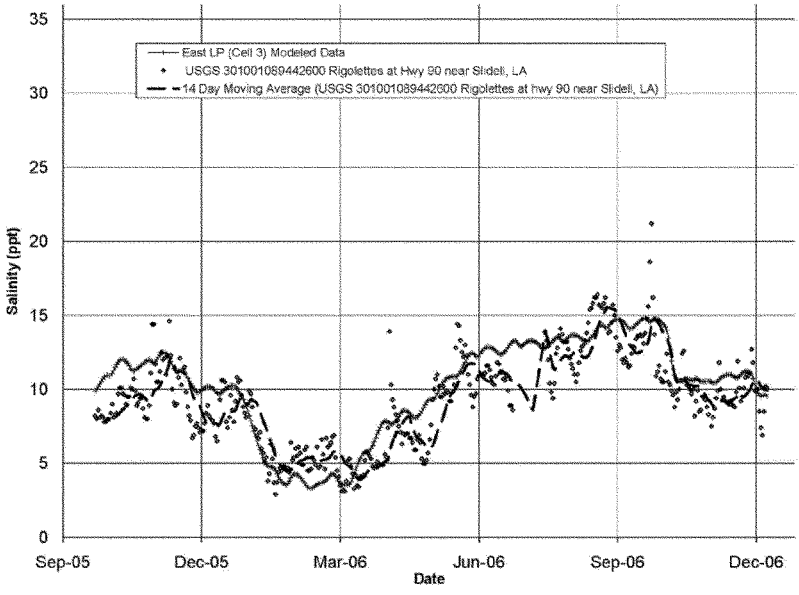


Figure 14 Modeled data vs. measured data at the Rigolets

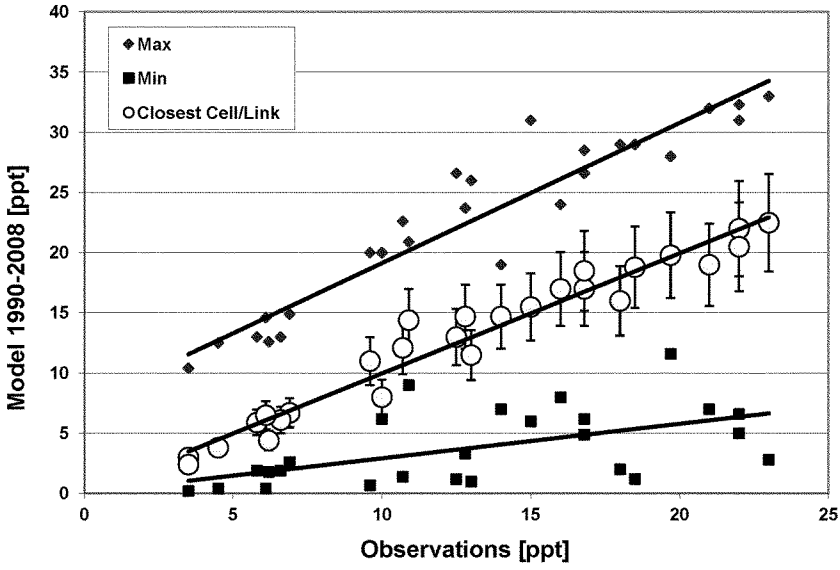


Figure 15 Plot of modeled data versus observed data

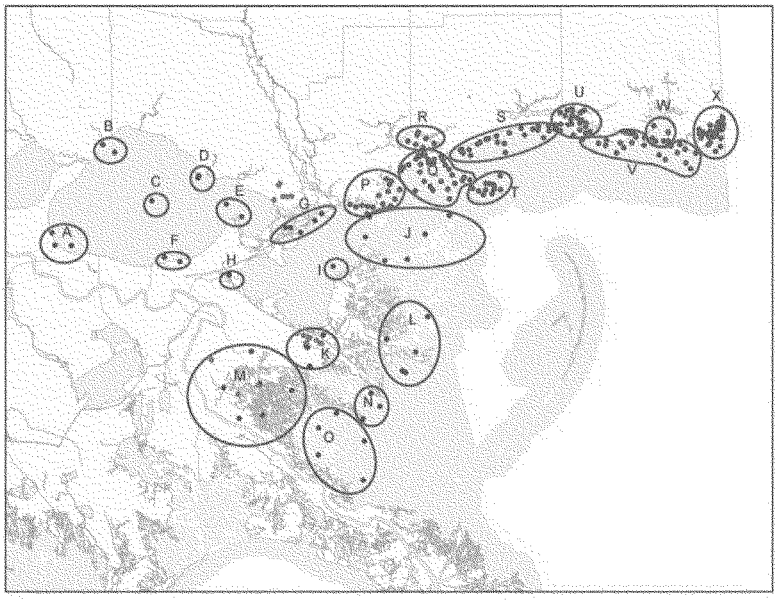


Figure 16 Locations of salinity data

2.5.3.6.7 Salinity Validation

Validation of a model consists of verifying that the model produces expected results for a simulation in which the observed data set is different from the one used in the calibration. No formal validation of the results was been completed. Lack of enough salinity data taken after the closure of the MRGO did not allow for validation of model results. The construction of the MRGO closure has significantly changed (lowered) the salinity patterns in Lake Borgne that existed since the 1950s dredging of the MRGO. Therefore, validation of this condition is not possible until a reliable long-term data set is generated. The existing UNO Mass Balance model previously validated for Lake Pontchartrain was calibrated to analyze the effects in the Biloxi Marsh. Comparison of model output with existing data provides confidence in the model results.

2.5.3.6.8 Model Simulation – Salinity Targets

2.5.3.6.8.1 Salinity Targets - Location and Calculation

The measure of meeting the salinity targets is defined as meeting the targets along a specific line (contour) defined in the Chatry et at. (1983). The Salinity Target Line, is defined in the "Flood Control of the Mississippi River and Tributaries Mississippi and Louisiana Estuarine Areas, Design

Memorandum No 1, Bonnet Carré Freshwater Diversion Structure, Appendix C, Salinity Study Results" and is the designated "point" in Biloxi Marsh where salinity from the model can be aggregated to compare against the Chatry limits. This line passes through computational boxes 14, 13, 78, 74, and 28 in the salinity model. Box 14 has been excluded from the analysis as the majority of this box is deeper water and not marshland and is subject to higher salt gradients and skews the depth averaged value to the saltier side. Box 28 within the model represents the MRGO seaward of the Bayou la Loutre and is not thought to represent the salinity within the Biloxi Marsh. Although the line does not pass through Box 73 this has been included in the weighting as this is a significant part of the marshland. From the salinity values of the remaining four boxes, salinity along the Salinity Target Line was determined by dividing the line into twelve points and using an inverse distance weighted process to establish the average salinity along the line. Each salinity value is weighted inversely to the square of the distance of the centroid of each box from the line. All points weighting gives a single set of weights that can be used to represent the average value along the whole line. A distance weighting factor of 1 was been used.

2.5.3.6.8.2 Methodology for Establishing Compliance with Salinity Target Values

Neither the target nor results from the UNO Mass Balance model represent a single number but a range or averaging of values over spatial and temporal scales. For the target values, the ranges have occurred due to the variability of the data analyzed to produce the results. The salinity values vary from year to year and the target ranges were statistical ranges about the mean value of selected years correlated to high oyster production. The optimum limits (which are the target of this exercise) are based on one standard deviation about this mean, whereas the range is the maximum and minimum values recorded in those months which were seen to contribute to optimize oyster production.

For the modeling results, there is a range in the values as a result of uncertainties within the model and also as a result of the averaging process to establish salinity values to compare against the target value. The model uncertainties were established as being around ±17% of the modeled salinity (e.g. a modeled value of 10ppt would have a model uncertainty of ±1.7ppt). In addition, a standard deviation associated with the averaging process defined in section 4.4 was established. These two values were combined as a vector sum to give a standard error for the modeled results.

Having established these standard deviations for both the target and modeled result it is then possible to plot the frequency distributions (based on a t-distribution) of the modeled salinity and the target value (an example of which is shown in Figure 17). This figure shows that for some percentage of the time the modeled distribution overlaps the target distribution. Significantly, most values are demonstrated to be lower in salinity than the upper optimum limit identified by Chatry. The results of the distributions were plotted as cumulative, as shown in Figure 18. From Figure 18 it can be seen that the percentage of time that the modeled results intersect with the Chatry limits is the models prediction against the target for that month. For this example the model generated salinity values in May along the target line below the Chatry Optimum upper value 30% of the time and above the Chatry optimum upper value 7% of the time, therefore the overlap within the optimum range is 23%.

For compliance with the 40% criteria, freshening of the system is examined. Therefore, all values lower than the upper Chatry limit are considered. In this example, the UNO Mass Balance model has

generated salinity values lower than the upper target for 30% of the Mays (over 19 years). Therefore, this scenario does not meet the 40% target.

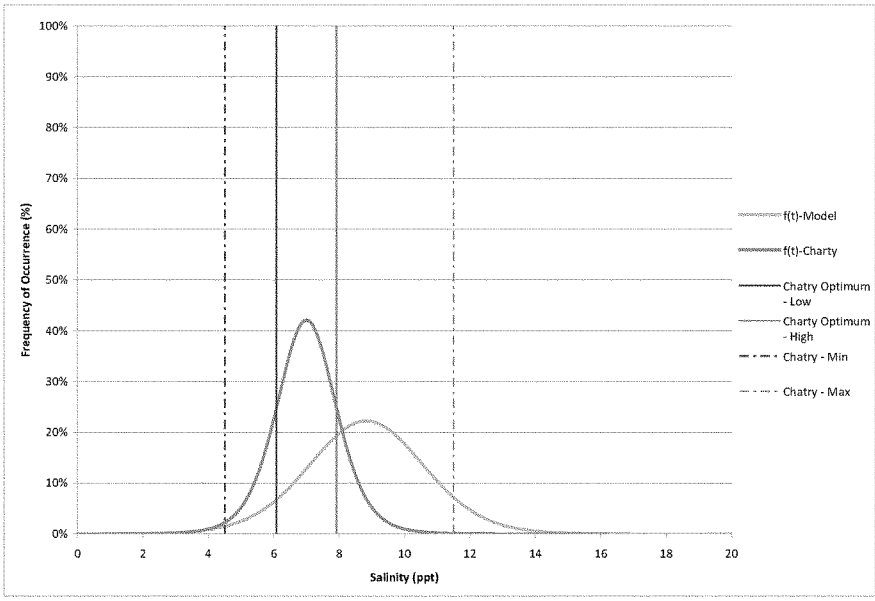


Figure 17 Salinity targets and modeled results plotted as t-distributed about the mean values

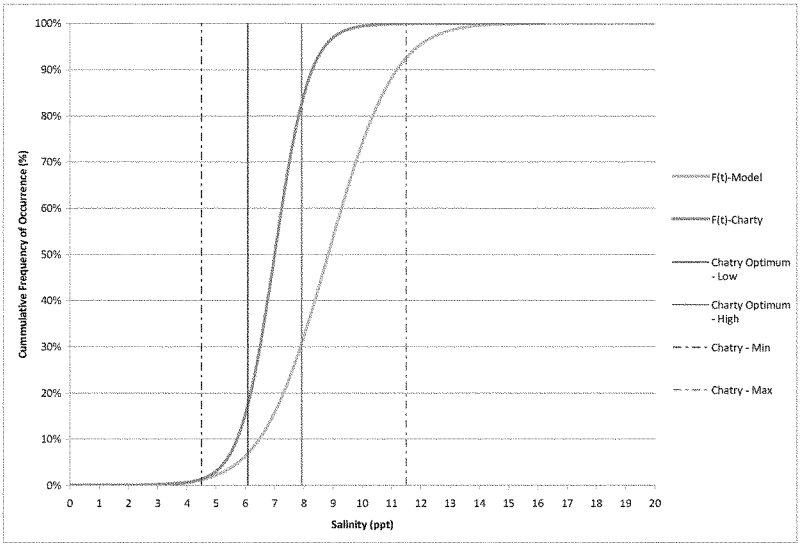


Figure 18 Salinity targets and modeled results taken as cumulative frequencies about the mean values

2.5.3.7 Model Results

2.5.3.7.1 Pre-MRGO Closure (Historic)

The Mass Balance model was run for a number of scenarios during the development of the diversion alternatives. The historic scenario was the calibration run. The recently constructed MRGO closure and other structures recently built are expected to have a substantial impact on salinity in Lake Borgne and surrounding areas but no data have been collected since construction to date to evaluate this impact. To demonstrate the reliability of the model, the alternatives and their detail are discussed further in the following sections.

The historic scenario simulation indicated, in agreement with the actual data, that the Chatry salinity target was met only 4% of the time in the critical month of May and only 24% in April. The salinity values fell below Chatry's optimum limits for the months of January, February, March, August, September, November and December; while falling just above Chatry's limits in June, July and October. Table 7 depicts the Historic Condition Model Runs. Figures 19 and 20 graphically compare the J and L data with the historic condition model run. The model agrees well with the physical data, especially in the months of April and May. These model runs point to the impact the MRGO had in the salinity regime of Lake Borgne, resulting in higher salinities in critical months (April, May) in the Biloxi Marsh.

Table 7 Pre-MRGO Closure (Historic)

	Model Results		Model Uncertainty	Below Chatry Target
	Mean (ppt)	Std Dev (ppt)	Sigma (ppt)	
January	13.3	3.72	2.55	94%
February	10.6	3.92	2.10	98%
March	9.9	3.80	1.99	90%
April	10.8	2.94	2.05	24%
May	12.5	4.12	2.44	4%
June	13.5	3.78	2.58	47%
July	14.2	3.67	2.69	37%
August	15.8	2.94	2.93	59%
September	16.7	3.14	3.08	67%
October	17.8	2.68	3.26	48%
November	17.7	2.85	3.25	41%
December	16.2	3.33	3.01	50%

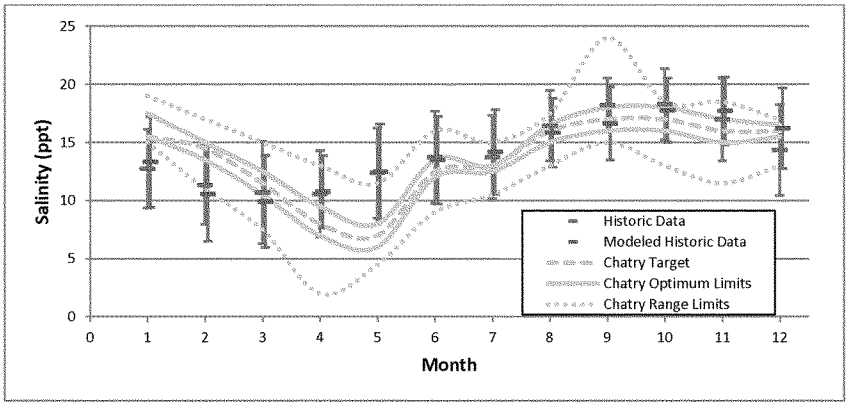


Figure 19 Monthly averages of modeled historical data compared with historic data from zones J&L

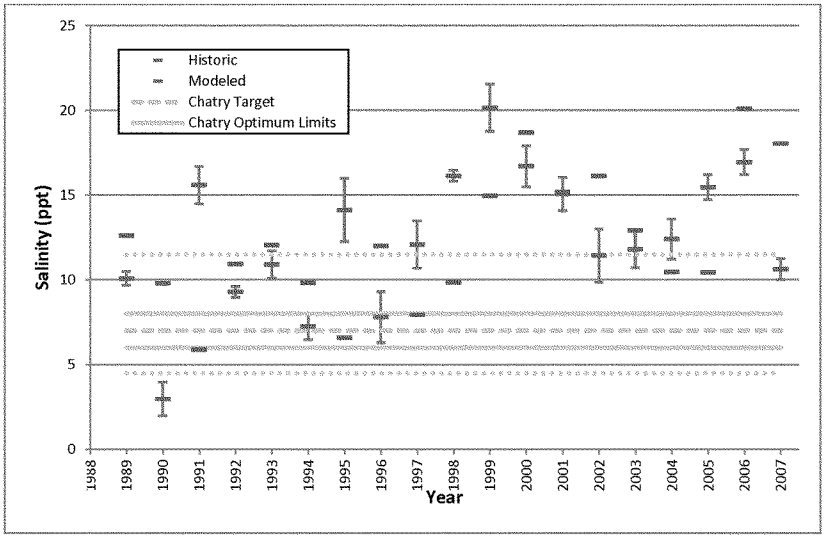


Figure 20 Yearly averages of modeled historical and J&L data for the month of May

2.5.3.7.2 Post-MRGO Closure (Baseline)

Baseline conditions for the model simulations included the MRGO closure structure at the La Loutre Ridge, the Seabrook Gate, and the IHNC Barrier (with openings for Bayou Bienvenue and the GIWW) all in place. For the Baseline model runs, the salinity targets were met for all months except May where the target is met only 6% of the time. The results for the baseline run are seen in Table 8.

This modeling scenario indicates that the existing closures and other changes to system that induce lower salinity levels would not be enough solely to reduce salinities to the recommended target in May in the Biloxi Marsh. Consequently, additional freshwater would need to be input into the system via diversions. Also to consider is the fact that April barely meets the criteria with salinity calculated below the upper limit 41% of the time. The salinities were above the upper limit over 50% of the time for the 19 year simulation.

Table 8 Post MRGO Closure (Baseline)

	Model Results		Model Uncertainty	Below Chatry Target
	Mean (ppt)	Std Dev (ppt)	Sigma (ppt)	
January	12.3	3.69	2.37	98%
February	9.4	3.85	1.91	99%
March	8.8	3.74	1.81	98%
April	9.7	2.86	1.86	41%
May	11.6	4.02	2.29	6%
June	12.7	3.77	2.45	59%
July	13.5	3.66	2.56	47%
August	15.2	2.85	2.80	68%
September	15.9	3.10	2.96	76%
October	17.1	2.63	3.14	57%
November	16.9	2.80	3.12	50%
December	15.2	3.35	2.85	63%

2.5.3.7.3 Future Without Project (FWOP)

Two FWOP conditions were examined based on the final disposition of future diversions. The FWOP includes the baseline conditions, existing diversions at Bonnet Carré and Caernarvon, and planned diversions at Maurepas Swamp, Convent, Hope Canal, Caernarvon, and the CWA Waste Water Treatment Program. Planned diversions from the lower Mississippi River located below the Caernarvon Diversion were not included in the simulation. The Bertrandville Siphon, Bohemia Mississippi River Reintroduction, Delta Building Diversion (North of Ft. St. Phillip), White Ditch, Bayou LaMoque and the Benney's Bay Diversion were deemed to be sufficiently far from the study area to not have a significant influence on salinity conditions in the study area. Also there was little available information as to the proposed operational scheme for these diversions. The diversion input for Bonnet Carré was the same as the calibration/historic run with a maximum flow of 240,000 cfs. The combined diversions into the Maurepas swamp area (Convent Diversion: 500 cfs, Hope Canal: 1,500 cfs and Maurepas Swamp River Reintroduction: 1,000 cfs) have a potential capacity of 3,000 cfs. Considering that these diversions are regulated to keep the salinity in Lake Maurepas below 1 ppt,

The model was operated in the FWOP scenarios to open the diversions when salinity in Maurepas was greater than 1 ppt; if the salinity was less than 1 ppt, they were closed. This results in a condition where Lake Maurepas was always less than 1 ppt. The CWA Waste Water Treatment Program flow totals approximately 300 cfs.

Input flows for the Caernarvon diversion were increased by roughly 25 percent in line with the projected increase in the capacity of the structure. The increase was calculated by increasing the actual flows for 2007 and 2008, in which the structure was operated to pulse large flows, by 25 percent. The resulting flows were then smoothed so as to eliminate rapid changes that might induce numerical instabilities in the model. The resulting smoothed flow was then repeated on that two year cycle over 19 years to examine salinity variability due to the Caernarvon input flows for the 19 year period. The model results indicate that the planned Caernarvon diversion and salinity constraint does modify the salinity regime in the Biloxi Marsh. For the month of April, salinity decreases over the baseline condition and the amount of time that the salinity is under the upper target increases from 41% to 85%. This reduction in salinity from the diversions infers that, on average, additional diversions may not be necessary during April. Consequent of the planned diversions, salinities in the month of May were now met 26% of the time in the simulations. This is a significant increase of 20% over the baseline conditions. This indicates that additional management changes may help meet the targeted goals. This finding also verifies that additional freshwater diversions will be necessary in freshening the Biloxi Marsh to meet the 40% Chatry goal. The FWOP model results are seen in Table 9.

Table 9 Future Without Project (FWOP)

	Model Results		Model Uncertainty	Below Chatry Target
	Mean (ppt)	Std Dev (ppt)	Sigma (ppt)	
January	10.8	3.32	2.09	99.7%
February	8.1	3.56	1.67	100.0%
March	7.35	3.40	1.54	99.9%
April	7.69	2.49	1.50	84.7%
May	9.11	3.44	1.82	26.1%
June	10	3.32	1.97	94.0%
July	11.1	3.15	2.13	83.9%
August	13.1	2.42	2.44	90.6%
September	14.3	2.78	2.66	91.1%
October	15.6	2.36	2.86	75.9%
November	15.4	2.49	2.84	69.3%
December	13.7	2.98	2.56	82.9%

The second FWOP condition adds in the Blind/Convent River diversion that is in the planning stages. Having conditional approval as an authorized project, the design flow for this diversion is anticipated to be approximately 4,500 cfs. Even though there was a small change in the average salinity, the diversion freshened the FWOP conditions in the Biloxi Marsh area. With Blind/Convent River, salinity targets were met nearly 31% of the time (vs. 26% without the diversion). Table 10 depicts this scenario.

Table 10 Future Without Project Conditions (FWOP1D)

	Model Results		Model Uncertainty	Below Chatry Target
	Mean (ppt)	Std Dev (ppt)	Sigma (ppt)	
January	10.3	3.09	1.99	99.9%
February	7.81	3.32	1.60	100.0%
March	7.14	3.17	1.48	99.9%
April	7.48	2.31	1.45	88.4%
May	8.82	3.24	1.75	30.7%
June	9.7	3.08	1.89	96.3%
July	10.6	2.90	2.04	89.0%
August	12.6	2.23	2.33	94.4%
September	13.6	2.62	2.53	94.9%
October	14.8	2.20	2.72	84.2%
November	14.6	3.31	2.69	79.3%
December	13	2.77	2.43	89.8%

2.5.3.7.4 Future With Projects/Project Alternatives (FWP)

The FWP scenario includes the closures, diversions outlined in the FWOP conditions, and the a freshwater diversion near Violet, La. All figures for the FWP scenarios are in Appendix E of Annex 1. There were three conditions for diversions as developed in the model. Initially, diversions between 7,000 and 30,000 cfs were discharged to Lake Borgne over the entire year were to investigate the sensitivity to salinity reductions and the ability of a diversion in this area to meet the salinity target or otherwise affect salinity. To discharge this amount of water through the CWA it was physically necessary to anticipate a direct channel through the CWA and through a new structure in the Chalmette levee into the MRGO and Lake Borgne. These higher flows could not be released inside the CWA due to the potential of severe flooding. Alternatives of 7,000; 10,000; 15,000; 20,000; and 30,000 cfs were modeled in this fashion.

To facilitate environmental enhancement of the CWA, a second stipulation was established where discharges of between 1,000 and 10,000 cfs were diverted into the CWA, inundating this area prior to discharging through the Bayou Bienvenue and Bayou Dupre control structures (and potentially a third structure). For these scenarios, a base flow of 1,000 cfs was run for all months except April and May.

In April and May, the flow was increased to 5,000, 7,000, and 10,000 cfs. The 1,000 cfs base flow provides hydration and is expected to create freshwater conditions in the CWA year round. Increased flows in April were included to account for the hydraulic residence time (approximately two weeks) in Lake Borgne to and to establish the freshest conditions possible to help meet the May target.

To improve the flow dispersion to the Biloxi Marsh region these modeling scenarios were also run to include a closure of the MRGO/Lake Borgne connection, forcing additional freshwater south and out through Bayou La Loutre rather than discharging directly through Lake Borgne. The Lake Borgne channel has recently been structurally altered to reduce the opening to a 200m wide channel. In the "closed opening" scenario, this opening is now completely blocked. This closure does not completely block water from moving into Lake Borgne since there are several other smaller channels connecting the MRGO and Lake Borgne.

Table 11 lists the FWP model configurations where the following denotes the type of run:

- A1 – Base flow is 1,000 and flow is increased in April and May. Lake Borgne is open.
- A2 – Base flow is 1,000 and flow is increased in April and May. Lake Borgne is closed.
- A3 – Flow is steady for all months. Lake Borgne is open.
- A4 – Flow is steady for all months. Lake Borgne is closed
-

Table 11 Future With Project Alternatives

Alternative	Base Flow (cfs)	April/May Flow (cfs)	Gap Between MRGO and Lake Borgne – Open/ Closed	Upper Diversion Lake Maurepas
1 - 1A1	1,000	0	Open	<1 ppt
1 - 7A1	1,000	7,000	Open	<1 ppt
2 - 5A2	1,000	5,000	Closed	<1 ppt
2 - 7A2	1,000	7,000	Closed	<1 ppt
2 - 10A2	1,000	10,000	Closed	<1 ppt
3 - 10A3	10,000	10,000	Open	<1 ppt
3 - 15A3	15,000	15,000	Open	<1 ppt
3 - 20A3	20,000	20,000	Open	<1 ppt
3 - 30A3	30,000	30,000	Open	<1 ppt
4 - 7A4	7,000	7,000	Closed	<1 ppt
5 - 7A2D	1,000	7,000	Closed	4,500 cfs
6 - 7A4D	7,000	7,000	Closed	4,500 cfs

The Upper Diversion (Blind/Convent River) for all runs was assumed to be moderated such that the salinity in Lake Maurapas was less than 1ppt except for cases 5 and 6, where runs included the Blind/Convent River at 4,500 cfs. Both the 1,000/7,000 cfs diversion and 7,000/7,000 cfs case at Violet were tested with Lake Borgne closed.

Table 12 depicts the results of project configuration scenarios in terms of % of time salinity met the upper Chatry Salinity. The results indicate that the salinity character of Lake Borgne was affected by which alternative was simulated.

Table 12 – Results of Diversion Scenarios in Terms of % of Time Salinity Meets the Upper Chatry Salinity Limit

			FWOP Scenarios		FWP Scenarios					
Flow (cfs)	Historic	Baseline	Alt - 1 (FWOP1)	Alt - 2 (FWOP1D)	Alt - 1	Alt - 2	Alt - 3	Alt - 4, 7A4	Alt - 5, 7A2D	Alt - 6 7A4D
0	3.90%	6.10%	26.10%	30.70%						
1,000					26.7%					
5,000						33.7%				
7,000					31.7%	36.7%		43.6%	43.0%	48.1%
10,000						41.6%	46.2%			
15,000							55.2%			
20,000							66.3%			
30,000							75.4%			

The results also indicate that the full freshwater diversion over the entire year had a greater impact (approximately 3% increase) on meeting salinity targets in May than just applying a diversion in April and May.

The closure of Lake Borgne affected salinity in the Biloxi Marsh a significant amount. At 7,000 cfs, the Lake Borgne closure was correlated to a 3 to 4% increase in time that the salinity target is met. As hypothesized, more flow moved south in the MRGO channel with the gap closed, discharging to Biloxi Marsh in a more efficient manner than through Lake Borgne alone.

Year-round flows via the Blind/Convent River diversion also impacted salinity in Biloxi Marsh on the order of a 4% increase. The variety of diversion alternatives between 5,000 and 10,000 cfs altered salinity in Biloxi Marsh relative to the 40% target goal. At 5,000 cfs, the salinities were in the range of 32% to 36%. At 7,000 cfs, the range was between 32% and 48%. A flow of 10,000 cfs resulted in a range in meeting the Chatry targets between 38% and over 50%. Choosing 7,000 cfs as a point of reference and omitting the Blind/Covent River as a FWOP condition, the Chatry limits were only met 32% of the time when the diversion was operated at 1,000 cfs year round and 7,000 cfs in April and

May. With Lake Borgne closed, the 7,000 cfs diversion lowered salinity to meet the target 37% of the time. When either adding the Blind/Covent River diversion or allowing the 7,000 cfs flow all year round, the salinity levels met the Chatry target 43% of the time. When including both conditions simultaneously, the target was met 48% of the time. These relationships with a graphic representation of Table 12 are provided in Figure 21.

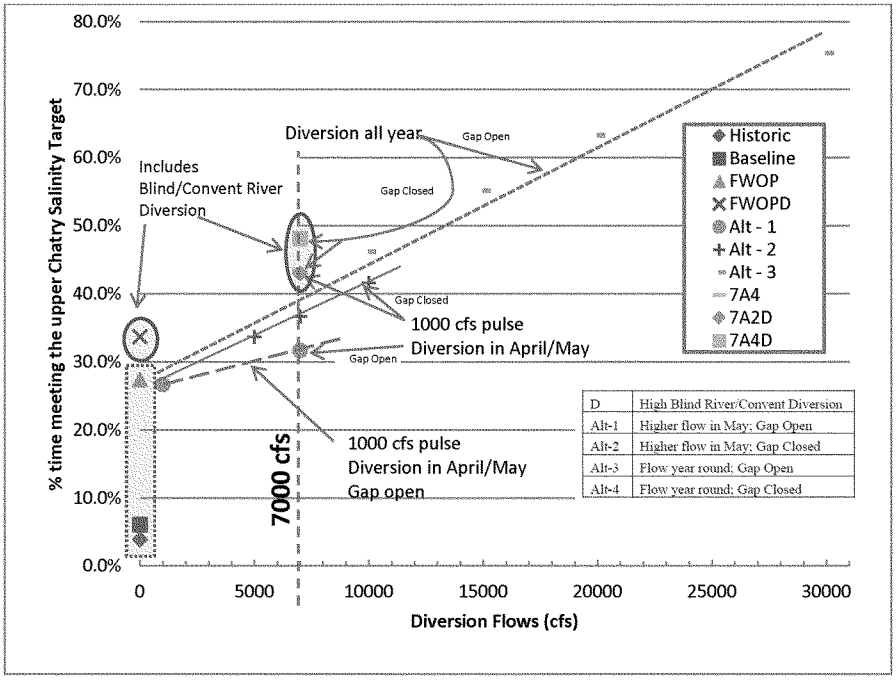


Figure 21. Comparison of alternatives versus % time the scenario meets the upper Chatry limit in Mays.

2.5.3.7.5 Area of Influence / Impacts to Mississippi Territorial Waters

The area of influence of the freshwater diversions is shown in Figure 22. Figure 22 depicts the influence of the 1,000/7,000 cfs diversion including the Blind/Convent River Diversion. In the Biloxi Marsh, there was relatively no salinity change (<0.5 ppt) in the southeast sectors (boxes 74 and 78). Box 73, the region of greatest impact from the diversion alone, was the primary contributor to changes in the salinity target measured at the Chatry Line. It was conclusive from Figure 22 that the Violet diversion most affects Box 78, which is the closest to the CWA and benefits due to the influence of the fresher adjacent regions depicted by Box 8 (Carnarvan) and Box 1 in Lake Borgne. Lake Borgne was significantly impacted by the diversions especially since it is able to trap fresh water behind the raised Biloxi Marsh plateau (which protects this region from the more dense salt water of the Gulf). Box 13 in the Biloxi Marsh was less changed due to the Violet diversion.

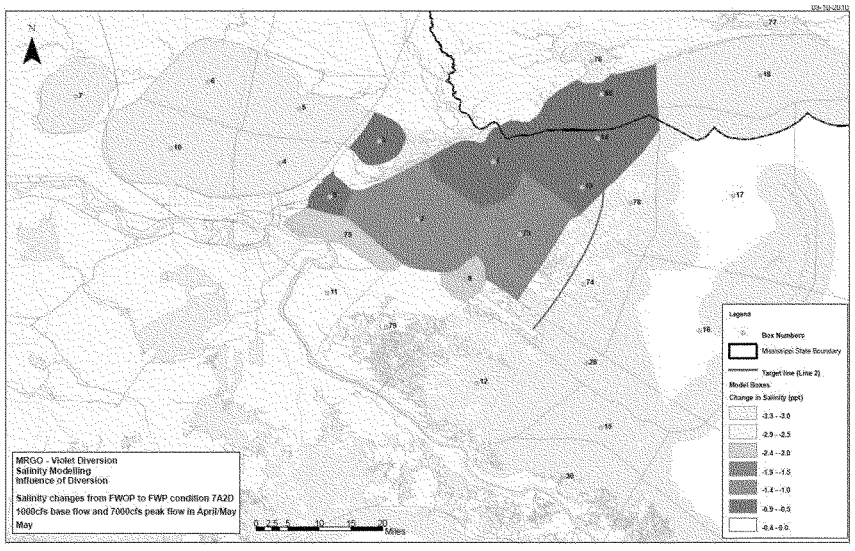


Figure 22 Area of influence of the 7A2D diversion in May (7,000 cfs in April and May with the Gap at Lake Borgne closed and the 4500 cfs diversion at Blind/Convent River)

Influence from the Violet Diversion alone to the Mississippi Coastline and territorial waters was shown to be limited (on average <0.5ppt in May). The salinity reduction is noticeable when including the Blind/Convent River Diversion in addition to the Violet Diversion. Figure 23 is a graphic presentation of all of the diversion combinations that were simulated with the model. The highlighted region represents the range of average salinity change on a month-to-month basis for the various 7,000 cfs diversions. The plot also demonstrates the added salinity reductions along the Mississippi coast for increased diversion flows up to 30,000 cfs.

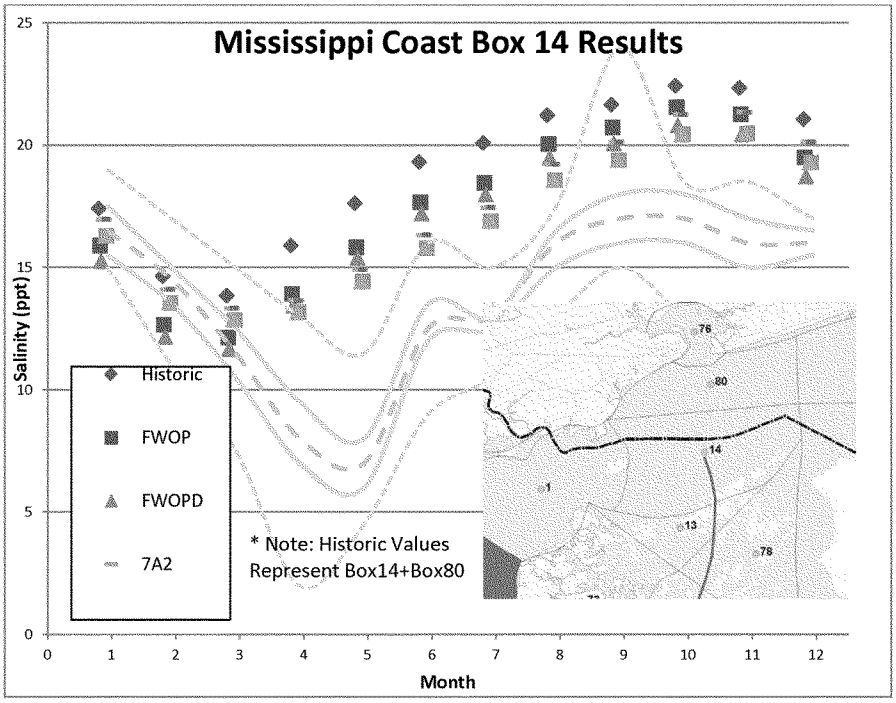


Figure 23 Changes in salinity along the Mississippi Coastal related to diversions near Violet Canal with an inset of the location of box 80 and box 14

2.5.3.8 Conclusions

Several conclusions were obtained in regards to the salinity regime of the Biloxi Marsh as a result of the UNO Mass Balance model simulation. Data and model results demonstrate that the Biloxi Marsh region is, for winter months on average, at or fresher than salinities required for oyster seed production as recommended by Chatry. The spring months of April, May and June have historically been saltier than the optimum salinity ranges. The MRGO closure, the construction of the IHNC barrier, and the Seabrook gate will have an immediate positive impact, in regards to lowering salinities in Biloxi Marsh, relative to these three key months. The baseline condition representing these changes appears to mitigate the long-term impact of salinity intrusion by freshening the system on the order of 1 – 2 ppt in all months. In May for the baseline condition, which includes the major modifications of the system, the probability of meeting the Chatry target is now 6% of the time, which is up from the historic 4%.

The USACE, the State of Louisiana, and others have studied and are implementing a number of planned freshwater diversions. The FWOP scenario adds these new inputs to the system. It is

probable that these diversions would have a significant effect on the year round salinity in Biloxi Marsh, with additional reductions in salinity on the order of 2 ppt. More importantly, it's probable, that there will be a considerable reduction in the salinity in May; the simulations indicating a reduction below the upper Chatry limit 26% of the time. This would be a significant change in the conditions of this area. Considering the Blind/Convent River diversion as a FWOP, the salinity target would be met, on average, 31% of the time.

In general, a new Violet Freshwater Diversion in May is shown to freshen the system. The 1000/7000 cfs diversion scenario without the coincident Blind/Convent River diversion met the upper target in the simulations in May only 37% of the time. It would take about 9000 cfs to meet the 40% criteria under this condition.

When adding the Blind/Convent River diversion to the 1000/7000 cfs Violet Diversion the Chatry limits were met 43% of the time in May. When diverting 7000 cfs yearlong simultaneously with the Blind/Convent River diversion, the salinities in the Biloxi Marsh met the Chatry criteria 48% of the time. Application of much larger diversions (on the order of 20,000 cfs) through the CWA without the benefit of the Blind/Convent River diversion generated even lower salinities and met the May target about 60% of the time. To determine the improvement in the efficiency of delivery of freshwater, another set of diversion alternatives was modeled: constricting the channel between MRGO and Lake Borgne by incorporating a barrier. This forced the freshwater north and south through existing natural channels but more importantly it forced additional water south through the Bayou La Loutre. This created a more direct connection with the Biloxi Marsh than when flows are directed through Lake Borgne and then to Biloxi Marsh.

It should be noted that the Pearl River has a large impact on salinities in Biloxi Marsh. In general, if the Pearl River discharge is unusually low for an extended period, the diversions would be, to a degree, be ineffectual in lowering salinity in the Biloxi Marsh.

2.5.3.9 Sensitivity Impacts to Sea Level Rise

The UNO Mass Balance model was run for two SLR scenarios: 1) a rise of 0.8 m over 100 years, and; a rise of 1 m over 100 years. The model was not modified to consider the effects of progressive land loss over the period of sea level change. The Gulf of Mexico mean stage was raised by 0.8 and 1 m respectively to represent the two SLR scenarios. The main changes that the model responded to were: a) an increase in the depth of the hydraulic links between the boxes and b) an increase in the mean storage in each box. No change in the rainfall-evaporation time series was made.

The example presented here is for the case with the Violet diversion in place at a peak flow of 7,000 cfs in April and May (FWP condition). The model was run for a hydrologic record of years with diurnal lunar tides. The case with no-SLR was run as a basis of comparison [BOC].

Figure 24 shows that the inner boxes of Biloxi Marsh experience little change while the ocean side demonstrates a small increase in salinity. The box that showed the greatest increase was the intermediate marsh in the Caernarvon area. This may be due the width of the direct hydraulic link between the open water and the intermediate marsh. The model showed that, when considering SLR, the Upper Pontchartrain Estuary has a mean salinity slightly less than that for the case of no

sea level rise. Small changes in salinity due to SLR, as depicted by the UNO Mass Balance model, are probably due to the geometry of the system as modified by the condition if it is considered that the Biloxi Marsh will continue to act as a sill, cutting of the salt water flux into the Lake Borgne region. Concurrently, there is a larger reservoir of fresh water because of the increased hydraulic detention times that result from the 0.8 to 1 m increase in depth.

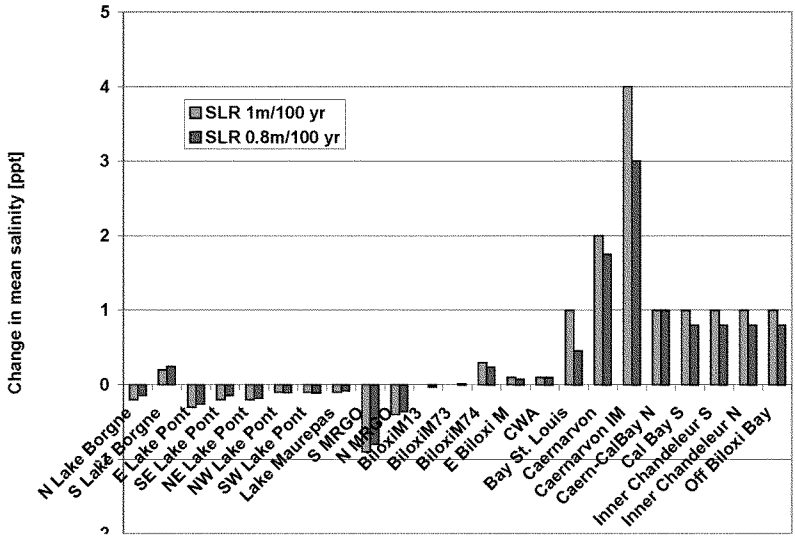


Figure 24 Preliminary Salinity Responses to Relative Sea Level Rise

The UNO Mass Balance model has serious limitations when applying it to predict changes in salinity 100 years into the future. First of all, the model does not take into account the changes in the landform during this period. For example, the increase in the hydraulic conveyance due to erosion is not considered. Secondly, no changes in the hydrologic and meteorological inputs that could significantly impact the Upper Estuary have been considered. The possible increases in wind and wave energies that are often predicted to accompany climate change have been neglected.

2.5.4 Central Wetlands Area – Detailed Modeling

2.5.4.1 General

The Central Wetland Area (CWA) formerly contained an extensive cypress swamp. Re-growth has been hindered by lack of fresh water, nutrients, and sediments. Lack of the natural overbank flow of the river lowers productivity and allows salt stress. The addition of freshwater with accompanying sediments and nutrients through the Violet Diversion would ecologically benefit the CWA. The USACE intends to conduct extensive restoration throughout the CWA. Details of the restoration

project include wetland, marsh, and swamp restoration and creation to restore the CWA to cypress swamp. Preliminary plans for the restoration project are included in Appendix F.

The UNO Mass Balance Model provided generalized hydrodynamic results in the CWA and coarse approximation of the effects of the diversion. To assess the effects and flow characteristics inside the CWA in more detail, the development of a detailed 2-dimensional hydrodynamic model was utilized. The MIKE21-HD (MIKE21) model by the Danish Hydraulic Institute (DHI) is specifically for the purposes of investigating the hydrodynamic effect of the inflow of fresh water into the CWA for existing conditions and for a restored scenario. The impact of the flow through the diversion and how this affects the salinity and circulation in the channels are investigated. The model is used to examine two scenarios, a 1,000 cfs maintenance flow for the purpose of freshening the CWA in support of ecological enhancement of the area by transforming the 48 square miles into freshwater marsh and cypress swamp; and a 7,000 cfs diversion scenario that is the benchmark for freshening the Biloxi Marsh region.

A 1,000 cfs diversion from the Mississippi River was estimated by calculating the inflow from a typical tide through the two navigation gates into the CWA. This order of magnitude of flow generally outlined the magnitude that could be added to the CWA without vastly changing the hydraulic character of the gate. That flow magnitude was carried through and tested as part of the UNO mass balance modeling where FWP scenarios that included the 1,000 cfs diversion indicated that the CWA "box" was adequately freshened by this level of flow.

2.5.4.2 Objectives

The MIKE21 simulation addressed the following questions relating to the diversion of flows through the CWA.

- What is the impact of the base flow through the diversion? How does it affect salinity in the CWA?
- Does the proposed change in topography for the restored marsh impact the base flows, levels and discharges?
- What happens during periods of peak diversion flows? Where does the water go? What is the flow split through the existing structures? Is a new outfall structure needed? How extensive is flooding (frequency, levels, etc) inside the CWA. Are new channels needed within the wetlands?
- What are the impacts of localized flooding due to the new diversions?
- What are the impacts of sea level rise on the marsh?

2.5.4.3 Conventions and Definitions

2.5.4.3.1 Vertical Reference Level

Water levels and depths mentioned in this study are given in feet with reference to NAVD88 (2004.65). However MIKE21 is a European model and works according to international SI

conventions. For this reason some plots direct from the model may be in meters. Special attention to the figure annotation is therefore needed. This is the conversion between feet and meters: 1 meter = 3.281 feet.

2.5.4.3.2 Current Directions

Current directions refer to the direction towards which the current is flowing. Current directions are always given as bearings (clockwise with respect to (wrt) North). The unit is degrees, where 360 degrees cover the circle. For example: current direction 90° means that the current is flowing towards the East.

2.5.4.3.3 Wind Directions

All directions referred to in this study are given in the nautical convention, which means that for winds, the direction refers to the direction where the winds are coming from and is measured positive in degrees from true north. This means that winds from a direction of 0°N are coming from the north and winds with direction 270°N are coming from west.

2.5.4.4 Methodology

2.5.4.4.1 Introduction

MIKE21, a software package from DHI, is a widely used, state of the art integrated modeling package for application in coastal and port areas. The hydrodynamic module solves the shallow water equations, depth-averaged, over a 2-dimensional plane, which implies that the salinity is calculated as a depth averaged concentration. This approach is justified if vertical mixing occurs within short distances of the source and no significant stratification occurs, which is what is expected to happen with the introduction of the near Violet Canal diversion.

2.5.4.4.2 Modeling Scenarios

2.5.4.4.2.1 Baseline Condition – MB

This scenario (MB) reflects existing conditions by including the existing bathymetry, vegetation, control structures at Bayou Dupre and Bayou Bienvenue, and normal tidal flows through the inlets at Bayou Dupre and Bayou Bienvenue. The best available bathymetry was used for this scenario supplemented by specific information on channels and other features that were specifically collected for this effort. Calibration and validation of the model was completed for this scenario and is discussed further in section 5.7. The model domain includes the CWA and extends only as far into the MRGO to enable the flows within the gates to be established.

2.5.4.4.2.2 Baseline Scenario with 1,000 cfs – MB1

The baseline condition with 1,000 cfs (MB1) is the baseline scenario with the existing bathymetry and the addition of a 1,000 cfs base flow from the Mississippi River through the new diversion channel. This scenario investigates the impacts of adding flows to the existing conditions in the CWA. This scenario introduces a new diversion channel that transfers flow into an open water areas of the CWA.

This scenario investigates punching the new diversion channel through a new control structure in the Chalmette levee into the MRGO. For the MB1 run, the flow is split is as shown in Table 13.

Table 13 Loction and Value of Flow for MB1

Location	Flow
New Diversion Channel	870 cfs
Existing Violet Siphon Diversion	100 cfs
WWTPs	30 cft

2.5.4.4.2.3 RESTORED WITH 1000 cfs – MR1

The restored condition with 1,000 cfs (MR1) is the baseline scenario with a restored bathymetry/topography and the addition of a 1,000 cfs base flow from the Mississippi River through the new diversion channel. This scenario investigates the impacts of increasing diversion flows with the restoration of the CWA. The restoration increased the bed levels in local areas and modifies the vegetation according the proposed plans developed by the USACE. The split in flow and configuration of channels and structures is identical to that of the MB1 run.

2.5.4.4.2.4 RESTORED WITH 7000 cfs – MR7

The restored condition with 7,000 cfs (MR7) uses the baseline scenario with the restored bathymetry/topography and the addition of a 7,000 cfs flow in April and May from the Mississippi River through a new diversion channel. This scenario includes a ramping up of flows from the baseline flow condition (1,000 cfs) to the peak over a timeframe of 14 days. It also includes a third control structure into the MRGO with controls to restrict outflow into the MRGO if required. The initial scenario will be established to divert approximately 6,000 cfs through the new control structure. This will force a similar amount of water to exit the Dupre and Bienvenue gates as in the maintenance case.

For the MR7 run, the flow into the CWA is as shown in Table 14.

Table 14 Location and Value of Flow for MR7

Location	Flow
New Diversion Channel	6870 cfs
Existing Violet Siphon Diversion	100 cfs
WWTPs	30 cft

2.5.4.4.2.5 Sea level rise condition – MR1S

The sea level rise condition (MR1S) is the baseline scenario with the restored bathymetry, the addition of a 1,000 cfs base flow from the Mississippi River through the new diversion channel, and accounts for the impact of potential sea level rise on the stage and salinity within the CWA. A mid range Sea Level Rise value of 2.2ft (0.69m) was considered.

2.5.4.4.2.6 Model run MB

2.5.4.4.2.6.1 Flow Distribution

The discharges through the Bayou Dupre and Bayou Bienvenue control structures openings fluctuate with the tide as seen in Figure 25. The maximum discharge through the Bayou Bienvenue structure is much larger (about 1,500 to 3,000 cfs) than through the Bayou Dupre structure (300 -700 cfs).

The average discharges are low, about 9.3 cfs at Bayou Dupre and -19.2 cfs at Bayou Bienvenue. Positive discharge is defined as flowing into the MRGO. Negative discharge is defined as flowing into the CWA. Although the values appear to show a small net inflow into the CWA, this is within the tolerances of the model and is effectively balanced.

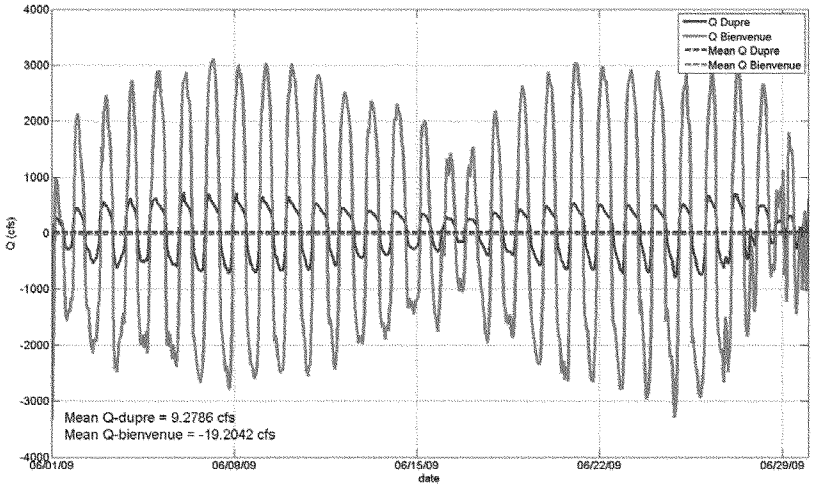


Figure 25 Discharge distribution over the Bayou Dupre and Bayou Bienvenue for the MB scenario

2.5.4.4.2.6.2 Water Levels

The results indicate a small water level gradient from north to south exists with water levels higher near Bayou Bienvenue (maximum at 1 to 1.05 feet) than at Bayou Dupre (maximum at 0.95 to 1.0 feet).

Inside the CWA there is not much variability in water level, except the western part. In that area the maximum water levels are limited to 0.6 to 0.8 feet. These lower water levels are probably due to the effect that Paris Road has on blocking flow into and out of this area.

2.5.4.4.2.6.3 Current Velocities

The maximum current velocities are generally low. The maximum velocities in the channels are low ranging from approximately 0.3 ft/sec to 0.6 ft/s. In the small channels, as well as the open water areas, the current velocities drop to almost 0 ft/s.

2.5.4.4.2.6.4 Salinity

Figure 26 shows the average salinity during the simulation period for the baseline scenario. Within the central wetlands, the mean salinity is typically about 4 ppt. In the Violet Canal the mean salinity drops to 2 ppt in the most western part.



Figure 26 Average salinity in the MB scenario

2.5.4.4.2.7 Model Run MB1

2.5.4.4.2.7.1 Water levels

At the end of the new diversion channel, the water level increases significantly. In the actual situation only during high waters is the area flooded. In the baseline scenario with 1,000 cfs, the water levels increase 0.3 to 1.1 feet and the tidal range is about 0.1 to 0.5 feet at that location.

At Paris Road and at the Bayou Bienvenue structure there is little change in water levels. However, at the Bayou Dupre structure, the water level increases by approximately 0.1 to 0.5 feet and, during high waters, the tidal range decreases by almost 0.3 feet.

The maximum water levels are found in the new diversion channel (above 1.2 feet) and in the adjacent wetlands (1 to 1.1 feet). The mean water level increases in the wetlands by approximately 0.6 feet.

2.5.4.4.2.7.2 Current velocities

The current velocity inside the new diversion channel is approximately 2.5 ft/s. At Paris Road no changes in velocities were observed. At the Bayou Dupre and Bayou Bienvenue structures there are some changes. At Bienvenue the maximum velocity increases by 0.1 ft/s during ebb flow (flow going towards the MRGO). Overall the velocities during ebb flow are larger than during flood flow (flow

going towards the CWA). During flood flow the current velocities decrease by almost 0.2 – 0.3 ft/s at the Bienvenue structure. This can be explained by the extra freshwater outflow from the CWA into the MRGO which increases the ebb flow and decreases the flood flow. At the Bayou Dupre structure flood flow is not easily distinguished due to this freshwater outflow.

Maximum velocities observed in the new diversion channel are on the order of 1.5 ft/s to 2.5 ft/s. In the adjacent wetlands, the maximum velocities are approximately 0.5 ft/s.

2.5.4.4.2.7.3 Salinity

The salinity in the new diversion channel is 0 ppt, whereas in the baseline scenario during high water peaks of 2 – 5 ppt were computed. At Paris Road the salinity fluctuates around 1 to 3 ppt as compared to 4 to 7 ppt in the baseline scenario.

At the Bayou Bienvenue structure, the salinity drops to 1 to 2 ppt during ebb flow (due to fresh water outflow), but does not change (with respect too the baseline situation) at flood flow. In the baseline scenario, values of 6 to 8 ppt were found.

At the Bayou Dupre structure, the salinity drops to almost 0 ppt. Only at high water inflow do the salinity levels increase locally, but do not reach the baseline values of 6 to 8 ppt.

Mean salinity can be seen in Figure 27. Compared to the baseline scenario, the wetland area in the center of the CWA almost becomes fresh with salinity values of 0 to 0.5 ppt. Also, the main channels in the systems become fresh with a mean salinity of 0.5 ppt. Near the Bayou Bienvenue structure, the mean salinity is around 4 – 5 ppt.



Figure 27 Mean salinity during June 2009 for the MB1 scenario

2.5.4.4.2.8 Model Run MR1

2.5.4.4.2.8.1 Flow Distribution

Figure 28 shows the discharge distribution over the Bayou Dupre and Bayou Bienvenue including the mean discharges. The restored scenario slightly modifies the discharge distribution over the two control structures with 377 cfs (38 %) flowing through the Bayou Dupre structure and 626 cfs (62 %) through the Bayou Bienvenue structure. In the baseline scenario, the ratio was 40 % - 60 %. The discharge through the opening to the MRGO from the new diversion is 0 cfs.

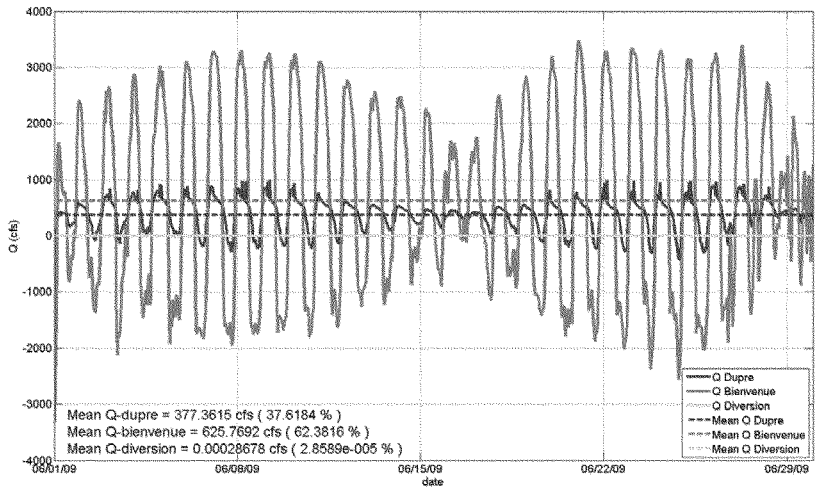


Figure 28 Discharge (cfs) through the Bayou Dupre (Blue), Bayou Bienvenue (red) and new Diversion (green) gates for the MR1 scenario. Dashed line indicate the mean discharge through the gates

2.5.4.4.2.8.2 Water Levels

The results of the water levels are similar to the MB1 scenario. At the end of the new diversion channel the water levels increase to 0.2 to 1.1 feet. The tidal range increases slightly by 0.1 to 0.6 feet.

At Paris Road the tidal range slightly increases by approximately 0.1 to 0.3 over the MB1 results to 0.5 to 1.6 feet. At the Bayou Bienvenue structure, there is little change in water levels. At the Bayou Dupre structure, the water level increases by approximately 0.1 to 0.5 feet and the tidal range decreases by almost 0.3 feet during high waters.

The maximum water levels are found in the new diversion channel (1.1 feet) and in the adjacent wetlands (1.1 feet). Compared to the MB1 scenario, a larger area is affected by the fresh water outflow, but the maximum level in the new channel is lowered by 0.1 feet. The maximum water level in the Violet Canal is 1.0 to 1.05 feet. The mean water level increases in the channel to 0.55 to 0.60 feet and in the wetlands to 0.40 to 0.60 feet.

The higher water levels in the northwestern part of the CWA can the explained by the wastewater outflow, which flows onto a piece of land at a higher elevation and roughness coefficient used in the model. This results in less flow to the neighboring channels and the water is stored in the area.

2.5.4.4.2.8.3 Current velocities

The mean velocity is about 0.3 to 0.35 ft/s at the end of the new diversion channel. Due to the restoration of the wetlands, the velocity also decreases at Paris Road to about half that seen in the baseline scenario.

At the Bayou Bienvenue structure, the same pattern is observed as in the MB1 scenario. The maximum velocity slightly increases by 0.1 ft/s during ebb flow and decreases by almost 0.2 to 0.3 ft/s during flood flow. The velocities during ebb flow are larger than during flood flow.

Compared to the MB1 scenario, the most significant changes are found in the new diversion channel. The maximum velocity is limited to approximately 0.3 ft/s, whereas in the MB1 scenario the maximum velocities were about 1.5 to 2.5 ft/s.

2.5.4.4.2.8.4 Salinity

The water in the new diversion channel is completely fresh, 0 ppt. At Paris Road the salinity fluctuates around 1 to 2 ppt, which is slightly lower than in the MB1 scenario. At the Bayou Bienvenue structure, the salinity drops to 1 to 2 ppt during ebb flow (due to fresh water outflow), but does not change at flood flow. In the baseline scenario values of 6 to 8 ppt were found. At the Bayou Dupre structure, the salinity drops to almost 1 ppt. Only at high water does the salinity increase, but does not reach the value of the baseline scenario of around 6 to 8 ppt.

Figure 29 shows the monthly averaged salinity for the whole area. The overall picture is the same as in the MB1 scenario. The fresh water discharge from the Mississippi River causes a decrease in salinity, not only in the wetland area in the center of the CWA, but also in the main channels like the Violet canal.



Figure 29 Mean salinity during June 2009 for the MR1 scenario

2.5.4.4.2.9 Model Run MR7

2.5.4.4.2.9.1 Flow Distribution

Figure 30 shows the discharge distribution over the Bayou Dupre, Bayou Bienvenue and the new diversion for this scenario, as well as the mean discharges. Due to the opening of the new diversion channel 5,660 cfs flows through the new channel. Approximately 1,260 cfs flows through the other two openings (479 cfs through the Dupre structure and 781 through the Bienvenue structure).

Including a structure at the end of the new channel will potentially result in lower discharges through the channel and will increase the discharge through the Bayou Dupre and Bayou Bienvenue.

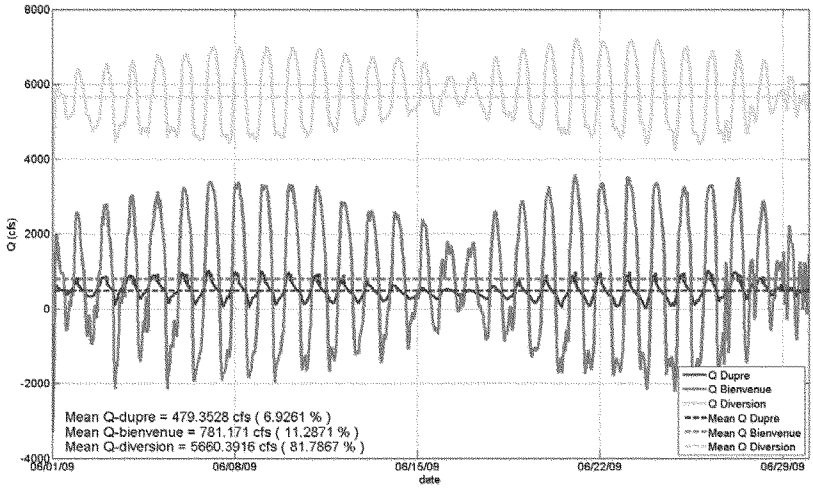


Figure 30 Discharge (cfs) through the Bayou Dupre (Blue), Bayou Bienvenue (red) and new Diversion (green) gates for the MR7 scenario. Dashed line indicate the mean discharge through the gates

2.5.4.4.2.9.2 Water levels

Near Paris Road the water levels increase during high water by about 0.2 to 0.3 feet but decrease during low water (about 0.2 feet) when compared to the baseline scenario. At the Bayou Bienvenue structure a small increase of 0.1 feet was found. At the Bayou Dupre structure, the effect appears to be larger.

The maximum water levels are higher in the new diversion channel (above 1.2 feet) and in the adjacent wetlands (also above 1.2 feet). The extent of the area affected by the freshwater inflow is the greatest in this scenario. Mean water levels in the channel and the surrounding wetlands are above 0.7 feet.

Although the water levels in and near the new channel increase significantly, no flooding of the higher wetlands areas occur. This means that the water levels do not reach the level of the banks of the channel.

2.5.4.4.2.9.3 Current velocities

The current velocity in the new channel fluctuates around 2.5 feet/second, which is almost the same as the velocity in the smaller channel in the MB1 scenario. Although there is a larger discharge, the channel also has larger dimensions which limit the velocities. The current velocities at the other

locations show the same results as in the other scenarios with additional fresh water inflow. Inside the new diversion channel, the flow velocities increase to above 2.1 ft/s, which is significantly larger than in the other channels within the CWA.

2.5.4.4.2.9.4 Salinity

The large fresh water diversion turns the CWA area almost completely becomes fresh. The mean salinity in all major channels and wetland areas is 1 ppt or below. At the MRGO a plume of fresher water is found at the outflow of the new diversion. Only at the main channel near the Bayou Bienvenue structure do higher salinity values penetrate slightly into the area.

At the point in the new channel and near the Bayou Dupre structure, the salinity drops to 0 ppt. At Paris Road the salinity drops to an equilibrium value of 0.2 to 0.3 ppt. At the Bayou Bienvenue structure, the salinity fluctuates with the tide and drops to 1 to 2 ppt during ebb flow (due to fresh water outflow). Salinity does not change noticeably at flood flow. Mean salinities are seen in Figure 31.



Figure 31 Mean salinity during June 2009 for the MR7 scenario

2.5.4.4.2.10 Model Run MR1S

2.5.4.4.2.10.1 Flow Distribution

Figure 32 shows the discharge distribution over the Bayou Dupre, Bayou Bienvenue and the new diversion for this scenario, as well as the mean discharges.

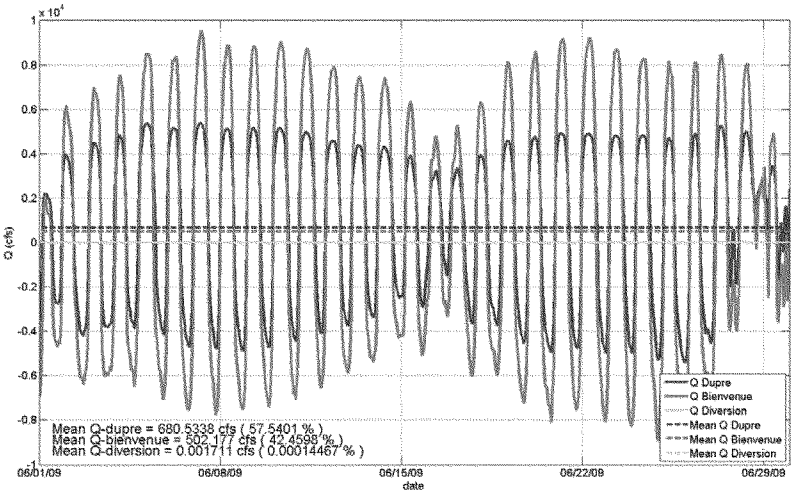


Figure 32 Discharge (cfs) through the Bayou Dupre Structure (Blue), Bayou Bienvenue Structure (red) and new Diversion (green) gates for the MRS1 condition. Dashed line indicate the mean discharge through the gates

Sea level rise affects the maximum discharges through the Bayou Dupre and Bayou Bienvenue structures significantly. Through the Dupre structure, the maximum discharge is to 3,000 to 5,000 cfs or about five times greater than the MR1 results of 600 to 1000 cfs. The maximum discharge through the Bienvenue structure is 5,000 to 9,000cfs when sea level rise is considered. Without the consideration of sea level rise, the maximum discharge is about three times less or 1,500 to 3,500 cfs in the MR1 scenario.

The mean discharges are on the same order as the MR1 scenario regarding no change in total fresh water outflow. However, the flow split over the Dupre and Bienvenue structures changes. When considering sea level rise, 680 cfs flows through Dupre (57.5 %) and 502 cfs flows through Bienvenue (42.5 %). The ratio is 38 % Dupre and 62 % Bienvenue with the MR1 scenario. Sea level rise causes a shift in discharge distribution such that the majority of the discharge is through the Bayou Dupre structure.

The discharge through the opening in the new diversion channel is 0 cfs, as the channel is closed by a weir structure.

2.5.4.4.2.10.2 Water Levels

The water levels increase significantly in this scenario. A large part of the CWA area is flooded due to the 3.7 feet increase of sea level. At all locations the water levels increase by almost 3.7 feet. The

tidal range inside the CWA decreases. In the new diversion channel, the tidal range becomes 0.1 to 0.5 feet. In the MR1 scenario, the tidal range was 0.1 to 0.6 feet.

At Paris Road, the tidal range is completely dampened. It becomes 0.1 to 0.5, whereas it was 0.5 to 1.6 feet in the MR1. This is also the case at Bienvenue where the tidal range in this scenario is 0.2 to 0.8 feet. In the MR1 scenario it was 0.4 to 1.7 feet. The same holds for the Bayou Dupre outflow.

Peak water levels are found at 4.3 - 4.4 feet for all locations.

2.5.4.4.2.10.3 Current Velocities

The current velocities increase at both Bayou Dupre and Bayou Bienvenue. Peak velocities inside the Bienvenue structure are approximately 2.7 ft/s, at Dupre it is 2.1 ft/s. In the MR1 scenario this is respectively 1.5 ft/s and 0.5 ft/s. Inside the Dupre structure outflow the velocities increase significantly. This is also due to the increased discharge through that opening.

Velocities of 0.8 – 1.0 ft/s are found in the channels which run to Bayou Dupre and Bayou Bienvenue. In the remaining portions of the CWA, velocity does not exceed 0.5 ft/s.

2.5.4.4.2.10.4 Salinity

Salinity is able to penetrate more easily into the CWA due to sea level rise.

Figure 33 shows the mean salinity in the CWA. Near Bayou Dupre and Bayou Bienvenue, the mean salinity becomes 4 to 6 ppt. The central CWA is influenced by the fresh water inflow from the new diversion channel and the salinity is 0 to 2 ppt). In the area west of Paris Road, the water becomes saltier with a mean salinity of 3 to 4 ppt.

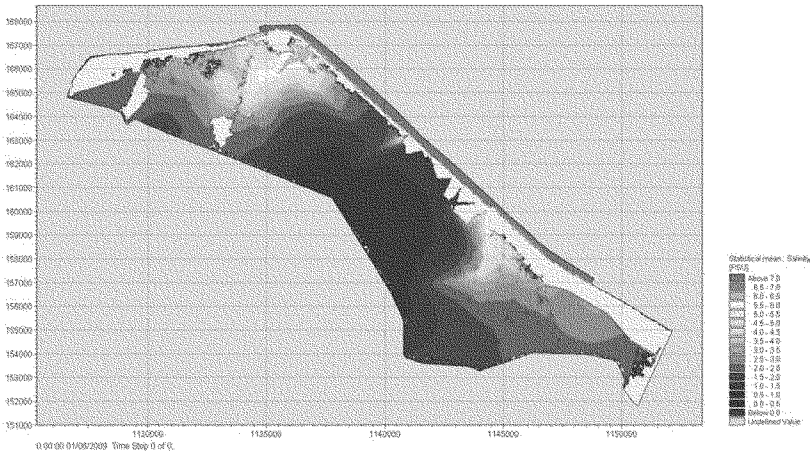


Figure 33 Mean salinity during June 2009, restored scenario with 1000 cfs including Sea level rise

Near Paris Road the salinity fluctuates with the tide. At peak flood the salinity is 6 to 7 ppt and during ebb the salinity drops to 3 to 4 ppt.At both the Bayou Dupre and Bayou Bienvenue structures, the salinity during flood matches the values of the MB scenario at 6.5 to 8 ppt. During low tide the salinity drops at Bayou Dupre to 3 to 4 ppt and Bayou Bienvenue to 4 to 5 ppt.

The salinity inside the CWA fluctuates with the tide. Figures 34 and 35 show the salinity during high water and low water. During high water salinity values of above 7 ppt are found west of the Paris Road. During low water the maximum salinity is approximately 4 ppt. Also notice the number of white cells during low water (Figure 35), which indicates that these cells have become dry.

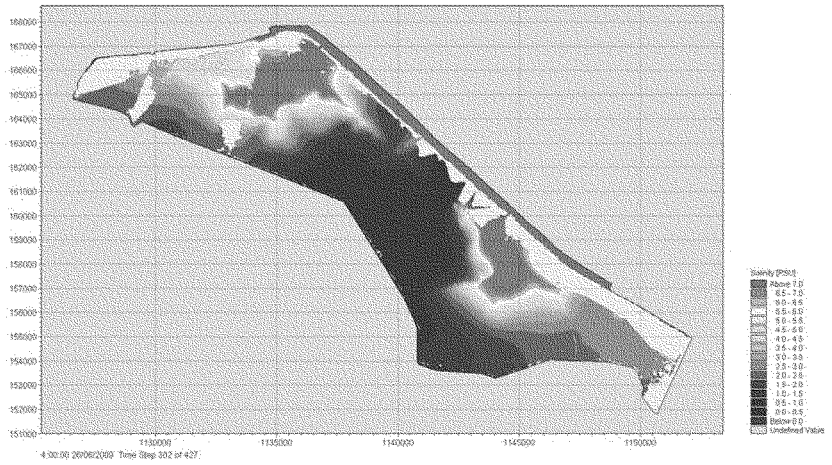


Figure 34 Salinity during high water, 26th June 2009, 4h00

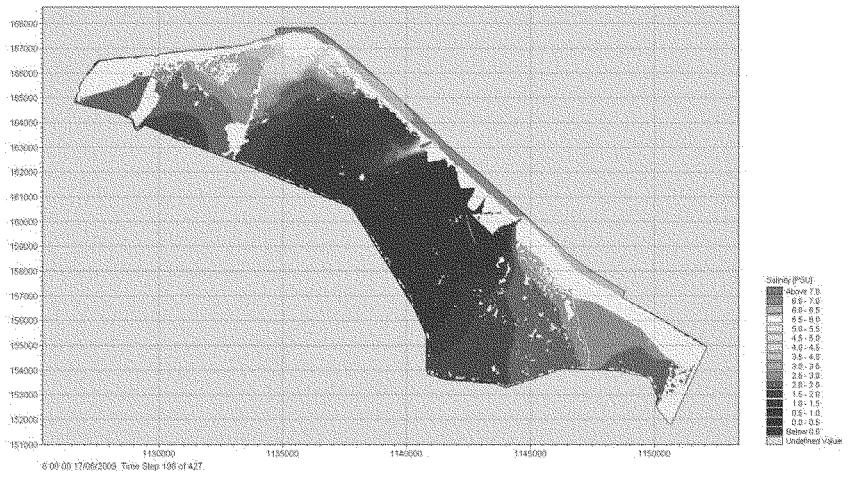


Figure 35 Salinity during low water, 17th June 2009, 8h00

2.5.4.4.3 Summary of Results

The following tables (tables 15 and 16) summarize the MIKE21 results for all scenarios.

Table 15 Discharge Distribution Summary.

	MB	MB1	MR1	MR7	MR1S
Discharge (cfs)					
Dupre	9.3	385	377	479	681
Bienvenue	-19.2	596	626	781	502
Diversion	-	-	-	5660	-
Discharge %:					
Dupre	-	39.2 %	37.6 %	3.9 %	57.5 %
Bienvenue	-	60.8 %	62.4 %	11.3 %	42.5 %
Diversion	-	-	-	81.8 %	-

Table 16 Water levels, current velocities and salinity results summary

	MB	MB1	MR1	MR7	MR1S
Water levels (ft)					
Dupre	-0.55 – 0.9	-0.1 – 0.9	-0.1 – 0.9	-0.2 – 1.1	3.3 – 4.4
Bienvenue	-1.1 – 1	-1 – 1.1	-1 – 1	-1 – 1.1	3.1 – 4.4
Diversion	Dry – 0.9	0.1 – 1.1	-0.15 – 1.1	0.7 – 1.4	3.4 – 4.4
Paris Road	-0.9 – 0.9	-0.7 – 0.95	-1 – 1.1	-1 – 1.1	3.4 – 4.4
Currents (ft/s)					
Dupre	Max 0.5	Max 0.45	Max 0.45	Max 0.55	Max 2.2
Bienvenue	Max 1.4	Max 1.5	Max 1.5	Max 1.5	Max 2.8
Diversion	Max 0	Max 2.7	Max 0.35	Max 2.7	Max 0.3
Paris Road	Max 0.8	Max 0.8	Max 0.55	Max 0.55	Max 0.85
Salinity (ppt)					
Dupre	6 – 8	0 – 7	1 – 7	0	2 – 8
Bienvenue	6 – 8	0.5 – 8	0.5 – 8	0 - 8	3.5 – 8
Diversion	Peaks 2 – 5	0	0	0	0 – 0.5
Paris Road	4 – 7	1 – 3	1 – 2	0.3	1 – 7.5

Conclusions

The following provides responses to the five objectives formulated above relating to the MIKE21 modeling effort.

1. **What is the impact of the base flow through the diversion? How does it affect salinity in the CWA?**

The base flow (1,000 cfs) generally lowers salinity levels within the CWA but raises levels and flow rates to some degree. The increase in water levels is generally less than 0.25ft across the wetlands. See Figure 36.

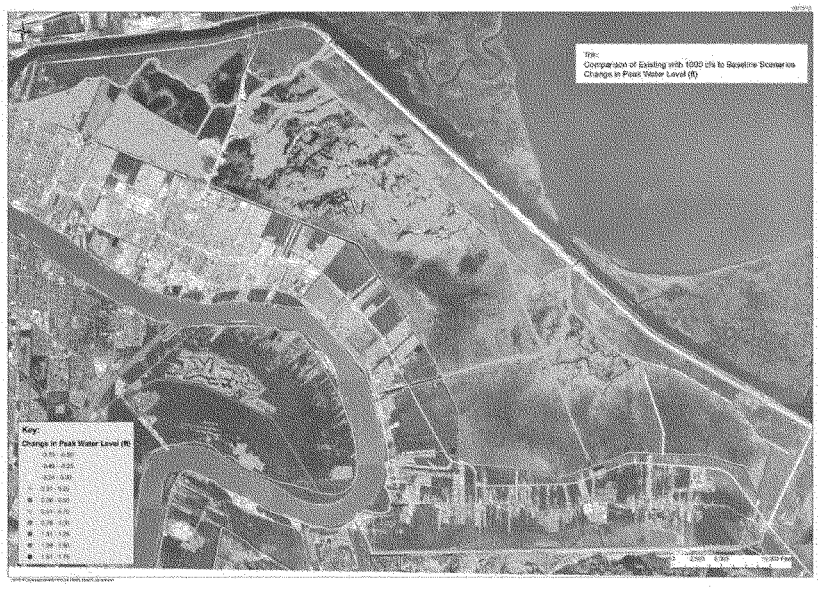


Figure 36 Comparison of the MB1 and MB Scenarios for Peak Water Level

2. **Does the proposed change in topography for the restored marsh impact the base flows, levels and discharges?**

The change in topography due to marsh and swamp recreation has little impact on the flows, levels and salinity values within the CWA, particularly with the increased channel designed to transfer the higher flows from the Mississippi River to the MRGO.

The water level increase is greatest to the west of Paris Road where the impact of the sewage treatment works discharge is felt together with the increase in marsh and wetland. See Figure 37.



Figure 37 Comparison of MR1 with MB Scenarios for Peak Water Level

3. **What happens during periods of peak diversion flows? Where does the water go? What is the flow split through the existing structures? Is a new outfall structure needed? How extensive is flooding (frequency, levels, etc) inside the CWA. Are new channels needed within the wetlands?**

Initial screening before developing the Mike21 model suggested that a third structure would be needed to prevent excessive flows in the existing channels and extensive flooding.

Therefore during periods of peak flow the water was directed to the MRGO via the new channel. The flow split through the existing structure followed the same proportions as with the 1000cfs background flow. There is some increase in water levels with the 7,000cfs flow in the area immediately adjacent to the new and existing channels when the majority of the flow was passed

directly to the MRGO. See Figure 38. Even at high tide the water levels are below the proposed marsh elevation and will generally in the channels.

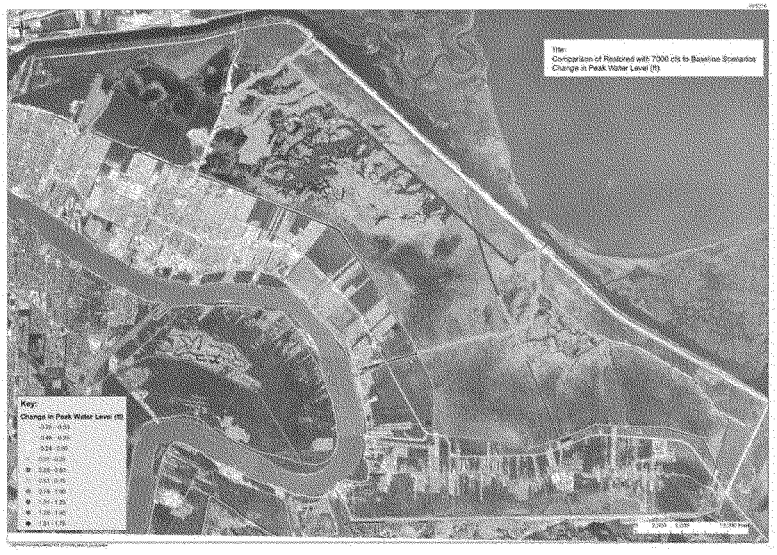


Figure 38 Comparison of MR7 with MB Scenarios for Peak Water Level

Reducing the discharge through the new structure would force water to the Dupre and Bienvenue gates and raise water levels but would increase the velocity through these gates with the increased flows. A variety of scenarios can be generated with the MIKE 21 model to examine impacts to the system by modifying the discharge through the third opening. Water levels would need to be raised on the order of a foot to flood the swamp areas at high tides only. To totally inundate the system the water levels would need to be increased by over 2.5 feet to keep the system we during low tide.

4. What are the impacts of localized flooding due to the new diversions?

The new diversions have little influence on the water levels outside of the channels. For the 1000cfs scenario, in the central area the effect is less than 0.5ft, for the 7000cfs scenario, the effect is less than 1ft. Flow velocities increase within the channels.

5. What are the impacts of sea level rise on the marsh?

About 80% (rough estimate) of the area will flood during high waters for the SLR scenario. This will change drastically the hydrodynamic behavior for the whole area and will likely indirectly induce morphological changes to the area. More areas will experience larger salinity levels.

2.5.5 DETAILED MODELING – FVCOM

The study objectives of the FVCOM modeling effort where to:

1. Better understand and quantify high frequency variability of the salinity field in open water using a numerical model, and
2. To understand the transient salinity field during a transition from low to high hypothetical flow magnitude and distribution between sites at Bayou Bienvenue and Bayou Dupre in the Central Wetlands Area (CWA).

The Finite Volume Coastal Ocean Model (FVCOM) was selected for this study because it is a prognostic, unstructured-grid, finite-volume, free-surface, 3-D primitive equation coastal ocean circulation model developed by Chen et al., (2003). The model consists of momentum, continuity, temperature, salinity, and density equations and is closed physically and mathematically using turbulence closure sub-models. FVCOM is solved numerically by a second-order accurate, discrete flux calculation in the integral form of the governing equations over an unstructured triangular grid. This approach combines the best features of finite-element methods (grid flexibility) and finite-difference methods (numerical efficiency and code simplicity) and provides a much better numerical representation of both local and global momentum, mass, salt, heat, and tracer conservation.

For a more detailed description of model development and other capabilities the reader is directed to Chen et al. (2003). The model was used in three-dimensional mode due to the episodic and seasonal stratification that the estuary experiences (Abadie and Poirrier, 2000; Georgiou, 2002; Li et al., 2008) and to capture additional stratification potentially induced near freshwater input sources. Finally, the freely available source code for FVCOM does not readily offer salinity transport under the two-dimensional mode without code modifications.

A detailed report including the background, model inputs, calibration, verification, and results can be found in Annex 1.

2.5.5.1 Simulation Matrix

The following simulation matrix was considered to address the objectives of this study. First, two simulations, one with wind and one without wind were conducted to compare the high frequency variability in the open water areas of the basin (Lake Borgne and Mississippi Sound in the vicinity of the Biloxi marshes). These simulations were conducted with realistic winds, did not include a closure at the connection between Lake Borgne and the MRGO, and without a new diversion. The second set of simulations, were performed using reconstructed winds, an no closure at the connection between Lake Borgne and the MRGO, and a 7,000 cfs diversion. Lastly, a longer simulation of 45 days was performed to investigate the time-dependent evolution of the salinity field resulting from a diversion of 1,000 cfs (split at 50/50 between Bayou Bienvenue and Bayou Dupre) to 7,000 cfs (with a split of 10/90 respectively). During this simulation, the MRGO closure structures were includes and connection between MRGO and Lake Borgne was closed. Table 17 shows a summary of the FVCOM simulations performed.

Table 17. Case Name and Initial and Boundary Conditions for Each Simulation Performed

Case name	Simulation time (days)	MRGO closure @ La Loutre	MRGO closure @ Bienvenue	Gap @ MRGO and Lake Borgne	Wind stress	Diversion flow
OPT1	5	yes	No	open	Yes, realistic	no
OPT2	5	yes	No	open	No wind	no
OPT3	5	yes	yes	open	Yes, realistic	yes
OPT5	10	yes	yes	closed	Yes, constructed	yes/7,000
OPT6	10	yes	yes	closed	No wind	yes/7,000
OPT7	45	yes	yes	closed	No wind	yes/(1,000-7,000)
OPTF	45	yes	yes	closed	No wind	yes/(1,000-7,000)

2.5.5.2 Model Results and Discussion

2.5.5.2.1 Simulated Salinity Distribution Under Wind Stress

Initially the model was used to investigate the short term high frequency variability in open water (in Lake Borgne and the Mississippi Sound). This was accomplished using realistic wind fields. Two simulations were performed, one with wind and one without wind. Figure 39 shows the depth-integrated distribution of salinity averaged over the 5 day simulation period for the case with wind. Figure 40 shows the same solution without wind. By comparison these two simulations look very similar. An initial conclusion would be to infer that there are negligible changes between the two simulations. When comparing the variance or dispersion in the system, however, by means of calculating the standard deviation of each node (in time) and plotting the results in two dimensions, a different pattern emerges. Figure 41 shows that wind induced circulation within Lake Pontchartrain will cause variation in the salinity near the coastlines where currents are larger. Similarly, higher variability, although small, is observed in the Mississippi Sound near Half Moon Island , at the location of interaction of the Pearl River freshwater plume in that vicinity, and within the Biloxi Marsh area.

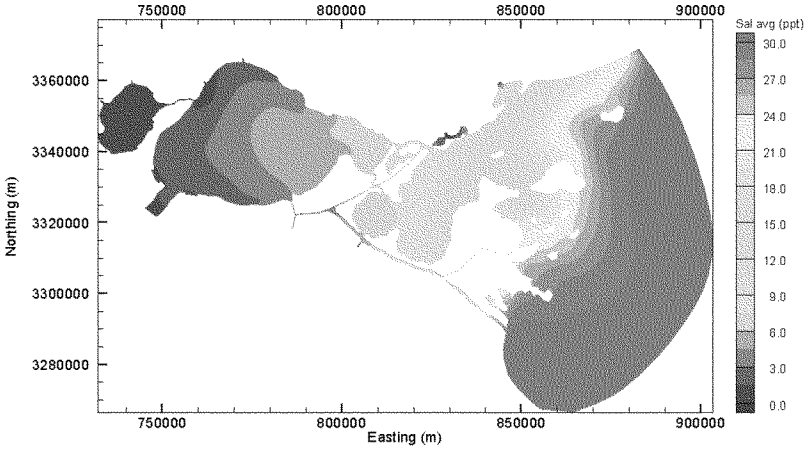


Figure 39 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt1; frontal wind)

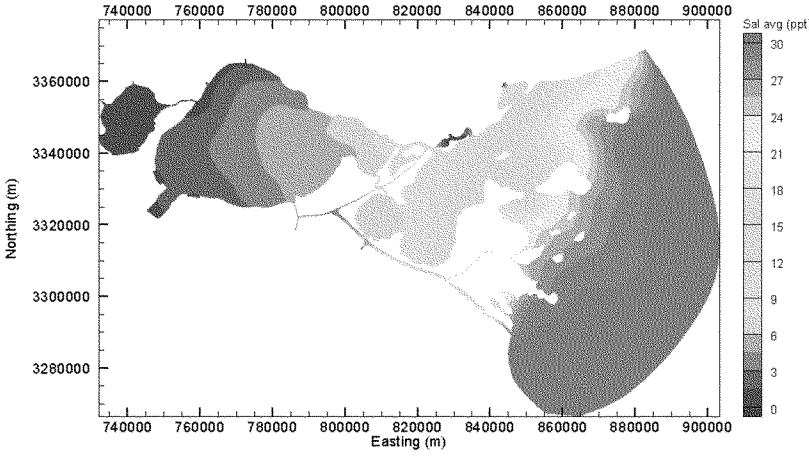


Figure 40 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt2; no wind)

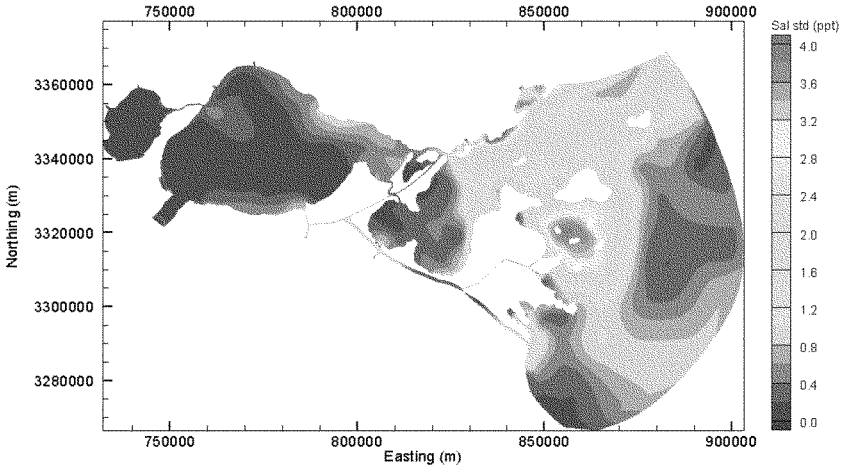


Figure 41. Model simulated depth-integrated standard deviation distribution for 5 days (case opt1; frontal wind)

In an attempt to investigate intermittent or transient conditions, the closure of the MRGO at Bayou Bienvenue was not included in simulations opt1 and opt2. Another simulation was performed (opt3), which was similar to opt1 (i.e., with frontal actual winds, and other boundary conditions), but included the closure of the MRGO near Bienvenue gates. Figure 42 shows that the average depth-integrated salinity for this simulation looks identical to that of opt1. Moreover, the distribution of the standard deviation for scenario opt3, shown in Figure 43, very closely compares to that of the simulation without the closure. Some obvious and expected differences exist between the two simulations and are largely in the MRGO itself, and as a result additional rather small difference in Breton Sound, and within the Biloxi Marshes. The differences however outside the navigation complex are rather small.

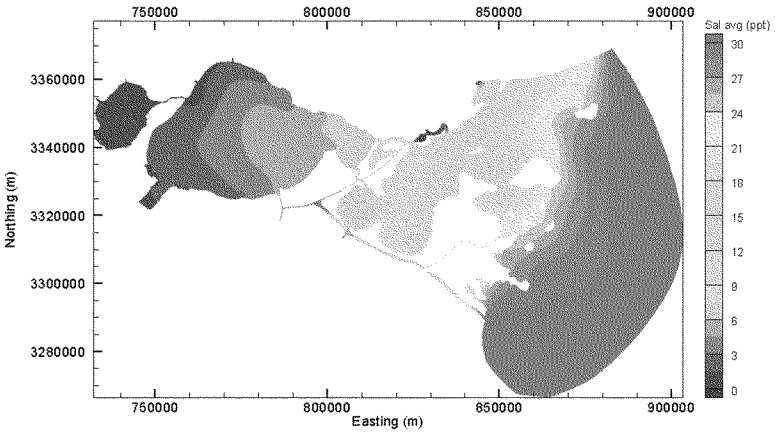


Figure 42 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt1; frontal wind)

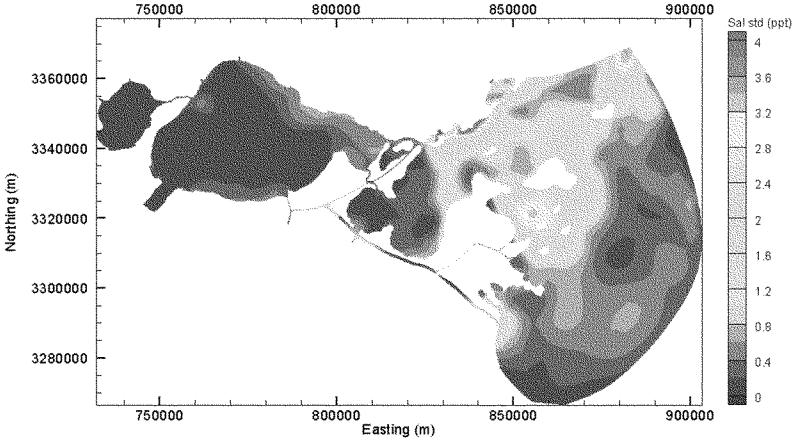


Figure 43 Model simulated depth-integrated standard deviation distribution for 5 days (case opt3; frontal wind)

A second set of simulations with and without winds were conducted with constructed and more persistent west and northwest winds during the post frontal phase of the storm. This wind pattern would have the tendency to push or force water seaward of the Basin, and in the process help

spread and disperse the salinity. As a subsequent result, salinity targets in Mississippi Sound, Biloxi Marshes and other areas of interest could be met faster than anticipated. These simulations, namely opt5 and opt6, have the same initial and boundary conditions as opt1 through opt3, with the exception of the winds which are constructed. An additional difference between these simulations is that there is a diversion at Violet with a constant flow of 7,000 cfs throughout the simulation. These simulations are slightly longer and last for 10 days. Comparatively, Figures 44 and 45 look again very similar, with average depth-integrated salinities fairly similar through the computational domain. When inspected closely, there is a small wind induced variability that shows in the averaged salinity field. This can be seen in Lake Pontchartrain, where the wind induced currents produce more mixing and hence more variability near the coast. Additional differences include small deviations in the Mississippi and Chandeleur sounds; however, when looking at the average salinity field these differences do not appear to be large.

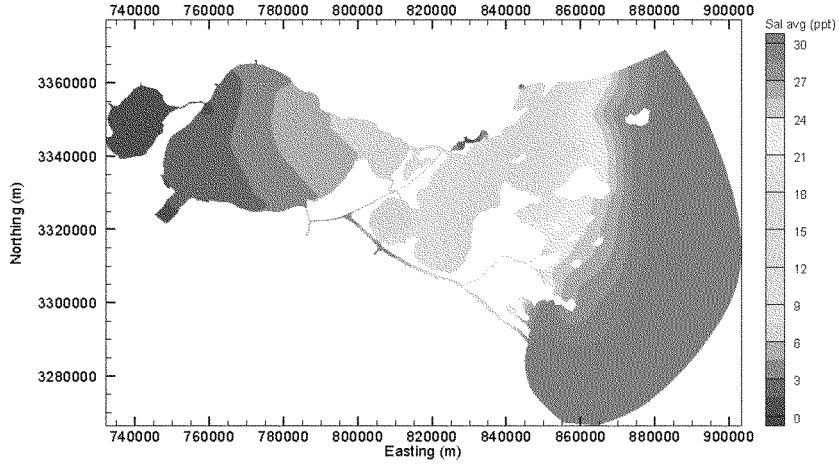


Figure 44 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt5; frontal wind)

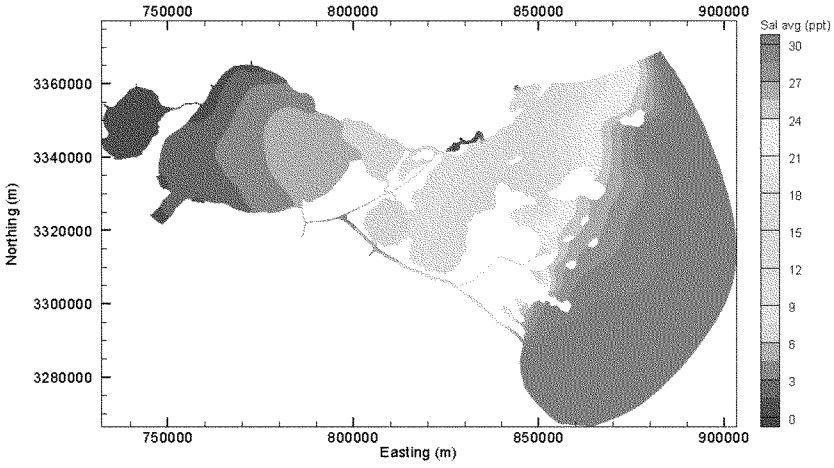


Figure 45 Model simulated depth-integrated salinity distribution averaged over 5 days (case opt6; no wind)

When we examine the variance by looking at the standard deviation in time for every node (Figure 46 and 47), the variability due to wind stress is great. Up-estuary, in Lake Pontchartrain, there appears to be very small variability due to tidal forcing alone (Figure 47). Moreover, in the Mississippi Sound standard deviations are of the order of 3 ppt, and are largely in areas where tidal range is high. In the area of interest, and within the Biloxi Marsh area, there is evident change, although most of this change can de attributed to freshwater input at Violet, which naturally flows seaward through Bayou La Loutre. When we compare Figure 46 to Figure 47 (frontal constructed wind stress), we notice that there is additional variability explained only by high frequency response to wind stress. Wind induced currents within Lake Pontchartrain cause, as previously observed, salinity to respond along the coastline. Furthermore, within the Biloxi Marsh area, the standard deviations appear to rise to 6 ppt or more. Similarly, Figure 46 also shows that open water bodies such as Breton, Chandeleur, and Mississippi Sound respond to wind stress rapidly. The areas, when compared to no wind simulations, showed double the variability in the presence of wind stress.

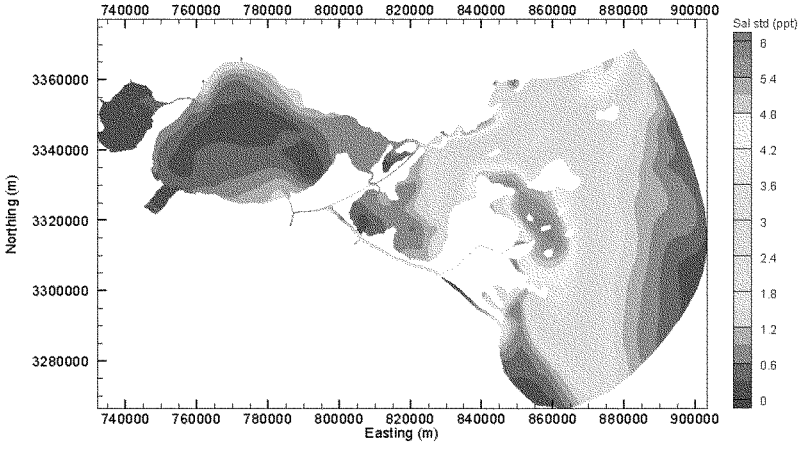


Figure 46 Model simulated depth-integrated standard deviation distribution for 5 days (case opt6; frontal wind)

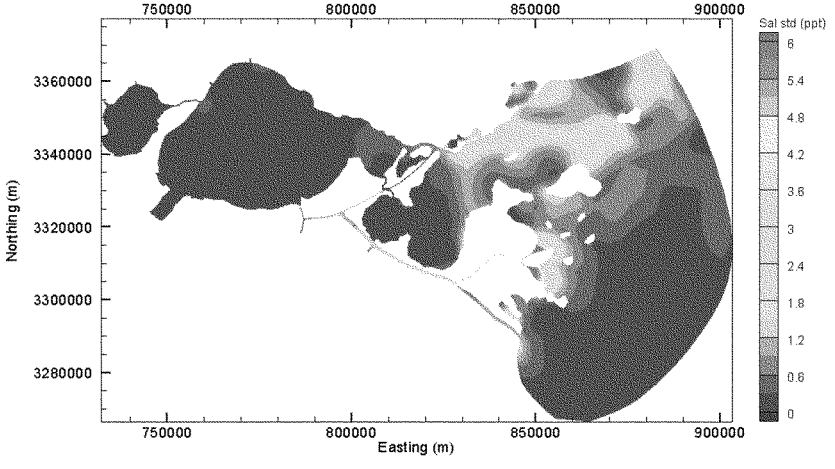


Figure 47 Model simulated depth-integrated standard deviation distribution for 5 days (case opt6; no wind)

2.5.5.2.2 Transient Salinity Response to a Diversion

The second objective of the study was to investigate the transient response of the salinity field from 1,000 cfs to 7,000 cfs during spring, with three closures implemented: (1) MRGO at Bayou La Loutre; (2) MRGO at Bayou Bienvenue; and (3) the connection between Lake Borgne and the MRGO. Two simulations were conducted. The first included the same boundary condition for salinity as in all previous simulations. The second included an open boundary obtained and forced from the UNO Mass Balance model simulations during spring. No wind was considered for this longer 45 day simulation.

Figure 48 and Figure 49 show the average depth-integrated distribution of salinity over the period of the simulation (45 days). The average value for every node (in time) is computed based on the hourly output. It is evident from the average salinity field that up-estuary (such as within Lake Pontchartrain) lower salinities in Breton Sound as a result of diversions in the Caernarvon Basin have little or no impact. This is the same for Lake Borgne and for parts of Biloxi Marsh and the Mississippi Sound. Average salinities however start to be considerably different within Breton Sound, the Chandeleur Sound, and the eastern part of Mississippi Sound. Within the Biloxi Marsh however, the change is rather small, perhaps due to the short simulation period.

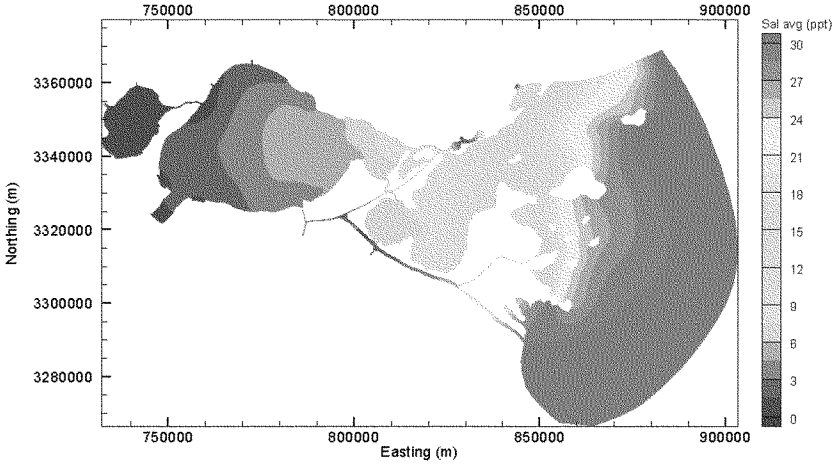


Figure 48 Model simulated depth-integrated standard deviation distribution for 45 days (case opt7; no wind)

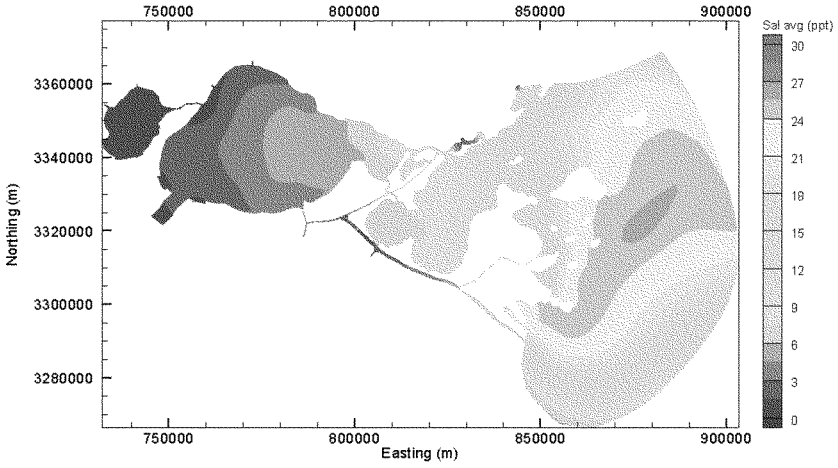


Figure 49 Model simulated depth-integrated standard deviation distribution for 45 days (case optf; no wind)

Looking at Figures 50 and 51, on the other hand, large differences in the standard deviation can be seen, which can explain areas that are more dynamic. For instance, the small and rather insignificant change up-estuary as a result of a diversion in Breton sound directly can be explained easily by direct comparison of Figures 50 and 51, where we see that these two images are very similar. Similarly, the freshwater diversion at Violet (through Bayou Dupre) is unaffected by additional input into Breton Sound. This is explained by the similar standard deviation within the Biloxi Marsh area between Figures 50 and 51. Finally, as expected and as shown to some extend in the average salinity field from Figures 48 and 49, the eastern portion of the Mississippi Sound, Breton Sound, Chandeleur Sound, and the eastern portion of the Biloxi Marsh can be affected by lower salinity in Breton Sound as shown in Figure 51.

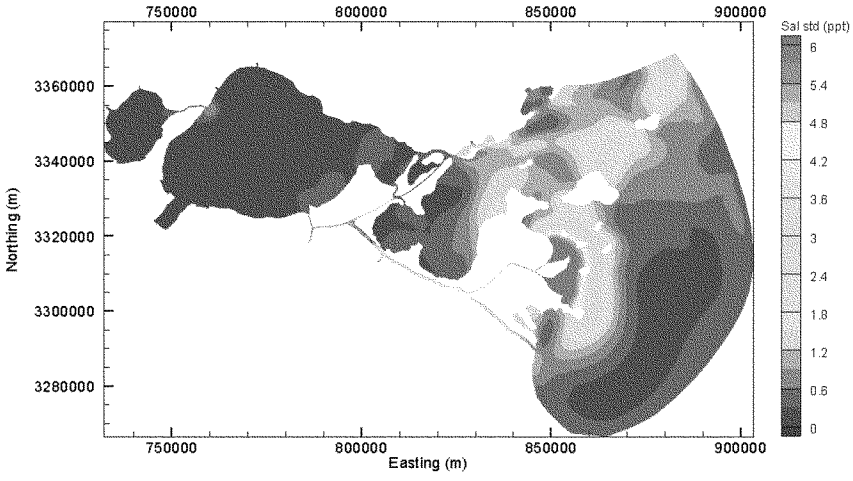


Figure 50 Model simulated depth-integrated standard deviation distribution for 45 days (case opt7; no wind)

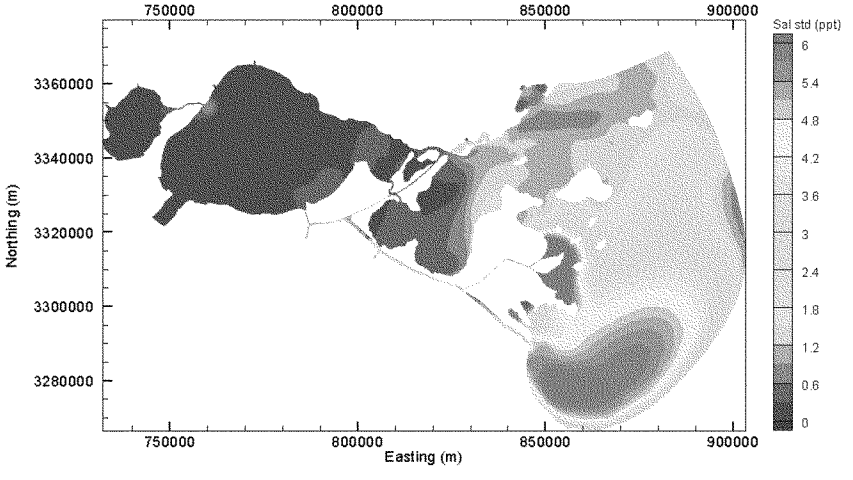


Figure 51 Model simulated depth-integrated standard deviation distribution for 45 days (case optf; no wind)

Most of this change and variability can be explained by either tidally induced circulation or freshwater induced circulation as a result of diversions. The large variation seen in Figure 51 can also be explained relative to the initial condition. Since the initial condition is somewhat saltier than the future and imposed boundary condition, this part of the domain responds to the forcing by rapidly mixing the forced salinity inside the domain. This may be somewhat unrealistic, and will be largely a function of the initial condition. However, the model predicts that this area will respond to a lower salinity in Breton sound, and would in fact, given sufficient time, reach within the area of interest.

Time-series results of the evolution of the salinity field during the longer simulation of 45 days, starting from 1,000 cfs and going through 7,000 cfs are shown in sequential plots in Appendix H of Annex 1 as Figure 22 through Figure 27. The figures show the evolution of the salinity field as a function of time. Figure 52, on the other hand, shows the evolution of an instantaneous surface salinity at two locations, one in the MRGO channel upstream of Bayou La Loutre, and the other in the center of the Biloxi Marsh. The figure shows that initially, when the diversion in the system is of the order of 1,000 cfs using a 50/50 split between Bayou Bienvenue and Bayou Dupre, the instantaneous salinity at both locations is dominated by tidal induced circulation. Both signals respond to tidal forcing by showing diurnal oscillations. The salinity within the MRGO (green solid line), although small, shows some response to diurnal oscillation. This is so small and cannot be seen with the salinity time-series but is seen in the gradient term. The gradient term responds to diurnal oscillations during the low diversion flow but they are rather negligible. However, once the flow starts to rise to 7,000 cfs there is a rather rapid response. The absence of the diurnal oscillation in this term also deems this area now dominated by river-water rather than tides.

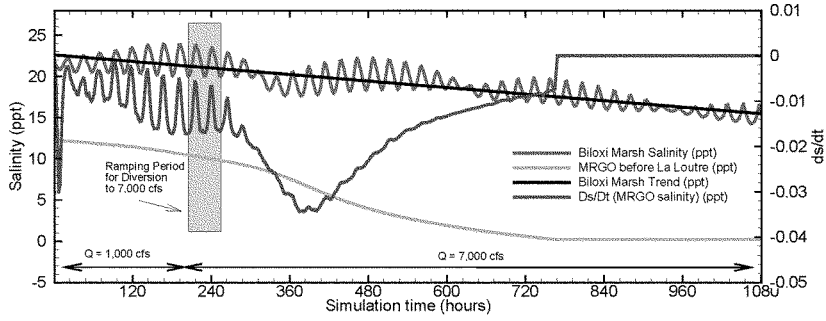


Figure 52 Instantaneous surface salinity for simulation optf, showing the salinity in the central Biloxi Marsh)red line) and within the MRGO channel upstream of Bayou La Loutre (green solid line)

In the Biloxi Marsh, despite the obvious decline in instantaneous salinity as a result of the diversion (black trend line, Figure 52), there seems to be a slightly different response. There is an obvious phase or lag in the system. For example, during the early part of the simulation, the area responds only to tidal forcing, as the local average or trend is a horizontal line up to hour 240 and above. By this time, the diversion has already been operating and is fully ramped to 7,000 cfs, but has not

produced a measurable change in this area. Subsequently, and coinciding with a neap cycle, the system responds with a sudden reduction in the salinity, verifying the small dominance of river-induced circulation in the absence of strong tidal induced flow. By this time, the diversion flow is fully developed and the declining trend in the salinity appears to be linear in time.

2.5.5.3 Conclusions to FVCOM Modeling

The model simulations showed that wind stress resulting from frontal weather can produce high frequency variability in the Pontchartrain Basin within just three days of the application of the wind. In 5 day simulations with half a day of spin up time, the model predicted double the variability. The model also predicted that when only using the averaged salinity field, one would tend to underestimate this variability and high frequency response, primarily because the response is rapid. The model also predicted that in longer simulations, the high frequency response would tend to be smaller due to the natural tendency of wind to cancel this response. This is largely a function of wind climate, basin geometry, duration and intensity of each event, and the relaxation scale of the basin.

Finally, a longer simulation of a diversion from 1,000 cfs to 7,000 cfs showed that the MRGO-La Loutre pathway is largely dominated by tidal currents when the flow is near the low 1,000 cfs magnitude. When the flow is near 7,000 cfs, the basin in this area is dominated by the diversion flow. Furthermore, the model predicted a lag time of the order 4-7 days for this flow to reach the Biloxi Marsh area through this direct route. It is emphasized that for this simulation, the Lake Borgne connection to the MRGO was closed, which further ensures that the conveyance is maximum through this pathway. The model also showed that the Biloxi Marsh area is largely tidally influenced when the flow at Violet is near 1,000 cfs. Although tidal flows continue to cause strong diurnal oscillations in the salinity, when the flow reaches 7,000 cfs and dynamic equilibrium after the lag period, there is a steady decline in the salinity.

2.5.6 HYDRAULIC DESIGN FRESHWATER DIVERSION

2.5.6.1 Preliminary Alternative Analysis

2.5.6.1.1 Channel and Culvert Design

Four alternative locations for the Violet Freshwater Diversion Canal for the subject project were investigated. The analysis was not an optimized design, but was done to compare the 4 alternative diversion alignments.

At the point when the alternatives were considered, it was projected that 15,000 cfs of freshwater would need to be diverted from the Mississippi River in order to achieve the Chatry line salinity targets. This amount was selected based on earlier designs for the Violet Diversion Project.

Figure 53 displays and labels the 4 diversion locations that were investigated for this effort. Figures 54-56 depict the cross section needed to convey the design flow for each alternative. Table 18 depicts the Invert Elevations of each Channel and Culvert. Table 19 shows the culvert dimensions for each culvert.

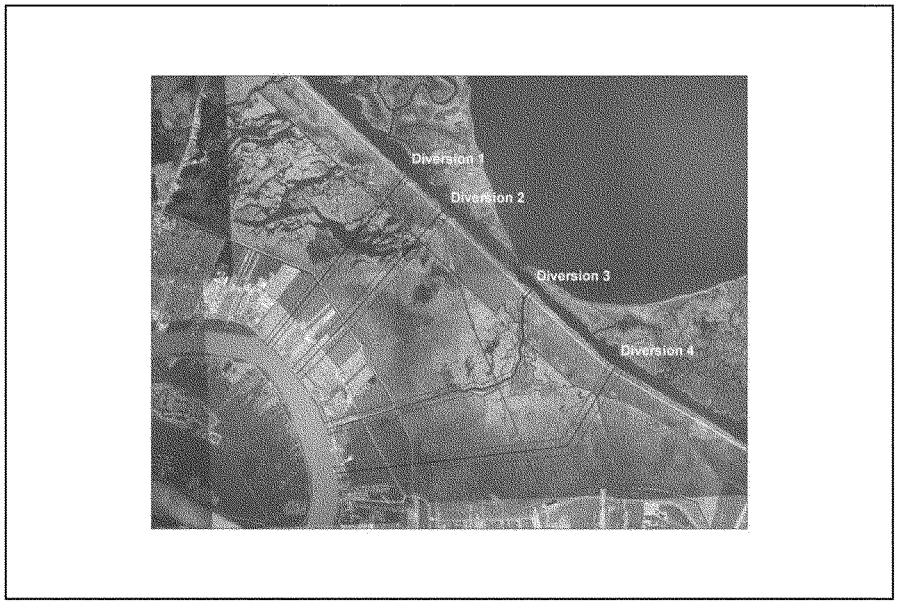


Figure 53 Alternative Diversion Locations

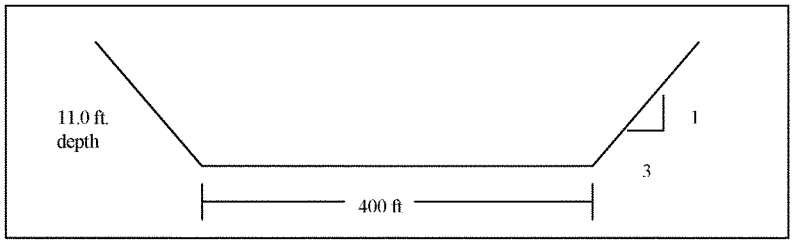


Figure 54 Diversions 1 & 2 Cross Sections

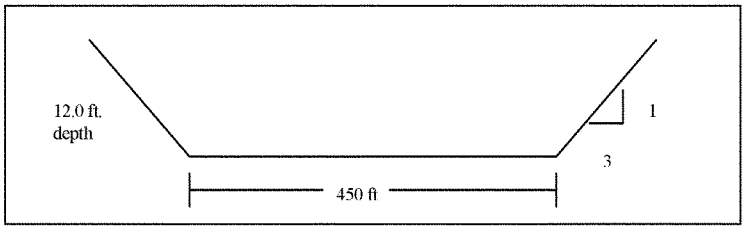


Figure 55 Diversion 3 Cross Section

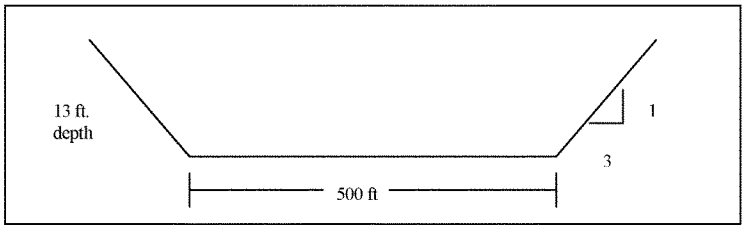


Figure 56 Diversion 4 Cross Section

Table 18 Design Invert Elevations

Diversion	Invert Elevation- Upstream Side of Culvert	Invert Elevation- Downstream Side of Culvert	Invert Elevation- After Culvert Flow is Expanded	Invert Elevation- Discharge of Diversion
1	-5.1	-5.6	2.7	-15.3
2	-5.1	-5.6	2.7	-15.3
3	-3.2	-3.7	2.7	-16.3
4	-2.5	-3.0	2.8	-15.8

Table 19 Culvert Dimensions

Diversion	Diversion Culvert - Assumed Length, ft.	Diversion Culvert, Dimensions (Each Box), ft.	Discharge Culvert – Assumed Length, ft.	Discharge Culvert, Dimensions (Each Box), ft.
1	400	35 x 15	400	25 x 15
2	400	35 x 15	400	25 x 15
3	400	40 x 15	400	30 x 15
4	850	50 x 15	400	35 x 15

2.5.6.1.2 Assumptions-Methodology

Similar to the design of the Davis Pond Diversion, 4-box culverts were utilized in the design for conveying flow under the railroad and Hwy 46, and also to avoid subjecting the diversion canal to the stages in the Mississippi River. The box culverts were assumed to be 400 feet long for Diversion 1, 2, and 3. The assumed length of Diversion 4 was 850 feet long to account for the wider widths between the diversion point, the railroad, and Hwy 46. The culvert was sized on the criteria not to allow significant backwater stages.

It was assumed that the maximum allowable velocity for the diversion is 4 ft. /sec., except in the vicinity of the contraction/expansion zones of the culverts.

The channel was designed with 1:3 side slopes. This may or may not be acceptable in accordance with soil conditions.

The channel depths were obtained by adding 1 ft. of freeboard to the maximum water surface along the channel for the design flow.

An n-value of 0.035 was used for the channel. This means that in order to maintain the design flows, the channel would have to remain reasonably clear of vegetation and debris.

The 95-percentile stage (Elev. 12.0 NAVD 88 2004.65) of the Mississippi River was used to determine the amount of head available to convey flow down the diversion. The data used was available daily gage data recorded at 8:00 AM each day for the period 3/20/1987 – 6/2/2009. Rather than breaking the data down on a temporal scale, all of the data was taken as one set.

For the discharge side of the diversion, the 70-percentile stage (Elevation 0.5 NAVD 88 2004.65) of the NOAA gage located at Shell Beach was used as downstream stage. Data used for this gage was at 8:00 AM for the period 6/03/2006 – 06/02/2009. There was a much more extensive record of data available, however this data was not used since it was not verified. The 70-percentile stage was used throughout the simulations. This stage was assumed to be the same at all diversion locations.

2.5.6.1.3 Further Analysis (Sensitivity)

Other percentile stages of the river were analyzed to illustrate what quantities of flows other than the design flow would be conveyed through the diversion. All stage data of the river were used as one set, and were not broken down on a temporal scale. To accomplish this, Elevation 0.5 NAVD 88 2004.65 was used (as in the primary analysis) as a downstream stage. Table 20 is a depiction of these results.

Based on the results of this investigation and other factors such as existing infrastructure, location on the river length of outflow channel and potential for influencing the Central Wetlands alternative Location 1 was selected as part of the TSP. Further plan selection details can be found in the main report.

Table 20 Diversion Flows

Diversion Flows				
Percent Exceedance – Stage, NAVD 88 2004.65	Diversion Flows, cfs			
	1	2	3	4
5% - 12	15000	15000	15000	15000
10% - 10.7	12300	12300	12100	11900
15% - 10.2	11350	11350	11050	10850
20% - 9.6	10300	10300	9850	9500
25% - 8.7	8700	8700	8100	7600
30% - 7.6	6900	6900	6200	5400

Based on the results of this investigation and other factors such as existing infrastructure, location on the river length of outflow channel and potential for influencing the Central Wetlands alternative Location 1 was selected as part of the TSP. Further plan selection details can be found in the main report.

2.5.6.2 Detailed Design of Violet Diversion

2.5.6.2.1 General

For the detailed design of Location 1, it became apparent that the design of the freshwater diversion consisted of several unique problems that needed to be addressed, revolving mainly around the stages in Lake Borgne vs. the stages in the Central Wetlands. Because the Central Wetlands are

proposed to not merely serve as a means of transmitting Mississippi River water but also as a receiving area, the question as to what happens with the stages and flow between the two areas is of great concern in the design. Figures 57 and 58 depict the nature of the water flow and discharge in the scenario of the familiar freshwater diversion operation, vs. the scenario that would persist routinely in the case of the Violet Diversion.



Figure 57 Continuous Diversion

For a continuous diversion (without gaps), Lake Borgne always contains the lowest stages in the system, thus water will always flow as intended (river to outfall area).

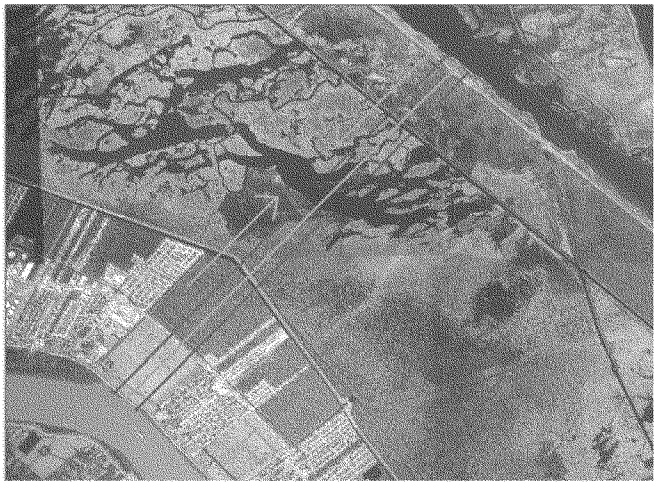


Figure 58 Proposed Violet Diversion

Depending on the Lake Borgne stage, the Central Wetlands are routinely the lowest stage in the system, resulting in the situation where the water from the river and water from Lake Borgne converges into the Central Wetlands.

To remedy the problem, there are at least several possible "solutions", detailed below.

1. Only operate the diversion during ebb (outgoing tide), since the Central Wetlands stages are higher than the Lake Borgne stages in this case. This would require either one-way flap gates (to allow only outgoing flow) or the constant closing and opening of the sluice gates with each tidal cycle. The issue would be exacerbated due to sea level rise if the stages in the Central Wetlands were required to remain similar to current stages.

2. Place pumps at the MRGO outfall to account for the negative head differential when flow is needed out into the Lake Borgne. The diversion would then be able to operate continuously.

3. Have the channel operate by discharging all flow into Lake Borgne, instead of discharging some into Lake Borgne and some into the Central Wetlands. Since this alternative was not acceptable to the project managers, a hydraulic analysis was not completed for this alternative.

Most of the following dialogue and figures are centered around Solution 1. Three scenarios of SLR were considered in the analysis: Low, Medium, and High. It should be noted that the channels in the detailed design are significantly narrower because 7,000 cfs was determined (by that point) to be the flow necessary to achieve the Chatry salinity limits.

2.5.6.2.2 Channel Designs, Assuming No Pumps Are Used

2.5.6.2.2.1 Low SLR

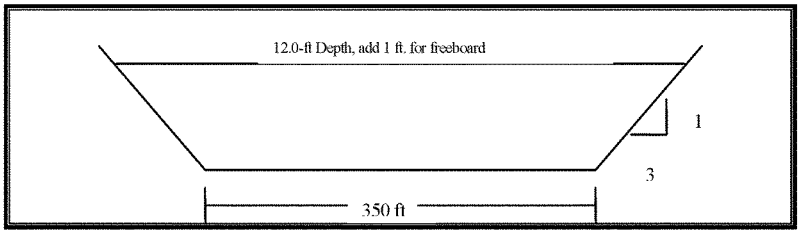


Figure 59 Channel Section

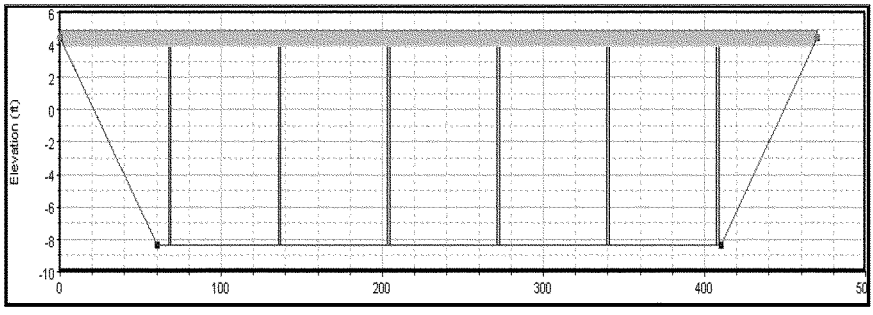


Figure 60 Judge Perez Bridge Section

Culvert Specs. Concrete box culverts with wingwalls angled between 30° and 75° to the barrel. Figure below shown to display wingwalls only (not culvert barrel).

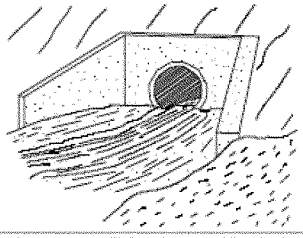


Figure 61 Culvert Specs

Table 21 Culvert Data

Culvert Location	Invert Elevation-Upstream Side of Culvert	Invert Elevation-Downstream Side of Culvert	# of Barrels	Dimension of Each Barrel	Total Flow Area of Culvert
Upstream	-12.3	-12.3	4	13' x 13'	676 ft^2
40-Arpent Levee	-13.3	-13.3	5	13' x 13'	845 ft^2
Downstream	-14.9	-14.9	8	13' x 13'	1352 ft^2

Note in the profile depiction that there are 500' transitions at each face of each culvert to the normal channel profile. For all cases, the upstream culvert encompasses the Mississippi River Levee, St. Bernard Highway, and the railroad.

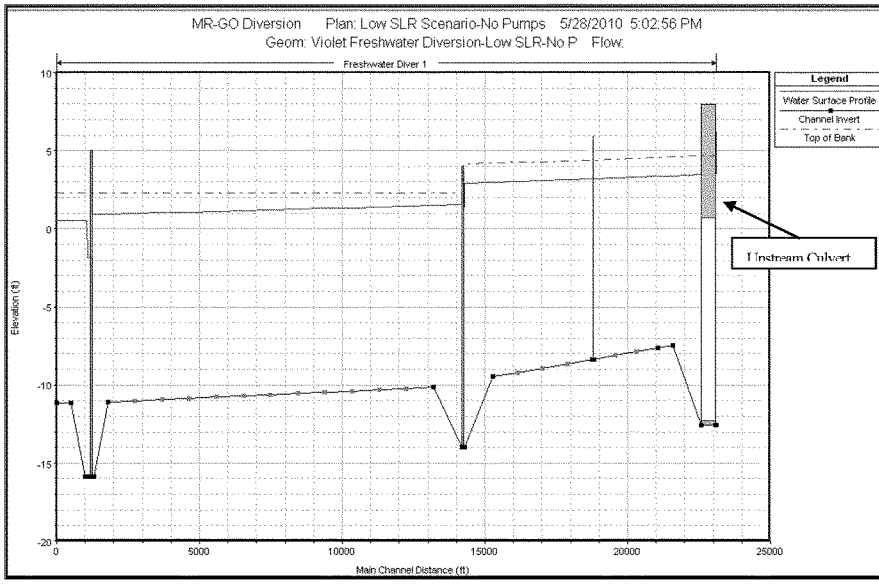


Figure 62 Channel Profile

Using an estimated Central Wetlands marsh elevation of Elev. 1.3 NAVD 88 2004.65, 1-ft (above marsh elevation) guide levees are needed between the Mississippi River and 40-Arpent Levees.

2.5.6.2.2.2 Medium SLR

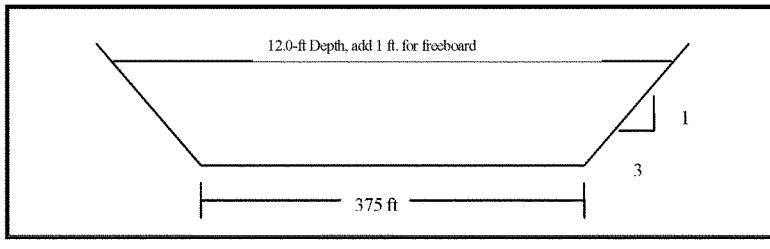


Figure 63 Channel Section

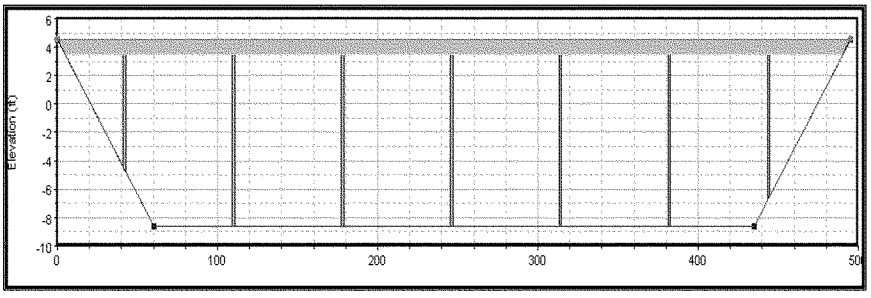


Figure 64 Judge Perez Bridge Section

Table 22 Culvert Data

Culvert Specs – Same as with low SLR scenario.					
Culvert	Invert Elevation- Upstream Side of Culvert	Invert Elevation- Downstream Side of Culvert	# of Barrels	Dimension of Each Barrel	Total Flow Area of Culvert
Upstream	-11.8	-11.8	4	13' x 13'	676 ft^2
40-Arpent Levee	-12.8	-12.8	5	13' x 13'	845 ft^2
Downstream	-14.4	-14.4	8	13' x 13'	1352 ft^2

Note in the profile depiction that there are 500' transitions at each face of each culvert to the normal channel profile.

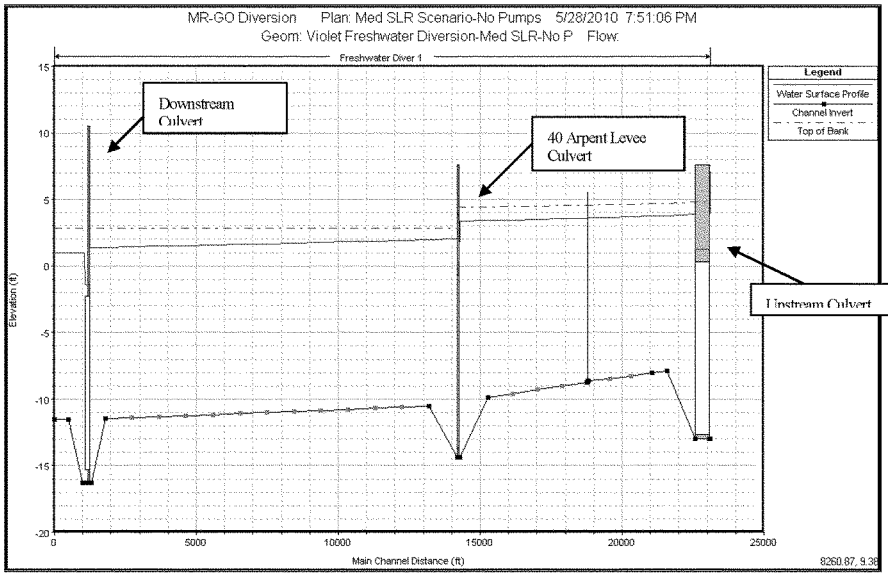


Figure 65 Channel Profile

Using an estimated Central Wetlands marsh elevation of Elev. 1.3 NAVD 88 2004.65, 1.5-ft (above marsh elevation) guide levees are needed between the Mississippi River and 40-Arpent Levees.

2.5.6.2.2.3 High SLR

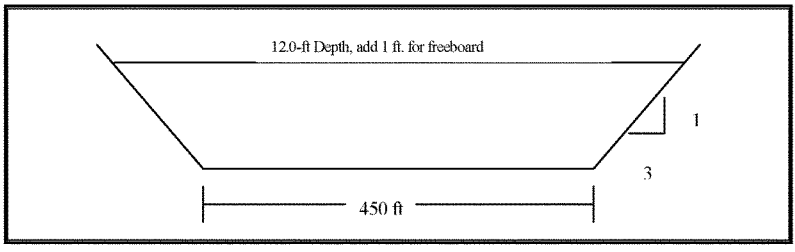


Figure 66 Channel Section

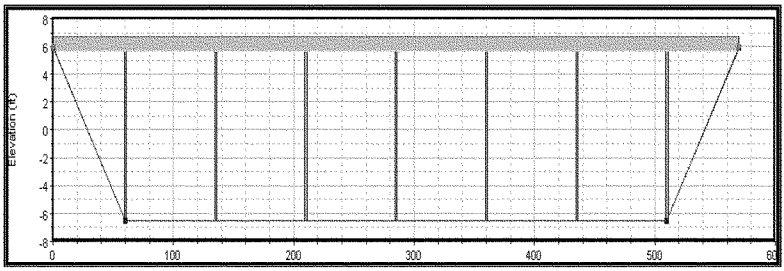


Figure 67 Judge Perez Bridge Section

Table 23 Culvert Data

Culvert Specs – Same as with low SLR scenario.					
Culvert	Invert Elevation- Upstream Side of Culvert	Invert Elevation- Downstream Side of Culvert	# of Barrels	Dimension of Each Barrel	Total Flow Area of Culvert
Upstream	-10.5	-10.5	4	13' x 13'	676 ft^2
40-Arpent Levee	-11.5	-11.5	5	13' x 13'	845 ft^2
Downstream	-13.1	-13.1	8	13' x 13'	1352 ft^2

Note in the profile depiction that there are 500' transitions at each face of each culvert to the normal channel profile.

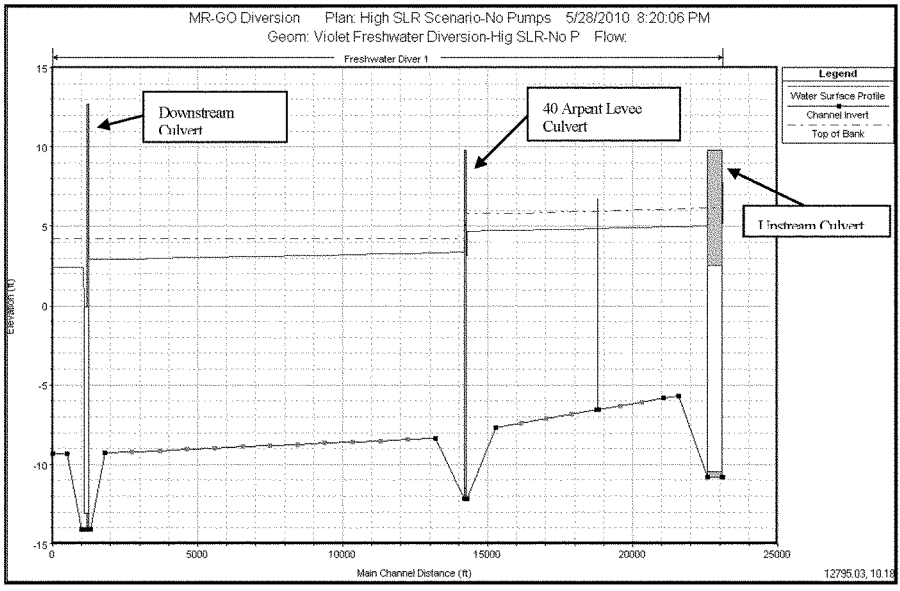


Figure 68 Channel Profile

Using an estimated Central Wetlands marsh elevation of Elev. 1.3 NAVD 88 2004.65, 3.1-ft (above marsh elevation) guide levees are needed between the Mississippi River and 40-Arpent Levees.

2.5.6.2.3 Channel Design Assuming Pumps are Used

As mentioned before, any case of sea level rise (and present conditions, for that matter) would require pumps if the diversion is to push water into Lake Borgne continuously and not be dependent of tidal fluctuations. The pumps generally do not change the design of the channel if they are sized to meet the flow demands at that point in the channel. However, oversized pumps can be used to lower the water stages in the channel if so desired. This would however increase flow rates and also velocities significantly. Oversized pumps located at the MRGO levee could also allow the channel to have a smaller cross section-footprint. For instance, a pump capable of pumping 6000 cfs at a -1.5 head would allow a 250 width bottom width channel.

2.5.6.2.4 Earthen Weirs

The diversion is proposed to operate at design level by depositing 1,000 cfs into the Central Wetlands and the other 6,000 cfs. into Lake Borgne. To do this, earthen weirs must be constructed at the intersections with existing open channels. Otherwise the 7,000 cfs will discharge into the Central Wetlands. Unless these weirs are adjustable, 1000 cfs can only be discharged into the Central Wetlands by manipulating the gates at the MRGO and Mississippi River levees. The concept is to keep stages in the diversion channel high enough to where flow is discharged from the channel

into the Central Wetlands. For Feasibility-Level design purposes the crest of the weir should be set at Elev. 0.5 (NAVD 88 2004.65) for the low SLR scenario, Elev. 0.9 for the medium scenario and Elev. 2.4 for the high scenario.

For the purposes of this design, the weirs are broad-crested. Maximum velocities of 2 ft/sec were calculated over the crest of the weirs. Consequently, the weirs would not have to be protected from scour.

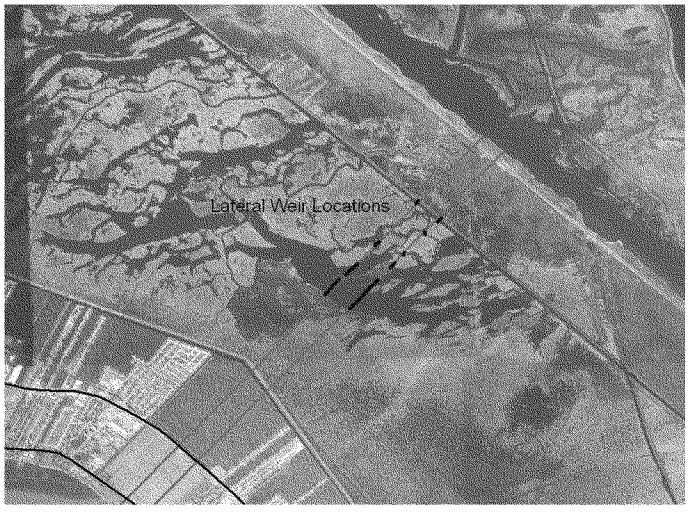


Figure 69 Lateral Weir Locations

2.5.6.2.5 Rip Rap

2.5.6.2.5.1 Culverts

Channel flow near the culverts presents the major concern for channel velocities. All SLR scenarios produced similar velocities for the transitions into and out of the culverts. Therefore, the rip rap gradations necessary to protect the channel and structures are listed below for each SLR scenario. The gradations were determined assuming placement in the dry. Tables 24 to 27 show riprap designs for each structure.

Table 24 Mississippi River Structure Riprap

Upstream, Weight, lb		
20" Layer Thickness		
Percent Lighter by Weight, 20" Thickness	W_{max}	W_{min}
100	400	160
50	160	80
15	80	30

Table 25 40 Arpent Levee Structure Riprap

40-Arpent Levee, Weight, lb		
12" Layer Thickness		
Percent Lighter by Weight, 20" Thickness	W_{max}	W_{min}
100	90	40
50	40	20
15	20	5

Table 26 MRGO Structure Riprap

Downstream, Weight, lb		
12" Layer Thickness		
Percent Lighter by Weight, 20" Thickness	W_{max}	W_{min}
100	25	10
50	10	5
15	5	2

Table 27 Placement Distance

Rip Rap Placement		
	Distance in Feet Upstream	Distance in Feet Downstream
Upstream	205	410
40-Arpent Levee	200	400
Downstream	190	380

2.5.6.2.6 Judge Perez Highway Bridge

During design flows, the average cross-sectional velocities at the upstream face of the bridge are 1.6 ft/sec. The velocities in the immediate vicinity of the piers are expected to be higher (as the HEC-RAS model is a 1-D model, not capable of modeling the flow around the piers unless a scour analysis is completed). Since soil borings along the channel were not yet available, it was estimated that scour protection would be needed around the bridge even though the velocities do not increase significantly as in the cases near the culverts. It was decided that it would be sufficient for the purposes of feasibility level study to utilize the design used for the Hwy. 90 Bridge for the Davis Pond Diversion, since Davis Pond has similar velocities. The gradations for the bridge assume placement in the wet. Rip rap extends 20 ft. upstream and downstream of the bridge. The design is sufficient for the case of with or without pumps, as in both cases the average velocities in the cross section remain below 3.0 ft/sec. Table 28 shows the riprap design for the Judge Perez bridge.

Table 28 Judge Perez Bridge Riprap

Rip-rap placement, Judge Perez Bridge		
Percent Lighter by Weight, 18" Thickness	W_{max}	W_{min}
100	25	10
50	10	5
15	5	2

2.5.6.2.7 Design Criteria

- Design flow of 7000 cfs total (6,000 cfs into Lake Borgne, 1,000 cfs into the Central Wetlands)
- A channel length of 22,000 ft.
- Sides slopes are 3H:1V
- Assume manning-n of 0.038

- Channel flows at a maximum depth of 12 feet.
- Assume a maximum permissible velocity of 4.0 ft/s for the channel.
- Data for "Mississippi River at Carrollton", "Mississippi River at Venice", and "Lake Borgne at Shell Beach" gages.
- All elevations-stages referenced to NAVD 88 (2004.65).
- A 500 linear foot culvert needed at the upstream end of the diversion (this culvert will flow under the MRL levee, St. Bernard Hwy and railroad).
- Assume (based on a 10 ft height and 12 foot crown) a 72 foot linear foot culvert needed at the 40-arpent levee.
- Six sets of 75-foot bridge bents at Judge Perez Drive. Three foot-diameter piles.
- 500 cfs needed to each side of channel through a lateral weir continuously.
- Assume a 150 foot culvert needed at the downstream end of the diversion (this culvert will flow under the HSDRRS floodwall).

2.5.6.2.8 Culvert Design

The bridges and culverts were placed into the model, submerging the culverts so the top is at a depth of at least ½ of the diameter/height. This is to help prevent formation of hydraulic jumps inside or near the culvert and to help prevent sedimentation around the culvert).

The culvert analysis consisted of sizing the culverts so that most of the head is lost at the upstream (Mississippi River) culvert. This would allow stages through the channel to remain relatively low (necessitated by the fact that the criteria was not to have guide levees in Lake Borgne and also to facilitate the lowering of stages as the channel traverses through developed areas) since significant backwater profiles wouldn't occur along the length of the channel. The culvert depth was determined from taking into account the types of culvert flow classifications that would occur depending on the parameters involved in the design. It was determined that a Type IV classification would be desirable since a hydraulic jump would not occur in this case and also because concerns of sedimentation occurring in the culvert. For this reason, the culvert invert is located lower than the rest of the channel invert.

2.5.6.2.9 Further Analysis-Sedimentation

In general, a sediment analysis of the channel should be performed in design phase in order to determine the actual maximum velocities and how the channel will perform under the sediment load presented by the river. In general, the slope and cross section must be designed such that the

channel does not have excessive depositional/erosion tendencies. If the channel does not have stable parameters and it is unlined, extensive deposition or erosion could occur at undesired locations, resulting in unexpected maintenance costs. Should the channel be found to convey extensive amounts of sediment, then a sediment basin will be recommended and designed to be constructed at the upstream end of the channel. Due to the extensive scope of a sediment analysis, this is recommended for the design phase of the study.

2.5.7 SHORELINE PROTECTION DESIGN

2.5.7.1 General

The proposed shoreline protection consists of rock breakwater located along several reaches in the Lake Borgne/Lake Pontchartrain Basins. This is a synopsis of design parameters and design methodology. Figure 70 depicts the proposed shoreline protection locations and the wind fetches which were used to determine wave heights to which these reaches are exposed to.

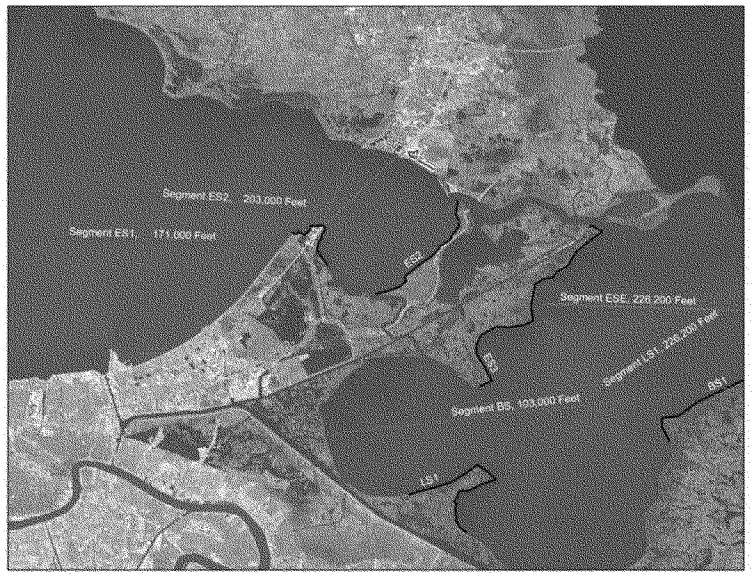


Figure 70 Shoreline Protection Reaches and Fetch Distances

2.5.7.2 Design Specifications

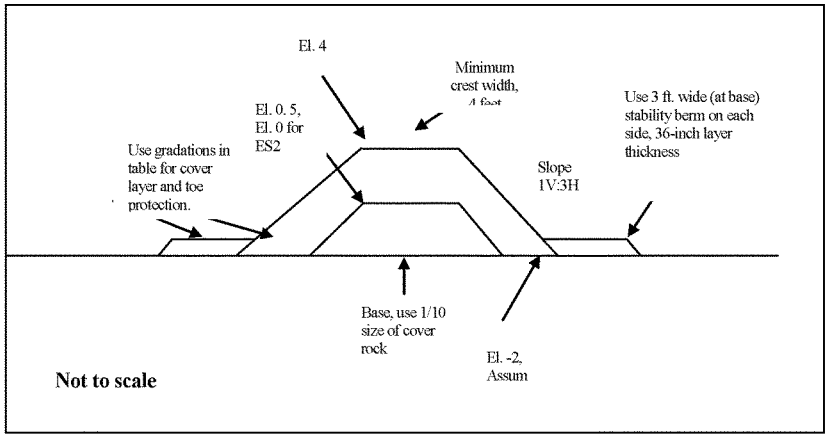


Figure 71 Cross-Section for Segments LS1, ES3, ES1, BS1, ES2

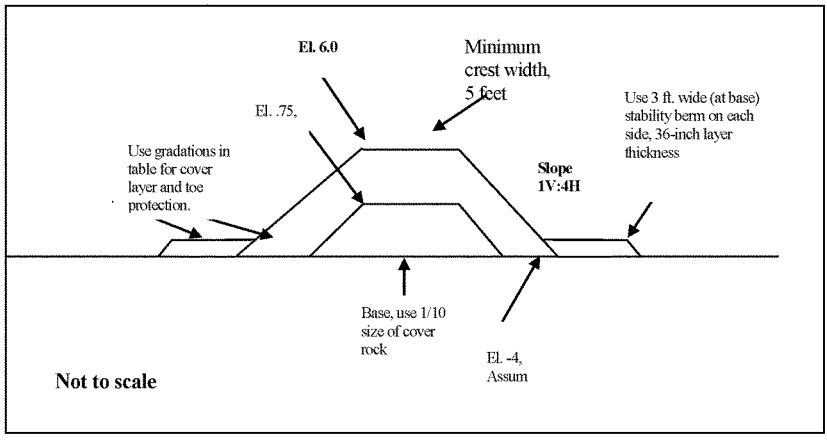


Figure 72 Cross-Section for Segments JS1, and BS2

Table 29 Stone Gradations for Areas LS1, ES3, BS1 and ES1		
42-Inch Layer Thickness Minimum		
Percent Lighter By Weight	Required Gradation, Percent Lighter by Weight, lbs	
	Upper Limit	Lower Limit
100	1000	400
50	430	200
15	210	60

Table 30 Stone Gradation for Area ES2		
48-Inch Layer Thickness Minimum		
Percent Lighter by Weight	Required Gradation, Percent Lighter by Weight, lbs	
	Upper Limit	Lower Limit
100	1500	600
50	650	300
15	330	100

Table 31 Stone Gradations for Areas JS1 and BS2		
63-Inch Layer Thickness Minimum		
Percent Lighter by Weight	Required Gradation, Percent Lighter by Weight, lbs	
	Upper Limit	Lower Limit
100	3500	1400
50	1500	700
15	700	200

2.5.7.3 Design Points

- A geotextile material shall be placed under the base of the structure.
- The stability berm shall have the same gradation as the cover layer of the main structure.
- The structure shall be placed where there is a maximum 125 ft. distance between the shoreline and the toe of the stability berm.

- Rough, angular rocks are more stable than smooth, round rocks and are recommended.

2.5.7.4 Design Assumptions

- For rock stability, design for the 90% case, a SWL at 3 ft, and a SWL at 6 ft. The SWL's were derived from stage-frequency curves formulated for ADCIRC modeling completed for USACE New Orleans District's Hurricane and Storm Damage Risk Reduction System (HSDRRS).

- For design crest elevation, design for mean higher high water and accompanying conditions.

- Design breakwater to have no overtopping for daily wave attack. The structure would be submerged during a low frequency event (the structure still will provide some wave attenuation).

- Assume that the base of the structure is at -2 NAVD 88 2004.65 for all segments except JS1 and BS2. For JS1 and BS2, assume a base elevation of -4 NAVD 88 2004.65. This may or not be the case. However, the crest elevation should be as given in the figures.

2.5.7.5 Design of Areas LS1, ES3, and BS1

2.5.7.5.1 ***Determine Structure Crest Elevation***

- Design elevation (peak crown elevation) = Design High Water (DHW) + Set-up + run-up + freeboard + SLR.
- Use Mean Higher High Water for Shell Beach Gage for DHW (in this case 1.5 ft. MLLW = 1.95 NAVD 88). The DHW was obtained from a November 2008 NOAA tidal bench mark report. The conversion to NAVD 88 was obtained from the IPET Report, Volume III.
- Set-up happens when after incoming waves break, the average level of the water surface inside the surf zone to the beach is set up higher than the sea level offshore from the breaker zone. Assume set-up = 0 because it's a sloped structure
- Run-up is the maximum vertical point on the dike face that a breaking wave travels as its energy is dissipated.
- Use a sea level rise rate of 10.24 mm/yr. Taken over a ten year design life, total sea level rise is 102.4 mm = .34 feet = 4 inches

Due to depths in Lake Borgne, the waves are shallow water waves. A wave height is needed for each segment. For the winds, an analysis where the Coastal and Hydraulics Laboratory at

Vicksburg, MS reconstructed hourly wind records from 1980 to 1999 for various stations along the Gulf coast was used. The wind rose in Figure 4 for station 142 at 29.83N 88.67W (70 miles east of Lake Borgne) shows that prevailing winds come from the north, east, and southeast. High winds however, usually come from the north. The wind field was transferred from over 70 miles offshore without any reduction for terrestrial friction and is very likely higher than what might be expected over Lake Borgne. From looking at the wind distribution graph, it is evident that the distribution of winds coming from the northeast is similar to the winds coming from the southeast. For this reason, the same winds from 359° to 89° (ES3 and LS2) were used for the winds from 90° to 179° (BS1). The 90-percentile wind speed was used for each segment.

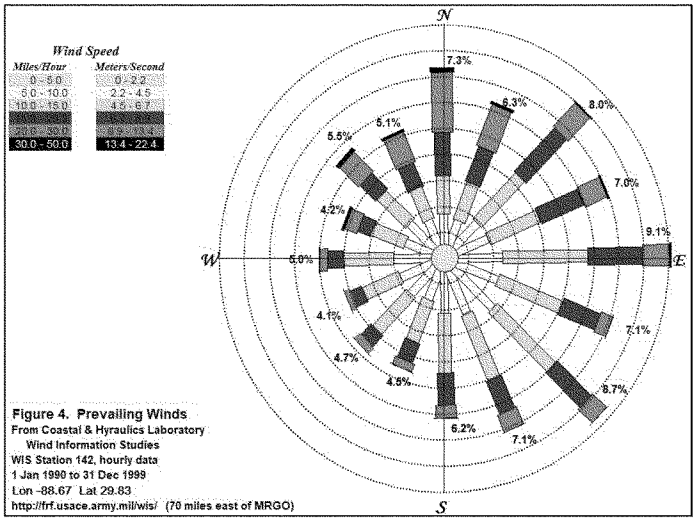


Figure 4

A 5-hour average wind speed was used because it requires about that long for waves over a 25-mile fetch to become fully developed. The hindcast maximum 5-hr wind speed was 50.8 mph from 45 degrees. The 90th percentile velocity is 21.5 mph. This 90-percentile case was adjusted to obtain the wind speed wind averaged over the length of the fetch. These windspeeds were used with the fetch distances (contained in Figure 5) in the shallow water wave prediction tables contained in SPM 1984. Table 4 depicts the windspeeds, periods, and design wave heights used for each segment. The broken wave heights were obtained using Figures 7-2 and 7-3 and Equation in SPM 1984.

Table 32 Design Period and Breaker Heights for 90-percentile case

Segment Corresponding to Section	Segments LS1, ES3	Segment BS1
90 Percentile Wind Speed mph	21.5	21.5
Duration-Averaged Windspeed mph	18.5	19.2
Wind-Stress Factor miles/hr	21.4	22.4
Fetch Length, feet	156000	103000
Depth of Fetch, feet	20	20
Design Wave Height	2.5	2.1
Design Period	3.5	3.1
Maximum Breaker Height (.4*D)	2.0	1.9

To determine crest height, the following example for Segments LS1 and ES3 are shown.

To determine run-up, use a van der Meer equation, located in the CEM 2003.

According to van der Meer (1988)

$R_u/H_S = a\xi_m$ for ξ_m < 1.5 Eq. 1

$R_u/H_S = b\xi_m^c$ *λ for ξ_m > 1.5 Eq. 2

where

R_u = Runup Level

H_S = Significant Wave Height

ξ_m = Surf similarity parameter $= \tan\alpha / \sqrt{H_s/L_m}$ Eq. 3

(where L_m is the deepwater wave length for the deepwater period, T_m and α is the structure slope)

a and *b* are defined in Table 33

λ = Reduction Factor, defined in Table 34

Table 33 Ru Exceedance Probability (%)

R_u exceedance probability (%)	*a*	*b*	*c*	*d*
0.1	1.12	1.34	0.55	2.58
2	0.96	1.17	0.46	1.97
5	0.86	1.05	0.44	1.68
10	0.77	0.94	0.42	1.45
50	0.47	0.60	0.34	0.82

Table 34 Reduction Factor

	Reduction factor (γ)
Smooth impermeable (including smooth concrete and asphalt)	1.0
1 layer of stone rubble on impermeable base	0.8
Gravel	0.7
Rock rip-rap with thickness > $2D_{50}$	0.5-0.6

Smooth impermeable rock is assumed for a reduction factor of 1.

- ξ_m = tan 17° / $\sqrt{2.0/62.7}$ [1]

  = 1.7

- R_u = (.6)(2.0)(1.7)(1) = 1.9 ft.

- Design Crest Elevation = 1.95 ft. + 1.9 ft. + .4 = **4.0 ft. NAVD 88 2004.65**

2.5.7.5.2 ***Determine Required Rock Sizes for Stability (selected size in bold)***

- Check for 90 percentile case using Hudson's Equation. Equation shown for example case

$$W_{50} = \frac{w_r H^3}{K_D (S_r - 1)^3 \cot\theta}$$

where w_r = unit weight of stone

W = Weight in pounds of median stone size

H = Design wave height of site

K_D = Stability Coefficient

θ = Angle of structure slope from horizontal

S_r = Specific gravity of stone

Using these parameters in the Hudson equation for Segments LS1 and ES3,

$$W_{50} = \frac{(155 \text{ lb/ft}^3) * (2.0 \text{ ft.})^3}{1.2\,(2.5 - 1)^3 \cot 3} = 102 \text{ lbs}$$

Table 35 Rip Rap Calculations Using Hudson Eq.

Segment Corresponding to Section	Segment LS1, ES3	Segment BS1
Design Wave Height	2.5	2.3
Maximum Breaker Height - Check (.4*D)	2.0	1.9
W_{50} lbs	102	87

- Check for SWL at 3 feet, use a wind stress factor of 1.4 times 90-percentile case and a depth of 27-feet (must be interpolated) in the shallow water wave tables in SPM 1984. Using the Hudson Equation,

Table 36 Hudson Formula-Wave Table

Segment Corresponding to Section	Segments LS1, ES3	Segment BS1
Wind-Stress Factor miles/hr	30	31.4
Fetch Length, feet	156000	103000
Design Wave Height	3.5	3

Design Period	4.2	2.8
Maximum Breaker Height – Check (.4*D)	2.5	2.3
W50	200	155

Check required size for a SWL level of 6 feet, assuming a design wind of 60 mph. Using the shallow water wave equations for a depth of 30 feet, the wind, and design sizes and weights determined for each segment are listed in Table 37.

Table 37 Rip Rap Calculations

Segment Corresponding to Section	LS1, ES3	BS1
60 mph windspeed converted to factored windspeed, mph	48.0	50.2
Wind-Stress Factor miles/hr	69.0	72.9
Fetch Length, feet	226201.0	103000
Design Wave Height	7.0	6.5
Design Period	6.0	5.5
Maximum Breaker Check (.4*D)	4.1	4.0
D_{50} (feet)	1.1	1.1
W_{50}	**200**	**200**

The D_{50} size was determined with the van der Meer equation for submerged structures.

$$h'_c / h = (2.1 + 0.1S) \exp(-0.14 N^*_s) \quad \text{Eq. 4}$$

where h'_c = Height of structure over seabed level

h = Water depth

S = Relative eroded area

N^*_s = Spectral Stability Number

For further explanation of this equation and its constituents, see Chapter VI-5 of the CEM. A spreadsheet table was made of the equation, and displayed here as Table 38, solving for the D_{50} (this is a metric table).

Table 38 Rip Rap Calculations Using van der Meer Equations

van der Meer 1991, Page VI-5-68		
Water depth	h	2.4
Relative Eroded Area	S	6.0
D50 Size	D_{50}	0.3
Deepwater Period	T	6.0
Specific Gravity		2.5
Wave Height	H	1.2
Local Wave Steepness	s_p	0.020632937
Height of structure over seabed level	h'_c	2.0

2.5.7.5.3 Determine Recommended Crest Width

The recommended crest width of the structure is dependent on the amount of allowable overtopping. Placement of rock in these locations along the shoreline will probably result in a high degree of overtopping. The Coastal Engineering Manual's equation VI-5-116 (Eq. === below) was used to calculate the crest width. The calculated crest width =

$$B = n\, k_{\Omega}(W/w_a)^{1/3}\text{, where}$$

B = Crest width

n = number of stones (n = 3 is recommended minimum)

k_{Ω} = layer coefficient from Table VI-5-51

W = primary armor unit weight

W_a = specific weight of armor unit material

Using the W_{50} of 200 lb, B = 3*1*(200 lb / 155 lb/ft^3)$^{1/3}$ = 3.2 ft., **use 4.0 ft.**

2.5.7.6 Design of Areas ES1 and ES2

2.5.7.6.1 Determine Structure Crest Elevation

- As in above, use Mean Higher High Water for Shell Beach Gage for DHW (in this case 1.5 ft. MLLW).
- Assume set-up = 0
- Use a sea level rise rate of 4 inches.

- A wave height is needed for each segment. For all segments, the NW Quadrant winds were used to determine wave heights and periods. The 90-percentile wind speed was used for each segment.

The fastest mile wind windspeed for the 90-percentile case (24.1 mph) was adjusted to obtain the wind speed wind averaged over the length of the fetch. These windspeeds were used with the fetch distances (contained in Figure 5) in the shallow water wave prediction tables contained in SPM 1984. Table 39 depicts the windspeeds, periods, and design wave heights used for each segment (assuming an average water depth of 20 feet). Using the same methodologies as used to obtain run-up for sections LS1, ES3, and BS1.

Table 39 Run-up Calculations

Segment Corresponding to Section	Segment ES1	Segment ES2
90 Percentile Wind Speed mph	24.1	24.1
Duration-Averaged Windspeed mph	20.8	21.5
Wind-Stress Factor miles/hr	24.6	20.4
Fetch Length, feet	171000	203000
Design Wave Height	2.5	2.3
Design Period	3.5	3.5
Maximum Breaker Check (.4*D)	2.0	2.0
Surf Similarity	1.7	1.7
Runup	1.9	1.9
Sea Level Rise	0.4	0.4
Design Crest, NAVD 88 2004.65	4	4

2.5.7.6.2 Determine Required Sizes for Rock Stability

- Check for 90 percentile case using Hudson's Equation.

Table 40 Rip Rap Calculations Using Hudson Equation

Segment Corresponding to Section	Segment ES1	Segment ES2
Design Wave Height	2.5	2.3
Maximum Breaker Height - Check (.4*D)	2.0	2.0
W_{50} lbs	102	102

- Check for SWL at 3 feet, use a wind stress factor of 1.4 times 90-percentile case and a depth of 17 feet (must be interpolated) in the shallow water wave tables in SPM 1984. Using the Hudson's Equation,

Table 41 Rip Rap Calculations Using Hudson Equation

Segment Corresponding to Section	Segments ES1	Segment ES2
Wind-Stress Factor miles/hr	34.4	28.6
Fetch Length, feet	171000	203000
Design Wave Height	3.7	4
Design Period	4.0	4.5
Maximum Breaker Height – Check (.4*D)	2.5	2.6

W50	**200**	**224**

-
- Check for a SWL level of 6 feet, assuming a design wind of 60 mph. Using the shallow water wave equations for a depth of 20 feet, the wind, and design sizes and weights determined for each segment are listed in Table 42 (obtained with the van der Meer equation).

Table 42 Rip Rap Calculations Using van der Meer Equation

Segment Corresponding to Section	Segment ES1	Segment ES2
60 mph windspeed converted to factored windspeed, mph	49	48.5
Wind-Stress Factor miles/hr	70.6	69.8
Fetch Length, feet	171000	203000
Design Wave Height	5.8	6
Design Period	5.3	5.5
Maximum Breaker Height – Check (.4*D)	3.9	4.0
D_{50}	1.0	1.0
W_{50}	111	111

2.5.7.6.3 Determine Recommended Crest Width

For ES1, use same crest width (4 ft) as LS1, ES3, and BS1, since the W_{50}'s are the same. For ES2, use $3*1*(224 \text{ lb} / 155 \text{ lb/ft}^3)^{1/3} = 3.39$ ft. **(use 4 ft.)**

2.5.7.7 Design of Areas JS1 and BS2

2.5.7.7.1 Determine Structure Crest Elevation

- Use Mean Higher High Water for Shell Beach Gage for DHW (in this case 1.5 ft. MLLW).
- Assume set-up = 0
- Use a sea level rise rate of 4 inches.
- Use a slope of 1:4 in order to have less runup.
- Use all fully-developed, depth-limited waves.
- R_u = (.6)(1.8)(3.2)(1) = 3.5 ft

Table 43 Run-up Calculations

Segment JS1, BS2	
Maximum Breaker Height – Check (.4*D)	3.2
T_{90} sec.	5.8
Runup	3.5

Table 43

Design Crest Elevation = 1.95 ft. + 3.5 ft. + .4 = 6.0 ft. NAVD 88 2004.65

2.5.7.7.2 Determine Required Sizes for Rock Stability (required W_{50} size in bold)

- Check for 90 percentile case using Hudson's Equation (Table 44).

Table 44 Rip Rap Calcuations Using Hudson Equation

Segment Corresponding to Section	Segment JS1, BS2
Design Wave Height	3.2
W_{50} lbs	418

- Check for a SWL level at 3 feet. Using a period of 6.0 sec, the design breaking wave from one wavelength away from structure is = 3.7 ft. The design is depicted in Table 45.

Table 45 Rip Rap Calculations Using Hudson Equation

Segment JS1, BS2	
H	3.7 ft
W_{50}	**646 lb**

- Check for a SWL level of 6 feet. Using a period of 6.4 sec, the design breaking wave from one wavelength away from structure is = 5.0 ft. Using the van der Meer equation.

Table 46 Rip Rap Calculations using van der Meer Equation

Segment JS1, BS2	
H	5.0 ft
T	6.4 sec
W_{50}	536 lb

2.5.7.7.3 Determine Recommended Crest Width

Use $3*1*(646 \text{ lb} / 155 \text{ lb/ft}^3)^{1/3}$ = 4.8ft. **(use 5 ft.)**

2.5.8 SYNOPSIS OF RELAVANT HISTORICAL STUDIES

2.5.8.1 Dortch, M. S., M. Zakakhani, M. R. Noel, S. Kim. 2007. Application of a Water Quality Model to Mississippi Sound to Evaluate Impacts of Freshwater Diversions. U.S. Army Corps of Engineers, Engineer Research and Development Center.

The study, completed under the MSCIP (Mississippi Sound Coastal Improvements Program), entails the development and application of a water quality model (WQM) of the Mississippi Sound region is an evaluation of various freshwater diversion alternatives.

The objective of this study was to develop and apply a water quality model of the Mississippi Sound and surrounding region to provide key information for a screening level evaluation and improvement alternatives for coastal restoration. The study used a previously developed, three-dimensional hydrodynamic and WQM. The model domain included a portion of Mississippi Sound to aid the Mobile District in evaluating dredging and dredge material disposal impacts resulting from channel widening and/or deepening for the Port of Gulfport, Mississippi (Bunch et al. 2005). The CH3D-Sigma model code was used for the hydrodynamic model (Chapmanet al. 1996), and the CE-QUAL-ICM (ICM) model code was used for water quality. In this original study, the domain extended from east of Mobile Bay (including Mobile Bay), south to the Chandeleur Islands, and west past the mouth of the Pearl River into eastern Lake Borgne. For the MSCIP study, the domain was extended southward beyond Chandeleur Islands and further west to include all of Lake Borgne and Lake Pontchartrain, the Inner Harbor Navigation Channel of New Orleans, and the Mississippi River Gulf Outlet channel

The following variables were activated in the model: temperature, salinity, fixed solids (inorganic suspended solids), dissolved oxygen (DO), dissolved organic carbon (DOC), Particulate Organic Carbon (POC), Ammonium (NH4) Nitrogen, Nitrate + Nitrite Nitrogen (NO3), Dissolved Organic Nitrogen (DON), Particulate Organic Nitrogen (PON), Total Phosphate or Total Inorganic Phosphorous (TIP), Dissolved Organic Phosphorus (DOP), Particulate Organic Phosphorus (POP), and Phytoplankton Carbon. For many of the rivers, assumptions were made to fill data gaps for state variables that were not available. Organic nutrients and organic carbon loads from the river are assumed to be comprised of mostly dissolved forms. Thus, TOC was assumed to be comprised of solely dissolved organic carbon (DOC), and particulate organic carbon (POC) was assumed to be zero. Similarly, total organic nitrogen (TON) was assumed to be dissolved organic nitrogen (DON), and particulate organic nitrogen (PON) was assumed to be zero. TON was computed by subtracting NH_4 from TKN. PO_4 was assumed to represent total inorganic phosphorus (TIP), the model state variable. Several other similar methods were utilized to estimate constituent loadings.

Loadings for all sources of nutrients and sediment must be specified for the model. These include loadings from inflowing rivers, atmospheric deposition, and other sources, such as local distributed runoff and major point source (e.g., wastewater discharge) loadings. Some of the riverine and atmospheric loadings had to be estimated by several methods (part of the reason that this is a screening level study). However, the majority of the data was collected and analyzed.

A partial model calibration was performed due to the limited scope of this study. Hydrodynamics from CH3D were supplied to the WQM for March through September 1998 conditions. The WQM was executed for the period April through September 1998 for calibration.

2.5.8.2 Mississippi-Louisiana Estuarine Area Study, Salinity and Circulation at or Near Bay Boudreaux in Biloxi Marshes Eastern Louisiana

This report is part of a long-term study conducted by the US Army Engineer District (USAED), New Orleans, concerning the feasibility of diverting fresh water into Lakes Pontchartrain and Borgne basins from the Mississippi River to increase fish and wildlife productivity.

2.5.8.3 EA Engineering, Science, and Technology. 2006. Proposed Reintroduction of Mississippi River Water at Violet, Louisiana. Preliminary Hydrologic Modeling to Support Environmental Benefits Estimates and Project Planning. Draft Technical Memorandum submitted to the U.S. Department of Commerce

The purpose of this study is to conduct a reconnaissance-level analysis to obtain a characterization of expected hydrologic and salinity changes in the project area. Hydrodynamic modeling of the study area was performed with the Surfacewater Modeling System (SMS). SMS is a graphical user interface that contains the U.S. Army Corps of Engineer's Waterways Experiment Station (USACE WES) two-dimensional finite-element models RMA2 (for hydrodynamics), and RMA4 (for water quality). The modeling was used to simulate tidal and diversion scenarios and to assess the resulting salinity conditions within the marsh area.

Modeling the study area was a several step process. First, the hydrodynamic model was executed to simulate the tidal and freshwater inflow conditions. This modeling was performed for multiple tidal cycles. A hydrodynamic solution file was then produced over a tidal cycle. RMA4 was then run for multiple tidal cycles to reach an equilibrium condition for the constituent of concern. For the Violet study, RMA4 was used to simulate the salinity interaction between Bayou Dupre and Bienvenue and the Mississippi River diversion at Violet.

The Violet study area was modeled for a base case scenario representing the existing siphon and for three alternative diversion scenarios. The base case scenario used a diversion flow of 200 cfs and alternative diversion flows of 1,000 cfs, 3,000 cfs, and 5,000 cfs were modeled. A mean 1.2 ft tide range was used for all scenarios. RMA4 was executed to simulate salinity within the Violet study area.

Three input salinity levels were modeled for each diversion scenario. These included mean annual level (10 ppt), mean salinity during the growing season (12.6 ppt), and maximum salinity level input during the growing season (20 ppt). At diversion rate of 200 cfs salinity levels vary from 0.5 ppt to 7.0

ppt along Violet Canal for average annual conditions. Salinity levels up to 9.0 ppt were noted at the northern marsh boundary. Under diversion of 1,000 cfs maximum salinity of 5.0 ppt was noted at the outlet of Violet Canal. Salinity levels of 9.0 ppt were still evident at northern marsh boundary. Diversion of 3,000 cfs results in 0.0 ppt salinity level along Violet Canal and a reduction to approximately 6.0 ppt at the northern marsh boundary. Salinity levels are reduced to approximately 2.0 ppt at northern boundary with diversion of 5,000 cfs.

2.5.8.4 Tate, J., A. Carrillo, R. C. Berger, and B. J. Thibodeaux. 2002. Salinity Changes in Pontchartrain Basin Estuary, Louisiana, Resulting from Mississippi River-Gulf Outlet Partial Closure Plans with Width Reduction.

This report presents the results of a numerical model investigation used to further study the average salinity changes that would occur in the Lake Pontchartrain Basin as a result of varying the level of closure of the Mississippi River- Gulf Outlet below Lake Borgne, LA.

A hydrological background is first given in the report. In the background, a comparison was made of salinities made at several locations within the Pontchartrain Basin pre-and post MRGO construction. The report then addresses the modeling effort. TABS-MDS, a three-dimensional finite-element code, was the numerical model used for this investigation. TABS-MD models three-dimensional hydrodynamics and salt transport accounting for unsteady river inflows, tides, wind effects, and density-driven circulation.

The boundary conditions (tides, freshwater inflows, wind) and initial conditions were then addressed. The base condition of a 47 ft-deep MRGO cross-section, and three combinations of depth and width closure were modeled. The proposed closure would consist of a sill across the LaLoutre Ridge in the MRGO and a section of surface width reduction at approximately the midpoint of the length of the ridge and extending for 300 ft along the ridge.

The experimental conditions were as follows:

- Base: Maximum depth in the cross section is 47 ft.
- 200-ft by -20-ft Plan: Closed to within 20-ft depth and 200-ft width.
- 160-ft by -16-ft Plan: Closed to within 16-ft depth and 160-ft width.
- 125-ft by -12-ft Plan: Closed to within 12-ft depth and 125-ft width.

The numerical model was used to calculate water-surface elevations, current velocities (three-dimensional components), and salinities at each node every 60 min for the 10-month period of simulation between January 1 and October 31. Those data were processed to provide average monthly salinity contour plots for base conditions and for each plan for April, May, September, and October.

The study concluded that the depth and width closure would produce a decrease in the salinity values at locations of interest. In general, the partial width/depth closure plans reduce salinity in Lake Pontchartrain and Lake Borgne, and their reductions are less than that of complete closure. The most severe partial closure plan (125 ft by -12 ft), as expected, produced the changes most nearly like that

of complete closure. The least severe partial closure plan had the least impact. All of the results resulting from the closure are given quantitatively in the report.

2.5.8.5 McAnally, W. H. and R. C. Berger. 1997. Salinity Changes in Pontchartrain Basin Estuary Resulting from Bonnet Carre Freshwater Diversion: Numerical Model Investigation. U.S. Army Corps of Engineers, Waterways Experiment Station.

This report entails the use of a numerical model to predict salinity changes that will occur in Lake Pontchartrain Basin estuary, Louisiana and Mississippi, as a result of proposed Mississippi River Freshwater Diversions at Bonnet Carre Spillway. A Bonnet Carre Freshwater Diversion would divert water through the existing Bonnet Carre Spillway to reduce salinities within the Lake Pontchartrain Basin. This study is of interest because it identified some target salinities as a result of the project. These salinities, called Chatry salinities in the report, were first defined in the Chatry Report (1983). They consist of a constricted band of optimum salinities and a broader band of "range limits." The optimum range represents plus or minus one standard deviation about the monthly mean observed salinities that correlated with The goal of the project is to achieve the target salinities on average every other year. The Chatry salinities were accepted by the Salinity Working Group (SWG) as the target salinities for the Ecosystem Restoration.

The Pontchartrain Basin was modeled using the TABS-MD model suite. The model grid is shown in Figure 73. The boundary conditions included were the tides at the Gulf of Mexico, freshwater inflows, and wind. Of particular note is the fact that the only freshwater inflow model was that of Pearl River. The model was used to compute instantaneous water levels, salinities, and velocities.

Four conditions were modeled for April through August of a typical year: a base condition with no diversion, a plan with freshwater diversion flow up to 20,000 cfs (called Plan RT), a plan with freshwater diversion flow up to 8,500 cfs (called Plan MPB5), and a plan with no freshwater diversion but with the connection between Lake Borgne and MRGO closed (called Plan LBC1)

.

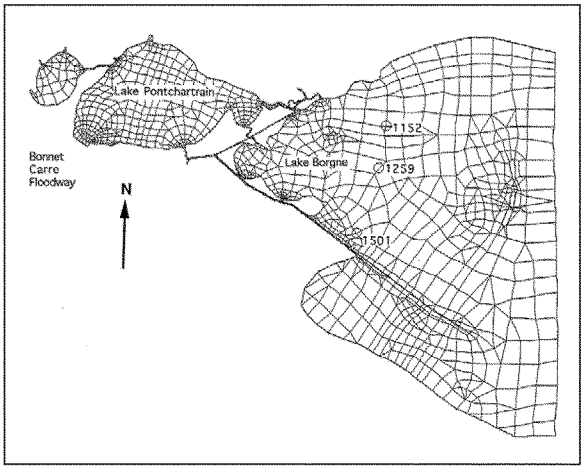


Figure 73 Model Grid

The model was verified by modeling two periods, March – July 1982 and March – May 1994, with a comparison of field data to literature. Salinity and stage were the main comparisons made in the verification. The salinity data used was gathered from the Biloxi Marsh area by the Louisiana Department of Fisheries and Wildlife.

Table 47 depicts the model output of the three plans.

Table 47 Salinity at Node 1259

Month	Base	Plan RT		Plan MPB5		Plan LCB1	
		ppt	Change, ppt	ppt	Change, ppt	ppt	Change, ppt
Apr	13.4	10.2	3.2	11.4	2	11.4	2
May	13.5	9.9	3.6	11.4	2.1	11.4	2.1
Jun	14.4	11	3.4	12.4	2	12.2	2.2
Jul	15.7	12.2	3.5	13.2	2.5	13.2	2.5
Aug	17.2	13	4.2	13.8	3.4	13.9	3.3

A regression analysis was used in order to determine salinities throughout the year and for other diversion scenarios at Node 1259. The end result was Eq 1, which is reliable for a Bonnet Carre Diversion up to 20,000 cfs and 50 percent exceedance tributary discharges.

$$S = -0.844\ Ln\ (P') - 2.68\ Ln\ (LP') + 26.4 \qquad \text{Eq. 1}$$

where:

S = Average Monthly Salinity at Node 1259

P' = Lagged, weighted, and normalized Pearl River monthly discharges

P = Lagged, weighted, and normalized Lake Pontchartrain monthly discharges

Several conclusions can be derived and from the modeling effort:

A. The Pontchartrain Basin salinities respond slowly to change. Salinities in the Biloxi Marshes showed a reduction, maximum effects, then a declining but noticeable affect at 30, 60, and 120 days, respectively.

B. It may be impossible for average monthly salinities to fall within the Chatry optimum limits for every month in any given year. The basin's slow response time and persistence of fresh water in the system may mean

C. Salinities in the target area respond nonlinearly, in that each succeeding salinity decrease requires more proportionally than the last decrease required.

D. Plan LCB1 confirms the significant role that the MRGO plays in altering salinities in the basin.

2.5.8.6 El-Sayed, Sayed Z., 1961. Hydrological and Biological Studies of the Mississippi River Gulf Outlet

The report summarizes a study conducted by the Department of Oceanography and Meteorology of the Texas Agricultural and Mechanical College under a contract entered with the Fish and Wildlife Service. The contract required the study team to establish hydrological boundaries between sub-areas and determine the interaction between these areas.

2.5.8.7 U.S. Army Corps of Engineers, Waterways Experiment Station. 1963. Effects on Lake Pontchartrain, LA., of Hurricane Surge Control Structures and Mississippi River-Gulf Outlet Channel: Hydraulic Model Investigation. Technical Report No. 2-636.

The report summarizes a model study proposed to determine the impacts on the salinity and hydraulic regimes of Lake Pontchartrain and its connecting water bodies due to New Orleans hurricane barriers. The proposed structures in the study were located in Chef Menteur Pass, the Rigolets, the Inner Harbor Navigation Canal, and the Mississippi River-Gulf Outlet. The model, which included the entire Lake Pontchartrain Basin, was equipped to reproduce and measure tides, tidal currents, salinity, freshwater inflow, etc. It was model utilized model-to-prototype ratios of 1:2000 horizontally and 1:100 vertically. Figure 74 depicts the general layout with all proposed modifications.

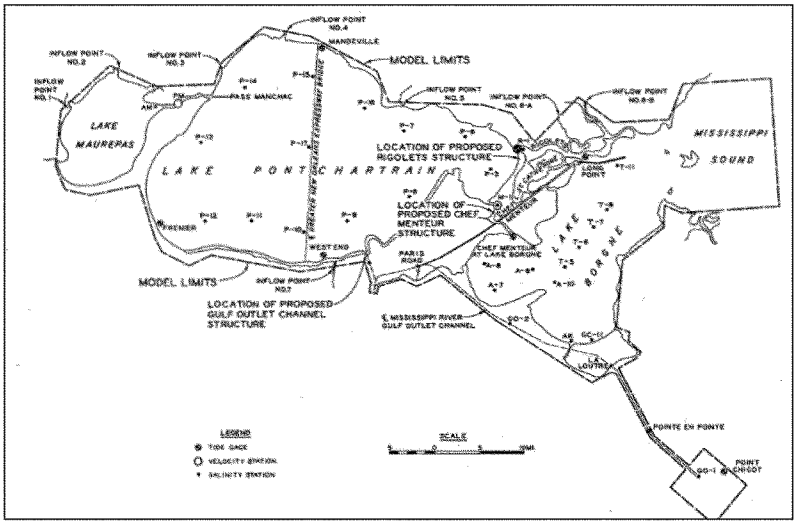


Figure 74 General Layout

The model was verified in two phases: hydraulic verification and salinity verification. Model base tests (tests of existing prototype conditions) were performed, and then tests were performed with the MRGO channel and hurricane surge barriers in place. The following conclusions were drawn from the analysis:

a. Gated structures at Chef Menteur and Rigolets Passes would cause no appreciable change in the salinity of Lake Pontchartrain, although reducing the cross-sectional areas by 25%, while raising the average water surface elevation Lake Pontchartrain by 0.1 ft and 0.4 ft, the latter being if there is a 250,000 cfs diversion flow at Bonnet Carre.

b. The MRGO channel resulted in a 5.0 ppt increase (1.1 to 6.1 ppt) in average salinities in Lake Pontchartrain for high freshwater inflow, a 5.9 ppt increase (3.2 to 9.1 ppt) for low freshwater inflow, with a 5.5 ppt average increase due to the addition of the channel. These results are all with gates in place at Chef Menteur and Rigolets Passes. Further tests indicate that the any desired degree of salinity can be obtained in Lake Pontchartrain by adding a gated structure at the entrance of the MRGO channel.

c. Operation of the Bonnet Carre Spillway at design flow with MRGO channel and gates in place raises the high-water elevation in the lake to a 1.4 ft. msl maximum.

2.5.8.8 Rounsefell, G. 1964. Preconstruction Study of the Fisheries of the Estuarine Areas Traversed by the Mississippi River-Gulf Outlet Project. Bureau of Commercial Fisheries, Louisiana Fish and Wildlife Service, Fisheries Bulletin, 63 (2): 373-393.

The report summarizes a study intended to address the biological and environmental concerns prevalent prior to the construction of the MRGO channel. Sampling stations for salinity, water temperature, dissolved oxygen, inorganic phosphates, turbidity, and currents were set up. Figure 75 depicts the project area with all sampling stations.

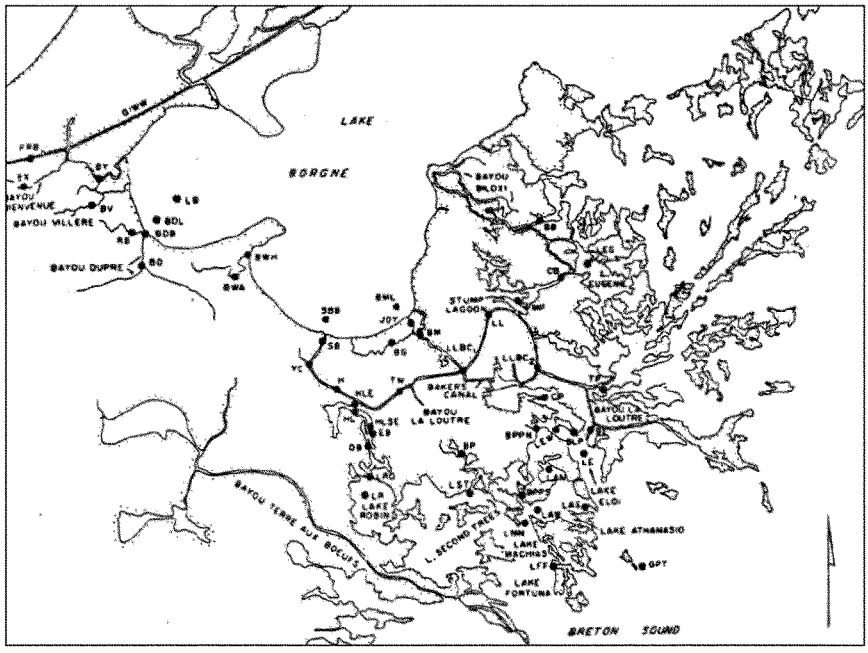


Figure 75 Sampling Stations

Table 48 depicts a summary of mean salinities for all stations.

Table 48 Mean Salinities

Station	1959					1960						1961				
	24-month average	Apr.-May	June-July	Aug.-Sept.	Oct.-Nov.	Dec.-Jan.	Feb.-Mar.	Apr.-May	June-July	Aug.-Sept.	Oct.-Nov.	Dec.-Jan.	Feb.-Mar.	Mean of two bimonthly periods		
														High	Low	Difference
BX	1.62	1.32	1.03	0.91	2.54	1.89	0.91	1.03	1.73	2.22	1.77	2.91	1.19	2.22	0.91	1.31
PBB	2.06	1.74	1.46	1.18	2.91	2.10	1.34	1.16	1.96	2.46	(2.94)	(3.70)	(1.51)	2.59	1.17	2.42
BD	2.39	2.00	1.52	1.50	2.93	2.68	1.90	1.19	2.38	4.09	3.24	3.92	1.56	4.00	1.34	2.66
BV	2.45	(1.87)	(1.43)	(1.48)	3.64	2.73	1.86	1.20	1.58	3.74	3.19	4.46	2.20	4.30	1.32	2.78
BY	2.51	1.92	1.46	1.32	3.78	2.51	1.47	1.38	2.11	3.92	3.33	4.86	1.88	4.38	1.42	2.96
BB	2.73	(2.12)	(1.62)	(1.60)	3.96	2.80	1.57	1.28	2.44	4.14	3.47	5.30	2.44	4.72	1.42	3.30
BDB	2.78	2.16	1.64	1.62	4.02	2.83	1.64	1.43	2.43	4.57	3.54	5.20	2.28	4.86	1.52	3.34
BDL	2.95	2.44	1.82	1.76	4.26	2.86	1.79	1.34	2.59	4.78	3.81	5.62	2.41	5.20	1.55	3.65
LB	3.04	(2.31)	(1.88)	(1.81)	(4.38)	2.66	1.68	1.23	2.88	5.26	3.76	5.72	2.74	5.30	1.46	4.04
BWA	3.24	2.63	2.12	2.04	4.62	3.44	2.41	1.70	2.63	4.12	(4.01)	(6.22)	(2.74)	5.52	1.87	3.65
BWH	3.26	2.53	2.09	1.97	4.99	3.58	2.60	1.54	2.54	4.35	4.04	6.26	2.76	5.82	1.76	3.86
BBB	3.77	3.60	2.81	2.65	5.68	3.84	2.64	1.92	3.40	4.86	4.06	6.29	3.68	5.96	2.18	3.80
BE	4.03	3.46	3.29	2.64	5.78	4.14	2.46	2.04	3.10	4.90	4.03	6.26	4.22	6.02	2.25	3.77
JDY	4.09	(4.74)	(3.36)	(2.37)	5.28	3.90	2.74	2.10	4.54	5.15	4.08	6.22	4.61	5.73	2.24	3.51
BML	4.13	4.94	3.22	2.47	5.54	3.93	2.60	1.90	4.66	5.25	4.14	6.44	3.95	6.24	2.16	4.08
BG	4.31	4.44	3.40	2.88	5.72	4.00	2.40	2.90	5.16	5.43	4.20	6.18	5.01	5.96	2.64	3.32
YC	4.44	5.58	3.36	2.56	5.30	4.00	2.47	3.59	6.29	5.46	4.14	6.09	5.50	6.38	2.52	3.86
BM	4.47	5.16	3.56	2.59	5.74	3.82	2.84	2.79	5.96	5.51	4.18	6.55	4.96	6.29	2.99	3.51
Hopedale	4.59	6.12	4.36	3.80	5.48	4.15	2.19	4.29	6.02	6.55	4.40	6.22	4.95	6.38	3.45	2.93
BLE	5.34															
HL	6.20	8.50	6.92	4.73	5.48	4.91	3.29	5.11	9.32	8.41	4.80	6.89	6.30	8.94	4.01	4.93
TW	6.22	8.39	4.48	4.86	5.78	5.80	4.26	5.24	10.72	6.50	4.43	6.38	5.93	9.55	4.34	5.21
HLSE	6.81															
LLBC	7.08	11.12	8.03	6.06	5.90	5.61	3.22	6.54	11.94	7.63	5.17	7.14	6.58	13.33	4.42	7.11
EB	7.21															
LL	7.17	10.64	8.73	7.70												
BB	7.24	10.20	8.15	7.86												
OB	7.35	9.98	8.34	8.69	6.94	6.10	4.75	6.62	11.32	11.94	5.70	7.37	7.80	13.18	5.22	7.96
MP	7.92	11.25	9.78	9.19												
LRO	8.32	11.08								9.88						
CB	8.69	11.58	10.34	9.80												
LR	8.82	10.66	7.04	7.95	7.94	6.98	7.90	7.46	12.96	12.24	6.97	8.75	8.94	12.60	6.98	5.62
LEG	8.90	12.10	10.98	9.18												
CP	9.85									9.96	5.69	9.82	9.06			
LLBC	9.94	14.58	12.84	8.60	8.32	8.71	5.84	8.82	15.54	9.55	(6.06)	(10.53)	(9.87)	15.06	5.96	9.10
BP	11.47	14.30	11.94	9.08	10.86	10.74	10.66	9.75	15.19	11.64	7.92	14.56	10.86	14.82	8.50	6.32
BPFN	11.61	14.27	13.86	10.38	10.28	10.20	8.96	10.60	17.48	11.50	9.04	11.66	11.74	16.96	8.06	8.88
TP	12.21	17.04	14.32	12.38	11.32	10.37	8.64	10.64	16.50	12.26	(7.48)	(12.94)	(12.36)	16.77	7.16	9.61
LST	12.22	15.10	13.56	10.64	12.19	9.30	10.62	10.40	16.22	13.45	8.56	15.57	11.02	15.90	8.93	6.97
LE	13.42	16.80	15.53	14.85	13.42	11.64	9.00	11.58	17.82	12.64	8.22	14.22	13.32	18.31	8.61	9.70
BPFS	13.90	17.22	15.76	13.43	12.90	12.38	10.90	10.80	16.68	(15.29)	(9.74)	(17.70)	(12.52)	17.89	10.27	7.62
LAW	14.02															
LAN	14.60	(13.20)	(13.62)	(13.68)	13.13	12.93	11.06	12.32	18.78	12.66	(8.66)	(15.64)	(12.59)	17.21	9.86	7.35
LMN	14.73	(19.72)	(16.94)	(14.84)	13.85	12.84	11.42	12.40	19.53	13.70	10.04	17.02	14.71	19.62	10.73	8.89
LAS	15.60	(20.60)	(17.70)	(15.50)	14.02	13.80	11.76	14.58	21.58	14.86	9.80	17.71	14.26	21.08	10.78	10.31
LFT	16.96	(22.69)	(19.49)	(17.06)	(17.18)	14.73	13.06	15.74	21.66	15.84	10.70	21.96	15.87	22.18	11.88	10.30
GPT	17.27										10.52	20.06	18.41			

There are several conclusions drawn from the observation and collection of this data. Relevant points are:

1. Large, short-term fluctuations in salinity are explicit in the bayous that form part of the water exchange route between Lake Borgne and Breton Sound.

2. Salinity levels in Lake Borgne are mainly controlled by freshwater input (of which the Pearl River discharge was used for this study) modified by winds.

3. Pearl River discharge and wind intensity require time, on the order of several weeks, to affect salinities in the western end of Lake Borgne.

2.5.8.9 Bretschneider, C. L., and J.I. Collins. 1966. Storm Surge Effects of the Mississippi River-Gulf Outlet. Study A.

This report was based on a study which determined the storm surge elevations of Hurricane Betsy at several locations along the MRGO channel and IHNC. The results were then used to predict surge levels for six synthetic hurricanes and evaluate the effects of the MRGO channel on hurricane storm surge. The storm surges were computed using the bathystrophic storm tide theory. The study area with points of interest (lettered A-F) is depicted in Figure 76.

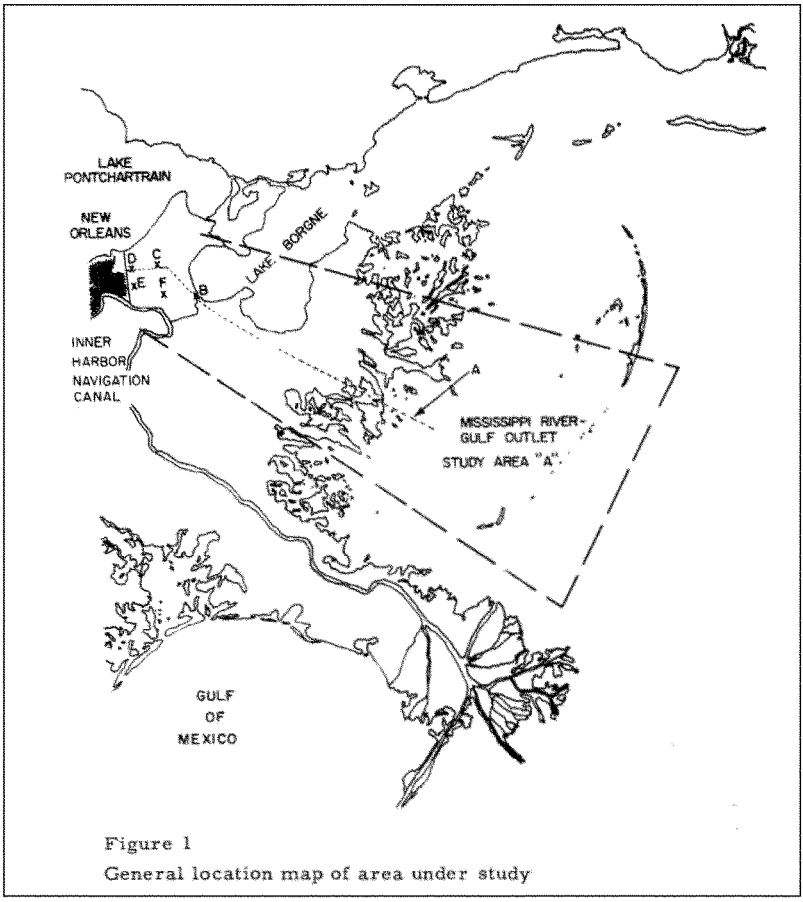


Figure 76 Study Area

The main relevant conclusion from the study is that the MRGO channel is almost negligent for all large hurricanes accompanied by slow rising storm surges. The channel would have a more relevant role in promoting surge in a storm producing a rapidly rising surge, but a storm of this type would not produce as high of a tide.

2.5.8.10 Sikora, Walter B. and B. Kjerfve. 1985. Factors Influencing the Salinity Regime of Lake Pontchartrain, Louisiana, a Shallow Coastal Lagoon: Analysis of a Long-Term Data Set. *Estuaries copyright 1985.*

The purpose of this study is to obtain an understanding of Lake Pontchartrain's salinity regime over the past three decades, to determine whether the long-term salinity has been affected by the MRGO channel, and to determine which environmental factors control the lake's salinity regime. The report first gives a detailed description of all data sets, which cover 36 years (from 1946 to 1982). The data used includes river discharges, rainfall, and salinities in the lake. Hourly salinity measurements were within 0.5m from the surface, which was acceptable since the salinities are well-mixed vertically within the water column in the lake. Because of the tidal variability, hourly (instead of daily) salinity measurements were taken with a mean salinity and root mean square deviation determined. In order to obtain freshwater inputs, correction factors were applied to the observed values since the gages were located upstream of the discharge. The report points out that the mean annual discharge of all freshwater inputs into the lake is 188 m^3 with a coefficient of determination of 184%.

The report asserts that the actual average increase in salinities in the lake was less than 2%, even though a 5% increase was expected. This increase was 2% in the eastern portion of the lake, but was substantially less in the western portion. Furthermore, it is suggested that salt water intrusion caused by the MRGO channel is short-lived. Table 49 depicts the mean salinity increases resulting from MRGO Channel construction.

Table 49 Mean Salinity Increases

	Before 1963	After 1963	Increase
Chef Menteur	3.2	5.8	2.6
Rigolets	3.8	5.8	2.0
North Side	2.6	3.9	1.3
Little Woods	3.2	4.8	1.6
Pass Manchac	1.2	1.4	0.2

There was not found to be a change in the variance in salinity pre- and post- construction. According to the study, freshwater discharge is the most important factor controlling lake salinities, the salinity signal has remained constant since the construction of the MRGO channel, and the channel is not responsible for the depletion of freshwater swamps and the retreat of lake shorelines. The study also finds that although the lake becomes fresh within a few days of opening the Bonnet Caree Spillway, long-term variations in salinity were not impacted by the spillway.

The study examines the effects of the MRGO channel on Lake Pontchartrain Basin salinities and oyster production by monitoring hydrological and biological parameters, pre- and post-construction. The study was conducted mainly by utilizing historical data and studies. The results maintain that the construction of the channel had a pronounced effect on salinities.

The report first gives a historical account of the MRGO channel, and also describes the following features of the study area: the areas considered to be affected by the channel, the historical impacts of Mississippi River alleviation regime, the tidal regime, the type of marsh, and past biological and hydrological studies completed in the study area by the Department of Wildlife and Fisheries. A list of the data sampling stations used in these studies is given in the report.

The conclusions maintain that there have been very pronounced salinity changes in the MRGO areas since the completion of the channel. In general, the report goes into detain in describing findings from historical studies. Some of the major assertions are that Fontenot and Rogillio (1971) and Rogillio (1975) reported an increase in Biloxi marsh salinities, there was a significant increase in salinity towards the northern end of the estuary, and the cypress swamp in the area between Lake Pontchartrain and Lake Maurepas was degenerated. The major cause of salinity increase was attributed to the saturation of the upper zone in the area just west of the MRGO.

2.6 BORROW PIT IMPACTS ASSESSMENT

A wave model of Lake Borgne was developed to determine the impact on wave climate due to the excavation of borrow pits proposed to be used for marsh and swamp restoration and nourishment. A summary of the results of this analysis is shown below. A detailed report of this analysis is included as Annex 2.

An unstructured SWAN model was chosen to provide high resolution wave calculations in the area of interest. For the with- and with-out borrow pit scenarios, simulations were performed for 24 wind directions, with 4 different wind speeds, and two water levels. This set of simulations is meant to provide an estimate of the impact for "normal" or "non-storm" conditions, where waves are locally generated by wind. A total of 120 simulations were performed for the with and without borrow pit scenarios. These scenarios are listed in Table 50.

Table 50 Borrow Pit Simulation Scenarios

Simulation Set	Wind Speed (mph)	24 Wind Directions (Nautical deg.)	Water Level (ft. NAVD88)	Number of Simulations
W20	20	[0:15:345]	0.92	24
W30	30	[0:15:345]	0.92	24
W40	40	[0:15:345]	0.92	24
W50	50	[0:15:345]	0.92	24
W30H	30	[0:15:345]	2.5	24

An additional ADCIRC+SWAN simulation of Hurricane Gustav was conducted to show the impact of the borrow pits for a recent high impact storm. Gustav has been chosen due to the unprecedented amount of observational data, and strong validation of the modeling. Peak water level, water velocity, significant wave height were determined for the with and without project conditions.

Very little difference in significant wave height and mean wave period was attributed to the proposed borrow pits along the Lake Borgne shoreline for the simulated "non-storm" conditions. We have calculated a 0 to 4% increase in significant wave height and a 0 to 3% increase in mean wave period along the shoreline. Within the borrow pits, there can be substantial increases: 3 to 39% increase to significant wave height and up to a 10% increase in mean wave period.

With the full-scale ADCIRC+SWAN simulation of hurricane Gustav, very little change in peak surge elevation was observed. The perturbation to the bottom bathymetry is not enough to significantly alter surge levels in the region of interest. However, the change in peak velocity surrounding the borrow pits is significant. We see a change of up to 0.7 ft/s at the Lake Borgne shoreline, which could be significant in terms of erosion and deposition patterns. The simulation of hurricane Gustav shows relatively large significant wave heights forming in Lake Borgne, at about 5.5 ft with a depth of about 18.0 ft. When we add the borrow pits and re-run the simulations, we see a relatively large increase in significant wave height within the borrow pit areas, at about 10 to 20%, or almost 1.0 ft higher. For this simulation, the larger waves that are developing within the borrow pit areas do not propagate far from the borrow pit areas, apparently due to depth limitation. The largest increase is about 0.2 ft, a 3% increase.

2.7 WATER QUALITY

An assessment of the potential water quality impacts of the proposed freshwater diversion was performed. The results of this assessment are included as Annex 3. An assessment of the existing water quality and potential impacts of the tentatively selected plan and other project alternatives is included in Sections 3.7 and 4.4 of the Environmental Impact Statement.

3.0 SURVEYS

Surveys for the shoreline protection, marsh creation, ridge restoration and diversion features have been taken for use in the design of the TSP. Existing survey information such as LIDAR and recent surveys taken for other projects in the area was also used.

Surveys for shoreline protection elements are approximately 500' in length and consist of a top of bank shot, water's edge shot, and 20' shot intervals to the required offshore distance. Periodic shots extend to the -8.0 contour (or to deepest available water) to determine the need for flotation access dredging. Surveys for marsh creation elements consist of transects along the marsh/swamp creation/restoration features in the TSP.

4.0 GEOTECHNICAL

4.1 GEOLOGY

4.1.1 Regional Geologic Setting

The geologic development of coastal Louisiana is closely related to shifting Mississippi River courses since the slowing of Holocene post-glacial sea level rise (Fisk, 1955; Frazier, 1967; and Coleman and Gagliano, 1964). The Mississippi River has changed its course several times during the last 7,000 years, leading to the development of the Mississippi River deltaic and chenier plains. The deltaic plain is composed of several major delta complexes, two of which (the Plaquemines/Modern and Atchafalaya) are still active (Fisk, 1955; Frazier, 1967; and Coleman and Gagliano, 1964). Dominant physiographic features of the deltaic plain include abandoned courses and distributaries and their associated natural levees, swamps, marsh, hundreds of lakes and bays, and barrier islands.

Recognition that the deltaic plain is formed by an orderly progression of events related to shifting Mississippi River courses led to the identification and characterization of the "delta cycle" (Scruton, 1960; Frazier, 1967). The "delta cycle" is a dynamic and cyclic process that alternates between periods of progradation and a subsequent transgression of deltaic headlands as deltas are abandoned and reworked by marine waters (Penland et al., 1988; Roberts, 1997). Throughout most of the last 7000 years the "delta cycle" has created more land by building deltas (regressive phase) than was destroyed by relative sea level rise and erosional processes (transgressive phase). Since the early 1900's man has had a major influence on many of the key elements controlling the "delta cycle". The Old River Control Structure has eliminated the delta switching process by maintaining the Mississippi River in its present course. Flood protection levees confine the flow of the Mississippi River eliminating overbank flooding and the nutrients and sediments that accompany these floods. Also, the suspended sediment load of the Mississippi River has declined by approximately 50 percent between the 1930 to 1952 period and the 1963 to 1982 period (Kesel, 1988). This decline has been attributed to bank stabilization by revetments, dams constructed on the Missouri River and other large tributaries, and other erosion control measures (Kesel, 1988).

As the natural delta-building process was restrained, relative sea level rise and erosion (transgressive processes) began to dominate the coastal landscape. Within this environment of diminished delta building, man began a period of extensive development in the coastal zone beginning in the early 1900's. Man-made alterations to the natural landscape such as dredging of navigation and access canals, construction of roads and levees within the wetlands, and drainage projects altered the natural hydrology compounding the negative effects of relative sea level rise and wetland erosion.

Coastal Louisiana is characterized by depositional environments and shoreline configurations representing various phases of the "delta cycle". Presently, most of the Louisiana coastal zone is in the marine-dominated, transgressive phase of the "delta cycle". Only the Modern and Atchafalaya Deltas are in the fluvially-dominated, regressive phase.

4.1.1.1 Geologic Setting of Study Area

The study area is part of the St. Bernard delta complex which began depositing deltaic sediments in the study area approximately 4000 years ago (Frazier, 1967). Prior to the initiation of delta growth, the entire study area was open water. Major distributaries of the St. Bernard Delta which contributed sediment to the study area were Bayous Bienvenue, LaLoutre, Sauvage, and Terre Aux Boeufs. Dominant physiographic features include Lakes Pontchartrain and Borgne, Bayous Sauvage and LaLoutre abandoned courses and their associated natural levees, the Chandeleur Island chain, swamp, marsh, and bays.

The entire St. Bernard delta is in the marine domininated/transgressive phase of the "delta cycle". During this phase, delta abandonment takes place and the processes of subsidence, erosion, and marine transgression dominate the landscape. The result is land loss, submergence, habitat change (driven mainly by elevation decrease and salinity increase), and an increase in water area. The St. Bernard delta complex has been in this marine dominated/transgressive phase since approximately 2000 years ago when the Bayou La Loutre course was abandoned, eliminating the major source of sediment for this delta (Frazier, 1967).

The surface and shallow subsurface is generally characterized by natural levee, swamp, and marsh deposits separated by abandoned distributaries. Natural levee deposits are generally characterized by medium to stiff clays and silt. Swamp and marsh deposits consist mainly of very soft clays and organic clays with peat. Natural levee, swamp, and marsh deposits are generally less than 20 feet thick. Beach deposits composed mainly of fine sand and shell are found at the surface along the Chandeleur Islands, a long arcuate-shaped barrier island chain located at the eastern boundary of the study area. Interdistributary deposits are located beneath natural levee, swamp and marsh deposits. Interdistributary deposits consist of very soft to medium clays with minor amounts of silt, shell fragments, and organics. Prodelta deposits, characterized by medium clays, underlie interdistributary deposits. Prodelta and interdistributary deposits vary widely in thickness throughout the study area, but generally thicken from west to east. Bay-sound deposits underlie the interdistributary and prodelta deposits. Bay-sound deposits are predominantly homogeneous fat clay with some lean clay and sand, with shells. Beneath the bay-sound deposits are Pleistocene deposits characterized by oxidized, stiff to very stiff clays and silty clays with areas of silty sand and sand, and concretions. Pleistocene deposits range from approximately -25 feet in elevation in Lake Maurepas to -150 feet in elevation in Chandeleur Sound.

4.1.1.2 Soils

The study area is characterized mainly by 4 soil types. The northwestern portion of the study area contains Maurepas and Barbary-Sharkey soils. Maurepas soils (Pt) are level, very poorly drained, organic soils that are mucky throughout. Barbary-Sharkey soils (OH,MH,CH,CL)are frequently flooded, clayey soils. The marshes in the central and eastern portions of the

study area generally contains Lafitte-Clovelly and Scatlake soils. Lafitte-Clovelly soils (Pt, MH, ML, CL, CH) are level, very poorly drained soils that have a thick or moderately thick, mucky surface layer and clayey underlying material, in brackish marshes. Scatlake soils (OH, MH) are level, very poorly drained soils that are clayey throughout, in saline marshes.

4.1.2 BORROW SOURCES

4.1.2.1 General

Approximately 150,350,000 cubic yards of dredged material will be required for swamp and marsh restoration features. The ridge restoration feature requires approximately 400,000 cubic yards of silty sand material.

4.1.2.2 Potential Borrow Sources

Potential borrow sources for swamp and marsh restoration features include the Mississippi River, the Inner Harbor Navigation Channel (IHNC) / Gulf Intracostal Waterway (GIWW), the former MRGO, Lake Pontchartrain, Lake Lery, Lake Borgne, Breton Sound, and offshore sources including the former MRGO offshore dredged material disposal site (ODMDS). Barges could be used to bring material from other locations in the region; however, the cost of transporting material by barge is generally much more expensive that pumping material via pipeline for a nearby source. Therefore, other sources of material from outside of the study area were not considered a practicable option due to the costs associated with obtaining, transporting, and stockpiling the needed volume of material.

4.1.2.3 Viable Borrow Sources

4.1.2.3.1 Mississippi River

The cost per unit associated with moving sediments from the river to restoration areas is significantly higher than using sediments from the nearest source. All things being equal, using river sediment for a restoration area with an average pumping distance of 20,000 feet (3.8 miles) would cost approximately 25 to 30 percent more than using material from Lake Borgne. However, all of the proposed marsh and swamp restoration features are significantly farther away from point bar deposits of river sediment than the nearest borrow source. Because dredging at depths greater than 70 feet necessitates costly modifications to dredging equipment, it is not feasible to dredge the nearest location on the river. It is possible to load dredged river sediment onto barges and transport it to a restoration site. However, this process costs at least twice as much as dredging and distributing via pipeline. Other factors influencing the feasibility of using Mississippi River sediment include considerations for laying pipe across levees and land, rather than water, and potential impacts to navigation.

Mississippi River sediment was determined to be feasible for construction of the proposed ridge restoration feature at Bayou La Loutre (BR1). Dredged material from between Miles 83 and 85 of the river would be transported approximately 52 miles via barge to this site.

4.1.2.3.2 Lake Lery

Lake Lery is in the vicinity of some of the proposed project features and could be a cost effective source of borrow. A number of other restoration plans currently under development are considering the use of Lake Lery as a borrow source. Because of the uncertainty associated with the use of Lake Lery as a borrow site in the future, Lake Lery is not considered to be the source of borrow materials for any of the TSP features.

4.1.2.3.3 Breton Sound

It is not practicable to use material from Breton Sound for TSP features because of distance.

4.1.2.3.4 GIWW/ Michoud Canal

Measure CM2 would utilize sediment from the adjacent GIWW channel between miles 66 and 60. The channel would be dredged to its authorized depth to provide material for this restoration feature. This feature would also utilize sediment from the Michoud Canal. The material needed to construct this feature would exhaust the supply from these sources for use elsewhere in the near-term.

4.1.2.3.5 MRGO ODMDS

This site is not a practicable site for marsh and swamp restoration features, because it is located over 30 miles away from the nearest restoration sites and 50 to 70 miles from other features.

4.1.2.3.6 MRGO Channel

Legally, it is unclear whether dredging the MRGO channel for non-navigation purposes is contrary to the Congressional intent. However, public preference for filling in the channel and restoring the area to historic conditions is documented in the Scoping Report for this study and numerous other public documents. The practicability and acceptability of the use of the MRGO must also be considered. The purpose of the study is to restore areas affected by the MRGO. The area that was dredged to create the channel is the most directly affected area. Dredging the channel would not restore the area to a more natural condition: it would alter conditions further. Therefore, dredging the channel would be contrary to the study purpose and is not a practicable alternative.

Degrading the MRGO spoil banks south of the Chalmette Loop Levee to marsh elevation was considered as a restoration feature that would also provide material. This alternative was rejected by the majority of the PDT, because the spoil bank provides more storm surge protection than it would as marsh.

4.1.2.3.7 Lake Pontchartrain

Lake Pontchartrain is a viable borrow source for features located on the East Orleans Landbridge. Like Lake Borgne, the portion of Lake Pontchartrain closest to these features is designated critical habitat for Gulf sturgeon. However, the sandy bottoms of Lake Pontchartrain were identified as preferred foraging habitat for this species. Therefore this borrow source was not considered further as other sources that are not preferred foraging habitat were identified closer to proposed restoration features.

4.1.2.3.8 Lake Borgne

Based on borrow borings taken at two potential borrow sites, the sediment in Lake Borgne can be characterized as primarily organic clay and clay with minor amounts of silt and fine sand. There are some concerns about the use of material dredged from the bottom of Lakes Borgne. Dredging in these areas may result in temporary adverse impacts to benthic resources, plankton, and other

marine wildlife. There are long-term concerns regarding potential impacts to Essential Fish Habitat and Gulf sturgeon critical habitat. Also, there may be unknown indirect impacts of deepening lake bottoms that have limited natural replenishment sources

4.1.2.4 Borrow from Critical Habitat

Lake Borgne water bottoms were determined to be the most cost-effective and feasible borrow source for construction of the remaining restoration features requiring sediment. To limit potential impacts to critical habitat, areas determined to have shell or hard bottoms were removed from consideration as borrow sites.

Borrow sites would be located a minimum of 3,000 feet from the Lake Borgne shoreline to minimize potential impacts to hydraulic conditions (e.g., wave climate), as well as to avoid existing oyster leases to the maximum extent practicable. Borrow material would be excavated with a hydraulic dredge and transported via pipeline to wetland creation and nourishment sites. Designated borrow areas are estimated larger than needed for each feature to ensure that adequate material is available in the event that environmental or cultural resources are discovered during construction that require avoidance. Borrow areas would be designed to minimize hypoxic (lack of dissolved oxygen) formation.

A phased implementation plan is proposed to remove borrow material from Lake Borgne. Borrow would be removed from the lake gradually over 10 implementation cycles that would allow no more than 2.5 percent of the lake bottom to be impacted during any given implementation cycle. The borrow plan limits dredging to one lobe of Lake Borgne per implementation cycle, therefore isolating increased turbidity to one lobe of the lake. As a new implementation cycle is being initiated, the borrow areas disturbed in the previous cycle for that lobe would have recovered sufficiently to support foraging and to allow benthic species to recover between implementation cycles.

To ensure that water quality is not sacrificed within Lake Borgne, MVN has included two years of water quality monitoring into the proposed action. Three test borrow pits would be constructed in implementation cycle number 1. The first pit would be constructed to 15' deep below the water surface, the second pit would be constructed to the proposed depth of 20' deep below the water surface, and a third pit would be constructed to approximately 25' deep below the water surface. After the borrow pits are constructed, monthly water quality monitoring would be used to determine if hypoxia formation was occurring within the borrow pits. Once the two years of monitoring is complete, the remaining borrow pits would be adjusted to ensure that hypoxia formation would not result within the remaining borrow pits. The MVN believes that the design of the borrow pits, coupled with the proposed water quality monitoring, would ensure that the proposed action would only temporarily impact the water quality of Lake Borgne.

4.2 GEOTECHNICAL DESIGN

4.2.1 General

Geotechnical investigations and analyses consider two distinct aspects of the MRGO Ecosystem Restoration Project, namely; the Shoreline Protection components and the Violet Diversion

components. In general, the field investigations and analyses completed for these separate components do not overlap, technically, and are discussed separately in the following paragraphs.

4.2.2 Design Reaches

Due to the vast project expanse, the project was initially divided into nine design reaches, with the Violet Diversion considered Reach 2. These reaches are shown on Figure ED-F-1 Sheet 2. These reaches were chosen based on location of existing borings, location of planned work, and sub-surface geology. Reaches 3 and 4 were added to the study after borings and CPTs were underway, therefore at this time no subsurface investigations have taken place in the area. A rock dike located between the two reaches located at Bayou Chevee and built under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) has been used in conjunction with the minimum hydraulic requirements to design the shoreline protection for Reaches 3 and 4. Further analysis determined that Reaches 5 and 6 were impractical based on costs associated with the amount of required rock. These rock dike features were replaced by three reaches of sheet pile wall along the eastern banks of the MRGO.

4.2.3 Field Investigations

4.2.3.1 Shoreline Protection Work

In conjunction with 19 historical borings, 23 undisturbed, 5-inch borings and 32 Cone Penetrometer Tests (CPTs) were completed in approximately two to three feet of water along the project shoreline as illustrated in Figure ED-F-2. Along the investigation alignments, undisturbed borings and CPT locations alternated at 2000-foot spacing and completed to sixty feet depth. Individual logs of undisturbed borings and CPT soundings are provided as Annex 4 and Annex 5, respectively. Ground surface cross sections at 1-mile intervals along the project shoreline provide topographic control.

4.2.3.2 Violet Diversion Channel

Subsurface investigations completed along the Violet Diversion alignment comprise ten 5-inch, undisturbed-type borings. The western half of the proposed Violet Diversion alignment consists of relatively large concrete structures such as concrete culverts; therefore, borings were completed to about 100-feet depth. The eastern half of the project is proposed as open channel with guide levees; therefore, borings were completed to about 60-feet depth.

This phase of geotechnical investigation was initiated in mid-April 2010 and completed in June 2010.. Analyses presented herein are based on historic borings completed in the general project area and will be reevaluated during additional studies to be done at a later date and documented in a separate report.

4.2.4 Laboratory Testing

Subsurface material collected from all undisturbed borings was submitted to a geotechnical laboratory for visual classification, index, strength and consolidation testing. All delivered samples

were visually classified at the laboratory. Visual classification logs are submitted to USACE for review and selection of specific samples for further testing. Select soil samples were identified by USACE for index testing consisting of: a) natural moisture and density; b) grain size analysis; c) Atterberg Limits; and, d) specific gravity. Select cohesive samples were assigned for strength testing, namely: a) unconfined compressive strength; and, b) unconsolidated, undrained triaxial compressive strength. Additional materials were assigned consolidation testing.

Annex 6 provides laboratory testing results and lab summary sheets, where available. Completed boring logs provided as Annex 4.

4.2.5 Geology

4.2.5.1 Shoreline Protection Geology

4.2.5.1.1 Rock Dike Section

Reaches 1, 8, and 9 are located in the eastern portion of the Mississippi River deltaic plain along the shoreline of Lake Borgne, north of the Mississippi River Gulf Outlet. This is an area of low relief averaging near sea level.

Based on subsurface boring information, the Reaches are characterized by a sequence of marsh, interdistributary, and Pleistocene deposits (see Figure ED-F-3). In addition, intradelta deposits are present in Reaches 1 and 9 and prodelta deposits are present in Reach 9. Marsh deposits generally consist of very soft to soft, organic clay with peat and lenses of silt. These deposits are approximately 10 to 15 feet thick. Interdistributary deposits underlie marsh deposits and consist of very soft to medium fat clay interbedded with occasional lenses of very soft to medium lean clay, silt, silty sand, and sand. These deposits are approximately 40 feet thick. Intradelta deposits are located within interdistributary deposits in Reaches 1 and 9. Intradelta deposits consist of silt and silty sand interbedded with occasional layers and lenses of sand and clay. Intradelta deposits are approximately 10 to 20 feet thick. Prodelta deposits underlie interdistributary deposits in Reach 9 and are composed predominantly of medium clay. Prodelta deposits were not fully penetrated by the borings, but are at least 10 feet thick. Pleistocene deposits were encountered in Reaches 1 and 8. They consist of interbedded, stiff to very stiff, oxidized, fat and lean clays, silt, silty sand, and sand. The surface of the Pleistocene deposits averages -50 feet in elevation and these deposits extend to an unknown depth.

4.2.5.1.2 Sheet Pile Wall Section

The MRGO Walls are located in the eastern portion of the Mississippi River deltaic plain along the northern shoreline of the MRGO. This is an area of low relief averaging near sea level.

Based on subsurface boring information, the Wall reach is characterized by a sequence of swamp/marsh, interdistributary, nearshore gulf, bay-sound, and Pleistocene deposits (see Figure ED-F-3). Swamp/marsh deposits generally consist of very soft to soft, organic clay with peat, wood, and lenses of silt. These deposits are approximately 15 feet thick. Interdistributary deposits underlie swamp/marsh deposits and consist of very soft to medium clays interbedded with occasional lenses

of silt, silty sand, and sand. These deposits are approximately 30 to 40 feet thick. Nearshore gulf deposits are located beneath interdistributary deposits and generally consist of silt and silty sand with shells. These deposits are approximately 5 feet thick. Bay-sound deposits are located below nearshore gulf deposits. They are approximately 15 feet thick and are composed of soft to medium clays with some silt and silty sand lenses, and shells. Pleistocene deposits underlie nearshore gulf deposits. They consist of interbedded, stiff to very stiff, oxidized, fat and lean clays, silt, silty sand, and sand. The surface of the Pleistocene deposits ranges from approximately -50 feet in elevation at the northern end of the reach to approximately -85 feet at the southern end. These deposits extend to an unknown depth.

4.2.6 Soil Design Parameters

4.2.6.1 General

Generalized soil profiles were developed for the design components based on laboratory geotechnical data specifically completed for this project, or in the absence of recent, site specific data, estimated from nearby borings. Values of soil cohesion and total unit weight assigned as material properties in the analyses are presented Figure ED-F-4. Development of material properties for the generalized soil profiles followed standard USACE procedures and guidelines.

4.2.6.2 Soil Conditions – Shoreline Protection Work

Review of completed subsurface investigations and laboratory testing reveal that all project reaches consist of very soft to medium fat clay interbedded with small silt layers to depth. Borings near the three sheet pile reaches also show isolated layers of very soft to medium fat clay interbedded with small silt layers and sand layers with large sand layers present at the bottom of all three reaches. For simplicity of design, the small silt and sand layers were excluded from the generalized soil profiles but the large sand layers remain included. Results of geotechnical investigations and laboratory testing are provided as Annex 6.

4.2.7 Stability Analyses

4.2.7.1 Shoreline Protection Work – Rock Dikes

Generalized cross-sections of the rock dike sections, suitable for wave energy dissipation, were provided by the Hydraulics Branch, MNV for evaluation with respect to slope stability. The Geotechnical Branch adjusts this generalized cross-section in order to provide an established reserve of safety with respect to slope stability. These typical sections are presented in Figure ED-F-5. Slope stability analyses were completed using the USACE Method of Planes and checked against a Spencer's method analyses. The resultant rock dike section consists of: a top elevation at 4.0-feet*, crown width of 5-feet, and side slopes of 1V:2H providing the required 1.30 factor of safety. Results of these analyses are presented in Figures ED-F-6, ED-F-8, ED-F-9, and Annex 7.

*All elevations in N.A.V.D 88

4.2.7.2 Shoreline Protection Work – Sheet Pile Walls

Slope stability of the sheet pile walls, with respect to overturning, was determined using an anchored bulkhead design option in the USACE program CWALSHT. A generalized soil profile was developed for the Reach 1 wall section and, due to the lack of site specific subsurface data, used in the stability analysis for all three sheet pile wall reaches. The results of the CWALSHT analyses are provided as Annex 8.

Topographic surveys in the area indicate a flood side elevation of -6.0-feet and a protected side elevation of 4.0-feet. The MRGO low water level of elevation -2.0-feet was used in the analyses.

Based on the estimated soils strength, surface water level and assumed construction loading conditions, the sheet pile needs to be driven to a minimum of elevation -40-feet The sheet pile wall will be further supported by a counterfeit frame with a horizontal wale bolted to vertical timber piles on the flood side and battered timber piles on the protected side. Additional pile analyses indicate the supporting timber piles need to be driven to elevation -70-feet.

4.2.7.3 Violet Diversion

Project planning to date indicates that the eastern half of the Violet Diversion channel will consist of a 375-foot bottom width open channel with guide levees between the Mississippi River levee and the 40-Arpent canal and through the Central Wetlands. Because the guide levees and channel are not directly related to flood protection, a minimum factor of safety of 1.30 was established for all water elevation (loading) conditions.

Based on hydraulic requirements and the results of slope stability analysis, the open channel between the Mississippi River levee and the 40-Arpent canal has a bottom elevation of -10.0-feet with 1V:3H side slopes ascending to the natural ground at elevation 2.0-feet for a total depth of 12-feet. Guide levees must be located a minimum of 20-feet from the channel and require 4H:1V side slopes and a maximum height of 6-feet above the ground surface. The guide levee crown width will be determined based on the amount of fill excavated from the channel.

The portion of the channel within the Central Wetlands has a bottom elevation of -11.7-feet with 1V:4H side slopes ascending to the natural ground at elevation 1.3-feet for a total depth of 13-feet. Based on the results of slope stability analysis, guide levees must be a minimum of 60-feet from the channel with 1V:3H side slopes and toe berms with 1V:4H slopes. The guide levee height above the ground surface should not exceed 6.5-feet.

Due to the remote location of the Central Wetlands portion of the proposed Violet Diversion, the guide levees will be used as haul roads during construction and require sand fill and 1,000 pounds/inch geotextile for stability. Results of these analyses are presented in Figures ED-F-7 and Annex 7.

4.2.8 Settlement

Immediate settlement of the rock dikes during construction is conservatively estimated to be 80-percent. Consolidation settlement has not been calculated at the time, but will be evaluated for the final project report.

4.2.9 Pile Foundations

4.2.9.1 Sheet Pile Wall

Based on the ease of use, relatively low cost and availability, timber piles with a 7-inch diameter tip and 12-inch diameter butt were chosen for the deep foundation components of the sheet pile wall system. Ultimate compression and tension pile capacities were developed based on nearby geotechnical borings, namely: LCAMN-2U, LCAMN-3U, LCAMN-4U, LCAMN-5U, LCAMN-10NU, LPV-145-52U, LPV-145-69U, LPV-145-70U and LPV-145-72U.

In determining pile capacities, overburden stress was limited to 3,500 psf. Soil unit weight and strength values were developed from the noted borings. Pile design soil coefficients used in developing ultimate pile capacities are presented in tables 35 and 36.

4.2.9.2 Violet Diversion

At this stage in the design process it was assumed that Violet Diversion Channel structures will be founded on 14-inch by 14-inch concrete piles. Accordingly, ultimate compression and tension pile capacities were developed based on database geotechnical borings. Three historic borings, R-85.5-LU, 1-AU-A, and LPV-145-10TU were used to develop design strengths at structure locations at the Mississippi River, 40-Arpent Canal and Mississippi River Gulf Outlet sites, respectively.

In determining pile capacities, overburden stress was limited to 3,500 psf. Soil unit weight and strength values were developed from the noted borings. Pile design soil coefficients used in developing ultimate pile capacities are presented in tables 51 and 52.

Table 51 Undrained Conditions (Q-case)

Soil Type	Friction Angle (phi)	Kc	Kt	Nc	Nq
Clay	0	1	1	9	1
Silt	15	1	0.5	12.9	4.4
Sand	30	1.25	0.7	0	22.5

Table 52 Drained Conditions (S-case)					
Soil Type	Friction Angle (phi)	Kc	Kt	Nc	Nq
Clay	23	1	0.7	0	10
Silt	28	1	0.5	0	19.5
Sand	30	1.25	0.7	0	22.5

Results of design pile load versus tip elevation are illustrated in Figure ED-F-10 and computer software output files are presented as Annex 9. At this stage of project development, a factor of safety of three should be used in determining appropriate pile lengths for both compression and tension piles.

During construction, test piles will be loaded for determining final recommended capacities and lengths for project service piles. The information presented here is preliminary and will be further refined upon completion of the site specific subsurface geotechnical investigations and further analyses.

5.0 DESIGN

5.1 MARSH CREATION/NOURISHMENT, SWAMP CREATION AND RIDGE RESTORATION

5.1.1 General

Marsh restoration involves the placement of dredged material in shallow open water areas and extensively broken marsh to raise the area to marsh elevation. Following compaction and dewatering, the area is planted with marsh vegetation. Retention dikes and/or closures may be used to contain material within the restoration area. Dredged material is allowed to overflow to nourish and consolidate existing marsh vegetation within the restoration area.

Marsh nourishment refers to the placement of a thin layer of dredged material into broken marsh. The placement of this material facilitates the recruitment and consolidation of marsh vegetation after dewatering. No plantings are associated with marsh nourishment features.

Swamp restoration involves the placement of dredged material, similar to marsh restoration described above. Swamp restoration features would have a higher elevation than marsh restoration features to support cypress trees.

Swamp nourishment is proposed for areas that are currently at marsh elevation, and consists of placing a thin layer of dredged material to nourish the area, raise elevation, and encourage the recruitment of cypress-tupelo community species.

Historically, ridges were formed as natural levees of major and minor distributary channels that diverge from larger distributaries as they trend toward the outer coast. Ridge restoration would consist of the placement of dredged material to a height suitable for upland habitat.

5.2 MARSH CREATION/NOURISHMENT

5.2.1 General

Due to the overall magnitude of the study area, funding was provided to obtain what was determined to be the minimum cross section and profile data that would be needed to reasonably scope out and quantify the work required for the numerous marsh and swamp features that were to be assessed under this study. Due to limited funds as well as time, geotechnical investigations of the marsh and swamp features, as well as the borrow pit locations, were not performed during this study phase. Instead, it was determined that these efforts would be performed during the PED phase. In the meantime, existing data would be used, as well as knowledge of the project area that had been obtained during prior O&M dredging of the MRGO, performed prior the de-authorization of the MRGO Reach 2 (reach southward from the intersection of the MRGO with the GIWW at approximate Mile 60 and in the vicinity of Michoud) in 2008.

5.2.2 Field Data and Design Assumptions

Surveys of the numerous marsh and swamp restoration and nourishment features, as well as the Bayou La Loutre ridge, were performed in 2010 and 2011. These surveys, consisting of cross sections and profiles, were used to determine the average elevations of the existing marsh and swamp, as well as the areas to be occupied by dredged fill for restoration and nourishment. In conjunction with these surveys, aerial photography was used to determine/verify the feature boundaries that had been proposed by the PDT and determine the acres and cubic yards of dredge fill that would be required to construct each feature. Profiles were taken at select locations where retention and closure features would be required in order to assure that the dredge material was retained within the feature boundaries. Perimeter retention features, consisting of earthen retention dikes, as well as earthen and vinyl sheetpile closures were estimated and quantified based off of elevations obtained from the surveys. In addition to these perimeter retention features, some project features also included the construction of internal earthen weirs which were used to maximize retention of dredge solids while also allowing for the finer sediments to flow over the weirs and nourish the adjacent marsh/wetlands. In areas where depths were determined to warrant non-earthen closures due to potential retention and constructability issues, vinyl sheetpile closures were planned, with timber piles spaced 6' to 8' along the closures also included. Dependent upon the existing depth at each closure location, an embedment depth factor of between 3 to 4 times the exposed piles was used in determining the required vinyl and timber pile lengths.

The marsh and swamp features were designed based off of the data obtained from the surveys mentioned in the above paragraph, as well as historical dredge fill elevations that were used during past maintenance dredging events along the MRGO prior to the de-authorization of Reach 2 in 2008. In the past, a maximum slurry elevation of +4.0' Mean Low Gulf (MLG) was successfully used in the creation of marsh along both the north and south banks of the MRGO channel. For this study, all survey data was referenced to NAVD88 (2004.65) datum. Thus, in order to properly quantify the cubic yards and borrow required for this study, a correlation between the old vertical datum of MLG and NAVD88 (2004.65) was required. The following was derived from information received from CEMVN's Survey Section and used to determine the relationship between MLG and NAVD88 in the MRGO - Lake Borgne area. This information was based off of gage information provided by the District's Operations Division/ Tech Support Branch which is in charge of the District's channel condition surveys.

****

a. From Ops Survey File: mi020311.raw

Gage used: 2.14
2/3/2011. MICHOUD.
Seas: Calm.
BYBIENVENUE E STAFF:
0.15 NAVD +1.21 (NAVD88 TO NGVD) +0.78 (NGVD TO MLG) = 2.14 MLG

Based off of the above, this states that at the Bayou Bienvenue Flood Gate,

0.0 MLG = -1.99' NAVD88

=> +4.0' MLG (old MRGO Slurry Elevation used for Marsh Creation) = +4.0-1.99' NAVD88

= +2.01' NAVD88; say +2.0' NAVD88

b. From Ops Survey File: am071910.raw

Gage used: 2.45
7/19/2010. MRGO SHEET 1.
Seas: Calm.
GAUGE = 2.45 MLG
Gauge =0.60(NAVD88) + 1.05(conversion) = 1.65(NGVD29) +.78(conversion) = 2.43 MLG @ IHNC LOCK

Based on the above, this states that at the IHNC,

0.0 MLG = -1.83' NAVD88

=> +4.0' MLG (old MRGO Slurry Elev used for Marsh Creation) = +4.0-1.83' NAVD88

= +2.17' NAVD88; say +2.2' NAVD88

****

In order to account for potential subsidence, as well as potential future epoch adjustments between now and construction, an elevation of +2.5' NAVD88 was used for the maximum slurry elevation for the MRGO marsh creation/restoration features, and +3.0' NAVD88 for the swamp creation/restoration features. This half-foot difference in elevation between the marsh and swamp restoration features was provided to the New Orleans District's Engineering Division by the environmental PDT for use in developing quantities.

Retention features will be required for each feature and will vary from features requiring 100% containment to others requiring partial containment. As stated earlier, retention features will consist of earthen dikes and closures, as well as non-earthen features such as vinyl sheetpile, supported with timber piles. Borrow for earthen dikes and closures will be obtained from within the area to be occupied by the dredged material, or in the case of earthen closures from within the adjacent waterway. As borings of the wetland restoration and nourishment sites were not obtained during this study phase, borrow to fill ratios varying from 2:1 to 3:1 were used in order to estimate the amount of borrow required for the earthen retention features. Also, for earthen dikes, side slopes of 1V on 3H were used, and for earthen closures 1V on 4H side slopes were used in determining the borrow quantities for these earthen features. These slopes are in line with those that could be anticipated within the MRGO area based off of the geology of the project area as well as prior dredging work performed in this area.

For project features calling for marsh nourishment, a 1' to 1.25' initial layer of fill, to consolidate to between 0.75' to 1.0', was used in determining the amount of borrow required for marsh and swamp nourishment. This is in line with criteria that had previously been approved by various

agencies and successfully implemented for marsh nourishment performed during previous O&M dredging events along the MRGO.

Also, when determining the amount of borrow (CYS) required to construct each feature, initial consolidation of the dredge fill was accounted for. This initial consolidation would occur within the first 6-12 months after pumping had ceased within the restoration sites. For the swamp and marsh creation/restoration features, 1-foot of initial dewatering/consolidation was accounted for when computing the CYS required, and ¼ to ½ foot used for the marsh and swamp nourishment features. Below are some of the factors considered in determining the amount of borrow material (CYS as well as acreage) required for each project feature.

- Average elevation within each project feature - based off of surveys
- Design fill elevations for marsh and swamp restoration and nourishment features - (previously addressed in this section)
- Cubic yards of borrow required - based off of surveys
- Average lake bottom elevation – based off of NOAA Charts
- Maximum borrow depth below lake bottom (12' except for test pits for Features LM 1 and LM 2)
- Borrow acres required, using a 2:1 Borrow to Fill ratio, and accounting for 1V on 3H side slopes
- Other sources of borrow to be used: Mississippi River, between Miles 83 and 85 along the right descending bank, and the GIWW/ MRGO Reach 1 (Miles 66 to 60) and the Michoud Canal project

It should be noted that a 2:1 borrow to fill ratio was used to determine the potential acres of borrow required within Lake Borgne. This 2:1 factor was used due to the fact that cultural surveys of the lake borrow sites have not yet been performed. These surveys will be performed during the PED phase. This ratio will account for any potential anomalies and pipelines not listed in current pipeline databases, and which would have to be avoided, as well as allowing for a (+)vertical working tolerance to assure that no dredging is performed below the specified/allowable borrow depths for each feature. Also, based upon a few isolated borings that were taken of four (4) potential borrow pits in Lake Borgne (1 pit in the northwest lobe and 3 in the southeast lobe) back in 2007 for the MRGO 3rd and 4th Supplemental work, the material consisted predominately of soft clays with some thin, isolated, interspersed layers of sands/silts. Additional borings will be required to verify the classification of the material within the borrow pits proposed within Lake Borgne.

5.2.3 Borrow

A borrow plan was developed for the TSP identifying borrow areas for each of the features. Borrow locations are shown on plate C-01 and described for each of the features in the descriptions below. Features LM 1, LM 2 and LM 4, which all call for borrow to come from Lake Borgne, will be

constructed initially. The borrow pits for each of these features will be dredged to different depths and monitored for a two (2) year period in order to determine the maximum allowable borrow depth for the remaining marsh and swamp features. Additional details on the borrow plan for Lake Borgne can be found in Section 4.1.2.4 of this appendix.

As cultural surveys, including magnetometer surveys, of the borrow sites have yet to be performed, a 2:1 borrow to fill ratio was used for this study in determining the acres of borrow that could possibly be required. This ratio also assures that the allowable borrow depth will not be exceeded. (I.e. a vertical working tolerance) It also accounts for other unknowns such as the existence of unknown anomalies (i.e. pipelines, sunken vessels, reefs, etc) that would have to be avoided. Due to these unknowns, the potential acres of borrow to be cleared within Lake Borgne are addressed in Table 53. These acreages also account for side slopes of 1V on 3H and a maximum borrow depth below the lake bottom of 12', except for features LM 1 and LM 2 where the maximum borrow depths would be approx 17' below the midline (25' below the water's surface) for LM 1 and approx 6.5' below the midline (15' below the water's surface) for LM 2.

Table 53 Potential Acres of Borrow Within Lake Borgne

FEATURE LABELS	**POTENTIAL ACRES OF BORROW FROM LAKE BORGNE** (2:1 BORROW TO FILL TO ACCOUNT FOR UNKNOWN P/L'S, CULTURAL FINDS,ETC)
LM 1	1075
LM 4	132
LM 2	860
CM 2	503
TM 1	396
TM 2	930
HM 1	469
M 5	322
M 8	385
EM 1	857
M 7	180
BM 1	1160
LM 3	669
TM 7	1306
TM 8	1066
CM 3	174
CM 4	68
EM 2	142
EM 3	438
EM 4	972

FEATURE LABELS	POTENTIAL ACRES OF BORROW FROM LAKE BORGNE (2:1 BORROW TO FILL TO ACCOUNT FOR UNKNOWN P/L'S, CULTURAL FINDS,ETC)
CC1	637
CC 2	185
CC 3	396
CC 4 SITE 2	522
CC 4 SITE 3	238
CC 4 SITE 4	78
CC 5	825
CC 6	553

5.2.4 EM 1

Feature EM 1 is a marsh creation and nourishment feature located in the New Orleans East along the south shore of Lake Pontchartrain and bounded by Chef Menteur Highway, Highway 11, Lake Pontchartrain and Chef Pass (see plate C-02).

The project will consist of converting approximately 1,175 acres of open water to marsh habitat, along with the nourishment of approximately 2830 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne, and located immediately west of the mouth of Chef Pass. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 8.1 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approx -2.0' NAVD88. The material may be transported directly to the site via pipeline, or may be placed within barges that would then be transported to the south shore adjacent to the site. The barges would then be pumped out and the material placed within marsh creation and nourishment areas. For this report, direct placement via pipeline was used for costs analysis. Access to the marsh creation and nourishment site will be via the Chef Pass, leading to the south shore of Lake Pontchartrain. The dredge material will be placed to a maximum slurry elevation of +2.5' NAVD88, and dredge effluent will be returned to canal and bayou, immediately adjacent to and west and south of the marsh creation and nourishment site, via spill box weirs.

Approximately 44,800' of earthen retention dikes will be constructed from adjacent borrow to an elevation of approx +4.5' NAVD88 and 2' of freeboard will be maintained at all times during pumping operations. The earthen dikes shall also be constructed to an approximate 5' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits.

In addition, approximately 77,000' of interior earthen weirs will be constructed in order to assist in maximizing development of the marsh creation sites. The weirs will be constructed from adjacent borrow and will be constructed to an elevation of +1.5' to +2.0' NAVD88. The weirs will be constructed to an approximate 5' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the weirs and the top of cut of the adjacent borrow pits.

In addition to the earthen dikes and weirs, it is estimated that three (3) closures, totaling approximately 3,820' in length, will be required in order to retain the dredge slurry. The closures would consist of vinyl sheet pile, sheets ranging from 30' to 40' in length, along with timber piles, ranging from 40' to 50' in length, spaced approximately 6' on center.

Surveys of the proposed restoration feature were taken in 2010 and are depicted in plan view on plate C-02. Based off of these surveys, the existing elevation within the marsh creation site is an average of approx -2.0' NAVD88 and the adjacent marsh is at approximate average elevation of +0.5 NAVD88'.

Ingress and egress to the site would be via Chef Pass, Lake Pontchartrain, Lake Borgne and the GIWW, as well as Federal, State and local highways.

5.2.5 EM 2

Feature EM 2 calls for marsh nourishment of Hog Island, located west of Hwy 90, and bounded by the Pearl River – East and West Mouth, Little Lake, and the Rigolets (see plate C-03).

The project will consist of nourishing approximately 800 acres of marsh. At the same time, approximately 295 acres of adjacent waters will be shallowed during this marsh nourishment feature which will be accomplished through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from Lake Borgne and the proposed borrow site is located immediately south of the mouth of the Rigolets. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. The material will be transported directly to the site via pipeline and placed within the marsh nourishment site. Access to the marsh nourishment site will be via the Rigolets, and both the East and West Mouth of the Pearl River. Approximately 1.3 million gross cubic yards of borrow will be required for this marsh nourishment feature. The dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing marsh not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work. Dredge effluent waters will be returned to adjacent waterways via spill box weirs that will be installed in the retention dike system.

Approximately 37,150' of earthen retention dikes will be constructed from adjacent borrow (either from within the marsh nourishment site or adjacent waterways) and 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes will also be constructed to an approximate minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the dikes and the top of cut of the adjacent borrow pits if borrow is obtained from within the site.

Surveys of the proposed restoration feature were taken in 2010 and are depicted in plan view on plate C-03. Based off of these surveys, the existing elevation of the marsh within the marsh nourishment site ranges from 0.0' to +2.0' NAVD88.

Ingress and egress to the site would be via access corridors depicted in the plan view, the GIWW, the Rigolets, West and East Mouth of Pearl River, Lake Borgne, as well as Federal, State and local highways.

5.2.6 EM 3

Feature EM 3 is a marsh creation and nourishment feature, located in the New Orleans East along the north shore of Lake Pontchartrain and west of Hwy 90 (see plates C-04 and 04A).

The project will consist of converting approximately 861 acres of open water to marsh habitat, along with the nourishment of approximately 180 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from Lake Borgne and the borrow site is located immediately south of the mouth of the Rigolets. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. The material will be transported directly to the site via pipeline and the material placed within marsh creation and nourishment areas. Access to the marsh creation and nourishment site will be via the Rigolets, leading to the north shore of Lake Pontchartrain, thence via a 300' access corridor leading from the lake shoreline to the marsh creation site. Approximately 4.1 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approx -1.75' NAVD88. The dredge material will be placed to a maximum slurry elevation of +2.5' NAVD88, and dredge effluent will be returned to Salt Bayou via spill box weirs.

Approximately 23,300' of earthen retention dikes will be constructed from adjacent borrow to an elevation of approx +4.5' NAVD88 and 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes shall also be constructed to an approximate minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits.

In addition, approximately 52,900' of interior earthen weirs will be constructed in order to assist in maximizing development of the marsh creation sites. The weirs will be constructed from adjacent borrow and will be constructed to an elevation of +1.5' to +2.0' NAVD88. The weirs will be constructed to an approximate minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the weirs and the top of cut of the adjacent borrow pits.

It is noted that the project feature area also includes three (3) areas north of Hwy 433 and located between the 37, 59, 93 and 354 acre sites. These sites have been selected for enhancement under the "HSDRRS - Lake Pontchartrain and Vicinity Mitigation, Fritchie Restoration" project and are to be avoided and not impacted at any time.

Surveys of the proposed restoration feature were taken in 2010 and are depicted in plan view on plates C-04 and 04A. Based off of these surveys, the existing elevation within the marsh creation site is an average of approx -1.75' NAVD88 and the adjacent marsh is an approximate average elevation of +0.5 NAVD88'.

Ingress and egress to the site would be via access corridors depicted in the plan view, the GIWW, Lake Borgne and the Rigolets, as well as Federal, State and local highways.

5.2.7 EM 4

Feature EM 4 is a marsh creation and nourishment feature, located in the New Orleans East along the north shore of Lake Pontchartrain and immediately east of Hwy 90 (see plates C-05 and 05A).

The project will consist of converting approximately 2,625 acres of open water to marsh habitat, along with the nourishment of approximately 1,455 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from Lake Borgne and the proposed borrow site is located immediately south of the mouth of the Rigolets. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. The material will be transported directly to the site via pipeline and the material placed within marsh creation and nourishment areas. Access to the marsh creation and nourishment site will be via the Rigolets, leading to the north shore of Lake Pontchartrain, thence via a 300' access corridor leading from the lake shoreline to the marsh creation site. Approximately 9.2 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approx -1.5' NAVD88. The dredge material will be placed to a maximum slurry elevation of +2.5' NAVD88, and dredge effluent will be returned to adjacent waterways, including the Rigolets, via spill box weirs.

Approximately 70,300' of earthen retention dikes will be constructed from adjacent borrow to an elevation of approx +4.5' NAVD88 and 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes shall also be constructed to an approximate minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits.

In addition, approximately 49,400' of interior earthen weirs will be constructed in order to assist in maximizing development of the marsh creation sites. The weirs will be constructed from adjacent borrow and will be constructed to an elevation of +1.5' to +2.0' NAVD88. The weirs will be constructed to an approximate minimum 5' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the weirs and the top of cut of the adjacent borrow pits.

Surveys of the proposed restoration feature were taken in 2010 and are depicted in plan view on plates C-05 and 05A. Based off of these surveys, the existing elevation within the marsh creation site

is an average of approx -1.5' NAVD88 and the adjacent marsh is an approximate average elevation of +0.75 NAVD88'.

Ingress and egress to the site would be via access corridors depicted in the plan view, the GIWW, Lake Borgne and the Rigolets, as well as Federal, State and local highways.

5.2.8 BM 1

Feature BM 1 calls for marsh nourishment within the Biloxi Marshes immediately adjacent to the east shoreline of Lake Borgne (see plate C-09).

The project will consist of nourishing approximately 8,000 acres of marsh. At the same time, approximately 295 acres of adjacent waters will be shallowed during this marsh creation feature which will be accomplished through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. Approximately 11 million gross cubic yards of borrow will be required for this marsh nourishment feature. The material will be borrowed from the south/east lobe of Lake Borgne, immediately west of the marsh nourishment site. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. The material will be transported directly to the site via pipeline and placed within the marsh nourishment site. Access to the marsh nourishment site will be via Lake Borgne and excavation for access to the site will not be required. The dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing marsh not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

A rear earthen weir, approximately 94,800' in length, will be constructed from adjacent borrow and essentially parallel the Lake Borgne shoreline. The weir will be constructed from adjacent borrow and will be constructed to an elevation of +1.5' to +2.0' NAVD88. The earthen weir will also be constructed to a minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the weir and the top of cut of the adjacent borrow pit.

Approximately 47,600' of earthen retention dikes will also be constructed adjacent to the Lake Borgne shoreline from adjacent borrow to an elevation of approx +3.0' to +3.5' NAVD88 and 2.0' of freeboard will be maintained at all times during pumping operations. In addition, approximately 32,800' of earthen retention dikes will also be required in order to prevent impacts to Bayou St. Malo. These dikes will be constructed from adjacent borrow to an elevation of approx +3.0' to +3.5' NAVD88 and 2.0' of freeboard will be maintained at all times during pumping operations. All earthen dikes will be constructed to an approximate minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and weirs and the top of cut of the adjacent borrow pits.

It is also noted that borrow for this feature will take place in the south/east lobe of Lake Borgne and within an area that was used as an anti-aircraft training center (AATC), located in Shell Beach, LA in the early to mid 1940's. As a result, it is possible that unexploded ordinances (UXOs) could be encountered when borrowing within the south/ east lobe of Lake Borgne. The cone defining the zone

within which these UXOs could potentially be located is depicted on the feature plate. Therefore, cutterhead dredges operating in this area will need to be equipped with approximately 2" x 2" intake screens and outfall/discharge baskets with screens small enough to catch any small munitions that might pass through the dredged prior to being deposited within the restoration area.

Surveys of the proposed restoration feature were taken in 2010 and are depicted in plan view on plate C-09. Based off of these surveys, the existing elevation within the marsh nourishment site is an average of approx +0.5' NAVD88, the average elevation at the location of the proposed Lake Borgne retention dike is approx 0.0' NAVD88, and the average elevations at the locations of the proposed Bayou St. Malo dike and rear earthen weir are approximately +0.5' NAVD88.

Ingress and egress to the site would be via access corridors depicted in the plan view, as well as the GIWW and Lake Borgne.

5.2.9 BR 1

Feature BR 1 calls for restoration of a portion of the Bayou La Loutre ridge. The area designated for ridge restoration is located immediately north of the MRGO, where Bayou La Loutre intersects the MRGO, and extends downstream along the south bank of Bayou La Loutre for a distance of approximately 17,500' (see plates C-12 and 12A).

The project will consist of restoring the ridge to an initial elevation of approximate +8.0' NAVD88 in order to achieve a desired final design elevation after consolidation of +6.0' NAVD88. The ridge would have a crown width of 25' and side slopes of 1V on 8H. While the base width of the ridge will vary with the topography, the average base width would be approximate 137', based off of an average existing ground elevation of +1.0' NAVD88 obtained from surveys taken in 2010. Surveys of the proposed restoration feature are depicted in plan view on plate C-12. A 50' access corridor along the backside would be made available for equipment necessary for hauling, moving and shaping of the material being placed at the site for restoration of the ridge.

The ridge would be constructed of silty sand which could come from the Mississippi River, the MRGO ODMDS site, or the Bonnet Carre spillway. For this report, borrow from the Mississippi River was used and borrow was figured to be obtained between river miles 83.0 and 85.0, along the right descending bank in order to minimize impacts to Mississippi River traffic. The excavated material would be loaded on barges and thence transported to the ridge restoration site via the IHNC, MRGO/GIWW, Chef Pass, Lake Borgne, Martello Channel and the MRGO downstream to Bayou La Loutre. This would be an approximate 54 mile transit (one way). This one-way transit distance is in line with the distance that would have to be transited if the material were borrowed from the MRGO ODMDS site and transported by barges through Breton Sound to Bayou La Loutre. Approximately 400, 000 cubic yards of silty sand would be required.

Access along Bayou La Loutre may require excavation. If excavation is required, excavation for floatation access would be allowed to elevation -6.0' NAVD88 by a 60' width and the permissible excavation is defined by the theoretical section depicted on the plate C-12. Material excavated for floatation would be placed within the footprint of the proposed ridge restoration work. Access to

Bayou La Loutre is available via the GIWW, Breton Sound, Lake Borgne, the MRGO, and other navigable waterways, as well as state and local highways.

5.2.10 CC 1

Feature CC 1 is a swamp restoration feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to the 40 Arpent levee and Bayou Dupre/Violet Diversion channel (see plates C-13 and C-13A).

The project will consist of restoring approximately 1,020 acres of open water to an elevation conducive to swamp creation/restoration, along with the nourishment of approximately 935 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow site is located between Bayou Bienvenue and the Bayou Dupre Cut/Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 6 million gross cubic yards of borrow will be required for this swamp restoration and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approx -0.5' NAVD88. The material will be transported directly to the swamp restoration and nourishment site via pipeline. Access for the dredge pipeline from Lake Borgne will be via Dupre Cut/Martello Channel, the MRGO channel and Bayou Dupre. The dredge material will be placed to a maximum slurry elevation of +3.0' NAVD88 within the swamp restoration area, and dredge effluent waters will be returned to either adjacent marshes for nourishment, and/or Bayou Dupre. For nourishment of the 935 acres of adjacent wetlands, dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing wetlands not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 35,700' of earthen retention dikes will be constructed from adjacent borrow and 2.0' of freeboard will be maintained at all times during pumping operations. This includes retention dikes that will be required to prevent dredged material from entering Bayou Chaperon which is considered a scenic stream and which is to not be impacted. The earthen dikes will be constructed to an elevation of +5.0' NAVD88, approximate 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes is approximately -1.0' NAVD88.

Based off of the 2010 survey data, it is estimated that three (3) closures, totaling approximately 1,345' in length, will be required in order to retain the dredge slurry. Two (2) earthen closures will be required along the west bank of Bayou Dupre and one (1) towards the northwest corner of the restoration feature and west of Bayou Chaperon. The earthen closures will be constructed from adjacent borrow and to an elevation of +5.0' NAVD88, approximate minimum 5.0' crown width, slopes no steeper than 1V on 4H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen closures and the top of cut of the adjacent borrow. Average elevation at these earthen closure sites is approximately -1.5' NAVD88.

In addition to the three (3) earthen closures, one (1) closure, consisting of vinyl sheet pile approx 30' in length, will be required at one (1) location along Bayou Dupre. The sheetpile closure be driven to an elevation of +4.0' NAVD88, will span approximately 200' and will also consist of timber piles, approximately 40' in length and spaced approximately 6' on center. Average elevation at the sheetpile closure location is approximately -1.5' NAVD88. This closure will be removed upon completion of the contract, or as soon as possible in order to assure that dredged material will not exit the restoration site.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, and Bayou Dupre, as well as Federal, State and local highways.

5.2.11 CC 2

Feature CC 2 is a swamp restoration feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to Feature CC 1, the back dike canal adjacent to the MRGO south bank disposal area, and Bayou Dupre/Violet Diversion channel (see plates C-14 and 14A).

The project will consist of restoring approximately 250 acres of open water to an elevation conducive to swamp creation/restoration, along with the nourishment of approximately 250 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow site is located north of the Dupre Cut/Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 1.7 million gross cubic yards of borrow will be required for this swamp restoration and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approx -1.25' NAVD88. The material will be transported directly to the swamp restoration and nourishment site via pipeline. Access for the dredge pipeline from Lake Borgne will be via the Dupre Cut/Martello Channel, the MRGO channel, a 300' access corridor across the south bank disposal area, the back dike canal, and a 300 access corridor leading from the back dike canal to Feature CC 2. The dredge material will be placed to a maximum slurry elevation of +3.0' NAVD88 within the swamp restoration area, and dredge effluent waters will be returned to either adjacent marshes for nourishment, and/or Bayou Dupre. For nourishment of the adjacent 250 acres of wetlands, dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing wetlands not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 11,500 of earthen retention dike will be constructed from adjacent borrow and 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes shall also be constructed to an elevation of +5.0' NAVD88, approximate 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. Based off of surveys obtained in 2010, the average elevation at the base of the retention dike is approximately -1.5' NAVD88.

In order to assist in the development of the swamp restoration site, approximately 7,300' of interior earthen weirs will be constructed. The weirs will be constructed from adjacent borrow and will be constructed to an elevation of +1.5' to +2.0' NAVD88. The earthen weirs will also be constructed to a minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the weir and the top of cut of the adjacent borrow pits. Based off of surveys obtained in 2010, the average elevation at the base of the weirs is approximately -1.25' NAVD88.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, the back dike canal, and Bayou Dupre, as well as Federal, State and local highways.

5.2.12 CC 3

Feature CC 3 is a swamp restoration feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to the 40 Arpent levee and Paris Road (see plates C-15 and 15A).

The project will consist of restoring approximately 370 acres of open water to an elevation conducive to swamp creation/restoration, along with the nourishment of approximately 790 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow site is located between Bayou Bienvenue and the Bayou Dupre Cut/Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 3.7 million gross cubic yards of borrow will be required for this swamp restoration and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approximately -2.0' NAVD88. The material will be transported directly to the swamp restoration and nourishment sites via pipeline. Access for the dredge pipeline from Lake Borgne will be via a 300' access corridor across the MRGO north bank, the MRGO channel, and a 300' access corridor leading from the MRGO and crossing the south bank disposal area, the back dike canal and Feature CM1. The dredge material will be placed to a maximum slurry elevation of +3.0' NAVD88 within the swamp restoration areas, and dredge effluent waters will be returned to either adjacent marshes for nourishment. For nourishment of the adjacent 790 acres of wetlands, dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing wetlands not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 20,400' of earthen retention dikes and 8,900' of earthen closures (6) will be constructed. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes is approximately 0.0' NAVD88 and approximately -2.0' NAVD88 at the six (6) closure locations. The earthen dikes and closures will also be constructed to an elevation of +5.0' NAVD88, approximate 5.0' crown width, slopes no steeper than 1V on 3H (for dikes) and 1V on 4H (for closures), and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. A 2.0' of freeboard will be maintained at all times during pumping operations.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, the back dike canal, and Bayou Dupre, as well as Federal, State and local highways.

5.2.13 CC 4 – Site 1

Project Description – Feature CC 4, Site 1, is a swamp restoration feature located south of the GIWW/MRGO (Reach 1) and within the Central Wetlands in Orleans Parish, LA. The project area is an open water area in the shape of a triangle, located between the IHNC and the Orleans / St Bernard Parish line, and immediately adjacent to the 40 Arpent levee and Bayou Bienvenue. (See plates C-16 and 16A)

The project will consist of restoring an area of open water, totaling approximately 400 acres in size, to an elevation conducive to swamp creation/restoration through dedicated dredging of material to be borrowed from the Mississippi River via hydraulic dredge, and transported via barges to an offloading area at approximate Mile 63.8 of the MRGO/GIWW (Reach 1) where the dredge material will then be pumped via pipeline to the restoration site. Access for the dredge pipeline from the GIWW/MRGO will be via a 300' access corridor extending across the MRGO/ GIWW south bank disposal area. The material will be borrowed from between Mississippi River Miles 84.5 AHP and 83.0 AHP along the right descending bank. Borrow will be allowed to an elevation of -70' NAVD88 and the top of cut on the landside will be no closer than 750' from the adjacent Mississippi River levee to assure stability of the levee is not jeopardized. Based off of surveys obtained in 2010, the average elevation within the restoration site is approximately -2.0' NAVD88. Approximately 2.6 million gross cubic yards of borrow will be required for this swamp restoration feature.

The dredge material will be placed to a maximum slurry elevation of +3.0' NAVD88, and dredge effluent waters will be returned to Bayou Bienvenue. At this time, as borings are currently not available, it is being assumed that the retention features will consist of earthen dikes and constructed from adjacent borrow, with a 2.0' of freeboard to be maintained at all times during pumping operations. However, it is possible that geotechnical investigations could warrant alternative types of retention features such as sheet pile. This assessment will be completed during the E&D phase of P&S preparation. Approximately 17,300' of earthen retention dikes would be required. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes is approximately 0.5' NAVD88. The earthen dikes will be constructed to an approximate elevation of +5.0' NAVD88, approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, and Bayou Bienvenue, as well as Federal, State and local highways.

5.2.14 CC 4 – Sites 2, 3 and 4

Project Description – Feature CC 4, Sites 2, 3 and 4, is a swamp restoration feature located south of the GIWW/MRGO (Reach 1) and within the Central Wetlands in Orleans and St. Bernard Parishes, LA. The project area is located between the IHNC and Paris Road, and between feature CM 2 and the 40 Arpent levee (see plates C-17 and 17A).

The project will consist of restoring three (3) areas of open water, totaling approximately 1,065 acres in size, to an elevation conducive to swamp creation/restoration through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow sites are located southwest of Chef Pass. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 7.8 million gross cubic yards of borrow will be required for this swamp restoration feature. Based off of surveys obtained in 2010, the average elevation within the restoration sites is approximately -3.0' NAVD88 (Site 2) and approximately 2.0' NAVD88 (Sites 3 and 4). The material will be transported directly to the three (3) swamp restoration sites by pipeline via Bayou Bienvenue, and/or by barges via the GIWW/ MRGO and offloaded to the restoration sites. Access for the dredge pipeline from the GIWW/MRGO will be via three (3) 300' wide access corridors extending across the MRGO south bank disposal area, as well as Feature CM 2.

The dredge material will be placed to a maximum slurry elevation of +3.0' NAVD88', and dredge effluent waters will be returned to Bayou Bienvenue and/or Feature CM 2 which is adjacent to Sites 2, 3 and 4 of Feature CC 4. Approximately 32,200' of earthen retention dikes would be required. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes is approximately -3.0' NAVD88 for Site 2, and approximately -2.0' NAVD88 for both Sites 3 and 4. At this time, as borings are currently not available; it is being assumed that all dikes will be earthen and constructed from adjacent borrow, with a 2.0' of freeboard to be maintained at all times during pumping operations. However, it is possible that geotechnical investigations could warrant alternative types of retention features such as sheet pile. This assessment will be completed during the E&D phase of P&S preparation. The earthen dikes will be constructed to an approximate elevation of +5.0' NAVD88, 5.0' crown width, and slopes no steeper than 1V on 4H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, and Bayou Bienvenue, as well as Federal, State and local highways.

5.2.15 CC 5

Project Description – Feature CC 5 is a swamp restoration feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to and east of the Bayou Dupre/Violet Diversion channel and the 40 Arpent levee (see plate C-18).

The project will consist of restoring approximately 1,120 acres of open water to an elevation conducive to swamp creation/restoration, along with the nourishment of approximately 1550 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow site is located northeast of the Bayou Dupre Cut/Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 7.8 million gross cubic yards of borrow will be required for this swamp restoration and nourishment feature. Based off of surveys obtained in 2010,

the average elevation within the restoration site is approximately -0.25' NAVD88. The material will be transported directly to the swamp restoration and nourishment site via pipeline. Access for the dredge pipeline from Lake Borgne will be via Dupre Cut/Martello Channel, the MRGO channel and south bank disposal area, as well as Bayou Dupre and the Tennessee Gas pipeline canal that crosses through the northern half Feature CC 5.

The dredge material will be placed to a maximum slurry elevation of +3.0' NAVD88, and dredge effluent waters will be returned to either adjacent marshes for nourishment, Bayou Dupre, and/or the Tennessee Gas pipeline canal. For nourishment of the adjacent 1550 acres of wetlands, dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing wetlands not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work. Approximately 20,100' of earthen retention dikes will be constructed from adjacent borrow and 2.0' of freeboard will be maintained at all times during pumping operations. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes is approximately -0.25' NAVD88. The earthen dikes will be constructed to an approximate elevation of +5.0' NAVD88, an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, and Bayou Dupre, as well as Federal, State and local highways.

5.2.16 CC 6

Project Description – Feature CC 6 is a swamp restoration feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to the back canal behind the MRGO south bank disposal area, and Bayou Dupre/Violet Diversion channel (see plate C-19).

The project will consist of the nourishment of approximately 2,568 acres of existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow site is located northeast of the Bayou Dupre Cut/Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 5.2 million gross cubic yards of borrow will be required for this swamp nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration site is approximately 0.0' NAVD88. For nourishment of these existing wetlands, dredge material will be placed to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the wetlands not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work. The material will be transported directly to the swamp restoration and nourishment site via pipeline. Access for the dredge pipeline from Lake Borgne will be via Dupre Cut/Martello Channel, the MRGO channel and south bank disposal area, Bayou Dupre, the Tennessee Gas pipeline canal that crosses through the southern half of Feature CC 6, and the back dike canal.

Approximately 28,160' of earthen retention dikes will be constructed from adjacent borrow and 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes will be constructed to an approximate elevation of +3.5' NAVD88, an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. In addition to the earthen dikes, it is estimated that five (5) earthen closures, totaling approximately 1,200' in length, will be required in order to retain the dredge slurry. The closures would be constructed to an approximate elevation of +3.5' NAVD88, an approximate 5.0' crown width, and slopes no steeper than 1V on 4H with a minimum 40' interior berm to be maintained between the toe of the closures and the top of cut of the adjacent borrow pits. The closures will be removed upon completion of the contract, or as soon as possible in order to assure that dredged material will not exit the restoration site. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes is approximately 0.5' NAVD88 and the average elevation at the five (5) closure locations is approximately -2.5' NAVD88.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, and Bayou Dupre, as well as Federal, State and local highways.

5.2.17 CM 1 and CM 5

Project Description – Features CM 1 and CM 5 are marsh creation and nourishment features located south of the GIWW/MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area for CM 1 is immediately adjacent to the back dike canal behind the MRGO south bank disposal area, Bayou Bienvenue and Paris Road (see plate C-20A). The project area for CM 5 is immediately adjacent to and north of Bayou Bienvenue, Paris Road, and Feature CM 2 (see plate C-20).

Feature CM 1 will consist of nourishing four (4) wetland areas, totaling approximately 1,240 acres in size. These four (4) areas consist of approximately 870 acres of existing marsh and approximately 370 acres of adjacent shallow water areas which will be nourished with dredged material. Feature CM 5 will consist of creating approximately 245 acres of marsh, along with the nourishment of an additional 70 acres of adjacent wetlands through dredged material. The dredge material that will be used to construct these marsh creation and nourishment features will be obtained from the GIWW/MRGO channel (Reach 1), between miles 66 and 60, as well as the Michoud Canal project which begins at approximate GIWW/MRGO mile 60 and extends east to the Michoud Canal slip. Borrow will be restricted to the currently authorized and NEPA cleared dimensions for these channels. It is currently estimated that Reach 1 of the GIWW/MRGO could provide approximately 2.6 million gross cubic yards of the estimated 2.5 million gross cubic yards of material that would be required to construct these features – approximately 1.5 million cubic yards for CM 1 and 1.0 million cubic yards for CM 5. Should additional material be required, it could come from the Michoud Canal project, or other sources such as Lake Borgne or the Mississippi River. The material would be obtained via hydraulic dredge and transported directly to the marsh creation and restoration sites via pipeline. Based off of surveys obtained in 2010, the elevation of the marsh within CM 1 ranged between 0.0 and +1.0' NAVD88 and the average elevation within CM 5 was approximately -1.0' NAVD88.

5.2.17.1 FEATURE CM 1

Disposal for Feature CM 1 will be unconfined with effluent allowed to run over adjacent wetlands for nourishment. Access for the dredge pipeline from the MRGO/ GIWW Reach 1 will be via a 300' wide access corridor that will straddle an existing aerial crossing corridor that runs through the GIWW/MRGO south bank disposal area at approx Mile 60.2, and then across Bayou Bienvenue to the restoration site. Access will also be available via the GIWW/MRGO, through the Bayou Bienvenue floodgate and down Bayou Bienvenue to the restoration site and the back dike canal.

The dredge material will be placed unconfined to a maximum slurry elevation of approximately +2.0' NAVD88 in order for the initial fill placed over the existing wetlands not to exceed 1.25' and to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work. Dredge effluent waters will be allowed to run over adjacent marsh for marsh nourishment, as well as adjacent water bodies. Approximately 27,800' of perimeter earthen retention dikes, approximately 9,200' of earthen closures, and approximately 4,870' of vinyl sheetpile closures will be constructed in order to prevent material from entering Bayou Bienvenue and the back dike canal, as well as maximize retention of material at isolated open water areas. Upon completion of the project, the vinyl sheetpile closures will be removed and the earthen closures will be gapped to allow for interchange.

The earthen and closures will be constructed from adjacent borrow, with a 2.0' of freeboard to be maintained at all times during pumping operations. The earthen dikes and closures will be constructed to +4.0' NAVD88, an approximate 5.0' crown width, slopes no steeper than 1V on 3H for earthen dikes and no steeper than 1V on 4H for the earthen closures, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and closures and the top of cut of the adjacent borrow pits. Based off of surveys obtained in 2010, the average elevation at the base of the retention dikes was approximately 0.0' NAVD88 and the average elevation at the closure locations was approximately -1.0' NAVD88.

5.2.17.2 FEATURE CM 5

Disposal for Feature CM 5 will be confined with the dredge material transported via pipeline to the proposed restoration site and placed to a maximum slurry elevation of +2.5' NAVD88. Access for the dredge pipeline from the MRGO/ GIWW Reach 1 will be via two (2) access corridors that will cross the GIWW/MRGO south bank disposal area at approximate Miles 62.9 and 61.2, as well as Bayou Bienvenue. Dredge effluent waters will be returned to Bayou Bienvenue via spill box weirs. Approximately 6,000' of earthen retention dikes would be constructed and approximately 10,000' of existing dikes will be refurbished. A minimum 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes will be constructed to +4.5' NAVD88, an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. Based off of surveys obtained in 2010, the average elevation at the base of the new retention dikes was approximately -2.0' NAVD88 and the average elevation at the locations of the dike to be refurbished was approximately +2.0' NAVD88.

Ingress and egress to the Features CM 1 and CM 5 would be via the GIWW/MRGO Reach 1, the designated access corridors crossing the GIWW/MRGO south bank disposal sites, Bayou Bienvenue, and the back dike canal, as well as Federal, State and local highways.

5.2.18 CM 2

Project Description – Feature CM 2 is a marsh creation and nourishment feature located south of the GIWW/MRGO (Reach 1) and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to Bayou Bienvenue, Paris Road, and Feature CC 4 (see plates C-21 and 21A).

The project will consist of creating marsh over approximately 795 acres, along with the nourishment of an additional 190 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and the proposed borrow site is located northeast of Bayou Bienvenue. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 4.72 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature. Based off of surveys obtained in 2010, the average elevation within the restoration site is approximately -2.0' NAVD88. The material will be transported to the marsh creation and nourishment site via pipeline. The material will be transported directly to the restoration site by pipeline via Bayou Bienvenue, and/or by barges via the GIWW/ MRGO and offloaded to the restoration sites. Access for the dredge pipeline from the GIWW/MRGO will be via two (2) access corridors extending across the MRGO south bank disposal area.

The dredge material will be placed to a maximum slurry elevation of +2.5' NAVD88 within the marsh creation site, and dredge effluent will be allowed to overflow adjacent marsh for nourishment. For nourishment of the 190 acres of adjacent wetlands, approximately 1.25' of dredge material will be placed over the existing wetlands to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 32,450' of retention features would be constructed and effluent waters will be returned to either Bayou Bienvenue via spill box weirs and/or allowed to flow into adjacent Feature CC 4 site. Approximately 20,800' of earthen retention dikes would be required along the west, north and east sides of feature CM 2. In addition, approximately 3,750' of vinyl sheetpile closures will be constructed in order to prevent material from entering Bayou Bienvenue. The rear 7,900' of the restoration site will require a closure. The rear closure would be constructed from either adjacent earthen borrow or vinyl sheetpile, approximately 30'to 35' in length, with timber piles 40'to 45' in length and with timber piles spaced 6' to 8' apart for added support.

The earthen dikes and closures will be constructed from adjacent borrow, with a 2.0' of freeboard to be maintained at all times during pumping operations. The earthen dikes and closures will be constructed to +4.5' NAVD88, an approximate 5.0' crown width, slopes no steeper than 1V on 3H for earthen dikes and no steeper than 1V on 4H for the earthen closures, all with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and closures and the top of cut of the adjacent borrow pits. The sheetpile closures would be driven to an elevation of +4.5' NAVD88. Based off of surveys obtained in 2010, the average elevation at the base of the proposed retention

dikes was approximatley -0.5' NAVD88 and the average elevation at the closure locations was approximately -2.0' NAVD88.

As the determination was made to defer any required geotechnical investigations of the restoration areas during this phase of study, final determination of what type of rear closure will be used for this feature will be performed during the next phase of design. All vinyl sheetpile closures will be removed and the earthen closures will be gapped to allow for interchange. The closures will be removed upon completion of the contract, or as soon as possible in order to assure that dredged material will not exit the restoration site.

Ingress and egress to the site would be via the GIWW/MRGO, Bayou Bienvenue, the designated access corridors, as well as Federal, State and local highways.

5.2.19 CM 3

Project Description – Feature CM 3 is a marsh creation and nourishment feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately south of the back dike canal, located behind the MRGO south bank disposal area, and adjacent to and upstream of the Bayou Dupre/Violet Diversion channel. The feature is also adjacent to project Feature CC 2 (see plate C-22 and 22A).

The project will consist of creating approximately 300 acres of marsh, along with the nourishment of approximately 215 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north lobe of Lake Borgne and the proposed borrow site is located northeast of Bayou Dupre Cut/ Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 1.6 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature. Based off of surveys obtained in 2010, the average elevation of the marsh creation site was approximately -2.0' NAVD88 and the average elevation of the adjacent marsh was approximately +0.5' NAVD88.

The material will be transported directly to the marsh creation and nourishment sites via pipeline. Disposal will be semi-confined with effluent allowed to run over adjacent wetlands. Access for the dredge pipeline from Lake Borgne will be via Bayou Dupre Cut/Martello channel, the MRGO channel, and via a 300' wide access corridor leading from the MRGO and crossing the south bank disposal area, the Bayou Dupre/ Violet Canal, and the adjacent back dike canal.

The dredge material will be placed semi-confined to a maximum slurry elevation of +2.5' NAVD88 for marsh creation and dredge effluent will be allowed to overflow adjacent marsh for nourishment. For nourishment of the 215 acres of adjacent wetlands, approximately 1.25' of dredge material will be placed over the existing wetlands to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 26,800' of earthen retention dikes, along with approximately eight (8) earthen closures totaling approximately 4,230', will be constructed. In order to assist in the development of the marsh

creation and nourishment sites, approximately 9,400' of interior earthen weirs will also be constructed. The earthen dikes and closures will be constructed to +4.5' NAVD88, an approximate 5.0' crown width, slopes no steeper than 1V on 3H for earthen dikes and no steeper than 1V on 4H for the earthen closures, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and closures and the top of cut of the adjacent borrow pits. The earthen weirs will be constructed to an approximate elevation of +1.5' to +2.0' NAVD88. Upon completion of the project, the closures along Bayou Dupre/Violet Canal and the back dike canal will be removed. In addition, approximately 2,915' of vinyl sheetpile closures will be constructed in order to prevent material from entering Bayou Dupre and the Tennessee Gas pipeline canal. Approximately 2,285' of sheetpile closures will consist of 35' length sheetpile and approximately 630' will consist of 45' sheets, with timber piles 45' and 55' in length respectively, required and spaced 6'to 8' apart for added support. The sheetpile closures would be driven to a top elevation of +4.5' NAVD88.

Based off of surveys obtained in 2010, the average elevation at the base of the proposed retention dikes was approximately 0.0' NAVD88, -1.0' NAVD88 at the weir locations and the average elevation at the earthen closure locations were approximately -2.0' NAVD88. All vinyl sheetpile closures will be removed and the earthen closures will be gapped to allow for interchange. The sheetpile closures will be removed upon completion of the contract, or as soon as possible in order to assure that dredged material will not exit the restoration site.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, the back dike canal, and Bayou Dupre, as well as Federal, State and local highways.

5.2.20 CM 4

Project Description – Feature CM 4 is a marsh nourishment feature located south of the MRGO and within the Central Wetlands in St. Bernard Parish, LA. The project area is immediately adjacent to the back canal behind the MRGO south bank disposal area, the Bayou Dupre/Violet Diversion channel, and Feature CC 6. (See plate C-23 and 23A).

The project will consist of creating and nourishing a total of approximately 226 acres of marsh through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. Of this 226 acres, approximately 97.5 acres are open water at approximate elevation -2.0' NAVD88 that will be restored to marsh, and approximately 128.5 acres of adjacent wetlands at approximate elevation 0.0' NAVD88 will be nourished. Approximately 1.25' of dredge material will be placed over the existing wetlands to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

The material will be borrowed from the north lobe of Lake Borgne and the proposed borrow site is located northeast of Bayou Dupre Cut/ Martello Channel. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Approximately 600,000 gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The material will be transported directly to the marsh creation and nourishment sites via pipeline. Disposal will be unconfined with effluent allowed to run over adjacent wetlands. Access for the

dredge pipeline from Lake Borgne will be via Bayou Dupre Cut/Martello channel, the MRGO channel, the Bayou Dupre/ Violet Canal, and the adjacent back dike canal.

The dredge material will be placed unconfined to a maximum slurry elevation of +2.5' NAVD88 within the marsh creation areas. Dredge effluent will be allowed to run over adjacent marsh for marsh nourishment with approximately 1.25' of dredge material to be placed over the existing wetlands to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 23,000' of earthen perimeter dikes will be required, along with approximately five (5) earthen closures totaling 2,470' that will be constructed in order to prevent material from entering adjacent natural and man-made waterways. Upon completion of the project, the closures will be breached to allow for interchange. Based off of surveys obtained in 2010, the average elevation at the base of the proposed retention dikes was approximately 0.0' NAVD88 and the average elevation at the earthen closure locations was approximately -1.0' NAVD88. All dikes and closures for this feature will be earthen and constructed from adjacent borrow, with a 2.0' of freeboard to be maintained at all times during pumping operations. The earthen dikes and closures will also be constructed to an elevation of +4.5' NAVD88, an approximate 5.0' crown width, slopes no steeper than 1V on 3H for the earthen dikes and no steeper than 1V on 4H for the earthen closures, all with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and closures and the top of cut of the adjacent borrow pits.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, the MRGO, Bayou Dupre, the back dike canal, as well as Federal, State and local highways.

5.2.21 HM 1

Feature HM 1 is a marsh creation and nourishment feature located in Hopedale, LA and bounded by Bayou La Loutre, Highway 624, Bayou Ysccloskey, and the MRGO (see plate C-33).

The project will consist of converting approximately 757 acres of open water to marsh habitat, along with the nourishment of approximately 973 acres of adjacent wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the south/east lobe of Lake Borgne, immediately north of the marsh creation and nourishment site. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation site was approximately -2.0' NAVD88. Approximately 4.5 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The material will be transported directly to the marsh creation and nourishment site via pipeline. Access for the dredge pipeline from Lake Borgne will be via Doulluts Canal, across the MRGO, and thence via a 200' wide access corridor across the former MRGO south bank disposal site to the marsh creation and nourishment site.

The dredge material will be placed to a maximum slurry elevation of +2.5' NAVD88 for marsh creation, and dredge effluent will be returned via spill box weirs to the adjacent back dike canal and

Portman Lagoon which both run north of and adjacent to the marsh creation and nourishment site. Dredge effluent will be allowed to run over the internal earthen weirs for nourishment of adjacent wetlands. The 973 acres outside the marsh creation area will be nourished with approximately 1.25' of dredge material placed over the existing wetlands to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 54,500' of perimeter earthen retention dikes will be constructed from adjacent borrow and 2.0' of freeboard will be maintained at all times during pumping operations. The earthen dikes will be constructed to an approximate elevation of +4.5' NAVD88, a minimum 5.0' crown width, and with slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. In addition, an interior earthen weir, approximately 17,300' in length, will be constructed around the perimeter of the 757 acre marsh creation site in order to assist in maximizing the construction of these wetlands. The weir will be constructed from adjacent borrow and will be constructed to an elevation of +3.0' to 3.5'. The weirs will be constructed to an elevation of between +1.5' and +2.0' NAVD88, a minimum 5.0' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the weir and the top of cut of the adjacent borrow pits. Based off of surveys obtained in 2010, the average elevation at the base of the new retention dikes was approximately -0.5' NAVD88 and the average elevation at the locations of the weir approximately 0.0' NAVD88.

Ingress and egress to the site would be via the GIWW, Chef Pass, Lake Borgne, Doulluts Canal, and the MRGO, as well as Federal, State and local highways.

5.2.22 TM 1

Project Description – Feature TM 1 is a marsh creation and nourishment feature located south of the MRGO and within St. Bernard Parish, LA. The project area is located in the vicinity of Yscloskey, LA and south of LA 46 and between Bayou Terre Aux Boeufs and the Tennessee Gas twin pipeline canals (see plate C-34).

The project will consist of creating approximately 798 acres of marsh within two (2) proposed marsh creation sites, along with the nourishment of an additional 223 acres of existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the south/east lobe of Lake Borgne and immediately northeast of Bayou Yscloskey. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation site was approximately -2.0' NAVD88. Approximately 3.8 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The material will be transported directly to the marsh creation and nourishment sites via pipeline. Access for dredge pipeline from Lake Borgne shall be via Bayou Yscloskey, thence crossing the MRGO channel and leading to a 200' wide access corridor across the MRGO south bank disposal site immediately adjacent to and upstream of the Tennessee Gas twin pipeline canal, and thence via a 450' wide access corridor (which includes the twin pipeline canal) leading to the marsh restoration site.

The dredge material will be placed semi-confined to a maximum slurry elevation of +2.5' NAVD88 within the marsh creation sites, and dredge effluent will be allowed to run over the rear earthen weirs for nourishment of adjacent wetlands. The 223 acres adjacent to the two (2) marsh creation sites and defining the northern boundary of feature TM 1 will be nourished with approximately 1.25' of dredge material placed over the existing wetlands to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 18,000' of perimeter earthen retention dikes will be required, along with approximately three (3) vinyl sheetpile closures totaling approximately 2,930'. In order to assist in the development of the marsh creation and nourishment sites, approximately 17,300' of rear earthen weirs will be constructed at the marsh creation sites and approximately 21,500' of perimeter earthen weirs will be constructed at the 223 acre marsh nourishment site. The earthen dikes and weirs will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and weirs and the top of cut of the adjacent borrow pits. The earthen dikes will be constructed to an elevation of +4.5' NAVD88 and the weirs will be constructed to an approximate elevation of +1.5' to +2.0' NAVD88. Two (2) feet of freeboard will be maintained at all times along the earthen dikes during pumping operations. Approximately 2,630' of vinyl sheetpile closure would be required at the south end of the western marsh creation site. This closure would consist of vinyl sheet pile, approximately 35' in length, along with timber piles, approximately 45' in length and spaced 6' on center for added support. Another closure would be required along the east side of the eastern marsh creation site and would consist of vinyl sheet pile, approximately 40' in length, along with timber piles, approximately 50' in length and spaced 6' on center for added support. The sheetpile closures would be driven to a top elevation of +4.5' NAVD88. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes was approximately -1.5' NAVD88, approximately -2.0' NAVD88 at the rear weir locations, approximately +0.5' NAVD88 at the location of the weirs for the marsh nourishment site, and average elevation of -1.0' and -5.0' NAVD88 at the western and eastern closure locations, respectively. Upon completion of the project, the closures will be removed.

It is also noted that borrow for this feature will take place in the south/east lobe of Lake Borgne and within an area that was used as an anti-aircraft training center (AATC), located in Shell Beach, LA in the early to mid 1940's. As a result, it is possible that unexploded ordinances (UXOs) could be encountered when borrowing within the south/ east lobe of Lake Borgne. The cone defining the zone within which these UXOs could potentially be located is depicted on the feature plate. Therefore, cutterhead dredges operating in this area will need to be equipped with approximate 2" x 2" intake screens and outfall/discharge baskets with screens small enough to catch any small munitions that might pass through the dredged prior to being deposited within the restoration area.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, the designated access corridor crossing the MRGO south bank disposal site, the Tennessee Gas pipeline canal, Bayou Terre Aux Boeufs, as well as Federal, State and local highways.

5.2.23 TM 2

Project Description – Feature TM 2 is a marsh creation and nourishment feature located south of the MRGO and within St. Bernard Parish, LA. The project area is located in the vicinity of Alluvial City, LA, south of Bayou La Loutre, and between Lake Ameda and the Tennessee Gas twin pipeline canals. (See plate C-34)

The project will consist of creating approximately 770 acres of marsh, along with the nourishment of an approximately 3,396 acres of existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the south/east lobe of Lake Borgne and immediately north of Bayou Yscloskey. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation site was approximately -3.0' NAVD88. Approximately 8.8 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The material will be transported directly to the marsh creation and nourishment sites via pipeline. Access for dredge pipeline from Lake Borgne shall be via the Bayou Yscloskey, across the MRGO channel, and along Bayous Yscloskey and La Loutre south of the MRGO and leading to the marsh restoration site.

The dredge material will be placed semi-confined within the marsh creation site to a maximum slurry elevation of +2.5' NAVD88, and dredge effluent allowed running over the internal earthen weir for nourishment of adjacent wetlands. A total of approximately 3,396 acres be nourished with approximately 1.25' of dredge material placed over the existing wetlands, as well as within adjacent water bodies, to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work. Spill box weirs will be installed in the retentions dikes and the effluent waters will be allowed to run over adjacent marsh for marsh nourishment, as well as the twin pipeline canal.

At this time, it is anticipated that all retention features for this project feature will be earthen. Approximately 163,200' of perimeter earthen retention dikes will be required, along with approximately 25,350' of internal earthen weirs that will be required for the 770 acre marsh creation site. Two (2) feet of freeboard will be maintained at all times along the perimeter dikes during pumping operations. The earthen dikes and weirs will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and weirs and the top of cut of the adjacent borrow pits. The earthen dikes will be constructed to an elevation of +4.5' NAVD88 and the weirs will be constructed to an approximate elevation of +1.5' to +2.0' NAVD88. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes was approximately 0.25' NAVD88, and approximately 0.0' NAVD88 at the rear weir location.

It is also noted that borrow for this feature will take place in the south/east lobe of Lake Borgne and within an area that was used as an anti-aircraft training center (AATC), located in Shell Beach, LA in the early to mid 40's. As a result, it is possible that unexploded ordinances (UXOs) could be encountered when borrowing within the south/ east lobe of Lake Borgne. The cone defining the zone within which these UXOs could potentially be located is depicted on the feature plate. Therefore,

cutterhead dredges operating in this area will need to be equipped with approximate 2" x 2" intake screens and outfall/discharge baskets with screens small enough to catch any small munitions that might pass through the dredged prior to being deposited within the restoration area.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, Bayous Yscloskey and Bayou La Loutre, as well as Federal, State and local highways.

5.2.24 TM 7

Feature TM 7 is a marsh creation and nourishment feature located south of the MRGO and within St. Bernard Parish, LA. The project area is located in the vicinity of Delacroix Island and bounded by Feature TM 1 on the north, Feature TM 8 on the south, Bayou Terre Aux Boeufs on the west, and the Tennessee Gas twin pipeline canals on the east. (See plates C-36 and 36A).

The project will consist of creating and nourishment of approximately 2,255 acres of wetlands within seven (7) proposed marsh creation sites, along with the nourishment of approximately 2,144 acres of adjacent existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the south/east lobe of Lake Borgne and immediately northeast of Bayou Yscloskey. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation site was approximately -2.5' NAVD88. A total of approximately 12.4 million gross cubic yards of borrow will be required for this marsh creation and marsh nourishment feature.

Access for dredge pipeline from Lake Borgne shall be via either Fort Bayou and/or Bayou Yscloskey, thence crossing the MRGO channel and leading to a 200' wide access corridor across the MRGO south bank disposal site immediately adjacent to and upstream of the Tennessee Gas twin pipeline canal, and thence for approximately 3 miles via a 450' wide access corridor (which includes the twin pipeline canal) leading to the marsh restoration sites.

The dredge material will be placed semi-confined within the marsh creation sites to a maximum slurry elevation of +2.5' NAVD88 and the dredge effluent discharged towards adjacent wetlands at select locations where gaps and/or spill box weirs will be installed in the retention dike system. Two (2) feet of freeboard will be maintained at all times during pumping operations. In addition, approximately 2,214 acres of adjacent wetlands will be nourished with approximately 1.25' of dredge material placed over these existing wetlands, as well as within existing water bodies, to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 105,000' of perimeter earthen retention dikes and closures will be required, along with approximately five (5) vinyl sheetpile closures totaling approximately 10,275'. The earthen dikes and closures will be constructed to an elevation of +4.5' NAVD88, an approximate 5.0' crown width, and slopes no steeper than 1V on 3H for the dikes and 1V on 4H for the closures, all with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. The sheetpile closures would consist of vinyl sheet pile, approximately 35' in length, along with timber piles, approximately 45' in length and spaced 6' on center for added support. Based off of surveys obtained in 2010, the average elevation at the base of the earthen

retention dikes was approximately +0.25' NAVD88 and approximately -3.0' NAVD88 at the closure locations. Upon completion of the project, the closures will be removed.

It is also noted that borrow for this feature will take place in the south/east lobe of Lake Borgne and within an area that was used as an anti-aircraft training center (AATC), located in Shell Beach, LA in the early to mid 1940's. As a result, it is possible that unexploded ordinances (UXOs) could be encountered when borrowing within the south/ east lobe of Lake Borgne. The cone defining the zone within which these UXOs could potentially be located is depicted on the feature plate. Therefore, cutterhead dredges operating in this area will need to be equipped with approximate 2" x 2" intake screens and outfall/discharge baskets with screens small enough to catch any small munitions that might pass through the dredged prior to being deposited within the restoration area.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, the designated access corridor crossing the MRGO south bank disposal site, the Tennessee Gas pipeline canal, Bayou Terre Aux Boeufs, as well as Federal, State and local highways.

5.2.25 TM 8

Project Description – Feature TM 8 is a marsh creation feature located south of the MRGO and within St. Bernard Parish, LA. The project area is located in the vicinity of Delacroix Island and northeast of Bayou Terre Aux Boeufs, and west of the Tennessee Gas twin pipeline canals. (See plates C-37 and 37A).

The project will consist of creating approximately 1,511 acres of marsh within five (5) proposed marsh creation sites through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the south/east lobe of Lake Borgne and immediately north of Bayou Yscloskey. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation sites was approximately -3.0' NAVD88. Approximately 9.7 million gross cubic yards of borrow will be required for this marsh creation feature.

Access for dredge pipeline from Lake Borgne shall be via either Fort Bayou and/or Bayou Yscloskey, thence crossing the MRGO channel and leading to a 200' wide access corridor across the MRGO south bank disposal site immediately adjacent to and upstream of the Tennessee Gas twin pipeline canal, and thence for approximately 3 miles via a 450' wide access corridor (which includes the twin pipeline canal) leading to the marsh restoration sites.

The dredge material will be placed semi-confined to a maximum slurry elevation of +2.5' NAVD88 and dredge effluent waters will be allowed to run over earthen weirs and upon adjacent marsh for marsh nourishment, as well as adjacent water bodies. Approximately 63,900' of perimeter earthen retention dikes will be required, along with approximately five (5) earthen closures totaling approximately 6,970'. In order to assist in the development of the marsh creation and nourishment sites, approximately 14,700' of earthen weirs will be constructed at the marsh creation sites. The earthen dikes and weirs will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of

the earthen dikes and weirs and the top of cut of the adjacent borrow pits. The earthen closures will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 4H with a minimum 40' interior berm to be maintained between the inside toe of the earthen closures and the top of cut of the adjacent borrow pits. The earthen dikes and closures will be constructed to an elevation of +4.5' NAVD88 and the weirs will be constructed to an approximate elevation of +1.5' to +2.0' NAVD88. Two (2) feet of freeboard will be maintained at all times along the earthen dikes during pumping operations. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes was approximately +0.5' NAVD88, approximately 0.0' NAVD88 at the weir locations, and approximately -1.75' NAVD88 at the closure locations. Upon completion of the project, the earthen closures will either be degraded or gapped to allow for interchange.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, the designated access corridor crossing the MRGO south bank disposal site, the Tennessee Gas pipeline canal, Bayou Terre Aux Boeufs, as well as Federal, State and local highways.

5.2.26 LM 1

Project Description – Feature LM 1 is a marsh creation and nourishment feature located just inside the IHNC surge barrier, at the confluence of the MRGO and the GIWW, and within Orleans and St. Bernard Parishes, LA. (See plate C-38)

The project will consist of creating approximately 3,253 acres of marsh, along with the nourishment of approximately 1,064 acres of adjacent existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and immediately southwest of Chef Pass. Borrow within the lake will be limited to a maximum of 17' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation sites was approximately -2.25' NAVD88. Approximately 14.3 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature. The material would be obtained via hydraulic dredge and transported directly to the marsh creation and nourishment sites via pipeline.

Disposal within the marsh creation sites will be semi-confined with effluent allowed to run over adjacent wetlands for nourishment. Access for the dredge pipeline from Lake Borgne will be via the access corridor depicted on plate C-38, Bayou Bienvenue and through the northern Bayou Bienvenue floodgate which is currently under construction.

The dredge material will be placed semi-confined within the marsh creation sites to a maximum slurry elevation of +2.5' NAVD88, and dredge effluent waters will be allowed to run over adjacent marsh for marsh nourishment, as well as adjacent water bodies. Approximately 103,700' of perimeter earthen retention dikes will be required, along with approximately nine (9) vinyl sheetpile closures totaling approximately 10,050' in length. In order to assist in the development of the marsh creation sites, approximately 93,700' of interior earthen weirs will also be constructed. The earthen dikes and weirs will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and weirs and the top of cut of the adjacent borrow pits. The earthen dikes will be constructed to an elevation

of +4.5' NAVD88 and the weirs will be constructed to an approximate elevation of +1.5' to +2.0' NAVD88. Two (2) feet of freeboard will be maintained at all times along the earthen dikes during pumping operations. The closures will consist of vinyl sheet pile, approximately 40' in length, along with timber piles, approximately 50' in length and spaced 6' on center for added support. The sheetpile closures would be driven to a top elevation of +4.5' NAVD88. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes was approximately +0.5' NAVD88, approximately -1.0' NAVD88 at the weir locations, and approximately -5.5' NAVD88 at the closure locations. Upon completion of the project, the closures will be removed.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, and Bayou Bienvenue, as well as Federal, State and local highways.

5.2.27 LM 2

Project Description – Feature LM 2 is a marsh creation and nourishment feature located north of the MRGO and within St. Bernard Parish, LA. The project area is located between the MRGO and Proctor Point and adjacent to both the north and south lobes of Lake Borgne (see plate C-39).

The project will consist of creating approximately 225 acres of marsh immediately the north/west lobe of Lake Borgne, south of Proctor Point, and behind proposed Feature LS 1, along with the nourishment of an approximately 2,523 acres of existing wetlands through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne, southwest of Proctor Point and adjacent to the proposed restoration feature. Borrow within the lake will be limited to a maximum of 6.5' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation site was approximately -2.0' NAVD88. Approximately 4.45 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The material would be obtained via hydraulic dredge and transported directly to the marsh creation and nourishment sites via pipeline. Disposal within the marsh creation site located south of Proctor Point will be semi-confined with an earthen weir constructed on the backside of the marsh creation site. Dredge effluent will allowed to flow over the weir run over adjacent wetlands for nourishment. Material placed within the marsh nourishment sites will be unconfined with effluent waters allowed to run over adjacent wetlands.

Access for the dredge pipeline from Lake Borgne will be via the access corridors depicted on plate C-39. Excavation for flotation access will not be required. Based upon preliminary lake bottom classification surveys, an area of hard bottom surface, which is conducive to sturgeon habitat, falls within the northern portion of Lake Borgne and between the proposed borrow site and Lake Borgne shoreline. As excavation for flotation access will not be performed, marsh buggy access will simply be allowed within the area(s) where the proposed access corridor(s) cross the hard bottom substrate area(s) in order to access the marsh creation sites.

The dredge material will be placed semi-confined within the marsh creation site to a maximum slurry elevation of +2.5' NAVD88. In order to assist in the development of the marsh creation site, a rear

earthen weir, approximately 11,500' in length, will be constructed around the marsh creation site and dredge effluent waters will be allowed to run over the weir and upon adjacent marsh, as well as adjacent water bodies, for marsh nourishment. The earthen weir will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen weirs and the top of cut of the adjacent borrow pit. The interior earthen weirs will be constructed to an approximate elevation of between +1.5' and +2.0' NAVD88. In order to prevent material from entering the north and south lobes of earthen Lake Borgne, approximately 49,200' of perimeter retention dikes will be constructed along the Lake Borgne shoreline. The earthen dikes will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the dikes and the top of cut of the adjacent borrow pit. The dikes will be constructed to an approximate elevation of between +4.5' NAVD88. In addition to the dikes and weir, sheetpile closures may be required within three (3) bayous on the northwest shoreline of the south/east lobe of Lake Borgne. The closures, approximately 600' in total length, will consist of vinyl sheet pile, varying from 20' to 40' in length, along with timber piles, varying from 30' to 50' in length and spaced 6' on center for added support. The sheetpile closures would be driven to a minimum top elevation of +2.5' NAVD88. Upon completion of the project, the closures will be removed. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes and weir was approximately +0.5' NAVD88, and approximately -6.0' NAVD88 at the closure locations. Access to the closure locations will be via Lake Borgne and it is possible that some floatation dredging may be required to access these three (3) sites. It is estimated that three (3) access channels might be required, each approximately 800' in length and 70' in width. The material from these access channels will be side cast adjacent to the channels and the access channels backfilled with any remaining stockpile materials upon completion of the work.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, and Lake Borgne, as well as Federal, State and local highways.

5.2.28 LM 3

Project Description – Feature LM 3 is a marsh creation and nourishment feature located along the south shore of the south/east lobe of Lake Borgne, and bounded by the MRGO, Lena Lagoon and Bayou St. Malo, and located St. Bernard Parishes, LA (see plate C-40).

The project will consist of creating approximately 911 acres of marsh, along with the nourishment of approximately 950 acres of adjacent existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the south/east lobe of Lake Borgne and adjacent to the proposed restoration feature. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation sites was approximately -2.0' NAVD88. Approximately 6.4 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The dredge material will be placed to a maximum slurry elevation of +2.5' NAVD88 within the areas targeted for marsh creation and approximately 1.25' of dredge material will be placed over existing

wetlands within the areas designated for marsh nourishment in order to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Access for the dredge pipeline from Lake Borgne will be via the access corridors depicted on plate C-40. Excavation for flotation access will not be required. Based upon preliminary lake bottom classification surveys, an area of hard bottom surface, which is conducive to sturgeon habitat, falls within the portion of Lake Borgne between the proposed borrow site and Lake Borgne shoreline. As excavation for flotation access will not be performed, marsh buggy access will simply be allowed within the areas where the proposed access corridors cross the hard bottom substrate areas in order to access the marsh creation and nourishment sites.

Approximately 49,000' of perimeter earthen retention dikes will be required, along with approximately 40,300' of earthen weirs that will be constructed within the marsh creation sites. The earthen dikes and weirs will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and weirs and the top of cut of the adjacent borrow pits. The earthen dikes will be constructed to an elevation of +4.5' NAVD88 and the weirs will be constructed to an approximate elevation of +1.5' to +2.0' NAVD88. Two (2) feet of freeboard will be maintained at all times along the earthen dikes during pumping operations. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes and weirs was approximately +0.5' NAVD88.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, and Lake Borgne, as well as Federal, State and local highways.

5.2.29 LM 4

Project Description – Feature LM 4 is a marsh creation and nourishment feature located just inside the IHNC surge barrier, at the confluence of the MRGO and the GIWW, and within Orleans and St. Bernard Parishes, LA (see plates C-41 and 41A).

The project will consist of creating approximately 226 acres of marsh, along with the nourishment of approximately 55 acres of adjacent existing wetlands, through dedicated dredging of material to be borrowed from Lake Borgne via hydraulic dredge. The material will be borrowed from the north/west lobe of Lake Borgne and east of the mouth of Bayou Bienvenue. Borrow within the lake will be limited to a maximum of 12' below the lake bottom and at no time will borrow be allowed beyond this maximum depth. Based off of surveys obtained in 2010, the average elevation within the marsh creation sites was approximately -1.5' NAVD88. Approximately 1.2 million gross cubic yards of borrow will be required for this marsh creation and nourishment feature.

The material would be obtained via hydraulic dredge and transported directly to the marsh creation and nourishment sites via pipeline and/or barges. Disposal within the marsh creation sites will be semi-confined with effluent allowed to run over earthen weirs and upon adjacent wetlands for nourishment.

Access for the dredge pipeline from Lake Borgne will be via Bayou Bienvenue. Excavation for flotation access will not be required. Based upon preliminary lake bottom classification surveys, an area of hard bottom surface, which is conducive to sturgeon habitat, falls within the portion of Lake Borgne between the proposed borrow site and the mouth of Bayou Bienvenue. As excavation for flotation access will not be performed, marsh buggy access will simply be allowed within the areas where the proposed access corridors cross the hard bottom substrate areas in order to access the marsh creation and nourishment sites.

The dredge material will be placed semi-confined within the marsh creation sites to a maximum slurry elevation of +2.5' NAVD88, and dredge effluent waters will be allowed to run over adjacent marsh for marsh nourishment, as well as adjacent water bodies. Approximately 1.25' of dredge material will be placed over existing wetlands within the areas designated for marsh nourishment in order to allow for the fill to consolidate to approximately 0.75' to 1.0' following completion of the work.

Approximately 24,000' of perimeter earthen retention dikes will be required and 2.0' of freeboard shall be maintained at all times during pumping operations. In order to assist in the development of the marsh creation sites, approximately 3,200' of earthen weirs will also be constructed around the marsh creation sites. The earthen retention dikes and weirs will be constructed to an approximate 5.0' crown width, and slopes no steeper than 1V on 3H with a minimum 40' interior berm to be maintained between the inside toe of the retention dikes and earthen weirs and the top of cut of the adjacent borrow pits. The earthen dikes will be constructed to an approximate elevation of +4.5' NAVD88 and the earthen weirs will be constructed to an elevation of between +1.5' and +2.0' NAVD88. In addition to the dikes and weirs, a sheetpile closure, totaling approximately 800' in length, will also be required along the north side of the western marsh creation site. The closure will consist of vinyl sheet pile, approximately 35' to 40' lengths, with timber piles 45' to 50' in length and spaced 6' on center for added support. The sheetpile closures would be driven to +4.5' NAVD88. Upon completion of the project, the closure will be removed. Based off of surveys obtained in 2010, the average elevation at the base of the earthen retention dikes and weir was approximately +0.5' NAVD88, and approximately -3.0' NAVD88 at the closure location.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, and Bayou Bienvenue, as well as Federal, State and local highways.

5.2.30 Planting

All marsh and swamp creation features have a planting plan associated with them. Details of this plan can be found in Appendix M to the EIS.

5.3 SHORELINE PROTECTION

5.3.1 Lake Shoreline Protection

Several different feature alternatives are proposed in the restoration of the project area, including shoreline protection to stabilize existing bank lines to promote plant growth, limit shoreline erosion, reduce bankline recession and interior marsh loss, and provide general stability to the existing topography.

Preliminary alternative analysis and screening to develop a tentatively selected plan maintained five (5) shoreline protection features in the final array of alternatives, and one (1) oyster reef demonstration feature. These shoreline protection features are described in the following pages. Specifically, two (2) features are located in Lake Pontchartrain (ES1 & ES2), three (3) features are located in Lake Borgne (ES3, LS1, & BS1), and the final oyster reef demonstration feature was located in Breton Sound; north of the inshore terminus of the MRGO north jetty.

The Lake Pontchartrain features assist in protecting existing infrastructure, and the existing land bridge between the Lakes Pontchartrain and Catherine. The Lake Borgne features will minimize shoreline erosion and provide protection to existing marsh habitat. Historic shoreline erosion rates cited in this report were obtained from the "Shoreline Change Rates of Lake Borgne", contributors: Zganjar, Westphal, McCarty, Bridges, and Penland. The Breton Sound features will be constructed as breakwater features, protecting the interior land features from wind driven waves out of Breton Sound. All completed structures will provide viable habitat and protection for various aquatic species.

Preliminary hydraulic analysis was performed to provide minimal foreshore criteria such as stone size, dike crown width and height. These designs were advanced with completion of minimal site specific hydrographic/topographic surveys and analysis of geotechnical considerations. Dike alignment was determined, based on water depths and bankline profile at the proposed placement site. Due to ongoing bankline recession and nearshore erosion, final design will require comprehensive surveys at each specific site to be taken during the PED phase. All Lake Borgne and Lake Pontchartrain shoreline protection features will be constructed using the following stone proposed stone gradation:

Stone (Weight in Pounds)	Percent Finer by Weight
1500-600	100
650-300	50
330-100	15

Stone meeting the requirements of this construction effort has been produced from multiple (previously approved) sources and used extensively for shoreline protection efforts throughout the District. A list of approved stone sources is updated periodically and includes quarries providing limestone, sandstone, gneiss, granite, dolomite, and basalt. Because of the proximity of the project site to the Mississippi River, we find most of our stone supplies (limestone and sandstone) come from Missouri, Kentucky, Arkansas, and Illinois; all having direct barge loading and shipping via the Mississippi River.

In general, all stone shall be a hard, durable material free from cracks, seams and other defects. Neither the width nor thickness of any piece shall be less than one third of its length. The faces of individual pieces of stone shall be roughly angular, not rounded in shape. Stone that weighs less than 155 pounds per cubic foot or has more than 2 percent absorption will not be accepted.

Differing alternative designs were contemplated for the shoreline protection features. Rubble mound structures, in addition to providing shoreline protection: (1) afford habitat for various species, (2)

afford continued access between the lake and the marsh for many species, and (3) afford recreational fishing opportunities, (4) afford continued protection even after some settlement or failures occur and (5) provide run-up considerations to dampen wave energy. In addition, these project areas are prone to seasonal hurricanes and tropical storms. Whereas the rubble mounds will simply be submerged during these potentially high-tidal storm events, the vertical wall and floating breakwater solutions are subject to significant forces and potential failure/maintenance during these events. Although relatively poor soil conditions result in concerns for stone dike settlement and increased construction quantities, alternative vertical wall (concrete panels, steel/vinyl sheetpile, timber pile walls) were eliminated from consideration for various reasons. Vertical wall construction on these long stretches of shoreline protection would greatly minimize water interaction and access for wildlife between the lake and the marsh. The proposed rock structures allow continued water interchange and the side slopes accommodate access by wildlife. In addition the vertical wall construction would result in 100% wave refraction in this shallow water region, likely resulting in scour at the wall toe along the structure. Vertical construction alternatives such as concrete and sheetpile walls were eliminated for multiple reasons with two main concerns being: (1) for the fairly long lengths of proposed shoreline protection, these walls would deter "critter" access from the lake to the marsh, which is not a desirable feature in environmental mitigation. (2) Vertical walls result in basically 100% wave diffraction, which could result in undesired scour on the unprotected side in these proposed shallow water depths. Floating structures such as the concrete or tire devices, in addition to "appearance" on these environmental mitigation efforts, will (1) limit access to the bankline for recreational/fishing vessels, (2) be prone to vandalism and anchor fatigue, (3) result in specific maintenance requirements inherited by the local sponsor, which may not be as forgiving as stone structures. Displaced or detached units would likely require immediate maintenance response. Successful stone foreshore dike projects have been successfully completed in the project area. These existing project designs will be referenced and modeled/altered as necessary to achieve success. An alternative design will be considered during the PED phase for the worst areas of settlement to incorporate a lightweight core section into the dike design to minimize settlement and construction quantities.

Multiple rock placement efforts to provide shoreline protection in the project area have been completed and/or currently under construction. Anticipated rock quantity contingencies present in the report are based on actual placement efforts realized in these previous contracts.

- CWPPRA, PO-32 Contract called for foreshore construction of approximately 3.5 miles of Lake Borgne shoreline south of proposed feature BS-1. Work was completed in 2008. Geotechnical analysis recommended using an anticipated settlement rate of 75% in estimating contract quantities. The actual settlement rate based on final contract quantities was approximately 25%. A major under run was realized in the contract quantity. Based upon recent site visits, this reach of foreshore rock protection remains fairly stable.

- Lake Borgne Shoreline Protection, Bayou Bienvenue Reach contract calls for foreshore construction of approximately 2.6 miles of Lake Borgne shoreline. Geotechnical analysis recommended using an anticipated settlement rate of 60% in estimating contract quantities. The actual settlement rate based on ongoing construction (approximately 50% complete) is currently running at approximately 45%.

- Lake Borgne Shoreline Protection, Bayou Dupre Reach contract calls for foreshore construction of approximately 3.3 miles of Lake Borgne shoreline. (The proposed feature LS-1 falls between this Bayou Dupre Reach and the previously mentioned Bayou Bienvenue Reach on the south shore of Lake Borgne.) Geotechnical analysis recommended using an anticipated settlement rate of 40% in estimating contract quantities. The actual settlement rate based on ongoing construction (approximately 45 to 50% complete) is currently running at approximately 45% to 55%. However, the contractor was directed to target a slightly higher target elevation to accommodate this increased percentage, thereby purposely slightly increasing realized tonnage per foot.

- The CWPPRA Bayou Chevee Shoreline Protection contract constructed in 1996 called for foreshore protection construction covering slightly less than 2 miles of Lake Pontchartrain shoreline, immediately south of proposed feature ES-1. Contract quantities were based on an anticipated settlement rate of approximately 40%. Actual settlement realized came in slightly lower. This reach of foreshore rock protection appears fairly stable today, approximately 15 years after construction.

Actual settlement rates for the aforementioned contracts, all on Lake Borgne and Lake Pontchartrain ranged from approximately 25% to 55%. As such, estimated settlement rates of 40% to 50% were used in quantifying Lake Shoreline features of this report.

Preliminary survey data has been obtained for previously proposed Breton Sound shoreline protection reaches. Preliminary geotechnical analysis indicates that rock structures in these water depths would require significant stability berms in addition to additional unanticipated rock quantities to reach desired height of protection. Due to these greater than anticipated water depths at the project sites and associated significant feature construction cost increases, offshore stone protection on the outer reaches of existing Biloxi Marsh were not carried forward. Feature BS2 will now be designated as an oyster reef demonstration area as a result of significant public comment that artificial oyster reefs should be a component of the plan, as surveys indicate this area would be suitable.

Descriptions of the remaining lake shoreline protection features, and general information on a proposed oyster reef element are as follows.

5.3.1.1 BS1

Element BS1 is located along the northeast shoreline of Lake Borgne (plate C-10). The project can be described as a nearshore stone dike, constructed along the existing water's edge for the purpose of shoreline protection. In conjunction with several other completed and proposed shoreline protection efforts, this reach of proposed work will complete shoreline protection of the entire south

lobe of Lake Borgne. This rock feature will tie into a reach of shoreline protection proposed under the State DNR CIAP efforts, beginning at Pointe Aux Marchettes and extending north east for approximately 10 miles. This project will halt shoreline erosion; protecting an estimated 50,637 feet of shoreline. The foreshore dike alignment intersections several natural bayous and canals which open up into Lake Borgne, and allow tidal interaction. These natural openings will be accommodated with 11 anticipated gaps in the foreshore dike to allow continued fish and wildlife access into the interior marshes.

Foreshore rock protection is proposed to stop wind driven wave erosion, and enlargement of natural openings into the marsh platform. Continued erosion along this reach will result in further fragmentation of the shoreline, increased tidal influence into the marsh, and accelerated recession of the shoreline. This area is currently eroding at approximately 3 to 5 feet per year due to storm and wind driven wave erosion.

The rock protection will be configured as a linear near-shore dike section. 10 cross section surveys were taken in March 2011 at approximate one (1) mile intervals along the proposed rock dike construction alignment. A stability analysis was performed based on existing borings in the vicinity and cross section data that was taken. Results of this analysis indicated that a 36 foot wide stability berm sloped from elevation 0.0 to elevation -1.0 was required to meet a 1.3 safety factor. This stability berm requirement significantly increased the anticipated cost of this construction feature, and will be revisited if more comprehensive surveys and analysis are conducted during a PED phase of design. This future evaluation may result in the incorporation of a light-weight core section embedded in the dike template to reduce structure weight and ultimate berm requirements. A lightweight core section has been previously used in previous Lake Borgne shoreline foreshore protection on the CWPPRA PO-32 contract along the south east rim of the lake, completed in 2008. A theoretical dike template of the currently proposed design is provided in the Geotechnical write-up of the Engineering appendix. The proposed dike centerline will be located at the approximate -2.0 to -3.0 foot contour. Although it was desirable to potentially construct slightly further offshore to allow for backfilling of the structure with flotation excavation material, deeper water depths further offshore discouraged this course of action. Each of the ten survey cross sections taken was assigned to a specific reach of shoreline based on shoreline topography. Stone quantities for the dike proper and the required stability berm were computed and an additional 40% of the dike proper quantity was added for anticipated settlement. Settlement was not added to the berm section. The dike will be constructed to an elevation of +4.0 NAVD88 with a 4-foot crown width. The dike will be constructed of a graded 1500# top size stone, underlain with a geotextile fabric to minimize settlement. The geotextile fabric quantity was computed, adding an additional 5 foot extension on either toe. The geotextile was measured in square yards. Overlapped fabric was not computed for quantification. An average width of 83' of geotextile was required. It is currently estimated that 890,000 tons of stone and 470,000 square yards of separator geotextile fabric will be required to complete this construction effort.

Flotation dredging is anticipated for access to the site for construction equipment and material barges. Flotation excavation along the dike alignment will be limited to an 80-foot bottom width channel not to exceed elevation -7.0 NAVD88. This limited flotation depth has been used successfully for similar work in Lake Borgne and Lake Pontchartrain with no serious implications to project cost. Flotation dredging was restricted to 10 feet beyond the toe of the stability berm. Barge

access to the site is available via the GIWW through the Rigolets and across Lake Borgne. The survey sections indicated that access corridors from the lake to the worksite were likely not required as the lake nearshore depths approach the -7.0' target in the vicinity of the outer limit of the flotation channel. As such, adequate deep water in the vicinity of the project will support movement of materials and equipment. Material excavated from the flotation channel would be stockpiled lakeside of the flotation channel to be backfilled if necessary upon completion of construction. The intent of this backfill requirement is to remove any shallow obstructions to recreational navigation. It is anticipated that the majority of stockpiled material will be washed away by wave action during the construction duration and any subsequent backfilling requirements will be minimal. The construction duration for total completion of this feature was estimated for two (2) separate contracts at approximately 845 days per contract.

5.3.1.2 LS1

Element LS1 is located in southern Lake Borgne, to be constructed along the perimeter of Proctor Point between the eastern and western lobes of Lake Borgne (plate C-42). The project can be described as a nearshore stone dike, constructed along the existing water's edge for the purpose of shoreline protection. This rock feature is bounded by the ongoing $75 million supplemental Bayou Dupre rock project to the west, and the proposed $75 million supplemental West of Shell Beach shoreline protection project to the east; extending along the lake shoreline for approximately 8.7 miles. This project will halt shoreline erosion, protect an estimated 45,000 feet of shoreline, and assist in retention of dredged material for future proposed marsh creation/nourishment efforts on Proctor Point (Element LM2). The foreshore dike alignment intersections several natural bayous and canals which open up into Lake Borgne, and allow tidal interaction. These natural openings will be accommodated with six (6) anticipated gaps in the foreshore dike to allow continued vessel traffic and allow fish and wildlife access into the interior marshes.

Foreshore rock protection is proposed for construction to stop wind driven wave erosion. The bankline of Lake Borgne in this area is eroding at approximately 4 feet per year conservatively) due to storm and wind driven wave erosion. Critical breaches in the shoreline are impacting interior wetland habitat including shallow water ponds and vegetated marshes. The interior marshes continue to fragment due to subsidence and tidal flows. The rock protection will be configured as a linear near shore dike section. 10 cross section surveys were taken in 2011 at approximate one (1) mile intervals along the proposed rock dike construction alignment. A stability analysis was performed based on existing borings in the vicinity and cross section data that was taken. Results of this analysis indicated that a significant 55-foot wide stability berm sloped from elevation 1.0 to elevation 0.0 was required to meet a 1.3 safety factor. In addition, a 25-foot landside berm was recommended at elevation +1.5. These are the most significant stability berm requirements of all the proposed stone features, significantly increasing the anticipated cost of this construction feature, and potentially resulting in construction complications due to the limited reach of anticipated stone placement equipment. As discussed in the BS-1 write-up above, future evaluation of this feature will also include the incorporation of a light-weight core section embedded in the dike template to reduce structure weight and ultimate berm requirements. The current theoretical dike template is provided in the Geotechnical write-up of the Engineering appendix. Promisingly, the ongoing foreshore dike construction within the Bayou Dupre reach immediately west of Proctor Point is currently being successfully constructed without berm requirements, and it is anticipated that further analysis during the PED phase will minimize the current berm recommendations for this feature. As such, the

lakeside dike template was modified to incorporate a 35' berm for quantity computations. In general this will result in a lower safety factor, but minimizes required stone quantities and constructability concerns. Additional borings would likely be taken during PED to more closely analyze required berm widths. However, as no life or infrastructure is impacted by the lower safety factor, current considerations could be given to proceeding with a lesser berm as was done on other reaches of Lake Borgne shoreline protection construction. In general, the proposed dike will be located at the approximate -2.0 to -3' foot contour, with the lakeside toe at the approximate -3.0 to -4.0 NAVD88 contour. Two survey lines taken on the east side of Proctor Point indicate deeper waters along that reach of bankline. The design may be converted to a bank paving section if comprehensive surveys taken during the next PED phase reveal consistent deeper waters. Each cross section taken was assigned to a specific section of shoreline based on shoreline topography. Stone quantities for the dike proper and the required stability berm were computed and an additional 40% of the dike proper quantity was added for anticipated settlement. Settlement was not added to the berm section. The dike will be constructed to an elevation of +4.0 NAVD88 with a 4-foot crown width. The dike will be constructed of a graded 1500# top size stone, underlain with a geotextile fabric to minimize settlement. The geotextile fabric quantity was computed, adding an additional 5 foot extension on either toe. The geotextile was measured in square yards. Overlapped fabric was not computed for quantification. An average width of 90' of geotextile was required. It is currently estimated that 930,000 tons of stone and 450,000 square yards of separator geotextile fabric will be required to complete this construction effort.

Flotation dredging along the dike alignment is anticipated for access to the site for construction equipment and material barges. Flotation excavation along the dike alignment will be limited to an 80-foot bottom width channel not to exceed elevation -7.0 NAVD88. Flotation dredging quantities were based from the hydrographic survey cross sections taken within this feature reach. In general, the flotation channel would begin approximately 70' off the dike centerline. In general, material excavated from the flotation channel would be stockpiled lakeside of the flotation channel to be backfilled if necessary upon completion of construction. The intent of this backfill requirement is to remove any shallow obstructions to recreational navigation upon completion of construction. It is anticipated that the majority of stockpiled material will be washed away by wave action during the construction duration and any subsequent backfilling requirements will be minimal. Backfill requirements will be estimated at approximately 25% of the original flotation excavation quantity.

Barge access to the site is available via the GIWW through Chef Pass. Any required access channel from the lake to the flotation channel alignment would be minimal. Access corridors, if used, would be spaced approximately 1 mile apart, with a bottom width not to exceed 100'. The construction duration for total completion of this feature was estimated for two (2) separate contracts at approximately 871 days per contract.

5.3.1.3 ES3

Element ES3 is located in the northwest quadrant of Lake Borgne (plate C-8). The project is fronting the GIWW and ultimately Lake Catherine. The project can be described as a nearshore stone dike, constructed along the existing water's edge for the purpose of reducing shoreline erosion and protection of adjacent marsh. In conjunction with several other completed and proposed shoreline protection efforts, this reach of proposed work will complete protection of the entire Lake Borgne shoreline south of the Rigolets. This rock feature will tie into a reach of shoreline protection proposed

under the State DNR CIAP efforts (Orleans Land bridge Shoreline Protection Project, PO-36), beginning at Alligator Point and extending north approximately 14 miles to the Rigolets. This project will halt shoreline erosion, protect an estimated 70,020 feet of shoreline. The foreshore dike alignment intersections several natural bayous and canals which open up into Lake Borgne. These natural openings will be accommodated with eight (8) gaps in the foreshore dike to allow continued vessel traffic and well as fish and wildlife access into the interior marshes.

Foreshore rock protection is proposed for construction to stop wind driven wave erosion, and enlargement of natural openings into the marsh platform. This reach of Lake Borgne shoreline fronts a critical land bridge between Lake Borgne and Lake Catherine, and affords a barrier between Lake Borgne and the GIWW. The bankline of Lake Borgne fronts numerous openings into the marsh, which allow tidal interaction. Continued erosion along this reach will result in further fragmentation of the shoreline, increased tidal influence into the marsh, and accelerated recession of the shoreline. This area is currently eroding at approximately 6-9 feet per year due to storm and wind driven wave erosion.

The rock protection will be configured as a linear near shore dike section. 14 cross section surveys were taken in March 2011 at approximate one (1) mile intervals along the proposed rock dike construction alignment. A stability analysis was performed based on existing borings in the vicinity and cross section data that was taken. Results of this analysis indicated that a 14 foot wide stability berm at -0.5 was required to meet a 1.3 safety factor. This stability berm will also provide toe protection against wave wash for the entire project reach. A theoretical dike template is provided in the Geotechnical write-up of the Engineering appendix. The proposed dike will be located at the approximate -2.0 foot contour. The dike will be constructed to an elevation of +4.0 NAVD88 with a 5-foot crown width. Each cross section taken was assigned to a specific section of shoreline based on shoreline topography. Stone quantities for the dike proper and the required stability berm were computed and an additional 50% of the dike proper quantity was added for anticipated settlement. Settlement was not added to the berm section. The dike will be constructed of a graded 1500# top size stone, underlain with a geotextile fabric to minimize settlement. The geotextile fabric quantity was computed, adding an additional 4 foot extension on either toe. The geotextile was measured in square yards. Overlapped fabric was not computed for quantification. An average width of 55' of geotextile was required. It is currently estimated that 655,000 tons of stone and 425,000 square yards of separator geotextile fabric will be required to complete this construction effort.

Flotation dredging is anticipated for access to the site for construction equipment and material barges. Flotation excavation along the dike alignment will be limited to an 80-foot bottom width channel not to exceed elevation -7.0 NAVD88. Flotation dredging was restricted to 20 feet beyond the toe of the stability berm. Required flotation excavation is estimated at approximately 600,000 cubic yards of earthen material, to be stockpiled lakeside of the flotation channel for backfilling upon completion of construction. As stated in previous write-ups, the intent of this backfill requirement is to remove any shallow obstructions to recreational navigation upon completion of construction. It is anticipated that the majority of stockpiled material will be washed away by wave action during the construction duration, minimizing any subsequent backfilling. Backfill requirements will be estimated at approximately 25% of the original flotation excavation quantity.

Barge access to the site is available via the GIWW through the Rigolets and across Lake Borgne. The survey sections indicated that access corridors from the lake to the worksite would be required to provide adequate water depths to support movement of materials and equipment, especially in the deep cove in the southern half of the project. The corridors will be spaced approximately 1 mile apart, with a bottom width not to exceed 100'. The construction duration for total completion of this feature was estimated for two (2) separate contracts at approximately 778 days per contract.

5.3.1.4 ES1

Element ES1 is located in eastern Lake Pontchartrain (plate C-6). The actual work limits are bounded by a rail road bridge and existing shoreline protection above the I-10 to the north, and extends south to the existing CWPPRA Bayou Chevee shoreline protection project to the south. The project will be constructed as a nearshore stone dike, constructed along the existing water's edge for the purpose of reducing shoreline erosion and protection of existing infrastructure and adjacent marsh. This project will halt shoreline erosion, protect an estimated 20,530 feet of shoreline. The foreshore dike alignment intersects several natural openings and canals which open up into the Lake Pontchartrain Middle Ground. These natural openings will be accommodated with approximately five (5) gaps in the foreshore dike to allow continued fish and wildlife access into the interior marshes, as well as boat access into the Irish Bayou Community. Project alignment will also be gapped at the crossing for the I-10 and I-11 corridor, where existing shoreline protection exists.

Six (6) cross sections were taken in March 2011 at approximate one-half to one (1) mile intervals along the proposed rock dike construction alignment. These surveys indicated a general bankline recession of approximately 4-feet per year based on comparison with the 2005 photography. Each survey line was plotted in cross section format and the stone template superimposed. Each cross section was assigned a specific section of shoreline based on shoreline topography. Stone quantities for the dike were computed and an additional 40% of the dike quantity was added for anticipated settlement.

The rock foreshore dike will be constructed to a crown elevation of +4.0' with a 5' crown and 1V on 2H side slopes. A 3-foot wide stability bench at elevation +1 is required on both sides of the dike centerline. A theoretical dike template is provided in the Geotechnical write-up of the Engineering appendix. The dike will be constructed of a graded 1500# top size stone, underlain with a geotextile fabric to minimize settlement. Based on the resulting dike footprint, the geotextile fabric quantity was computed, adding an additional 5-foot extension on either toe. The geotextile was measured in square yards. Overlapped fabric was not computed for quantification. An average width of 43-feet of geotextile was required. It is currently estimated that 210,000 tons of stone and 100,000 square yards of separator fabric will be required to complete this construction effort.

Barge access to the site is available via the GIWW through the Rigolets or via IHNC and across Lake Pontchartrain. Flotation dredging is anticipated for access to the site for construction equipment and material barges. Flotation excavation along the dike alignment will be limited to an 80-foot bottom width channel not to exceed elevation -7.0 NAVD88. Due to bankline profiles realized from the survey effort, disposal of flotation excavation materials landside of the flotation channel does not

appear feasible. All flotation excavation will be stockpiled on the lake side to be backfilled upon completion of construction. Flotation excavation will be restricted to 50-feet beyond the dike centerline. South of the I-10, two gaps in the foreshore dike alignment are proposed; the first a navigation gap at the entrance to the Irish Bayou area, and the second a water access gap to the open water areas west of the existing shoreline. Access corridors will be allowed to accommodate barge movement during construction. The corridors, if used, will be spaced approximately one (1) mile apart, with a bottom width not to exceed 100'. Material from the access corridors will be side cast and backfilled upon completion of construction. The construction duration for total completion of this feature is approximately 788 days.

5.3.1.5 ES2

Element ES2 is located in eastern Lake Pontchartrain, in an area sometimes defined as "Middle Ground" (see plate C-7). The work limits are bounded by Chef Pass and the Rigolets. The site is broken out into three separate reaches, separated by existing camps and similar structures.
This reach of Lake Pontchartrain shoreline fronts a critical land bridge between Lake Pontchartrain and Lake Catherine, and affords a barrier between Lake Pontchartrain and the GIWW. The project will be constructed as a nearshore stone dike, constructed along the existing water's edge for the purpose of reducing shoreline erosion and protection of existing infrastructure and adjacent marsh. This project will halt shoreline erosion; protecting an estimated 30,765 non-continuous feet of shoreline. The foreshore dike alignment intersects several natural openings and canals which open up into the Lake Pontchartrain Middle Ground. These natural openings will be accommodated with seven (7) gaps in the foreshore dike to allow continued fish and wildlife access into the interior marshes.

Five (5) cross sections were taken in March 2011 at approximate one (1) mile intervals along the proposed rock dike construction alignment. Each survey line was plotted in cross section format and the stone template superimposed. Each cross section was assigned a specific section of shoreline based on shoreline topography. Stone quantities for the dike were computed and an additional 50% of the dike quantity was added for anticipated settlement.

The rock foreshore dike will be constructed to a crown elevation of +4.0' with a 5' crown and 1V on 2H side slopes. A 3-foot wide stability bench at elevation +1 is required on both sides of the dike centerline. A theoretical dike template is provided in the Geotechnical write-up of the Engineering appendix. The dike will be constructed of a graded 1500# top size stone, underlain with a geotextile fabric to minimize settlement. Based on the resulting dike footprint, the geotextile fabric quantity was computed, adding an additional 5-foot extension on either toe. The geotextile was measured in square yards. Overlapped fabric was not computed for quantification. An average width of 43-feet of geotextile was required. It is currently estimated that 310,000 tons of stone and 150,000 square yards of separator fabric will be required to complete this construction effort.

Flotation dredging is anticipated for access to the site for construction equipment and material barges. Flotation excavation along the dike alignment will be limited to an 80-foot bottom width channel not to exceed elevation -7.0 NAVD88. Barge access to the site is available via the GIWW through the Rigolets. The project alignment offers a fairly broken shoreline. In general, all flotation

excavation will be stockpiled on the lake side to be backfilled upon completion of construction. This is to assure no underwater obstructions remain fronting the shoreline upon demobilization of the construction equipment. In isolated pockets where possible, the required flotation excavation will be cast landward of the dike alignment in an effort to beneficially use this material to restore the shoreline embankment. Flotation excavation will be restricted to 50-feet beyond the dike centerline. Access corridors will be allowed to accommodate barge movement during construction. The corridors, if used, will be spaced approximately one (1) mile apart, with a bottom width not to exceed 100'. Material from the access corridors will be side cast and backfilled upon completion of construction. The construction duration for total completion of this feature is approximately 401 days.

5.3.1.6 BS2

As stated previously, Breton Sound Shoreline Protection features were eliminated from further consideration due to greater than anticipated water depths at the project sites and associated significant feature construction cost increases. In lieu of total elimination, it was decided to replace the proposed stone foreshore feature at BS2 with various bio-engineered oyster reef units. In addition to simple placement of limestone pads to enhance and maintain oyster growth, several technical solutions to oyster reef construction exist that can be implemented into this Element design, including but not limited to concrete rings, metal frames, geotextile filled bags, etc. The Element BS2 footprint encompassed approximately seven (7) miles of shoreline, north of the MRGO and adjacent to the outer marsh fringe of Eloi Bay immediately south of Bayou La Loutre (plate C-11). It is envisioned that oyster reef units can be established with appropriate spacing and bedding as required to result in functioning units. For instance, doubling the width of the proposed features and halving the length provides a more compact (potentially more stable) final product for approximately the same construction effort and cost. Currently, approximately seven (7) miles of oyster habitat construction is assumed for this planning effort. These dimensions and final planning of feature layouts can be further coordinated with the local oyster industry and State planning representatives.

In an effort to regenerate oyster growth, a primary requirement is the creation of a hard surface onto which oyster larvae can attach to. Steel, rock, oyster shell, and wood are all potential materials; with the key to this demonstration project being to provide a stable platform, able to resist anticipated site conditions. Although this demonstration effort is proposing the use of pre-fabricated products and standard stone paving, the use of concrete rubble such as construction waste products should be considered for large scale production. Both the concrete and potential steel rebar would be adequate for this application.

For this demonstration project Element B2, located in Breton Sound bounded by Bayou La Loutre and Eloi Bay, was divided into three (3) fairly equal length test reaches. Each reach will be constructed as described below in an attempt to promote oyster growth. It should be understood that the ultimate design section(s) can be scaled to meet available funding and needs. Costs should be fairly proportional in enlarging the section, for instance doubling the width of the feature should approximately double the costs provided. All three (3) reaches are currently constructed to a width of 15' to 20' along the shoreline. In Reaches 1 and 2, a 6-inch crushed stone blanket was included to place atop a filter fabric base. In each scenario, the filter fabric width was set at 17 feet and the 6

inch crushed stone blanket width was set at 15 feet. This crushed stone will provide stability to the structure, assist in anchoring the filter fabric, add additional height to the structure, and provide additional oyster habitat. The quantity of fabric and crushed stone is exactly the same for both alternatives; the cost differential will rest solely in the commercial product cost. The proposed configuration not only provides oyster habitat, but should also provided some wave break potential for shoreline protection. No flotation excavation is anticipated for construction of these elements. The structures will all be built at approximately the -3.0 to -4.0 contour. It is desired to get the top of the structures to approximately the low water elevation. This will provide visual observability during low water and, as previously stated should provide some shoreline protection feature to these elements.

Reach 1, approximately 11,200 feet in length will be constructed using Triangular Steel Structures (Reefblks). These structures are prefabricated double framed steel rebar units which hold mesh bags that are filled with oyster shell and seed oysters. The structures emulate and create new artificial oyster reef, and potentially provide some immediate shoreline relief. Based on water depths at the project site, it is anticipated that these structures will be constructed within 50' of the existing marsh shoreline. The welded triangular frame measures 5' on each side and stands 3' high. On this frame hang nine mesh weave baskets filled with oyster shells. The units are deployed in a saw-tooth pattern to maximize bankline coverage. The weight of the 5' x 3' metal unit is 155 pounds. The complete unit with oyster bags weighs 530 pounds. No flotation dredging is anticipated to construct this test reach. The resulting structure could theoretically be placed on geotextile separator fabric alone in lieu of the crushed stone pad to minimize costs and to keep the soft earth foundation material out of the oyster reef structure. The crushed stone pads do however provide additional hard surface for oyster habitat. Each unit is anchored with a 3' screw anchor and cable.

Reach 2, approximately 11,200 feet in length will be constructed using 5' diameter concrete rings (OysterBreak). Two rows of concrete rings would be placed approximately 1 foot apart, and interlocked by a second layer single ring. This configuration (based on the 20" height of the rings) provides slightly over 3' in height, which mimics the Reach 1 metal frames. The configuration could be revised to place three (3) rows of rings in a single layer, covering approximately 17' per linear foot of bankline; providing a greater base footprint but less height. Concrete rings fabricated with oyster shell show significantly more success than concrete alone. Assuming the low center of gravity of these rings, no anchor system is proposed for this test reach.

Reach 3, approximately 13,200 feet in length will be the most simplistic of the construction efforts, involving placement of a crushed stone, oyster shell, or combination pad paralleling the shoreline. In an effort to compare the three alternatives, the pad will be constructed to a height of three feet and base width of approximately 15 feet. If constructed of oyster shell alone, it is recommended that the shell be contained in mesh bags to minimize losses and structure migration. This reach will also be placed on a geotextile separator fabric. The anticipated construction duration for total completion of this feature is approximately 318 days.

5.3.2 MRGO Bankline Restoration

One of the most direct impacts resulting from the existence of the MRGO channel is continued bankline erosion resulting from boat and wind waves and natural tidal action. Several different

feature alternatives are proposed to directly alleviate and mitigate bankline loss, including shoreline protection to stabilize existing bank lines, bankline reestablishment via placement of structural walls, and marsh creation behind the newly aligned shoreline configurations. Due to the construction of closure structures on both the north and south limits of the MRGO channel, access to MRGO ecosystem construction sites will be from the GIWW via Chef Pass or the Rigolets and then across Lake Borgne to either the Dupre Cut or Doullet's Canal.

5.3.2.1 MRGO Shoreline Restoration

The tentatively selected plan currently includes three (3) distinct reaches of north bank reestablishment between approximate miles 58.5 to 56.0, miles 48.2 to 44.4, and miles 39.9 to 37.5. These alternatives will narrow the open water top width of the MRGO by reestablishing a new north shore bank line via wall construction. These three reaches combine for a proposed 548 acres of marsh creation behind a combination vinyl sheet pile/timber pile wall. The wall will be constructed along approximately a -6.0 NAVD88 contour, and will serve not only as future shoreline protection, but also as a retention device for dredged material placement. In light of the retention requirements for marsh creation, the ultimate retention structure must be built to a minimum +4.0 NAVD88 elevation to allow for marsh platform overbuild and subsequent dewatering and settlement to a suitable target marsh elevation. Dredged material will be obtained by cutterhead dredging of the proposed borrow sites within Lake Borgne, and will be transported directly to the marsh creation and nourishment site via pipeline. Several alternatives were investigated for construction of these potential retention structures.

Rock Dike Retention. A standard rock foreshore dike was considered. Poor soil conditions prohibited the use of rock dike containment, which would required a theoretical 10-foot height along the proposed alignment. Anticipated continued settlement and failure concerns, in addition to the extensive quantities of rock required, eliminating this potential alternative.

Concrete Wall Retention. Concrete wall construction has been successfully completed for shoreline wave wash protection within the New Orleans District. The proposed wall called for 80-foot long x 18" grooved concrete piles at 20-foot spacing to provide structural strength. Installation of 6" thick x 20' wide x 6' tall concrete panels would complete the structure; being slid into the grooves between the piles for retention of dredged material. Two panels would be installed per section, resulting in complete coverage from +4.0 to -8.0 NAVD88. A crushed stone scour protection blanket was proposed on the channel side of the wall to prevent undermining. Preliminary geotechnical analysis indicated potential stability concerns upon placement of the marsh creation backfill, eliminating this alternative from consideration.

Vinyl Sheet pile/Timber Pile Retention. The tentatively selected plan calls for a combination timber pile/vinyl sheet pile wall section. The tentative design requires 70-foot class B treated timber piles driven at 4-foot spacing along the proposed wall alignment. Each pile will be battered within the marsh creation sites at a 30 degree angle with an additional similar pile. The timber piles will support a vinyl sheet pile wall, consisting of SG 950 vinyl sheet pile driven from +4.0 NAVD88 to -38.0 NAVD88. The wall will be completed with a double row of 4" x 6" timber wales, a 2" wide timber cap and associated hardware. Minimal strength geotextile separator fabric will drape the interior of the vinyl wall prior to marsh creation to maximize material retention. Due to the channel bed elevation

along the alignment and the recent closure construction on both ends of the MRGO channel, crushed stone toe protection was eliminated from the feature design. The depth of water along the wall alignment, deep embedment length of the proposed piles, and elimination of deep draft navigation wave action alleviated the concerns of toe scour along the proposed walls.

5.3.2.1.1 MRGO-7

Element MRGO-7 will be constructed along the north bank of the MRGO channel between approximate channel miles 58.5 to 56.0 (non-continuous), located immediately east of the IHNC Surge Barrier (plate C-29). It will consist of 9,170 linear feet of vinyl sheet pile wall, to be backfilled with earthen material to create approximately 110 acres of new marsh. Based on historic available surveys it is anticipated that the existing elevation within the marsh creation site is an average elevation of -4.5'. It was assumed that the adjacent marsh is an approximate average elevation of +1.5'. This will be the ultimate marsh target elevation for the proposed marsh creation. Borrow for the marsh fill is anticipated to come from approximately two (2) miles offshore in Lake Borgne, with pipeline access via Bayou Bienvenue. Borrow within the lake will be limited to a maximum of 10'-12' below the lake bottom. Including anticipated foundation settlement and contingencies, approximately 1,650,000 cubic yards of borrow material will be required to construct the proposed marsh platform. The proposed borrow site was sized at 192 acres to accommodate this need. Prior to hydraulic dredging and material placement, approximately 6,050 linear feet of backside retention dikes will be constructed along the existing marsh platform. In addition, approximately 3,750 linear feet of earthen closures will be required across open waters areas. These earthen retention features will be constructed to elevation +4.0 NAVD88 with a crown width of 5-feet, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. Interior borrow ditches will be allowed for construction of the earthen retention features, which will be backfilled during the marsh creation operation. The dredge material will be placed to an anticipated slurry elevation of +2.5 to +3.0, allowing for 1.0' to 1.5' of freeboard. Strategically placed overflow weirs will be located to allow dredge slurry to overflow and nourish additional existing marsh. No flotation excavation is anticipated to access and construct this feature. Stone bank protection features, approximately 150-feet in length, will be constructed at each point where the timber/vinyl walls tie-into the natural bankline. A total of approximately 4,000 tons of stone will be required for these features. The construction duration for total completion of this feature is approximately 230 days.

5.3.2.1.2 MRGO-8w

Element MRGO-8w will be constructed along the north bank of the MRGO channel between approximate channel miles 48.2 to 44.4 (non-continuous) (plate C-30). It will consist of 17,785 linear feet of vinyl sheet pile wall (plate S-9), to be backfilled with earthen material to create approximately 236 acres of new marsh. Based on historic available surveys it is anticipated that the existing elevation within the marsh creation site is an average elevation of -5.0'. It was assumed that the adjacent marsh is an approximate average elevation of +1.5'. This will be the ultimate marsh target elevation for the proposed marsh creation. Borrow for the marsh fill is anticipated to come from within two (2) miles offshore in Lake Borgne, with pipeline access via an existing access canal West of Shell Beach to the MRGO channel. Borrow within the lake will be limited to a maximum of 10'-12' below the lake bottom. Including anticipated foundation settlement and contingencies, approximately 3,500,000 cubic yards of borrow material will be required to construct the proposed marsh platform.

The proposed borrow sites were sized at 400 acres to accommodate this need. Two separate polygons were identified to provide adequate borrow and avoid depicted environmental "hard bottom" locations. Prior to hydraulic dredging and material placement, approximately 23,800 linear feet of backside retention dikes will be constructed along the existing marsh platform. In addition, approximately 2,800 linear feet of earthen closures will be required across open waters areas. These earthen retention features will be constructed to elevation +4.0 NAVD88 with a crown width of 5-feet, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. Interior borrow ditches will be allowed for construction of the earthen retention features, which will be backfilled during the marsh creation operation. The dredge material will be placed to a maximum slurry elevation of +2.5 to +3.0, allowing for 1.0' to 1.5' of freeboard. Strategically placed overflow weirs will be located to allow dredge slurry to overflow and nourish additional existing marsh. No flotation excavation is anticipated to access and construct this feature. Stone bank protection features, approximately 150-feet in length, will be constructed at each point where the timber/vinyl walls tie-into the natural bankline. A total of approximately 4,000 tons of stone will be required for these features. The vinyl wall construction under consideration for this element is divided into two distinct non-continuous reaches. Between these two (2) reaches the element proposal calls for approximately 2,140 linear feet of foreshore dike construction. The dike will be constructed to elevation +4.0 NAVD88, with a 4 foot crown and 1v on 2h side slopes. The dike centerline will target construction along the -2.0' contour, resulting in a quantity including anticipated settlement and contingencies of approximately 20,000 tons. The dike will require geotextile fabric underlay to minimize settlement, extending 4 feet beyond each toe-of-dike. The anticipated fabric quantity including a 10% contingency is approximately 9,700 square yards. The construction duration for total completion of Feature MRGO-8w is approximately 306 days.

5.3.2.1.3 MRGO-5

Element MRGO-5 will be constructed along the north bank of the MRGO channel between approximate channel miles 39.9 to 37.5 (plate C-27). It will consist of 13,685 linear feet of vinyl sheet pile wall, to be backfilled with earthen material to create approximately 236 acres of new marsh. Based on historic available surveys it is anticipated that the existing elevation within the marsh creation site is an average elevation of -4.0'. It was assumed that the adjacent marsh is an approximate average elevation of +1.5'. Borrow for the marsh fill is anticipated to come from approximately two (2) miles offshore in Lake Borgne, with pipeline access via Doullut's Canal to the MRGO channel. Borrow within the lake will be limited to a maximum of 10' to 12' below the lake bottom. Including anticipated foundation settlement and contingencies, approximately 3,000,000 cubic yards of borrow material will be required to construct the proposed marsh platform. The proposed borrow site was sized at 336 acres to accommodate this need. Prior to hydraulic dredging and material placement, approximately 14,950 linear feet of backside retention dikes will be constructed along the existing marsh platform. In addition, approximately 2,050 linear feet of earthen closures will be required across open waters areas. These earthen retention features will be constructed to elevation +4.0 NAVD88 with a crown width of 5-feet, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. Interior borrow ditches will be allowed for construction of the earthen retention features, which will be backfilled during the marsh creation operation. The dredge material will be placed to an anticipated slurry elevation of +2.5 to +3.0, allowing for 1.0' to 1.5' of freeboard. Strategically placed overflow weirs will be located to allow dredge slurry to overflow

and nourish additional existing marsh. Minimal flotation excavation may be required in the western half of the project reach to assure adequate access to the project site. All material excavated for flotation access will be cast to the north of the wall alignment and used in the marsh creation effort. Stone bank protection features, approximately 150-feet in length, will be constructed at each point where the timber/vinyl walls tie-into the natural bankline. A total of approximately 2,000 tons of stone will be required for these features. The construction duration for total completion of this feature is approximately 555 days.

5.3.2.2 MRGO Shoreline Protection

In addition to the bankline restoration features above, additional reaches of the north bank of the MRGO are included in this restoration plan to be protected along their existing alignment with newly constructed stone foreshore dikes. These dikes are proposed landward of the -4.0 NAVD88 contour to minimize stone quantities and afford protection against continued bankline recession and erosion. With the de-authorization of the MRGO channel, vessel driven waves resulting from deep draft navigation are no longer a concern. Preliminary hydraulic analysis was performed to provide minimal foreshore criteria such as stone size, dike crown width and height. To protect against the smaller tidal and wind-driven waves, a standard near-shore trapezoidal stone dike with a 4-foot crown to elevation +3.0 NAVD88 is sufficient for bankline protection. The dike side slopes will be specified as 1v on 3h channel side, and 1v on 2h marsh side to better accommodate wave run-up on the channel side. Prior to the discontinuation of deep draft navigation and the stone closure of the MRGO, all foreshore work on the navigation channel was constructed using 2200# top size stone gradation to protect against vessel driven waves. All MRGO shoreline protection features inshore of the existing stone channel closure in the proximity of Bayou la Loutre at channel mile will now be constructed using the following stone proposed stone gradation:

Stone (Weight in Pounds)	Percent Finer by Weight
650-260	100
280-130	50
130-40	15

Three (3) reaches of new foreshore dike protection are proposed as follows:

5.3.2.2.1 MRGO-1

Element MRGO-1 will be constructed along the north bank of the MRGO channel between approximate channel miles 56.6 and 57.4 (plate C-23B). This stone protection feature is embedded within the limits of the non-continuous shoreline restoration Element MRGO-7 discussed above. It will consist of approximately 3,848 linear feet of rock foreshore dike, constructed immediately nearshore of the existing marsh platform within these limits. This dike structure will be constructed with a 4-foot crown width to elevation +3.0 NAVD88. Dike side slopes will be 1v on 3h channel side, and 1v on 2h marsh side. The trapezoidal stone dike section will be underlain with a geotextile separator fabric. The requirement for flotation excavation to access the site with rock and equipment barges is anticipated. Allowances for flotation dredging will be limited to an access channel located 50-feet off the centerline of the proposed structure, not to exceed 80' in width or elevation -7.0

NAVD88. Material excavated for flotation will be stockpiled channelward of the rock structure and backfilled upon completion of the construction effort. It appears based on survey analysis that water depths for a majority of the work reach are already adequate for equipment and material barges. It will be assumed that only half of the dike alignment will require minimal flotation dredging. Estimated flotation excavation quantity is 12,000 cubic yards. Preliminary analysis indicates that approximately 45,000 tons of stone and 20,000 square yards of geotextile fabric will be required to complete construction of this element. The construction duration for total completion of this feature is approximately 85 days.

5.3.2.2.2 MRGO-8r

Element MRGO-8r will be constructed along the north bank of the MRGO channel between approximate channel miles 50.9 and 48.2 (plate C-31). This stone protection feature is immediately west of and ties into the limits of the shoreline restoration Element MRGO-8 discussed above. The western limit of work ties into existing foreshore protection. This feature will consist of approximately 14,825 linear feet of rock foreshore dike, less three (3) 200-foot gaps left within the alignment for navigation and water interchange, constructed immediately nearshore of the existing marsh platform within these limits. The water interchange gaps will be left at existing openings and/or natural bayous, and will allow fish and wildlife habitat passage into the interior marshes. This dike structure will be constructed with a 4-foot crown width to elevation +3.0 NAVD88. Dike side slopes will be 1v on 3h channel side, and 1v on 2h marsh side. The trapezoidal stone dike section will be underlain with a geotextile separator fabric. Flotation excavation to access the site with rock and equipment barges is anticipated. Allowances for flotation dredging will be limited to an access channel located 50-feet off the centerline of the proposed structure, not to exceed 80' in width or elevation -7.0 NAVD88. Material excavated for flotation will be cast behind the dike alignment where adequate open water exists, or stockpiled channelward of the rock structure and backfilled upon completion of the construction effort. Estimated flotation excavation quantity is 90,000 cubic yards. Preliminary analysis indicates that approximately 165,000 tons of stone and 75,000 square yards of geotextile fabric will be required to complete construction of this element. The construction duration for total completion of this feature is approximately 423 days.

5.3.2.2.3 MRGO-6

Element MRGO-6 will be constructed along the north bank of the MRGO channel between approximate channel miles 35.7 and 34.2, non-continuous (plate C-28). This stone protection feature is immediately east of the existing stone channel closure of the MRGO, and ties into an existing foreshore dike which ends immediately downstream of that structure. Element MRGO-6 will consist of approximately 8,132 linear feet of rock foreshore dike, constructed immediately nearshore of the existing marsh platform within these limits. This proposed foreshore extension is broken into two (2) reaches separated by natural water access channels. The lengths of these two reaches are approximately 3,820 feet and 4,312 feet respectively. This dike structure will be constructed with a 4-foot crown width to elevation +4.0 NAVD88. This is slightly higher than the proposed shoreline protection inside the channel closure to account for more significant weather induced waves. Dike side slopes will be 1v on 3h channel side, and 1v on 2h marsh side. The trapezoidal stone dike section will be underlain with a geotextile separator fabric. Minimal requirements for flotation excavation to access the site with rock and equipment barges is anticipated. Allowances for flotation

dredging will be limited to an access channel located 50-feet off the centerline of the proposed structure, not to exceed 80' in width or elevation -7.0 NAVD88. Material excavated for flotation, where necessary, will be stockpiled channelward of the rock structure and backfilled upon completion of the construction effort. Preliminary analysis indicates that approximately 113,000 tons of stone and 45,000 square yards of geotextile fabric will be required to complete construction of this element. Because of the project location outside of the MRGO stone channel closure, access to the site for equipment and construction materials will likely be from the Mississippi River via the Baptiste Collette/MRGO Alternate Route. The construction duration for total completion of this feature is approximately 382 days. This element will be constructed using a top size of 2200# stone since it's outside the protection of the MRGO closure. Standard requirements for this gradation of stone are as follows:

Stone (Weight in Pounds)	Percent Finer by Weight
2200-900	100
930-440	50
460-130	15

5.3.2.3 MRGO Shoreline Repairs

Several existing stone foreshore features exist along the north shore of the MRGO channel, all constructed to minimize damage to existing marsh and to retain existing shoreline materials from sluffing into the MRGO channel. Although the majority of these existing features were repaired after Hurricane Katrina, it is prudent to consider the long term maintenance requirements of all existing and proposed ecosystem features and those features that provide protection thereto. Protection to existing MRGO north bank shoreline protection features are not warranted at the time of this document preparation, but repairs to these elements will be done as needed. Repairs to these structures will consist of capping the existing structure with additional stone, and/or repairing isolated failures, areas of settlement, and breaches. The dike structures will be restored to an elevation of +3.0 NAVD88 with a 4-foot crown width. Specific features meeting this description are tabulated in the chart below:

Feature Name	Description	Location
MRGO-2	North Shore Foreshore	MRGO Miles 44.4 to 39.9 (Non-Continuous).

Eight distinct reaches of existing rock foreshore exist within these miles, separated by existing canals or back water bodies. Respective reaches of rock navigating from west to east are approximately 2350', 1378', 726', 1178', 2188', 4890', 4982' and 3938' in length, for a total feature length of 21,630 linear feet. No fabric underlay is required for this maintenance effort. Based on site surveys, majority of these reaches will require minimal flotation dredging to access for equipment and material barges. Maintenance cycles would be targeted on a 10-year cycle, beginning in Target year 10.

MRGO-3	North Shore Foreshore	MRGO Miles 56.0 to 51.0(Non-Continuous)

Similar to the MRGO-2 reach, this project feature is segmented into nine distinct reaches of rock foreshore due to the fragmented existing bankline, existing canals or back water bodies, etc. The combined total feature length is approximately 26,650 linear feet. No fabric underlay is required for this maintenance effort. Based on site surveys, no flotation dredging is required for equipment and material barges access. Maintenance cycles would be targeted on a 10-year cycle, beginning in Target year 10.

MRGO-4	North Shore Foreshore	MRGO Miles 35.6 to 37.2 (Non-Continuous) and MRGO Miles 33.9 to 32.9

These existing rock elements were constructed as retention features for marsh creation and nourishment during backfilling of existing pipeline canals. The reach of non-continuous dike between miles 35.6 and 37.2 spans the MRGO stone closure and will require separate access from either side of the closure to complete construction. These reaches of foreshore dike are currently in fairly stable condition. Stone repairs inside the MRGO closure structure will cover 4,550 linear feet of existing foreshore. No flotation dredging is anticipated for this reach of repairs. Access will be through Lake Borgne. The reach(es) of repairs outside the MRGO stone closure structure will require access via the MRGO channel; most likely using the Baptiste Collette/MRGO Alternate Route from the Mississippi River. Repairs of the reach of foreshore dike between miles 33.9 and 32.9 will span 5,058 linear feet of existing foreshore dike and will likely require moderate flotation excavation to access the project footprint by equipment and materials barges. A slightly larger stone gradation will be used outside the closure structure than inside due to potential higher wave/storm energy. Maintenance cycles would be targeted on a 10-year cycle, beginning in Target year 10.

5.4 DIVERSION CHANNEL EXCAVATION AND DISPOSAL

5.4.1 Project Description

Feature D 1 is for the construction of a freshwater diversion near Violet, LA located in St Bernard Parish (see plate C-42). The proposed diversion would be constructed off the Mississippi River, approximate river mile 85.8L AHP. The diversion channel will be approximately 22,500' in length and tie into the MRGO at approximate Mile 55.6.

The diversion channel will be constructed to a 375' bottom width, with side slopes between 1V on 3H and 1V and 4H (to be verified upon receipt of geotech field data and tests prior to submission of final feasibility) and with a invert for the channel ranging from approximate elevation -8.5' NAVD88 (2004.65) on the river side to approximate elevation -11.5' NAVD88 (2004.65) on the MRGO side. In addition, a minimum 40' berm would be maintained between the inner toe of the guide levees and the top of cut of the diversion channel, with the exception of the Central Wetlands reach where a minimum 60' berm would be required. Excluding excavation required for the structural components associated with this diversion, approximately 4,090,000 gross CYS (net grade plus 1' of allowable overdepth) will be excavated for construction of the diversion channel.

The diversion channel will consist of excavation within 3 specific reaches. The first reach will extend between Highway 46 (E. St. Bernard Highway) and the 40 Arpent Levee. Approximately 1,240,000 gross CYS will be excavated from within this reach. Approximately 607,000 cys will be used for construction of guide levees along both banks of the diversion channel. At this time, based upon the limited geotechnical and survey data currently available, the guide levees would be constructed to a maximum 6' height above the natural ground line with 1V on 6H side slopes and an approximate crown width of 175'. Disposal of this material would be uncompacted.

As the material within the Central Wetlands area (located between the 40 Arpent Levee and the back dike canal immediately south of and adjacent to the MRGO south bank disposal area) is not considered suitable for guide levee construction, the remaining 633,000 gross CYS to be excavated from within the reach between Highway 46 and the 40 Arpent Levee will be hauled to the Central Wetlands to cap the core of the guide levees to be constructed within that reach of the proposed diversion. Prior to placement of this material, a 3' thick sand fill base approximately 90' wide would be placed along the guide levee alignments, along with an additional 3' high sand core with a 12' crown. Approximately 200,000 CYS of sand would be required. In addition, a 950 lbs/ft geotextile will also be placed over the 3' sand fill base prior to construction of the 3' sand core and excavated fill cap and berm. See Figure 77 below.

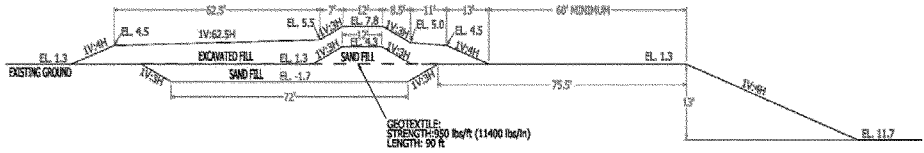


Figure 77 Guide Levee Design for Central Wetlands

In addition to the guide levees, 2-300' wide earthen weirs will also be constructed along each bank of the diversion channel and within existing shallow open waters within the Central Wetlands. The weirs will have a crest elevation of +1.0'.

The diversion channel between the 40 Arpent Levee and the back dike canal immediately south of and adjacent to the MRGO south bank disposal area will be excavated via hydraulic dredge and it is anticipated that approximately 2,100,000 gross CYS will be removed during this process. Access for the dredge is anticipated to be via the GIWW, Bayou Bienvenue via the Bienvenue floodgate and the back dike canal immediately adjacent to and behind the former MRGO south bank disposal areas. As surveys are not presently available at this time, it is estimated that flotation access dredging within the canal will be required. The material that is excavated for flotation access will be side cast to the maximum extent practicable for either marsh creation or nourishment southeast of the canal, or for re-construction of the former bank line.

The hydraulic dredged material will be placed within portions of Features CM 1 and CC1 for both marsh nourishment and swamp restoration/nourishment. Approximately 290 acres of existing marsh

and shallow open waters would be nourished within Feature CM 1. For Feature CC 1, it is estimated that approximately 212 acres of swamp would be restored and another 182 acres nourished. Perimeter retention dikes would be constructed around Features CM 1 and CC 1 would in order to contain the dredge slurry. The slurry would be placed to a maximum elevation of +4 within CM 1 and a maximum slurry elevation of +4.5' within CC 1. Approximately 43,550' of earthen retention dikes (16,700' for Feature CC 1 and 26,850' for Feature CM 1) will be constructed from adjacent borrow, and 2' of freeboard will be maintained at all times during pumping operations. The earthen dikes shall also be constructed to an approximate 5' crown width, slopes no steeper than 1V on 3H, and with a minimum 40' interior berm to be maintained between the inside toe of the earthen dikes and the top of cut of the adjacent borrow pits. In addition, as Feature CC 1 is immediately west of Bayou Chaperon, which is considered a "scenic stream", measures will be taken to assure this waterway is not impacted.

Material excavated from within the former MRGO south bank disposal area will be placed uncompacted along the banks of the diversion channel in order to create a continuous guide levee. Based upon the limited geotechnical and survey data currently available, these guide levees would be constructed to a maximum 8' height above the natural ground line with 1V on 10H side slopes and an approximate crown width of 325'. Approximately 740,000 gross CYS will be excavated from within this reach.

As topographic surveys were not available for this phase of the study, an available LIDAR survey was used in order to estimate the existing ground line elevations and estimated quantities to be dredged from within the various reaches. For determining disposal capacities within the swamp and marsh restoration/creation/nourishment sites, it was assumed that the existing elevation within the swamp restoration site (Feature CC 1) is an approximate average elevation of -1.0' and that the adjacent marsh is an approximate average elevation of +1.5'. For the marsh nourishment Feature CM 1, it was assumed that the existing marsh ranged in elevation from +0.5' and +1.0', and that approximately 1.5' of fill would be placed throughout this project feature for nourishment.

Ingress and egress to the site would be via the Mississippi River, the GIWW, the MRGO, and Bayou Bienvenue, the back dike canal, as well as Federal, State and local highways.

5.4.2 Back Dike Canal

The hydraulic design called for a weir to elevation +1 at the intersection of the guide levees and the back dike canal. Because of the requirement to maintain navigation in this canal these weirs were removed from the plan. This feature will be reanalyzed and if induced flooding issues are a concern navigable features such as navigable gates will be added at this location.

5.4.3 Detailed Design

More detailed design of the diversion channel and levees will be done as part of a separate study and report for the diversion.

6.0 RECREATION FEATURES

6.1 GENERAL

Two recreation features are included as part of the proposed plan. These features are in the Bienvenue Triangle and at Shell Beach. A brief description of these features is shown below. Further details of these plans can be found in Appendix W of the EIS.

6.2 BIENVENUE TRIANGLE RECREATION FEATURE

The site of the proposed recreation feature is located in Orleans Parish's Bienvenue Triangle. Located at the terminus of Caffin Avenue, the site currently offers a viewing platform overlooking the marsh. The platform is used by the neighborhood, tourist and by schools both recreationally and as an educational tool. Martin Luther King Elementary School located on Caffin Avenue and North Claiborne Avenue currently uses the platform for teaching students about environmental principles, processes and a general education concerning marshland, habitat, and wildlife.

The recommended plan for the Bienvenue Triangle consists of a 100 lf (linear feet) of platform, 995 lf of boardwalk into the swamp, 4 picnic shelters, interpretive signage, bathrooms, parking, solar lighting and vegetative plantings. Figure 78 showns the recommended plan for the Bienvenue Triangle. Details of the plan are shown on plates RF-1 to RF-3.

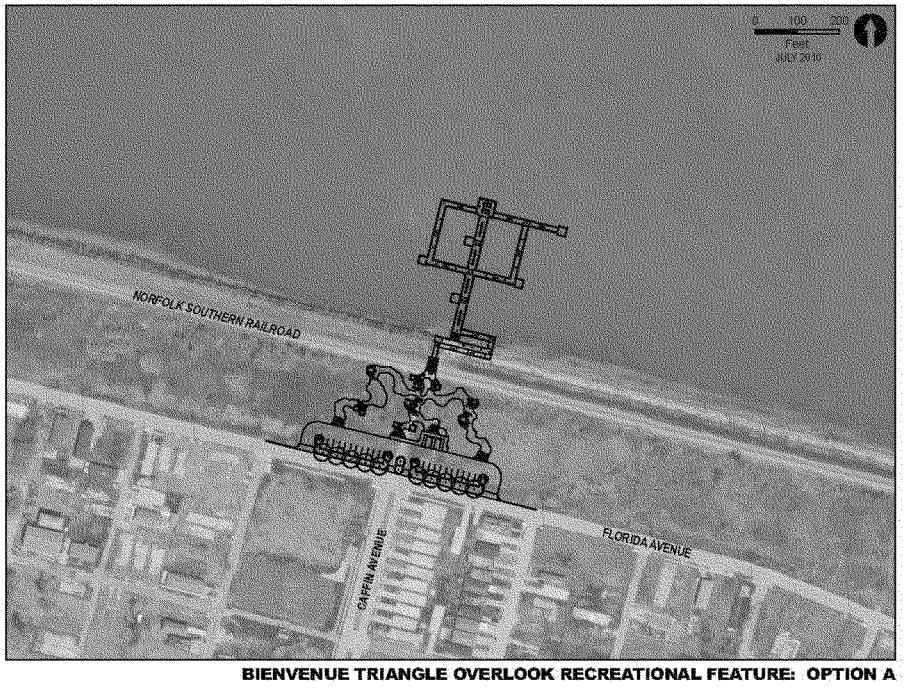


Figure 78 Bienvenue Triangle Recreation Feature

6.3 SHELL BEACH RECREATION FEATURE

Currently, the shoreline of Shell Beach, located in St. Bernard Parish at the end of Yscloskey Road where it meets the MRGO, is often used by fisherman. Fishermen are confronted with a rocky, jagged shoreline and snakes in the area. The shoreline is used extensively on the weekends by many in the area. Additionally, a memorial is located at this location which lists the names of those who lost their lives as a result of Hurricane Katrina. The recreational plan will attempt to incorporate the memorial in a way that is both respectful and functional.

The recommended plan for Shell Beach consists of a 343 lf of boardwalk into the MRGO, 805 lf of shoreline boardwalk to 5 picnic shelters (2 handicap accessible), interpretive signage, bathrooms, parking, solar lighting and vegetative plantings. Figure 79 shows the recommended plan for Shell Beach. Details of the plan are shown on plates RF-4 to RF-8.



Figure 79 Shell Beach Recreation Features

7.0 STRUCTURES

7.1 SCOPE

The analysis and design concepts for the structural concepts are presented in the following text. A general layout of the diversion is presented on plate C-42.

7.2 REFERENCES

The structural components shall be designed according to the applicable portions of the US Army Corps of Engineers (USACE) publications and other applicable reference material.

7.2.1 USACE Publications

(1) EM 1110-2-2105, Design of Hydraulic Steel Structures (Mar 93), Including Change 1, (May 94)

(2) EM 1110-2-2104, Strength Design for Reinforced Concrete Hydraulic Structures, June 92 (Including Change 1, Aug 03)

(3) EM 1110-2-2102, Waterstops and Other Joint Materials (Sep 95).

(4) EM 1110-2-2400, Structural Design and Evaluation of Outlet Works (June 03)

(5) EM 1110-2-2502, Retaining and Flood Walls (Sep89).

(6) EM 1110-2-2701, Vertical Lift Crest Gates (Nov 97).

(7) EM 1110-2-2902, Conduits, Culverts, and Pipes (Oct 97), Including Change 1, (Mar 98).

(8) EM 1110-2-2906, Design of Pile Foundations (Jan. 91)

(9) EM 385-1-1, Safety Manual (Sep 2008)

(10) EM 1110-2-2503, Design of Sheet Pile Cellular Structures Cofferdams & Retaining Structures, Sept. 89

(11) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Design Criteria 2010, where applicable.

7.2.2 Technical Publications

(1) American Association of State Highway and Transportation Officials (AASHTO)

(2) American Concrete Institute, Building Code Requirements for Structural Concrete (ACI 318)

(3) American Institute of Steel Construction (AISC), Manual of Steel Construction Allowable Stress Design, (9th Edition)

(4) American Welding Society, Structural Welding Code, (AWS-D 1.1)

(5) Louisiana Department of Transportation and Development (LDOTD), Louisiana Standard Specifications for Roads and Bridges

(6) Portland Cement Association, Concrete Culverts and Conduits.

(7) AREMA

7.2.3 Computer Programs

(1) CWALSHT" WES Program No. X0031.

(2) Pile Group Analysis (CPGA)," WES Program No. XOO8O.

(3) Pile Group Graphics Display (CPGG) ,WES Program N0. XOO81.

(4) "C-Frame," WES Program N0. X0030.

(5) Structural Analysis and Design Software, "STAAD

(6) Ensoft, "Group 7.0"

7.3 DESIGN CRITERIA

7.3.1 General

Design criteria shall be according to the referenced EM's and technical publications.

7.3.2 Material Weights

Item	Unit Weight (PCF)

Water	62.4 to 64.0 (Site dependent)
Reinforced Concrete	150.0
Steel	490.0
Rip rap	132.0
Semi-Compacted Granular Fill	120.0
Fully-Compacted Granular Fill, Wet	122.0
Fully-Compacted Granular Fill Effective	58.0
90% -Compacted Clay Fill, Wet	110.0
Non-plastic Embankment	120.0
Asphaltic Concrete	100.0

7.3.3 Design Stresses

7.3.3.1 Concrete

Reinforced concrete hydraulic structures shall follow USACE criteria (EM 1110-2-2104). EM 1110-2-2104 procedures are referenced to the load factors and strength reduction factors found in ACI 318. In general, the specified compressive strength (f 'c) shall be 4000 psi.

A Single Live Load Factor of 1.7, for dead and lives, loads shall be used in addition to a Hydraulic Factor.

A Hydraulic Factor of 1.3 shall be applied to both shear and moment. The hydraulic factor is used to improve crack control in hydraulic reinforced concrete structures by increasing reinforcement requirements, thus reducing steel stresses.

Strength reduction factor for bending shall be 0.90 and the strength reduction factor for shear shall be 0.85.

7.3.3.2 Reinforcement

The design strength of reinforcement shall be based on the use of ASTM A 615, Grade 60, steel having yield strength of 60,000 psi.

Maximum Flexural Reinforcement

0.25 pb (Recommended)
0.375 pb (Permitted w/o special studies)

Minimum Flexural Reinforcement - per ACI Code

Temperature Reinforcement - 0.0028Ag (1/2 in each face)

7.3.3.3 Structural Steel

The basic stresses for structural steel shall be in accordance with the 9th Edition of the AISC, Manual of Steel Construction Allowable Stress Design, as modified by EM 1110-2-2105, Design of Hydraulic Steel Structures.

Minimum thickness for corrosion control shall be 5/16".

Allowable stress = 5/6 of AISC allowable stress.

Allowable stresses for the design of welds shall be according to the latest AWS Welding Code as modified by EM 1110-2-2101.

7.3.3.4 Sheet Piling

Design Stresses

Fb = 0.5 fy
Fv = 0.33 fy
Fa = 5/6 AISC allowable

Thickness = 0.375 in. minimum, only hot-rolled steel sheet piling sections are allowed.

7.3.3.5 Service Piling

The allowable compressive strength used for southern pine treated timber piling will be 825 psi (parallel to grain).

Prestressed concrete piling will be 14" square piles with a specified compressive strength (f'c) of 6000 psi.

H-Piles - The basic stresses for structural steel shall be in accordance with the 9th Edition of the AISC, Manual of Steel Construction Allowable Stress Design, as modified by EM 1110-2-2906, Design of Pile Foundations.

7.3.3.6 Allowable Overstress

The allowable overstresses used in the design of the structural components shall be as shown in the following table:

Loading Condition	Allowable Overstress
Normal Operating	0 %
Construction	16-2/3 %
Maintenance Dewatering	33-1/3 %
Project Flood	0 %
Temporary Loadings (Wind and Impact)	33-1/3 %

7.4 GENERAL DESCRIPTION OF PROJECT FEATURES

7.4.1 Gated Diversion Structure at the Mississippi

See plates S-1 and S-2 for details of the structure.

7.4.1.1 Inflow monoliths (U-1 and U-2)

The inflow portion of the structure is comprised of two 30'-0" long reinforced concrete, U-frame monoliths. The base of each monolith flares, from a maximum width of 86'-6" at the channel, downward until they meet the gated portion of the structure. The tops of the base slabs remain constant at El. -11.8. Both monoliths will be designed independently and founded upon steel piles. Steel sheet pile, provided for erosion protection, will follow the outside perimeter of each monolith.

7.4.1.2 Service gate monolith (C-1)

The service gate monolith can be considered as comprised of two sections. The upper 16'-6" by 71'-0" tower extends from the top of the base slab, at El. -11.8 to El. 25.0. This section houses the four vertical lift service gates and accompanying machinery. The lower 56'-6" length of the monolith is a typical 67-0" wide box culvert section. The top of the base slab remains constant at El. -11.8 for the full length of the monolith. The monolith will be founded upon steel piles and will support a portion of the main line levee. Steel sheet piling extending to El. -35.0 is provided along the front sides of the monolith for seepage cut-off. A walkway will extend from the top of the levee (El. 20) to the top of the tower (El. 25), providing access to the gate machinery.

7.4.1.3 Box Culvert Monoliths

The main body of the structure is composed of 15 box culvert type monoliths designated (C-3) thru (C-17). Each monolith is 27' wide by 15' long, containing 4 individual 13-0" by 13-0" chambers. The top of the base slab is continuous at El. -11.8, with the top roof continuous at El. +4.2. Each monolith will be pile founded and designed independently. Expansion joints will be provided between monoliths to prevent load transfer. The pile foundations vary as required for the applied loads.

7.4.1.4 Monolith (C-2 and C-3)

These monoliths will support most of the main line levee on steel piles. A seepage cutoff wall spans its entire width.

7.4.1.5 Monoliths (C-4 and C-5)

These monoliths support the Railroad (one track) on steel piles.

7.4.1.6 Monoliths (C-6 thru C-13, C-16 and C-16)

These are typical monoliths supporting 2 ft. of backfill.

7.4.1.7 Monoliths (C-14 and C-15)

These monoliths support the LA Hwy 18 on steel piles.

7.4.1.8 Downstream bulkhead monolith (C-18)

The downstream bulkhead monolith is comprised of two sections. The first 17'-0" is in part a typical 67'-0"' wide box culvert and contains provisions for placing the downstream bulkheads. The lower 48'-0" of the monolith is a reinforced concrete U-frame. The top of the base slab is at El. -11.8. The base of the U-frame portion of the monolith flares from a width of 62'-6" to 76-6". The monolith will be founded upon steel piles.

7.4.1.9 Outflow monoliths (U-3 and U-4)

The outflow portion of the structure is comprised of two reinforced concrete U-frame monoliths. The bases of the monoliths flare from a width of 76'-6" at monolith C-9, to 90'-0" at the channel. The walls of both monoliths remain constant at El. 12. The tops of the base slabs remain constant at El. -11.8. Both monoliths are pile founded on steel piles. Steel sheet piling provided for erosion protection follows the outside perimeter of both monoliths.

7.4.1.10 Service gates

Flow through the structure will be regulated by four vertical flush-bottom sluice gates, one at the entrance of each chamber. Each gate will be constructed from cast- iron with bronze seats or stainless steel.

7.4.1.11 Emergency bulkheads

Two (2) emergency bulkheads will be constructed from structural steel for maintenance dewatering and emergency closures. The bulkheads shall be placed by land based equipment into the slots provided in monolith (C-18). The bulkheads will be stored on a rack at the outflow channel end of the structure.

7.4.2 Highway Crossing at West Judge Perez

The work consists of excavating a 1,500-foot segment of the Violet Diversion Structure Outfall Channel and constructing a simple span concrete bridge at the existing West Judge Perez roadbed (605 feet long with 10 spans) (see plates S-3 and S-4). The work includes constructing and removing a detour road and preloading a portion of the new approach ramps. The bridge

construction includes testing and installing precast, prestressed, concrete piles; channel excavation and riprap placement; fabricating and installing Type III precast, prestressed concrete girders; constructing cast-in-place abutments, T-walls, bridge deck, and barrier walls. Roadwork includes placing an embankment and asphalt and concrete approach slabs; installing roadway appurtenances; and drainage work.

7.4.3 Gated Structure at the 40 Arpent Canal

See plates S-5 and S-6 for details of the structure.

7.4.3.1 Inflow monolith (U-1)

The inflow portion of the structure is comprised of one 30'-0" long reinforced concrete, U-frame monoliths. The base of the monolith flares, from a maximum width of 118 '-0" at the channel, downward until they meet the gated portion of the structure. The tops of the base slabs remain constant at El. -12.8. The monolith will be founded on steel piles. Steel sheet pile provided for erosion protection, follows the outside perimeter of each monolith.

7.4.3.2 Service gate monolith (C-1)

The service gate monolith can be considered as comprised of two sections. The upper 16'6" by 71' tower extends from the top of the base slab, at El. 0.2, to El. 12.0. This section houses the seven vertical lift service gates and accompanying machinery. The lower 61' length of the monolith is a typical 58-6" wide box culvert section. The top of the base slab remains constant at El. -12.8for the full length of the monolith. The monolith will be founded upon steel piles and supports a portion of the main line levee. Steel sheet piling extending to El. -35.0 is provided along the front sides of the monolith for seepage cut-off. A walkway will extend from the top of the levee (El. 10) to the top of the tower (El. 12), providing access to the gate machinery.

7.4.3.3 Downstream bulkhead monolith (C-2)

The downstream bulkhead monolith is comprised of two sections. The first 17'-0" is in part a typical 108'-0" wide box culvert and contains provisions for placing the downstream bulkheads. The lower 48'-0" of the monolith is a reinforced concrete U-frame. The top of the base slab is at El. -12.8. The base of the U-frame portion of the monolith flares from a width of 108'-0" to 117'-6". The monolith will be founded upon steel piles.

7.4.3.4 Service gates

Flow through the structure will be regulated by seven (7) vertical flush-bottom sluice gates, one at the entrance of each chamber. Each gate will be constructed from cast- iron with bronze seats or stainless steel.

7.4.3.5 Emergency bulkheads

Two (2) emergency bulkheads will be constructed from structural steel for maintenance dewatering and emergency closures. The bulkheads shall be placed by land based equipment into the slots

provided in monolith (C-2). The bulkheads will be stored on a rack at the outflow channel end of the structure.

The location of the structure at the 40 Arpent levee will be placed in such a manner that the 40 Arpent canal will be blocked off. The impacts of this structure on the local drainage are being studied and the appropriate actions will be taken to ensure this project does not impact the local drainage system.

7.4.4 Gated Structure at the MRGO Outlet

See plates S-7 and S-8 for details of the structure.

7.4.4.1 Inflow monoliths (U-1 and U-2)

The inflow portion of the structure is comprised of two 30'-0" long reinforced concrete, U-frame monoliths. The base of each monolith flares, from a maximum width of 150 '-6" at the channel, downward until they meet the gated portion of the structure. The tops of the base slabs remain constant at El. -14.4. Both monoliths will be designed independently and founded upon steel piles. Steel sheet pile, provided for erosion protection, will follow the outside perimeter of each monolith.

7.4.4.2 Service gate monolith (C-1)

The service gate monolith, can be considered as comprised of two sections. The upper 16'-6" by 71' tower extends from the top of the base slab, at El. 1.6, to El. 32.0. This section houses the eight vertical lift service gates and accompanying machinery. The lower 53'-6" length of the monolith is a typical 131'-0" wide box culvert section. The top of the base slab remains constant at El. -14.4 for the full length of the monolith. The monolith will be founded upon steel piles and supports a portion of the main line levee. Steel sheet piling extending to El. -35.0 is provided along the front sides of the monolith for seepage cut-off. A walkway will extend from the top of the floodwall (El. 30) to the top of the tower (El. 32), providing access to the gate machinery.

7.4.4.3 Monoliths (C-2 and C-3)

These are typical monoliths supporting 2 ft. of backfill.

7.4.4.4 Downstream bulkhead monolith (C-4)

The downstream bulkhead monolith is comprised of two sections. The first 17'-0" is in part a typical 131'-0" wide box culvert and contains provisions for placing the downstream bulkheads. The lower 48'-0" of the monolith is a reinforced concrete U-frame. The top of the base slab is at El. -14.4. The base of the U-frame portion of the monolith flares from a width of 131'-0" to 140'-6". The monolith will be founded upon steel piles.

7.4.4.5 Outflow monoliths (U-3 and U-4)

The outflow portion of the structure is comprised of two reinforced concrete U-frame monoliths . The bases of the monoliths flare from a width of 140'-6" at monolith C-4, to 154'-0" at the channel. The

tops of the base slabs remain constant at El. -14.4. The monolith will be pile founded on steel piles. Steel sheet piling provided for erosion protection follows the outside perimeter of both monoliths.

7.4.4.6 Service gates

Flow through the structure will be regulated by eight (8) vertical flush-bottom sluice gates, one at the entrance of each chamber. Each gate will be constructed from cast- iron with bronze seats or stainless steel.

7.4.4.7 Emergency bulkheads

Two emergency bulkheads will be constructed from structural steel for maintenance dewatering and emergency closures. The bulkheads shall be placed by land based equipment into the slots provided in monolith (C-4). The bulkheads will be stored on a rack at the outflow channel end of the structure.

7.5 LOADING CONDITIONS

7.5.1 Diversion Structure

7.5.1.1 General

A wide range of possible loading conditions will be considered for both the planned operation and construction of the structure. In addition to dead and live loads, the effects of superimposed temporary loadings such as wind, debris, and boat impact will be considered.

7.5.1.2 Construction

Lateral earth pressures will be developed considering the type of backfill, and where appropriate, will be considered as loading on various structural elements during the entire construction period. These cases will be designated as follows:

Construction with no backfill
Construction with fully compacted backfill
Construction with total backfill (TW=O. 0)

7.5.1.3 Hydraulic

The structure will be investigated for a range of possible hydraulic and operational modes. These cases will be designated as follows:

Maint. Dewatering, 2 culverts (HW=8.0, TW=4.0)
Maint. Dewatering, 2 culverts (HW=8.0, 'TW=0.0)
Normal operating (HW=12.5, TW=5.0)
Maximum Operating (HW=18.0, TW=0.0)
Flood Stage (HW=22.0, TW=0.0)

Hurricane (HW=0. 6, TW=7.5)

7.5.1.4 Uplift

Uplift pressure is comprised of position pressure and seepage pressure. Position pressure is based on the hydrostatic head due to the difference in water elevation and the base of the structure. Seepage pressure is a function of the equipotential flow line caused by the difference in water elevation between headwater and tailwater. To insure a conservative design, two uplift conditions, designated 1 and 2, will be used in the design for all monolith foundations. Uplift condition 1 will be derived assuming the sheet pile cut-off under the sluice gate monolith as effective. Uplift condition 2 will be derived by assuming the sheet pile cut-off as ineffective.

7.5.1.5 Superimposed

In addition to the primary loads on the structure, the application of the following additional loadings will be considered:

(1) **Soil drag loads (D).** Drag load due to differential settlement of the surrounding backfill with respect to the structure will be incorporated into the design.

(2) **Silt Loads (S).** Structural components will be designed for silt deposits up to 12 feet in height, where applicable.

(3) **Debris loads (DI).** A uniform load of 1.5 kips per foot water line will applied to the applicable structural.

(4) **Boat impact (BI).** A uniform load of 5.0 kips per foot in the direction of flow will be applied 1 foot above the waterline.

(5) **Wind loads (WI).** A wind load of 50 psf will be considered in the design of applicable structural components.

(6) **Highway loads (H)** • A Louisiana Department of Transportation and Development HST-18 truck loading will be considered in the design of its applicable structural component

(7) **Train loads (T).** Cooper E-80 train loads will be applied to the applicable structural components of the permanent work. A Cooper E-65 load will be used in the design of the temporary detour.

8.0 RELOCATIONS

8.1 SUMMARY

8.1.1 Scope and Purpose

All the relocation information provided below pertains to relocations for the proposed diversion. This information will be updated as part of the separate study on the diversion. There are no relocations identified for the shoreline protection or marsh/swamp creation/nourishment features. Relocation data was collected and tabulated by U.S. Army Corps of Engineers, New Orleans District, Engineering Division, Relocations Team, to a feasibility study level. Relocations Team made contact with owners to obtain preliminary information on existing facilities. Relocations Team then made assumptions based on project design and facility locations to determine project relocation requirements and for developing the cost estimates presented in this report. A preliminary compensable interest report will be compiled during the Preconstruction Engineering and Design phase.

The MRGO Ecosystem Restoration Feasibility Study, study includes diverting freshwater from the Mississippi River and introducing it to the western Mississippi Sound for the purpose of salinity control, with some of the water influencing the Central Wetlands area. A multi celled gated box culvert control structure will be placed through the Mississippi River levee. An outlet structure will be constructed through the existing HSDRRS system at the MRGO. The two structures will be connected by a channel with guide levees on each side. The diversion canal will stretch from the Mississippi River to the MRGO; crossing both Judge Perez Drive and St. Bernard Highway. It is anticipated that a temporary detour roadway will be required at Judge Perez Drive and a temporary detour (shoe-fly) for the railroad between St. Bernard Highway and the Mississippi River. A bridge will be constructed at Judge Perez Drive and the detour road will be removed upon completion of construction. This report has been prepared by the U.S. Army Corps of Engineers, New Orleans District, Engineering Division, Relocations Team.

8.1.2 Estimated Relocation Cost

The total preliminary estimated costs for relocation of pipelines, power and communication lines for the proposed project is $14,116,437 (Note: the total cost doesn't include the cost of the railroad or road relocation.) This figure includes 12% for owner's engineering and design, 10% for owner's contract administration, and 35% for contingencies. The relocation plan and cost will be revised during the separate study on the Violet Diversion.

8.1.3 Authority for Accomplishing Relocations

The MRGO Ecosystem Restoration Study was authorized by the Water Resources Development Act of 2007 Section 7013. Cost-sharing is subject to the rules for ecosystem restoration projects established in Section 210 of WRDA 1996, with the exception of the Violet Freshwater Diversion, which would be divided between the States of Louisiana and Mississippi as stipulated in WRDA 2007, Section 3083. Accordingly, the non-Federal share will be 35 percent of the implementation

costs. Non-Federal sponsors are responsible for 100 percent of lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRD), and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The value of LERRD is credited to the 35 percent share.

8.2 DESCRIPTION OF AFFECTED FACILITIES, PROPOSED RELOCATION, AND COSTS

Described below are the facilities affected by the project. All relocations will be performed concurrent with construction.

8.2.1 Roads

All roadways and bridges requiring replacement or installation to accommodate the project are accounted for in structural design (Section 6). There will be a two (2) lane temporary detour roadway and a permanent bridge installation at Judge Perez Drive. The bridge installation and temporary detour roads are considered relocation items.

8.2.2 Railroads

Existing Alabama Great Southern Railroad (Norfolk) between St. Bernard Highway and the Mississippi River shall have a temporary shoe-fly during construction. The design will be accounted for under structural design (Section 6) however; the temporary shoe-fly is considered a relocation item.

8.2.3 Facilities

(1) American Midstream (Enbridge) Pipeline (From MRGO to Judge Perez Drive).

Item 1 consists of an 8"gas pipeline. The line would be directionally drilled 35' beneath the channel (approximately 1000 linear feet) with a lateral shift of 5'-10'. A hot tap will be required and the owner will be responsible for removing the existing pipe. This work will be performed by American Midstream (Enbridge) Pipeline. The estimated cost for this relocation is as follows:

Cut, cap and remove existing line (approximately 1000 linear feet). Install new pipeline, directionally drilling 35' beneath channel (approximately 1000 linear feet). Install hot tap at both ends of existing pipe and connect new pipeline. New line shall be installed with an approximate 5'-10' lateral shift. = $1,826,523

Item 2 consists of a 16"gas pipeline. The line would be directionally drilled 35' beneath the channel (approximately 1000 linear feet) with a lateral shift of 5'-10'. A hot tap will be required and the owner will be responsible for removing the existing pipe. This work will be performed by American Midstream (Enbridge). The estimated cost for this relocation is as follows:

Cut, cap and remove existing line (approximately 1000 linear feet). Install new pipeline, directionally drilling 35' beneath channel (approximately 1000 linear feet).Install hot tap at both ends of existing pipe and connect new pipeline. New line shall be installed with an approximate 5'-10' lateral shift. = $2,300,859

(2) Gulf South Pipeline (From MRGO to Judge Perez Drive)

Item 1 consists of a 16" gas pipeline. Both lines would be directionally drilled 35' beneath the channel (approximately 1000 linear feet) with a lateral shift of 5'- 10'. A hot tap will be required and the owner will be responsible for removing the existing pipe. This work will be performed by Gulf South Pipeline. The estimated cost for this relocation is as follows:

Cut, cap and remove existing line (approximately 1000 linear feet). Install new pipeline, directionally drilling 35' beneath channel (approximately 1000 linear feet). Install hot tap at both ends of existing pipe and connect new pipeline. New line shall be installed with an approximate 5'-10' lateral shift. = $2,300,859

Item 2 consists of a 20" gas pipeline. Both lines would be directionally drilled 35' beneath the channel (approximately 1000 linear feet) with a lateral shift of 5'- 10'. A hot tap will be required and the owner will be responsible for removing the existing pipe. This work will be performed by Gulf South Pipeline. The estimated cost for this relocation is as follows:

Cut, cap and remove existing line (approximately 1000 linear feet). Install new pipeline, directionally drilling 35' beneath channel (approximately 1000 linear feet). Install hot tap at both ends of existing pipe and connect new pipeline. New line shall be installed with an approximate 5'-10' lateral shift. = $2,646,729

(3) St. Bernard Parish (water main) - (At Judge Perez Drive)

Item 1 consists of a water main (approximately 10"). The assumed current alignment of the water main is parallel to Judge Perez Drive. Owner will perform a temporary bypass following the route of the temporary detour road (approximately 800 linear feet). The permanent relocation will be attached to the newly installed bridge after construction complete (approx. 700 linear feet). The relocation of St. Bernard Parish's water main will be performed by St. Bernard Parish. The estimated cost for this relocation is as follows:

Cut, cap and remove existing pipeline (approximately 700 linear feet). Owner will route the new pipeline (approx. 800 linear feet) along alignment of the temporary detour road. Upon bridge construction completion, the temporary line will be cut, capped and removed. The permanent line will be attached to the newly constructed bridge (approx. 700 linear feet) = $345,870

(4) Entergy Louisiana, LLC (Entergy) – (At Judge Perez Drive)

Item 1 encompasses 2 existing power poles and approximately 700 linear feet of 13.8kV power cable. The owner will temporarily install 4 new poles and approx. 800 linear feet of 13.8kV cable along the temporary detour road alignment. The permanent relocation will be along the original alignment after construction completion. The construction of the new support system will be performed by Entergy Louisiana, LLC. The estimated cost for this relocation is as follows:

Temporarily install 4 new poles and approx. 800 linear feet of 13.8kV cable following temporary detour road alignment. After installing new poles and cable, owner will remove 2 existing poles and 700 linear feet of 13.8kV along existing alignment. For the permanent relocation the owner will install 2 new poles and 700 linear feet of 13.8kV cable along the original alignment. After the new poles are installed the owner will remove the 4 poles and associated cable along the detour route and re-establish service. = $184,464

(5) AT&T Communications (Telephone) – (At Judge Perez Drive)

Item 1 assumes aerial lines that share poles with Entergy. Therefore the temporary and permanent relocation shall follow that of Entergy Louisiana, LLC. The relocation will be performed by AT&T. The estimated cost for this relocation is as follows:

Temporarily route approx. 800 linear feet of cable on newly installed Entergy poles following temporary detour road alignment. After installation of new poles owner will remove 700 linear feet of cable along existing alignment. For the permanent relocation the owner will install 700 linear feet of cable along the original alignment on 2 newly installed Entergy poles. After the new poles are installed the owner will remove the cable along the detour route associated with the 4 poles (along detour route) and re-establish service. = $156,465

(6) Cox Communications (Cable) – (At Judge Perez Drive)

Item 1 assumes aerial lines that share poles with Entergy. Therefore the temporary and permanent relocation shall follow that of Entergy Louisiana, LLC. The relocation will be performed by Cox Communications. The estimated cost for this relocation is as follows:

Temporarily route approx. 800 linear feet of cable on newly installed Entergy poles following temporary detour road alignment. After installation of new poles owner will remove 700 linear feet of cable along existing alignment. For the permanent relocation the owner will install 700 linear feet of cable along the original alignment on 2 newly installed Entergy poles. After the new poles are installed the owner will remove the cable along the detour route associated with the 4 poles (along detour route) and re-establish service. = $107,055

(7) St. Bernard Parish (sewer main) – (At Judge Perez Drive)

Item 1 consists of a sewer main (approximately 10"). The assumed current alignment of the sewer main is parallel to Judge Perez Drive. Owner will perform a temporary bypass following the route of the temporary detour road (approximately 800 linear feet). The permanent relocation will be attached to the newly installed bridge after construction complete (approx. 700 linear feet). The relocation of St. Bernard Parish's sewer main will be performed by St. Bernard Parish. The estimated cost for this relocation is as follows:

Cut, cap and remove existing pipeline (approximately 700 linear feet). Owner will route the new pipeline (approx. 800 linear feet) along alignment of the temporary detour road. Upon bridge construction completion, the temporary line will be cut, capped and removed. The permanent line will be attached to the newly constructed bridge (approx. 700 linear feet) = $345,870

(8) Atmos Gas 6" Natural Gas Pipeline – (At Judge Perez Drive)

Item 1 consists of a 6" natural gas line. The assumed current alignment of the line is parallel to Judge Perez Drive. Owner will perform a temporary bypass following the route of the temporary detour road (approximately 800 linear feet). The permanent relocation will be a directional drill (with a lateral shift of 5'- 10' from original alignment) 35' beneath the channel (approx. 1000 linear feet). A hot tap will be required and the owner will be responsible for removing the existing pipe. The relocation of Atmos's natural gas pipeline will be performed by Atmos Gas. The estimated cost for this relocation is as follows:

Cut, cap and remove existing line (approximately 800 linear feet). Install new pipeline, directionally drilling 35' beneath channel (approximately 1000 linear feet). Install hot tap at both

ends of existing pipe and connect new pipeline. New line shall be installed with an approximate 5'-10' lateral shift from original alignment. = $1,831,464

(9) St. Bernard Parish (water main) – (At St. Bernard Highway)

Item 1 consists of a water main (approximately 10"). The assumed current alignment of the water main is parallel to St. Bernard Highway. Owner will perform a temporary bypass with an offset of 50' from the current alignment. The bypass will run for a distance of 500'. After completion of the bypass the owner will remove approx. 400 linear feet of existing pipeline. The owner will permanently relocate the pipeline (approx. 400 linear feet) along its original alignment upon completion of construction. The relocation of St. Bernard Parish's water main will be performed by St. Bernard Parish. The estimated cost for this relocation is as follows:

Cut, cap and remove existing pipeline (approximately 400 linear feet). Owner will install a temporary bypass (approximately 500') offset 50' from the current alignment. Upon completion of construction the owner will permanentlyrelocate along the original alignment (approximately 400 linear feet. = $251,991

(10) Entergy Louisiana, LLC. (Entergy) – (At St. Bernard Highway)

Item 1 encompasses 2 existing power poles and approximately 700 linear feet of 13.8kV power cable. The owner will temporarily install 4 new poles and approx.800 linear feet of 13.8kV cable offset 75' from the existing alignment; removing the existing (2) poles and associated cable (approx. 700 linear feet). The permanent relocation will be along the original alignment after construction completion. The construction of the new support system will be performed by Entergy Louisiana, LLC. The estimated cost for this relocation is as follows:

Temporarily install 4 new poles and approx. 800 linear feet of 13.8kV cable offset 75' from the existing alignment. After installing new poles and cable, owner will remove 2 existing poles and 700 linear feet of 13.8kV along existing alignment. For the permanent relocation the owner will install 2 new poles and 700 linear feet of 13.8kV cable along the original alignment. After the new poles are installed the owner will remove the 4 poles and associated cable along the detour route and re-establish service. = $184,464

(11) AT&T Communications (Telephone) – (At St. Bernard Highway)

Item 1 assumes aerial lines that share poles with Entergy. Therefore the temporary and permanent relocation shall follow that of Entergy Louisiana, LLC. The relocation will be performed by AT&T. The estimated cost for this relocation is as follows:

Temporarily route approx. 800 linear feet of cable on newly installed Entergy poles offset 75' from the existing alignment. After installation of new poles owner will remove 700 linear feet of cable along existing alignment. For the permanent relocation the owner will install 700 linear feet of cable along the original alignment on 2 newly installed Entergy poles. After the new poles are installed the owner will remove the cable along the temporary alignment and re-establish service. = $156,465

(12) Cox Communications (Cable) – (At St. Bernard Highway)

Item 1 assumes aerial lines that share poles with Entergy. Therefore the temporary and permanent relocation shall follow that of Entergy Louisiana, LLC. The relocation will be performed by Cox Communications. The estimated cost for this relocation is as follows:

Temporarily route approx. 800 linear feet of cable on newly installed Entergy poles offset 75' from the existing alignment. After installation of new poles owner will remove 700 linear feet of cable along existing alignment. For the permanent relocation the owner will install 700 linear feet of cable along the original alignment on 2 newly installed Entergy poles. After the new poles are installed the owner will remove the cable along the temporary alignment and re-establish service. = $107,055

(13) St. Bernard Parish (sewer main) – (At St. Bernard Highway)

Item 1 consists of a sewer main (approximately 10"). The assumed current alignment of the water main is parallel to St. Bernard Highway. Owner will perform a temporary bypass with an offset of 50' from the current alignment. The bypass will run for a distance of 500'. After completion of the bypass the owner will remove approx. 400 linear feet of existing pipeline. The owner will permanently relocate the pipeline (approx. 400 linear feet) along its original alignment upon completion of construction. The relocation of St. Bernard Parish's sewer main will be performed by St. Bernard Parish. The estimated cost for this relocation is as follows:

Cut, cap and remove existing pipeline (approximately 400 linear feet). Owner will install a temporary bypass (approximately 500') offset 50' from the current alignment. Upon completion of construction the owner will permanently relocate along the original alignment (approximately 400 linear feet. = $251,991

(14) Atmos Gas 10" Natural Gas Pipeline – (At St. Bernard Highway)

Item 1 consists of a sewer main (approximately 10"). The assumed current alignment of the water main is parallel to St. Bernard Highway. Owner will perform a temporary bypass with an offset of 50' from the current alignment. The bypass will run for a distance of 500'. After completion of the bypass the owner will remove approx. 400 linear feet of existing pipeline. The owner will permanently relocate the pipeline (approx. 400 linear feet) along its original alignment upon completion of construction. The relocation of Atmos Gas's sewer main will be performed by Atmos Gas. The estimated cost for this relocation is as follows:

Cut, cap and remove existing pipeline (approximately 400 linear feet). Owner will install a temporary bypass (approximately 500') offset 50' from the current alignment. Upon completion of construction the owner will permanently relocate along the original alignment (approximately 400 linear feet. = $741,150

(15) AT&T Communications (Fiber Optics) – (At the Railroad)

Item 1 encompasses an assumed 2" pipeline with a 6-cable, fiber optic bundle. The owner will permanently jack the cables (encased in the 2" pipeline) beneath the Railroad after the installation of the culverts (approximately 400 linear feet of pipe). The relocation of AT&T's fiber optic lines will be performed by AT&T. The estimated cost for this relocation is as follows:

Cut, cap and remove existing pipeline (approximately 400 linear feet). Owner will install a temporary bypass (approximately 500') offset 50' from the current alignment. Upon completion of construction the owner will permanently relocate along the original alignment (approximately 400 linear feet. = $192,699

(16) Entergy Louisiana, LLC. (Entergy) – (At the Railroad)

Item 1 encompasses 2 existing power poles and approximately 700 linear feet of 13.8kV power cable. The owner will temporarily install 4 new poles and approx. 800 linear feet of 13.8kV cable offset 75' from the existing alignment; removing the existing (2) poles and associated cable (approx. 700 linear feet). The permanent relocation will be along the original alignment after construction completion. The construction of the new support system will be performed by Entergy Louisiana, LLC. The estimated cost for this relocation is as follows:

Temporarily install 4 new poles and approx. 800 linear feet of 13.8kV cable offset 75' from the existing alignment. After installing new poles and cable, owner will remove 2 existing poles and 700 linear feet of 13.8kV along existing alignment. For the permanent relocation the owner will install 2 new poles and 700 linear feet of 13.8kV cable along the original alignment. After the new poles are installed the owner will remove the 4 poles and associated cable along the detour route and re-establish service. = $184,464

9.0 OPERATION, MAINTENANCE, REPAIR, REPLACEMENT AND REHABILITATION (OMRR&R)

9.1 SHORELINE PROTECTION

For the rock shoreline protection features a maintenance event is assumed to be needed in year 5 based on the fact that a majority of the settlement occurs fairly quickly after construction. Additional maintenance events would occur at 10 year intervals after the first maintenance event. For existing features MRGO 2, MRGO 3 and MRGO 4 since the initial construction is a maintenance event, the initial lift at year 5 would not be needed. These would be maintained at 10 year intervals after the initial event. Table 54 below shows the estimated cost and year for these maintenance events.

Table 54 Shoreline Protection Maintenance Events

Feature	Maintenance Event 1		Maintenance Events 2-5	
	Year	Estimated Cost	Years	Estimated Cost Per Event
LS1	FY21	$2,475,000	FY31, FY41, FY51, FY61	$2,475,000
BS1	FY22	$2,612,500	FY32, FY43, FY53, FY63	$2,612,500
ES1	FY23	$937,500	FY33, FY43, FY53, FY63	$937,500
ES2	FY23	$1,293,750	FY33, FY43, FY53, FY63	$1,293,750
ES3	FY24	$2,187,500	FY34, FY44, FY54, FY64	$2,187,500
MRGO1	FY19	$281,250	FY29, FY39, FY49, FY59	$281,250
MRGO6	FY20	$500,000	FY30, FY40, FY50, FY60	$500,000
MRGO8	FY23	$812,500	FY33, FY43, FY53, FY63	$812,500
MRGO2	N/A	N/A	FY33, FY43, FY53, FY63	$1,225,000
MRGO3	N/A	N/A	FY33, FY43, FY53, FY63	$1,506,250
MRGO4	N/A	N/A	FY33, FY43, FY53, FY63	$206,250

9.2 MARSH AND SWAMP CREATION AND NOURISHMENT

For the marsh and swamp creation and nourishment features acres needed to be restored during a maintenance event were determined based on the calendar year of predicted marsh collapse used in the WVA . Further details of this determination are described the Main Report. The maintenance event would occur as shown in Table 55. Marsh and swamp restoration maintenance quantities were based off of the following assumptions:

- areas requiring maintenance will have subsided to an elevation of approximately -1.0' NAVD88;
- allowable borrow depth at the time maintenance is performed would be 12' maximum below the lake bottom for Lake Borgne borrow and MRGO Reach 1/ GIWW and/or Michoud Canal would again be used for O&M of Features CM 1 and CM 5; and
- all required retention features would consist of earthen materials obtained from adjacent borrow.

Table 55 OMRR&R Marsh and Swamp Creation and Restoration

Contract	Features	Acres	Estimated Cost
1	CM1, CM2, CM5, CC1, CC3	670	$51,240,000
2	CM3, CM4, CC2, CC5, CC6	794	$46,240,000
3	LM1, EM1	1,050	$44,140,000
4	LM2, LM4, MRGO7, EM2, EM3, EM4	946	$53,840,000
5	BM1, MRGO5, MRGO8, LM3	1,375	$47,920,000
6	HM1, TM1, TM2	882	$51,200,000
7	TM7, TM8	764	$54,040,000

The contracts listed in Table 55 were scoped out as such in an attempt to balance out the amount of borrow required per contract, to minimize mobilization costs, and to assure that each contract requiring borrow from Lake Borgne would be restricted to one lobe.

9.3 INVASIVE SPECIES CONTROL

Invasive species control measures would be required throughout the life of the project. It was estimated that the cost would be ten percent of the initial planting cost or $10,757,000.

10.0 COST ESTIMATES

10.1 ALTERNATIVE COST ESTIMATES

The cost estimates for the measures combined to make the alternatives were prepared in an expedited manner based on readily available New Orleans District data and quantities provided by the PDT. The estimated costs were based upon an analysis of each line item evaluating quantity, production rate, and time, together with the appropriate equipment, labor, and material costs or the costs were based on in- house knowledge and experience by NOD cost engineers who estimated similar projects. Cost Estimates were developed using historical data, CEDEP, and Mii estimating software. All features were estimated based on standard construction methods all of which are common to the New Orleans District and South Louisiana. The estimates assumed access was available to proposed areas unless otherwise stated. Each element cost was developed independently and assumed equipment availability is not an issue. A 25% - 30% contingency was added to the measure estimates along with 4% E&D and 6% S&A. Table 56 shows the preliminary measure estimates.

Table 56 Preliminary Measure Estimates

Measure	Estimated Cost
ES1	$14,683,913
ES2	$18,571,669
ES3	$58,351,563
EM5	$36,589,438
EM1	$46,198,629
EV1	$6,400,031
EM3	$25,540,625
EM4	$147,391,754
EM2	$12,564,063
LM4	$23,947,344
LM1	$114,479,063
LM2	$45,485,688
LS1	$38,338,438
LM3	$38,070,313
Old 024	$247,779,354
MRGO7	$27,127,513
MRGO2	$6,590,625
MRGO1	$6,325,000

Table 56 Preliminary Measure Estimates	
Measure	Estimated Cost
MRGO3	$3,400,050
MRGO5	$34,279,575
MRGO8	$52,991,950
MRGO6	$6,121,800
MRGO4	$2,023,500
CC4	$279,000,000
CM2	$28,010,000
CM5	$26,160,000
CM1	$55,330,000
CC3	$97,240,000
CC2	$63,600,000
CC1	$120,210,000
CC5	$136,640,000
CC6/CM4	$171,600,000
Old 030sp	$2,535,075
Old 010sp	$27,056,219
Old 011sp	$10,791,431
BS1	$51,122,500
Old 014sp	$36,700,950
BM1	$113,745,504
Old 042	$124,850,000
Old 020	$92,890,000
Old 98asp	$42,050,580
Old 98bsp	$94,188,380
Old 111sp	$36,817,138
Old 017sp	$23,998,397
Old 107sp	$23,703,108
BM2	$38,040,000
BS3	$83,963,523
BS2	$40,373,548
JS1	$30,210,180
Old 110	$96,733,313

Table 56 Preliminary Measure Estimates	
Measure	Estimated Cost
BR1	$16,760,000
Old 133b	$12,500,000
TM4	$40,028,317
TM6	$100,449,254
TM5	$81,671,910
TM3	$26,234,611
TM2	$93,534,375
TM1	$43,901,348
TM7	$190,090,000
TM8	$98,523,567
HM1	$36,171,252
Old 004	$146,676,754
Old 013	$375,209,660
Old 022	$195,558,004
Old 023	$199,156,723
Old 78	$260,536,348
Old 191	$30,530,000
Old 240	$52,652,029

10.2 DETAILED COST ESTIMATES

The cost estimate for the TSP is $3,371,652 (fully funded). Details on how this cost was prepared are shown below. Tables 57, 58 and 59 show the baseline project cost, October 2011 cost and fully funded project cost from the Total Project Cost Sheet (TPCS), The TPCS is included in Annex 10.

Table 57 Baseline Project Cost Estimate	
FEATURE	COST ($1,000)
01 Lands and Damages	99,060
06 Fish & Wildlife Facilities	133,990
06 Fish & Wildlife Facilities Adaptive Management	142,115
14 Recreation Facilities	4,362
17 Marsh Creation	2,181,565
30 PED	96,687

Table 57 Baseline Project Cost Estimate	
30 PED Adaptive Mgmt & Monitoring (AM&M)	34,709
31 Construction Management	132,594
31 Construction Management AM&M	9,570
Total Project Cost	2,834,652

Table 58 October 2012 Project Cost Estimate	
FEATURE	COST ($1,000)
01 Lands and Damages	99,060
06 Fish & Wildlife Facilities	136,477
06 Fish & Wildlife Facilities Adaptive Management	144,752
14 Recreation Facilities	4,443
17 Marsh Creation	2,222,056
30 PED	98,030
30 PED Adaptive Mgmt & Monitoring (AM&M)	35,191
31 Construction Management	134,435
31 Construction Management AM&M	9,703
Total Project Cost	2,884,147

Table 59 Fully Funded Project Cost Estimate	
FEATURE	COST ($1,000)
01 Lands and Damages	99,060
06 Fish & Wildlife Facilities	164,088
06 Fish & Wildlife Facilities Adaptive Management	194,610
14 Recreation Facilities	4,766
17 Marsh Creation	2,541,801
30 PED	122,208
30 PED Adaptive Mgmt & Monitoring (AM&M)	52,279
31 Construction Management	176,102
31 Construction Management AM&M	16,739
Total Project Cost	3,371,652

10.2.1 Contingencies

Contingencies are based on a Cost Risk Analysis. Results of this analysis are discussed in the Risk Analysis Section below.

10.2.2 Escalation

Escalation is based upon the US Army Corps of Engineers Engineering Manual (EM) 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) revised 30 Sep 2011.

10.2.3 MCACES

The cost estimate for the recommended plan was prepared utilizing Mii. The summary portion of the Mii estimate is included in annex 10. The estimated costs were based upon an analysis of each line item evaluating quantity, production rate, and time, together with the appropriate equipment, labor, and material costs.

10.2.4 Risk Analysis

A cost risk analysis was performed for this project in accordance with ER 1110-2-1302 paragraph 7.3.2 and ER 1110-2-1302, appendix B, paragraph 4. The result of the cost risk analysis is shown in the Project Cost and Schedule Risk Analysis Report included in annex 10.

11.0 DESIGN AND CONSTRUCTION SCHEDULE

11.1 CONSTRUCTION SEQUENCE

A construction sequence was developed as shown below. The sequence was based on the construction durations, land loss rates and the limitations of alternating dredging cycles in the lobes of Lake Borgne. Each of the features would be done under a separate contract. This sequence was used to develop the design and construction schedule.

Year 1 LS1A, MRGO1, MRGO6, LM1, LM4, LM2, Beinevnue Recreation Feature
Year 2 BS1A, BS2, CC4 Site 1, BR1, CM1/CM5
Year 3 ES1, LS1B
Year 4 ES2, ES3A, BS1B
Year 5 Shell Beach Recreation Feature, TM1, TM2, HM1, MRGO5, MRGO8
Year 6 ES3B, EM1, MRGO7
Year 7 BM1, LM3
Year 8 CM3, CM4, CM2, CC2, CC3
Year 9 EM2, EM3, EM4
Year 10 MRGO2, MRGO3, MRGO4
Year 11 CC1, CC4 Site 2/3/4, CC5, CC6
Year 12 TM7, TM8

11.2 DESIGN AND CONSTRUCTION SCHEDULE

11.2.1 General

The design and construction schedule used to develop the Mii, Cost and Schedule Risk Analysis and TPCS is shown in figure 80. This schedule includes construction of the features and associated plantings. A more detailed construction schedule can be found in annex 11.

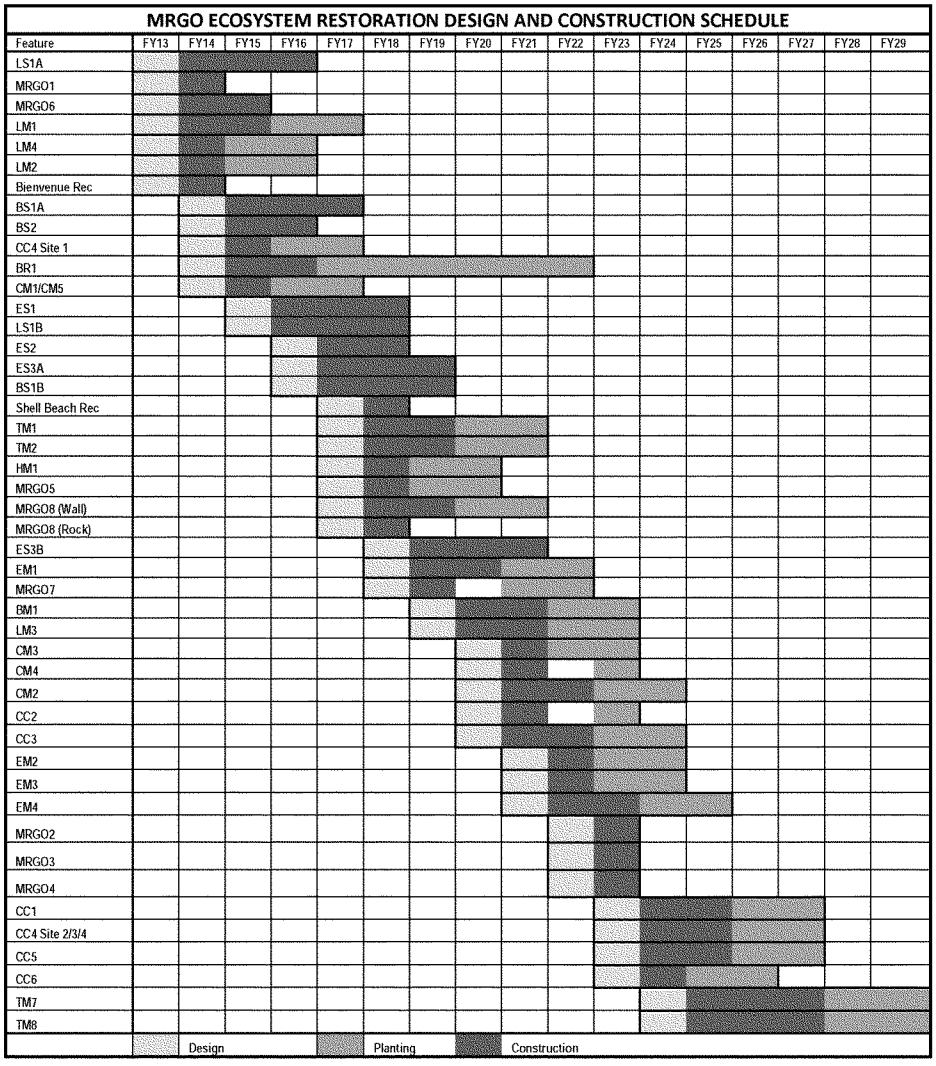


Figure 80 Design and Construction Schedule

11.2.2 Revised Implementation

The timing and availability of financial resources for implementation is a major uncertainty that must be considered given current Federal budgetary constraints. If the plan is not implemented in the near future, conditions will continue to degrade. The impact of the uncertainties associated with the future condition of the study area could increase restoration costs, decrease restoration benefits, or both. The uncertainties associated with implementation are increased because a non-Federal sponsor has not been identified.

Construction sequencing assumed optimal funding appropriations and an aggressive schedule to complete implementation as soon as realistically possible. Given the considerable need for the plan, Federal interest, significance of resources, and the conditional authorization for implementation, an aggressive implementation sequence was considered appropriate. The implementation of the HSDDRS demonstrates National interest in study area resources and the magnitude of what can be achieved when stakeholders are united in purpose. However, current budgetary conditions and the lack of a non-Federal sponsor make it very likely that reality will differ from these optimal assumptions. Risk and uncertainties related to implementation have been assessed in the Cost Risk Analysis. However, due to uncertainties associated with the timing and availability of funding for the plan, only features that are sustainable without the implementation of any other feature are recommended for construction at this time. Further details of this recommendation including the proposed tiered implementation plan can be found in the Main Report.

APPENDIX
V

HABITAT IMPACTS OF CONSTRUCTION OF THE MRGO mrgoclenvir2
11/6/99

Purpose

The purpose of this report is to 1) estimate the habitat types lost due to channel excavation, spoil disposal and erosion of the MRGO, and 2) estimate the habitat shifts caused by the salinity brought in by the MRGO and 3) estimate the amount of increased land loss due to by the hydrological changes caused by the MRGO.

Habitat Types Lost Due to Construction and Erosion

The first task was to determine the habitat type of the land when the MRGO was built. Several habitat type maps have been prepared for the areas influenced by the MRGO (see Appendix A for a description of these habitat type changes). During the Coast 2050 planning effort, the Louisiana coast was subdivided into mapping units and habitat information was compiled for each unit for 1956, 1978, and 1990. The spoil from the MRGO was included in two of the mapping units - Central Wetlands and Eloi Bay (see Figure 1). The channel of the MRGO was included in the mapping unit known as South Lake Borgne. Erosion occurred in South Lake Borgne and Eloi Bay.

"Footprint" of MRGO Spoil, Back Canal, and Channel

The "footprint" is the area of land excavated for the MRGO and back canal channel and the land covered by material dredged from the MRGO. When possible, the footprint was drawn on pre-MRGO quad maps. The earliest quad available for the St. Bernard area was from 1969 at a scale of 1:62,500. It already indicates the MRGO channel and spoil (see Figure 2). Portions of the 1:62,500 New Orleans 1967 quadrangle is also included in Figure 2. The Shell Beach quad of 1939 at a scale of 1:62,500 forms the base for Figure 3. The 1:24,000 Lake Athanasio quad of 1955 is the base for Figure 4.

There are two possible maps that could be used to determine the habitat immediately pre-MRGO – the 1955 map prepared by Wicker et al. in 1982 (see Figure 5) and the 1960 map prepared by Wright et al. in 1960 (see Figure 6). The Wicker map was chosen because it appeared to most accurately reflect the habitat that was there when the MRGO was built. Wright classified all of the marsh in the Central Wetlands and South Lake Borgne as intermediate in 1960. It is unlikely that this classification was correct. O'Neil (1949) had classified half of the Central Wetlands marshes and all of the South Lake Borgne marshes as brackish (see Figure 7). In 1968, Chabreck et al. (see Figure 8) called over half the Central Wetlands and most of South Lake Borgne brackish. It is unlikely that these areas switched from brackish in 1949 to intermediate in 1960 and back to brackish in 1968. A portion of the Central Wetlands from the hurricane protection levee to Bayou La Loutre was not mapped by Wicker. An Atlas of Louisiana Coastal Habitats compiled by Barras and Swan in 1989 was consulted for this area.

The habitat types from the Wicker maps were drawn on the quad maps with the MRGO footprint (Figures 2-4). Then the acreage of each habitat type impacted by the MRGO footprint was measured. The acreage of each habitat type impacted by the MRGO footprint is shown by mapping unit in Table 1.

Habitat Loss Due to Erosion on the North Bank of the MRGO from 1965-1999
The 15 feet per year erosion rate reported by Howard et al. (1984) was verified by measuring erosion on the north bank of the MRGO between 1985 and 1995 on aerial photographs. Marsh lost between 1965-68 was assumed to be the type indicated in the Chabreck et al. 1968 map. Similarly, erosion from 1968-1978 was assumed to be the habitat shown in the 1978 Chabreck map and erosion from 1978-1999 was assumed to be that shown on the 1988 Chabreck map. The results are indicated in Table 1.

Habitat Shifts Caused by Salinity Brought in by the MRGO

Digitized Habitat Maps
In order to determine habitat shifts caused by the increased salinity and tidal energy brought in by the MRGO, acreage of various habitat types in years past was necessary. The data determined by Eldridge (1999) for the Coast 2050 mapping units was used (see Table 2). The map produced by Wicker et al. for 1955 was used as the habitat base for the 1956 map. Chabreck et al. was generally used as the base for the 1978 and 1990 maps. In preparing Table 2, various habitat types were combined. For instance, in 1990, all the Ag/Pasture was on the MRGO spoil so this habitat type was combined with the Spoil category.

Increased Land Loss Caused by Hydrological Changes Brought in by the MRGO

This estimate is far more speculative than those above. The amount of "without MRGO" land loss was estimated for each applicable mapping unit by subtracting the footprint loss from the 1956-1990 wetland loss. Then a very rough estimate was made of the amount of this loss that was caused by the hydrological changes brought about by the MRGO. This loss rate was applied to the wetlands in 1956 and the difference between the loss with and without the MRGO was calculated. This is a very rough estimate, but gives some indication of the impacts of the hydrological changes.

Results

Impacts of the MRGO in the Central Wetlands
This unit lies between the 40-Arpent Levee and the MRGO and goes from the Inner Harbor Navigation Canal to Hopedale. This unit had 35,310 acres of marsh and cypress swamp in 1956 (see table 2). About 11,620 acres were fresh/intermediate, 13,490 acres were brackish, and 10,200 acres were cypress swamp. There were also 2,740 acres of forest, 520 acres of developed/agricultural and 4,020 acres of water.

The MRGO "footprint" covered 5,530 acres of brackish marsh, 3,080 acres of fresh/intermediate marsh, 1,110 acres of swamp and 1,700 acres of shallow open water with spoil (see Table 1). The spoil bank eroded 200 acres since construction and 620 acres of fresh marsh had formed on the spoil bank. Thus, the net loss of wetlands due to the footprint was 9,100 acres.

By 1990, the only fresh marsh remaining was 620 acres that had formed due to ponding on the MRGO spoil bank. The only cypress left was 90 acres near two pumping stations that discharge fresh water into the "ghost swamp". About 90 acres of saline marsh existed. The amount of brackish marsh had increased to 19,710 acres as about 2,700 acres of the fresh/intermediate marsh and nearly 8,000 acres of cypress converted to this marsh type. Thus, in 1990, there was a total of 20,510 acres of marsh and cypress swamp.

If the MRGO had never been built, what would the Central Wetlands Unit have looked like in 1990? If the losses caused by the MRGO footprint are not considered, approximately 4,730 acres of marsh converted to water from 1956 to 1990. It is very difficult to determine what portion of this loss would have occurred without the hydrological influence of the MRGO. The brackish marsh beneath the "ghost" cypress swamp is unhealthy, but has not yet turned to open water. The 1,700 acres of failed impoundment west of Paris Road was not influenced by the MRGO. If the assumption is made that half the 4,730-acre loss is due to the salinity and tidal energy brought in by the MRGO, then the "without MRGO" loss rate would be .42% per year.

The "without MRGO" loss rate was applied to the marsh acres present in 1956. By 1990, there would have been 10,630 acres of fresh/intermediate marsh, 12,340 acres of brackish marsh, 9,330 acres of cypress swamp for a total of 32,300 acres of wetlands. Instead, there was 620 acres of fresh/intermediate marsh, 19,710 acres of brackish marsh, 90 acres of saline marsh, and 90 acres of swamp for a total of 20,510 acres of wetlands. This represents a loss of 3,010 acres of wetlands since 1956 without the MRGO compared to a loss of 14,800 acres with the MRGO. When the 9,100 acre loss due to the footprint is considered, the increased wetland loss due to the MRGO could have been 2,690 acres. In addition, without the MRGO, over 8,000 acres of fresh/intermediate marsh and cypress would not have converted to brackish marsh.

Impacts of the MRGO in Eloi Bay

This unit lies between Bayou La Loutre and the MRGO back dike canal. This unit had 33,660 acres of marsh in 1956 according to Eldridge (1999) (see Table 2). About 950 acres were fresh, 18,000 acres brackish, and 14,700 acres saline (assuming that the brackish/saline percentage was the similar to that when O'Neil mapped the area in 1949). There were also 360 acres of swamp and 63,850 acres of water.

The MRGO "footprint" covered 1,880 acres of brackish marsh, 1,950 acres of saline marsh, 300 acres of swamp and 2220 acres of shallow open water with spoil. Channel excavation destroyed 460 acres of brackish marsh, 360 acres of saline marsh and 60 acres of swamp. Erosion on the north bank destroyed 100 acres of brackish marsh and 790 acres of saline marsh. Meanwhile, the spoil bank eroded 280 acres since construction. Since 1956, 990 acres of fresh marsh have formed on the spoil bank. Thus, 2,440 acres of brackish marsh, 3,100 acres of saline marsh and 360 acres of swamp have become open water or spoil and 2,200 acres of shallow open water have been filled. A total of 5,900 acres of wetlands were lost due to MRGO, but then 990 formed so the net loss was 4,910 acres.

By 1990, the amount of brackish marsh had dropped to only 5,320 acres, while saline marsh had increased to 19,160 acres. About 990 acres of fresh marsh formed on the MRGO spoil. Nearly 4,000 acres of brackish marsh and swamp had converted to saline marsh. In 1990, there was a total of 25,470 acres of marsh.

If the MRGO had never been built, what would the Eloi Bay Unit have looked like in 1990? The data provided by Eldridge (1999) shows a loss of 8,190 acres of marsh from 1956 to 1990. The net loss due to the MRGO footprint was 4,910. Therefore 3,280 acres of the loss can be called "background"; 0.30 percent per year. It is unlikely that the salinity brought in by the MRGO would increase the loss rate in this brackish/saline environment. However, the increased tides could have accounted for a 10 percent increase in the loss rate. Thus, the "natural" loss rate could have been 0.27 percent per year.

The "natural" loss rate was applied to the acres of marsh in 1956. By 1990, without the MRGO, there would have been a total of 30,780 acres of marsh (870 acres of fresh/intermediate, 16,460 acres of brackish, and 13,450 acres of saline). Instead there was a total of 25,470 acres (990 acres fresh/intermediate, 5,320 acres of brackish and 19,160 acres of saline). This represents a loss of 2,880 acres since 1956 without the MRGO compared to a loss of 8,190 acres with the MRGO. When the 4,910 loss due to the footprint is considered, the increased loss due to the MRGO could be about 400 acres. In addition, compared to conditions with the MRGO, conversion of 870 acres of fresh/intermediate marsh and 11,140 acres of brackish marsh to more saline types would have been prevented.

Impacts of the MRGO in South Lake Borgne

This unit had 24,300 acres of marsh and swamp in 1956 according to Eldridge (1999) (see Table 2). About 540 acres were fresh/intermediate marsh and 23,760 acres brackish marsh. There were also 4,450 acres of water, 390 acres swamp and minor amounts of other habitat types.

The MRGO "footprint" and subsequent erosion converted 290 acres of fresh/intermediate marsh, 2,340 acres of brackish marsh, 1,110 acres of saline marsh, and 40 acres of swamp to channel. Thus, the net loss of wetlands due to the MRGO was 3,780 acres.

By 1990, there was no fresh/intermediate marsh or swamp and the brackish marsh had decreased to 16,950 acres. Meanwhile, saline marsh had increased to 9,510 acres as over 9,500 acres of brackish marsh and swamp became this habitat type. In 1990, there were 16,590 acres of wetlands.

If the MRGO had never been built, what would the South Lake Borgne Unit have looked like in 1990? Ignoring the MRGO footprint, approximately 3,980 acres of marsh converted to water between 1956 and 1990, a loss rate of 0.48 percent per year. It is very difficult to determine what portion of this loss would have occurred without the MRGO. The salinity brought in by the MRGO could have increased the loss rate in this mostly

once low-brackish environment by 10 percent. In addition, the increased tides could have accounted for another 10 percent increase in the loss rate. Thus, the "natural" loss rate could have been 0.4 percent per year.

The "natural" loss rate was applied to the acres of marsh in 1956. By 1990, without the MRGO, there would have been a total of 21,290 acres of marsh (20,820 acres of brackish, and 470 acres of fresh/intermediate). Instead there was a total of 16,590 acres (7,080 acres of brackish and 9,510 acres of saline). This represents a loss of 3,010 acres of marsh since 1956 without the MRGO compared to a loss of 7,710 acres with the MRGO. When the 3,780 acre loss due to the footprint is considered, the net loss due to the MRGO could be about 920 acres. In addition, compared to conditions with the MRGO, conversion of 540 acres of fresh/intermediate marsh, 10,270 acres of brackish marsh, and 390 acres of swamp to more saline habitat types would have been prevented.

Impacts of the MRGO in the Biloxi Marshes
This unit lies east of the MRGO, stretching from Bayou St. Malo to Chandeleur Sound. It appears that the only influence of the MRGO in the Biloxi Marshes was the shift of 1,010 acres of intermediate marsh to brackish marsh, scrub shrub and water (see Table 3). The MRGO has had essentially no influence on shifting the brackish/saline interface. The salinity and increased tidal exchange connected with the MRGO are not likely to have increased the marsh loss rate in the Biloxi Marshes.

Impacts of the MRGO on the East Orleans Land Bridge
This unit lies between Lake Pontchartrain and Borgne and the Lake Pontchartrain Hurricane Protection Levee and the Rigolets. The influences of the MRGO did not appear to have caused any habitat shifts in this unit (see Table 3). Also, it is unlikely that presence of the MRGO increased the marsh loss rate here.

Impacts of the MRGO on the La Branche Wetlands
This unit contains the wetlands on the south shore of Lake Pontchartrain between the city of Kenner and the Bonnet Carre Spillway and north of U.S. Highway 61 (Airline Highway). It does not appear that intermediate marsh has converted to brackish since 1956. Instead, this marsh has converted to forest and open water. Swamp has converted mainly to forest with some changing to intermediate marsh. Thus, salinity increases caused by the MRGO do not appear to have shifted habitat types.

Scientists from LSU's Center for Wetland Resources (Pierce et al., 1985) analyzed aerial photographs to determine wetland losses in the La Branche Wetlands from 1956 to 1983 (see Figure 9). The areas north of I-10 lost over 950 acres of marsh and swamp between 1956 and 1965. The marshes south of I-10 lost nearly 760 acres from 1965-1972. There are numerous factors contributing to these large losses: the recently completed MRGO, access canals for I-10, the poor condition of the water control structures south of I-10, subsidence and sea level rise. However, the most likely major cause of these losses was Hurricane Betsy in September 1965. It generated a tidal surge of nearly 12 feet in Lake Pontchartrain. The openings in the shoreline and the canals would have guided the scouring action of the surge into the marshes between the lake and I-10 and caused the

immediate loss of the remaining marsh in the failed agricultural impoundment in the northwest corner of the La Branche area. This loss showed up on the 1965 photo. The hurricane would have subjected the areas south of I-10 to a greater duration of flooding and increased salinities, which would have caused opening up of ponds, showing up as loss on the 1972 photo. Since 1972, loss rates have slowed significantly and some areas are actually healing. The construction of the MRGO has played a part in increasing marsh loss in this unit. A rough estimate might be made that 20 percent of the 1956-65 loss north of I-10 (190 acres) and 10 percent of the loss south of I-10 (80 acres) could have been attributed to the MRGO.

Impacts of the MRGO on the Eastern Manchac Land Bridge

This unit lies along the western shore of Lake Pontchartrain between the western guide levee of the Bonnet Carre Spillway and North Pass. This unit, which contains the only passes between Lakes Pontchartrain and Maurepas, has received enough slightly saline water from the MRGO for habitat types to switch (see Table 4). Nearly 7,500 acres of swamp have become intermediate marsh. Most of these changes can be attributed to the construction of the MRGO. The deep navigation raised salinity less than 3 ppt, but this change in a swamp/fresh marsh area was enough to prevent the swamp from regenerating and to allow the colonization of intermediate marsh plants beneath the cypress.

Impacts of the MRGO on the North Shore Marshes

This unit lies between Fontainbleau State Park and Green Point along the north shore of Lake Pontchartrain. Despite the influence of salinity from the MRGO, this unit freshened from 1956 to 1990 - there was more fresh marsh in 1990 than in 1956 (see Table 4).

Summary of Results of Habitat Loss Due to Construction

Construction of the MRGO and subsequent erosion has caused extensive loss of land in St. Bernard Parish. Nearly 3,400 acres of fresh/intermediate marsh, nearly 10,300 acres of brackish marsh and nearly 4,200 acres of saline marsh have been converted to open water or spoil. Over 1,500 acres of cypress swamp and levee forest have become disposal area. A total of nearly 20,000 acres of wetlands have been lost and nearly 4,800 acres of shallow open water have been converted into deep water or disposal area.

Then, if the roughly estimated amount of increased loss is considered, the area influenced by the MRGO could have lost nearly 4,300 acres of wetlands due to increased tides and salinity.

Habitat shifts caused by saline waters brought in by the MRGO have caused 3,350 acres of fresh/intermediate marsh and 8,000 acres of cypress swamp to shift to brackish marsh. Approximately 7,500 acres of swamp have converted to intermediate marsh. Also, 13,500 acres of brackish marsh and swamp have shifted to saline marsh.

APPENDIX A
HABITAT TYPE MAPPING

Central Wetlands

This unit lies between the 40-Arpent Levee and the MRGO and goes from the Inner Harbor Navigation Canal to Hopedale. In 1949, O'Neil classified about 40% of these marshes as fresh/intermediate and the remainder as brackish (see Figure 7). He did not include cypress in his map, probably because the cypress in the Central Wetlands have always had an understory of marsh plants. Wicker et al. (1982) classified about 23 percent of the Central Wetlands as brackish marsh, 35 percent as fresh/intermediate marsh and 38 percent as cypress swamp (see Figure 5). Wright et al. (1960) classified the Central Wetlands as 50 percent intermediate marsh and 50 percent cypress swamp (see Figure 6). In 1968, Chabreck, Joanen and Palmisano classified the area between Bayou Bienvenue and the Violet Canal/Bayou Dupre as brackish marsh and the area to the south as intermediate marsh (see Figure 8). Valentine in the same year classified some of the marsh near the upper Bayou Bienvenue drainage as intermediate. In 1978, Chabreck et al. classified the entire area as brackish marsh (see figure A-1). In 1978, Wicker et al. classified areas near the pumping stations as intermediate marsh with dead or dying cypress, the majority of the area as brackish marsh and the northeastern corner as saline marsh (see Figure A-2). In 1988, Chabreck showed only brackish marsh in the area.

Eloi Bay

This unit lies between Bayou La Loutre and the MRGO back dike canal. Classification in this area has been fairly consistent among authors. In 1949, O'Neil classified the area as about half brackish and half saline marsh (see Figure 7). Barras and Swan (1989) classified the entire area as non-fresh marsh in 1956. Chabreck et al. (1968) classified the area similar to O'Neil (see Figure 8). By 1978, according to Chabreck et al., the saline marsh had moved slightly northward along the MRGO and significantly north in the center of the unit, nearly to Bayou La Loutre (see Figure A-1). In Chabreck et al. 1988, there was saline marsh adjacent to the MRGO, but the brackish marsh had moved slightly southward near Bayou La Loutre.

South Lake Borgne

Habitat mapping efforts have shown inconsistent results in this area. In 1949, O'Neil mapped the entire area as brackish except the tip of Proctor Point, which he called saline (see Figure 7). Wicker et al. (1982) classified the northern portion of the area as brackish in 1955; they indicated saline marsh from Shell Beach to Bayou La Loutre (see Figure 5). Wright et al. (1960) mapped the entire area as intermediate (see Figure 6). Chabreck et al. (1968) classified most of the area as brackish (see Figure 8) and the entire area as brackish in 1978 (see figure A-2). In 1968, Chabreck et al. showed a small area of intermediate marsh just north of Bayou La Loutre. Wicker et al. (1982) mapped most areas adjacent to the MRGO as saline and the remainder of the area as brackish in 1978 (see Figure A-2). By 1988, Chabreck et al. classified much of Proctor Point and the area north of Bayou Dupre as brackish and the remainder of the area as saline.

Biloxi Marshes

This unit lies east of the MRGO, stretching from Bayou St. Malo to Chandeleur Sound. O'Neil mapped the area in 1949 and indicated much of the area as saline and the remainder as brackish (see Figure 7). In 1956, Barras and Swan (1989) indicated 1,010 acres of intermediate marsh just north of Bayou La Loutre. The remainder of the unit was classified as non-fresh marsh since the 1956 habitat maps did not distinguish between brackish and saline marsh. Chabreck et al. in 1968 (see Figure 8) found that the brackish marsh had extended further eastward than it had in 1949, even with the influence of the MRGO. It could be assumed that the brackish/saline line in 1956 might have been about half way between the lines in 1949 and 1968. Chabreck et al. also recorded intermediate marsh just north of Bayou La Loutre. By 1978, Chabreck et al showed that the intermediate marsh had become brackish, but the brackish/saline line extended even further eastward (see Figure A-2). Then, in 1988, the brackish/saline line moved westward, nearly to where it might have been in 1956.

East Orleans Land Bridge

This unit lies between Lake Pontchartrain and Borgne and the Lake Pontchartrain Hurricane Protection Levee and the Rigolets. O'Neil classified it as saline marsh near Lake Borgne and the remainder as brackish marsh (see Figure 7). In 1956 according to Eldridge (1999), the unit contained 30,580 acres of brackish marsh (see Table 4). Chabreck et al. classified it as brackish in 1968, 1978, and 1988. By 1990, the major change was the loss of over 5,000 acres of this marsh. Over 1,000 acres became scrub shrub and nearly 4,100 acres became water.

La Branche Wetlands

This unit contains the wetlands on the south shore of Lake Pontchartrain between the city of Kenner and the Bonnet Carre Spillway and north of U.S. Highway 61 (Airline Highway). Since 1949, it has consisted of swamps near Airline Highway, intermediate marshes lakeward of the swamp and brackish marshes near the lake (see Figures 7, 8, and A-1) . Since 1978, the intermediate brackish line has been the railroad just south of Interstate 10. The intermediate area is now "protected" by levees and water control structures (some functioning and some not). The habitat types that have increased since 1956 are open water and forest (see Table 4).

Eastern Manchac Land Bridge

This unit lies along the western shore of Lake Pontchartrain between the western guide levee of the Bonnet Carre Spillway and North Pass. This area was not mapped by O'Neil in 1949 or by Chabreck et al. in 1968. In 1978 and 1988, Chabreck et al. indicated it was intermediate and brackish marsh. This unit, which contains the only passes between Lakes Pontchartrain and Maurepas, has received enough slightly saline water from the MRGO for habitat types to switch. In 1956, Eldridge (1999) showed that 69 percent of the land in this unit was swamp, 23 percent was fresh marsh and 5 percent was forest (see Table 4). By 1978, only 35 percent was swamp and 31 percent was fresh marsh. Much of the swamp was not regenerating and bulltongue colonized beneath the stunted cypress so 24 percent of the area was intermediate marsh. In 1990, the loss of swamp and fresh marsh had continued and only 3 percent was fresh marsh, 16 percent swamp.

Intermediate marsh now covered 42 percent of the area and forest 18 percent and scrub shrub 19 percent.

North Shore Marshes

This unit lies between Fontainbleau State Park and Green Point along the north shore of Lake Pontchartrain. O'Neil classified it as brackish in 1949 (see Figure 7). In 1956, according to Eldridge (1999) the unit contained 120 acres of fresh/intermediate marsh and 12,250 acres of brackish marsh (see Table 4). By 1978, the fresh/intermediate had increased to 550 acres and by 1990, it covered nearly 3,700 acres. Chabreck et al. classified it as intermediate and brackish in 1968, 1978, and 1988.

LITERATURE CITED

Barras, J. A. and M. Swan. 1989. A study of marsh management practice in coastal Louisiana. Atlas of Louisiana coastal habitats. Prepared under MMS Contract 14-12-0001-30410. Prepared by Louisiana Geological Survey, Louisiana Department of Natural Resources.

Chabreck, R. H., T. Joanen, A. W. Palmisano. 1968. Vegetation type map of the Louisiana coastal marshes. Published by the Louisiana Wildlife and Fisheries Commission.

Chabreck, R. H. and G. Linscombe. 1978. Vegetation type map of the Louisiana coastal marshes. Published by the Louisiana Wildlife and Fisheries Commission.

Chabreck, R. H. and G. Linscombe. 1988. Louisiana coastal marsh vegetative type map 1988. Published by the Louisiana Wildlife and Fisheries Commission.

Eldridge, K. 1999. Personal communication (Habitat types of Coast 2050 mapping units in 1956, 1978, and 1990).

Howard, P.C., T. J. Duenckel, S. W. Gagliano, G. J. Gasperecz, and J. C. Leslie. 1984. The Mississippi River Gulf Outlet: A study of bank stabilization. Produced for the St. Bernard Parish Police Jury. U. S. Department of Commerce, NOAA Grant No. NA-83-AA-D-CZ025 and La. Department of Natural Resources (DNR Cooperative Agreement No. 21920-84-03).

O'Neil, T. 1949. Map of the southern part of Louisiana showing vegetation types of the Louisiana Marshes.

Pierce, R. S., J. W. Day, Jr., E. Ramcharan, W. H. Conner, R. Boumans, and J. Visser. 1985. A comprehensive wetland management plan for the La Branche Wetland, St. Charles Parish, Louisiana. Coastal Ecology Institute, Center for Wetland Resources, LSU. 71 pg.

Wicker, K. M., G. C. Castille III, D. J. Davis, S. M. Gagliano, D. W. Roberts, D. S. Sabins, and R. A. Weinstein. 1982. Prepared for the St. Bernard Parish Police Jury, Chalmette, LA. Contract No. 168-909.

Wright, R., J. Sperry, and D. Huss. 1960. Vegetation type mapping studies of the marshes of southeastern Louisiana. Submitted to the Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, U. S. Department of the Interior by Texas A and M Research Foundation, Project 191. Contract No. 14-16-008-538. 42 pg.

APPENDIX W
RECREATIONAL DEVELOPMEMT PLAN

1. **Recreation Development Plan**

2 **MRGO Recreation Feature Benefit-to-Cost Ratios**

3. **Recreation Supply Demand Analysis**

1.0 RECREATIONAL DEVELOPMENT PLAN

1.1 Introduction

Recreation facilities provide community citizens with social opportunities, physical activities, educational programs and community pride. Access to recreational facilities is a crucial component to community health as it is known to reduce crime. It is important to residents to provide future generations with natural resources that are minimally impacted and recreationally enjoyable. Natural areas facilitate multiple uses including outdoor recreation, environmental education, storm surge protection, tourism, community and cultural activities, and fish and wildlife habitat preservation.

The Office of State Parks in the Louisiana Department of Culture, Recreation and Tourism prepared the Louisiana Statewide Comprehensive Outdoor Recreation Plan (SCORP). This report, completed in 2009, cites outdoor recreation participation rates across an array of recreational resources, including biking, birding, picnicking, fishing, boating, and hiking. The SCORP shows participation rates increasing in nature-based activities by region for 2009. Much of the information presented in this section is from the SCORP.

Unfortunately, environmental degradation caused by extreme weather conditions has affected the availability of recreational features offering nature-based activities. Particularly, Hurricane Katrina caused extensive urban flooding, massive property damage, and loss of life. Recreational features allowing for the enjoyment and use of the natural environment and offering a higher quality of life experience were also destroyed.

Health and fitness, education and sustainability, and community are all components of recreation that contribute to the quality of life for citizens. It is the goal of the MRGO Recreation Development Plan to provide the highest quality, sustainable features to promote recreational outdoor activities and education related to the restored wetland, which enhance quality of life. Quality of life can also be an economic driver to the area because it attracts businesses and industries. People want to live in areas reflecting factors that contribute to quality of life and where recreation is a primary component. Recreation features provide opportunities for various age groups and abilities to engage in physical activity, education, and social interaction.

The SCORP identifies priorities for Region 1, which includes Orleans and St. Bernard Parishes as well as other surrounding parishes. One of the top priorities is expanding successful outdoor recreation outreach and education programs, especially wetland education. Another is utilizing "Green" concepts and sustainable features. An example provided in the SCORP is to offer recreation that encourages community integration that is sympathetic to neighborhood recreational needs, providing nature in the neighborhood as islands of refuge and connectivity.

The SCORP identifies priorities based upon discussions with citizens through Louisiana Outdoor Recreation Forums (LORF) and surveys. These forums were primarily focused

upon effectively identifying and meeting community recreational needs and utilizing innovative and sustainable design methods. Information gathered at the forums reflects impacts of the recent hurricanes which devastated the region, pushing residents to appreciate sustainable building practices. Designs generated include utilizing nature as an attractor and connectivity of trails and open spaces. Also, priorities identified by residents through the SCORP indicate a need for more recreational land and variety that is accessible and safe. The top three activities identified for Region 1 relate to passive recreation including: visiting natural places, fishing, and gardens.

The recreational features described in this development plan are based upon, 1) the LORF, 2) discussions through meetings with the general public in the St. Bernard area related to the MRGO Ecosystem Restoration Plan and recreation plan and 3) a report titled "Water Resources Management Practicum 2008", prepared by Nelson Institute for Environmental Studies and by the University of Wisconsin at Madison (WRM-UW), which surveyed residents of the Lower Ninth Ward during 2007 and 2008. Citizens have expressed a desire and need for recreational facilities that could help bring the community together while offering a place for both passive and active recreation and educational opportunities.

Three sites have been identified, one in Orleans Parish and two in St. Bernard Parish. The Orleans Parish site is located at the Bienvenue Triangle at the terminus of Caffin Avenue. The second site is situated on either side of the proposed Violet Diversion while the third site is the Shell Beach area, located at Yscloskey and the MRGO.

All three sites should use innovative techniques that expand beyond traditional ideas and plans to encourage recreational excellence, education, and promotion. New facilities, improvements, and upgrades should focus upon innovative and/or environmentally sensitive recreational ideas and activities that inspire people of all ages and physical ability levels. Innovative examples include: providing for activity variety, utilizing green building principles and techniques, educating users in an inspiring way about the environment, and developing inspirational activities for disabled users. All three sites should provide bathrooms, parking and be ADA (American Disability Act) accessible so as to provide for the minimal health and safety of users.

The recreation experience offered at the three sites shall build upon the ecosystem restoration objective and take advantage of the restored resources rather than detract from them. The recreation features proposed for the sites will take advantage of the education and recreation potential of the ecosystem restoration project while not adversely impacting the restoration purpose.

The Recreation Development Plan recommends recreational features for the MRGO Ecosystem Restoration project in concurrence with facilities that are approved in ER 1105-2-100 for ecosystem restoration projects. When implementation funds are appropriated, a non-Federal sponsor, yet to be identified, would participate in a cost-sharing agreement for construction of the recreation plan. Accordingly, the non-Federal share will be 50 percent of the recreation development costs. Non-Federal sponsors are

responsible for 100 percent of lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRD), and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The value of LERRD is credited to the 50 percent share.

The features described in this Recreation Development Plan are ancillary to the MRGO Ecosystem Restoration project, work harmoniously with the measures of the restoration project and are proposed on fee title lands for cost-sharing.

All of the recreation features recommended in this report were first identified through USACE meetings with groups and non-governmental organizations (NGOs) from St. Bernard and Orleans Parish. Additionally, the Louisiana Outdoor Recreation Plan (SCORP) performed focus group meetings to identify locally preferred outdoor recreation activities. A third source, University of Wisconsin (UW), prepared a recreation needs report for St. Bernard and part of Orleans Parishes. All three of these resources are used in identifying the recommended recreation features, including development of the benefits of each recreation development. All three sites offer ADA accessible features, including parking, bathrooms, access to boardwalks, ramps, and picnic shelters.

1.2 Bienvenue Triangle Recreation Feature

Existing Condition

The MRGO Ecosystem Restoration Plan proposes creation of a cypress swamp in the Bienvenue Triangle. Current conditions reflect a dying ecosystem infiltrated with saltwater causing cypress trees and marsh grasses to die. A visit to the site indicates remains of a once vibrant cypress swamp. Plans are to restore the swamp through infiltration of freshwater, dredge material placement, and vegetative plantings.

The WRM-UW report found that residents would like to use the Bayou Bienvenue Wetland Triangle (BBWT) if access were improved. Popular activities identified within the BBWT include fishing, walking, bird watching and relaxation. The report cited fishing as the most common use in the BBWT.

The proposed site currently offers a viewing platform that looks out over the marsh. The WRM-UW report, in part, detailed findings of a survey regarding use of the platform. This report found that lack of knowledge about the viewing platform, constructed in January 2008 by the University of Colorado-Denver and local residents, was the main reason residents did not use it. The platform is used by some residents in the neighborhood, tourists, and by schools as an educational tool. Martin Luther King (MLK) Elementary School, located on Caffin Avenue and North Claiborne Avenue, currently uses the platform to teach students about environmental principles and processes and to provide a general education concerning marshland, habitat, and wildlife.

Proposed Improvement: Opportunities and Constraints

The main elements of the recreation development include multi-use walks, a large viewing platform, and picnic shelters. Interpretive signage would be placed throughout the development describing the BBWT's context, history, wetlands restoration mission, the project development process, educational programming, and sustainable design elements.

The recreation features should be constructed before wetland restoration begins to afford viewing opportunities of the stages of cypress swamp creation. Opportunities for increasing the recreational experience include development of a nature boardwalk through the swamp with interpretive signs describing viewsheds, plants, processes, and wildlife within the area. Also, wetland pilot research sites could be developed by the local sponsor adjacent to the boardwalks to test certain types of marsh grasses and other research projects related to wetland restoration. Additionally, the WRM-UW report found that most residents surveyed would like to see something for children, such as programming, where children could learn about the plants and animals on the bayou. Signage explaining the proposed marsh creation project could help educate children about restoration and ways to counter man-made and natural environmental degradation. A boardwalk would also provide access to the restored wetland, while a bird watching boardwalk would provide access for viewing wildlife in a very secluded structure. An expanded land-based viewing platform would also provide space for larger groups visiting the site. Land-based picnic shelters built between Florida Avenue and the floodwall would offer visitors a place to eat separate from the swamp nature walk, keeping food away from the swamp area and its associated wildlife.

The expanded platform, interpretive signage, boardwalks and picnic shelters could be part of a larger vision discussed in various reports prepared by NGOs for the BBWT, which identified a desire for a community-based wetland research and environmental education facility located in or near the restoration area. The facility, although not part of this recreational plan, could focus on wetland education and environmental research which would, in conjunction with the boardwalk area, discuss and use sustainable design and functionality elements to ensure its survivability in a vulnerable community. Restoration of the BBWT will not only restore a wetland, but will help restore a community through education and awareness, community economic development, and healthy recreational options for the surrounding residents.

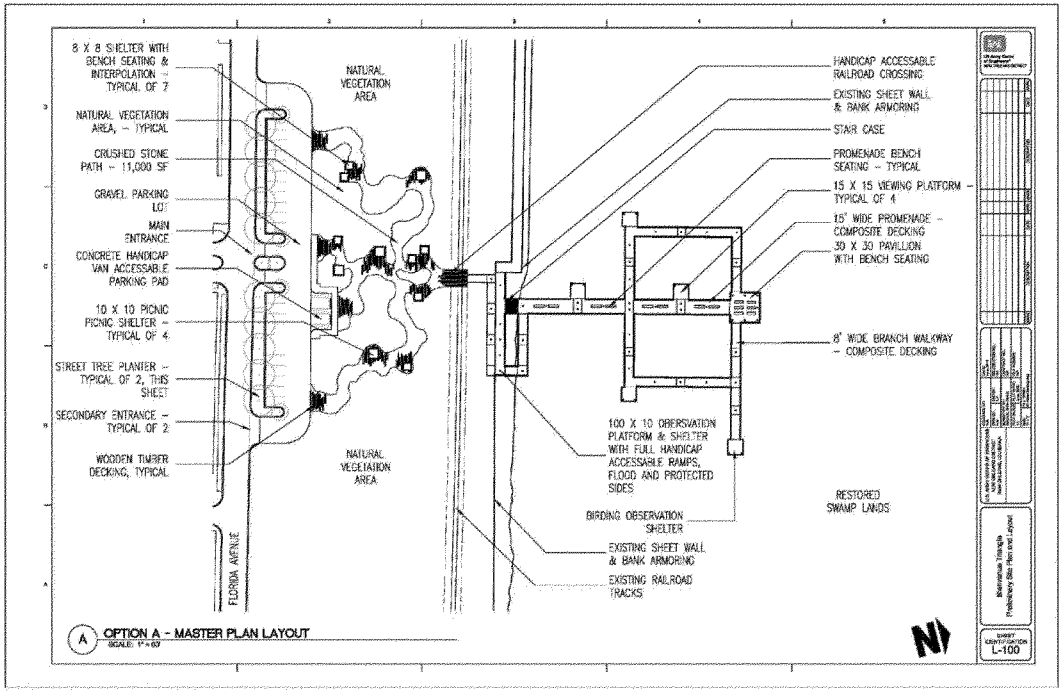
Two recreation designs at Bienvenue Triangle, Option A and B, were evaluated in terms of benefits and costs, each having the same features and differ mainly in size and design. Option A maximizes net benefits, has a BCR of 1.05 and is the recommended plan (see the BCR section of this appendix).

Constraints to development of the Bienvenue Triangle site include the Alabama Great Southern Railroad and local sponsor real estate acquisition. Discussion regarding crossing the railroad must be finalized. Currently, the railroad is crossed to gain access to the existing platform. An at-grade, ADA compliant crossing is proposed, such as is available at other crossings to recreational features in the city of New Orleans. Finally,

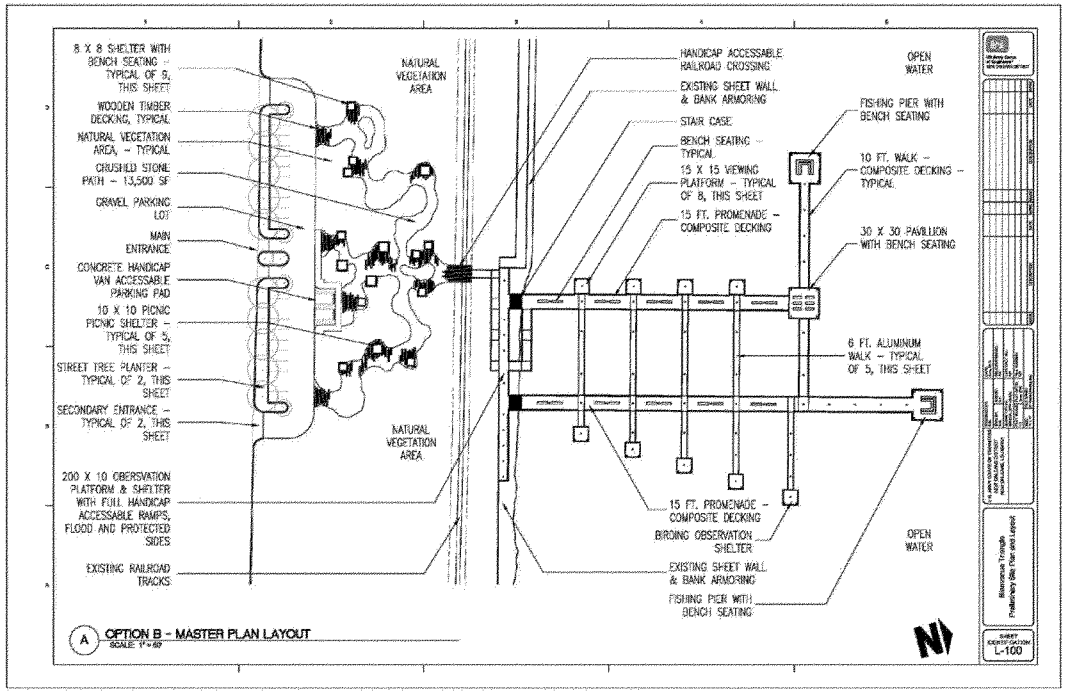
the local sponsor must obtain real estate fee title of recreation development lands. The land between Florida Avenue and the railroad track is owned by the Sewerage and Water Board (City of New Orleans), the railroad is owned by Alabama Great Southern Railroad (aka Norfolk Southern), the levee is owned by the New Orleans Levee Board, and the boardwalk area in the swamp by less than five owners.

The proposed nature walk and viewing platform are proposed on restoration project lands and would have to be purchased fee-simple by the local sponsor. The nature walk is dependent on and compatible with the ecosystem restoration project and enhances the visitation experience by taking advantage of the natural values created by the project. The parking lot, bathroom and picnic areas on the protected side of the project are on lands that are not part of the ecosystem project; however, they are features on lands necessary for access, health and safety of the users. According to EP 1165-2-502, Appendix B, 3.a.(3), "The Corps may participate in facility development to provide access to and along the project features. The development of these facilities should not involve extensive structural modification of the terrain and may include rest areas and picnic facilities." Additionally, ER1165-2-400, section 7.a. states that, in general, recreation development is limited to those provided on the lands required for the basic project except on those additional lands outside the basic project boundary which may be required for access, parking, potable water, sanitation and related developments for health, safety and public access. Separable lands required for public access, health and safety are the responsibility of non-federal sponsors, with crediting toward the sponsor's 50% share of the recreation development costs" (EP 1165-2-502, Appendix B, 4).

Bienvenue Triangle Recreation Design Drawing Option A (recommended plan), 995 linear feet (lf) boardwalk, 100 lf platform, 4 picnic shelters, interpretive signage, bathrooms, parking, solar lighting and landscaping.



Bienvenue Recreation Design Drawing Option B, boardwalk, platform, 5 picnic shelters, interpretive signage, bathrooms, parking, solar lighting and landscaping.



1.3 Violet Diversion Park Recreation Feature

Existing Condition

The proposed site for the Violet Diversion is currently used as agricultural land and is surrounded on either side by small neighborhoods. Five municipal parks exist in the area: Archbishop Hannan Park, Violet Playground #2, Sidney Torres Park, Val Riess Park, and Kenilworth Park. The Hannan Park is 33 acres and is immediately adjacent to the proposed diversion park. The Hannan Park offers four football fields, six soccer fields, one volleyball court, a picnic pavilion with tables, and a playground. The Violet Playground #2 is much smaller at two-acres, is approximately three miles from the proposed site, and offers a basketball court. Sidney Torres Park, 20 acres, offers an amphitheater, walking trail, picnic pavilion and tables, and a playground. Val Reiss Park, a 33-acre facility currently under construction in the heart of Chalmette, promises to be a premier recreational complex when more than $20 million in construction is completed. It is located 3.5 miles from the proposed Violet Diversion site. Plans for the Val Reiss Park include eight baseball diamonds, picnic tables, a 47,000-square foot multi-purpose building, and a mini-water park. Kenilworth Park, located over five miles from the proposed site, is a three-acre park offering a football field and three baseball diamonds. Finally, the St. Bernard State Park (SBSP) is located approximately 5 miles from the proposed site. SBSP offers fishing, swimming, boating, picnicking, a picnic pavilion, playground, trails, and 51 campsites.

Proposed Improvement: Opportunities and Constraints

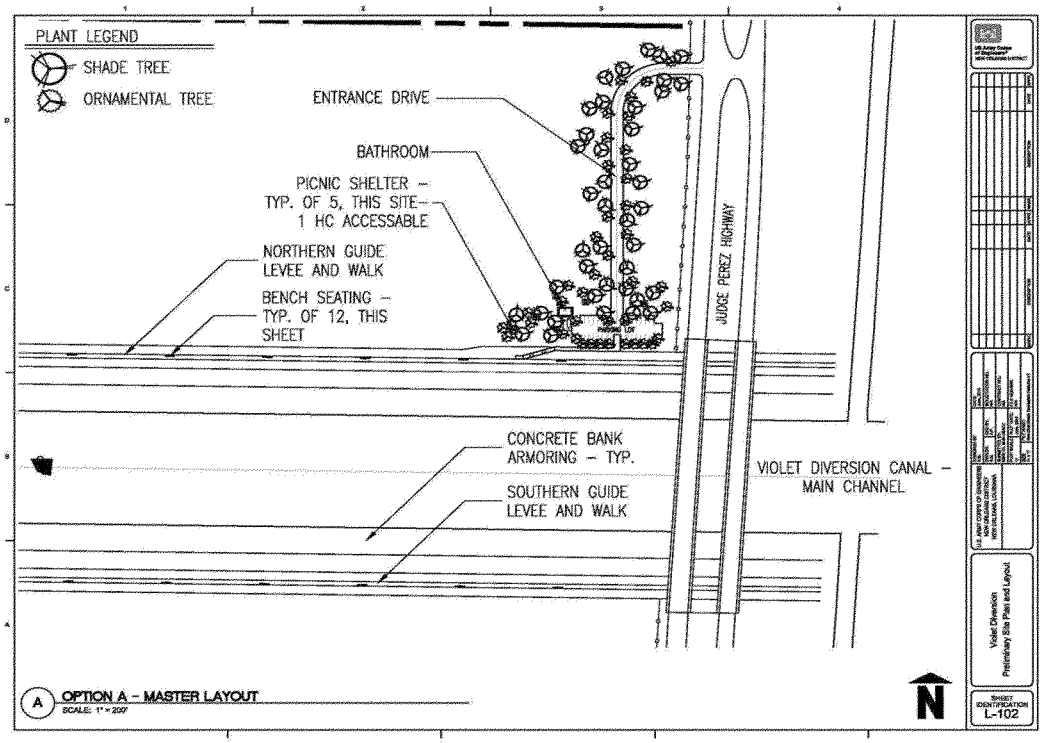
Opportunities at the proposed Violet Diversion site include creating multi-use paths, open space, picnic tables and shelters and interpretive signage in a park setting with landscaping, trees and lighting. The trail/path would run along the top of the guide levees and meander off the levee to areas with picnic tables and signage. The trail could also connect to the adjacent park at the old Archbishop Hannan site and lead to other bike paths in the area. A parking lot would also be provided on-site. Interpretive signage would provide a description of the diversion's function of conveying freshwater to the central wetlands and to the entire basin and the general purpose of the ecosystem project surrounding the MRGO.

Walking, hiking, and biking trails, in particular, are identified in the SCORP as in demand. Trails have rapidly become one of the top issues identified as a universal need within the entire state. Trails provide methods for alternative transportation, if linked, connections to community recreation areas, opportunities for passive recreation, and if a multi-use trail, more active use such as for cycling. The increase in demand for walking reflects continuing interest in healthy outdoor activity. Integrating proposed bike paths with other existing bike paths is highly recommended.

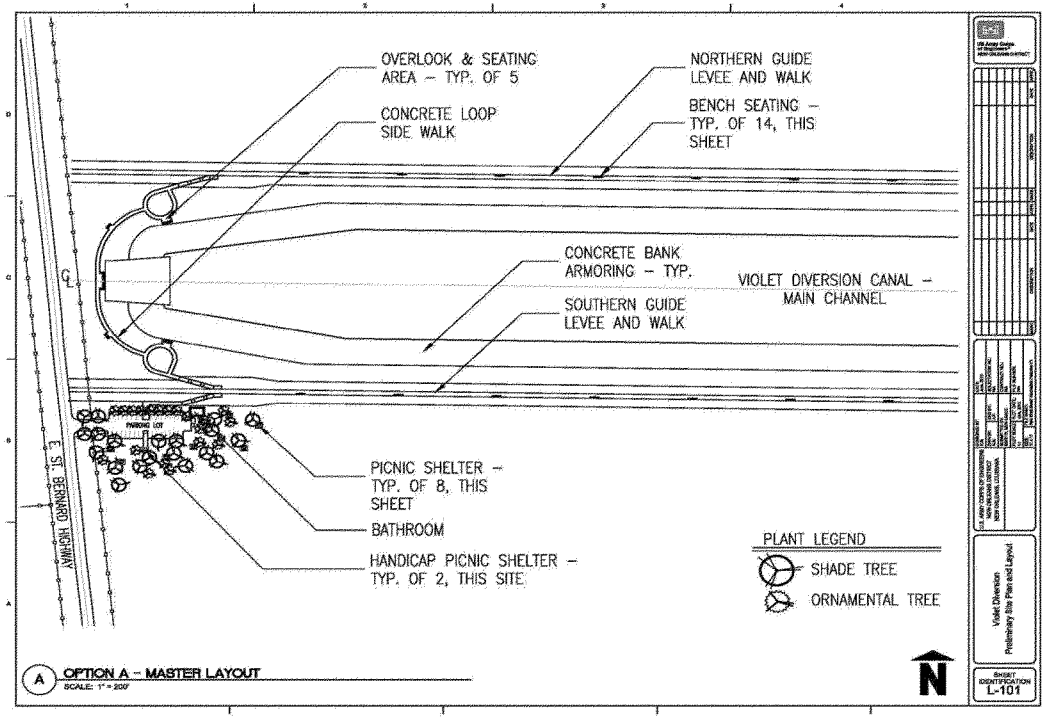
Two recreation designs at the Violet Diversion, Option A and B, were evaluated in terms of benefits and costs and differ mainly in size. Option B maximizes net benefits, has a BCR of 5.63 and is the recommended plan (see the BCR section of this appendix).

There are no constraints to recreation development at this location since the land needed is within the right-of-way (ROW) of the diversion and would be part of the land purchase for the structure. As stated before, a local sponsor is needed to assist with construction costs and operation and maintenance. The educational component of interpretive signage would be located along the trail, which would discuss the conveyance channel objectives of restoring the central wetlands. EP 1165-2-502, Appendix B, 1.a. states, "The social, cultural, scientific, and educational values should be considered within the framework and scope of the ecosystem restoration project."

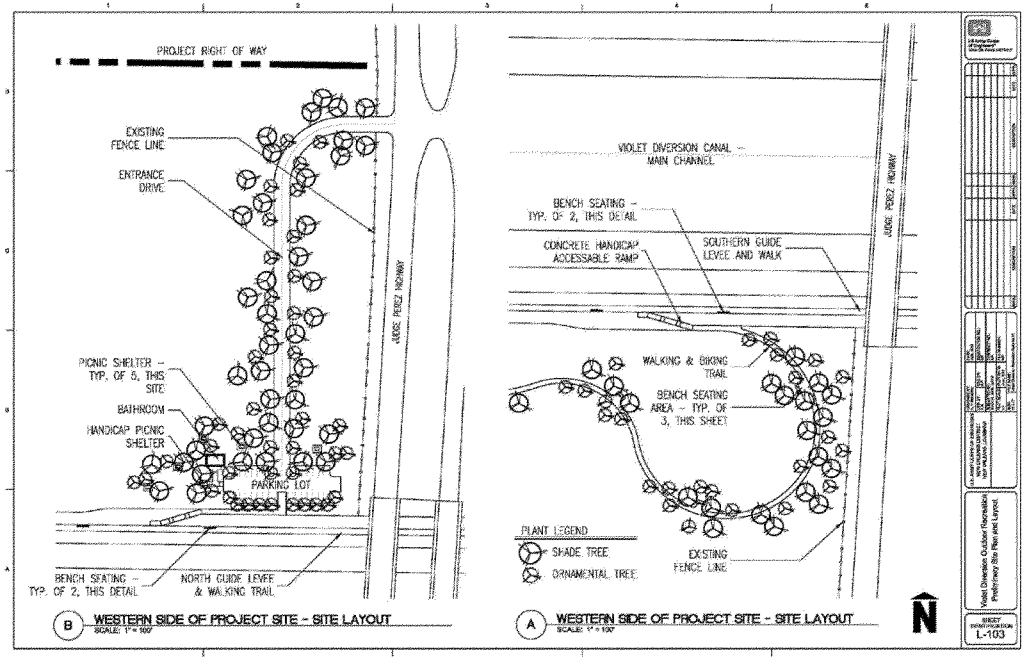
Violet Diversion Recreation Design Drawing: Option A: 7,000 lf of trail on guide levee, 16 picnic shelters (including 3 HC accessible), parking ,planting, benches, 2 bathrooms, solar lighting.



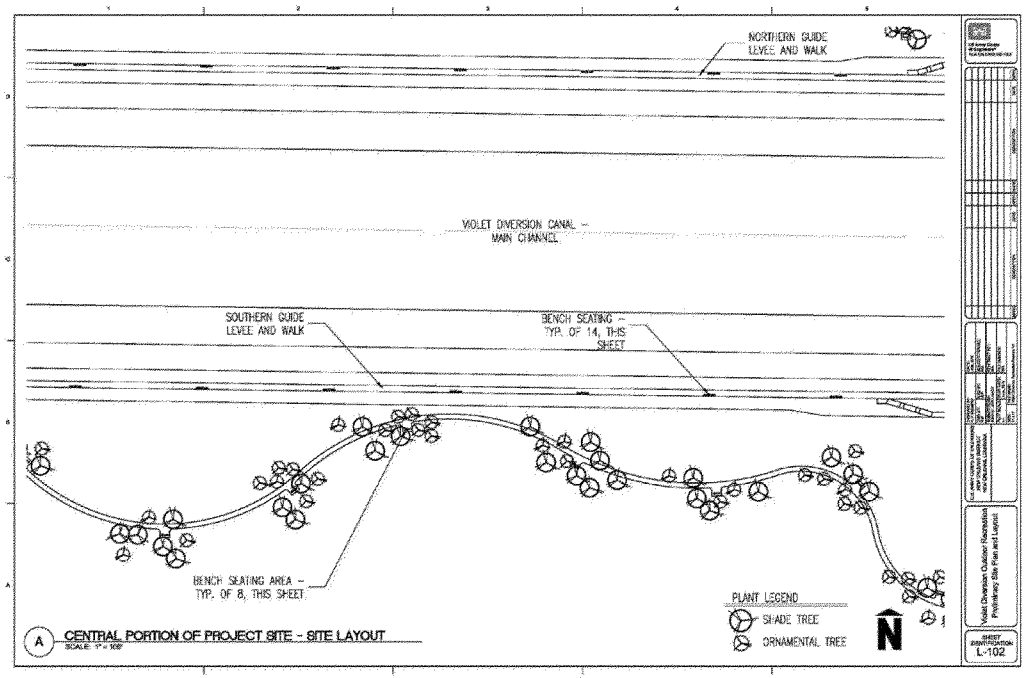
Violet Diversion Recreation Design Drawing: (Option A continued).



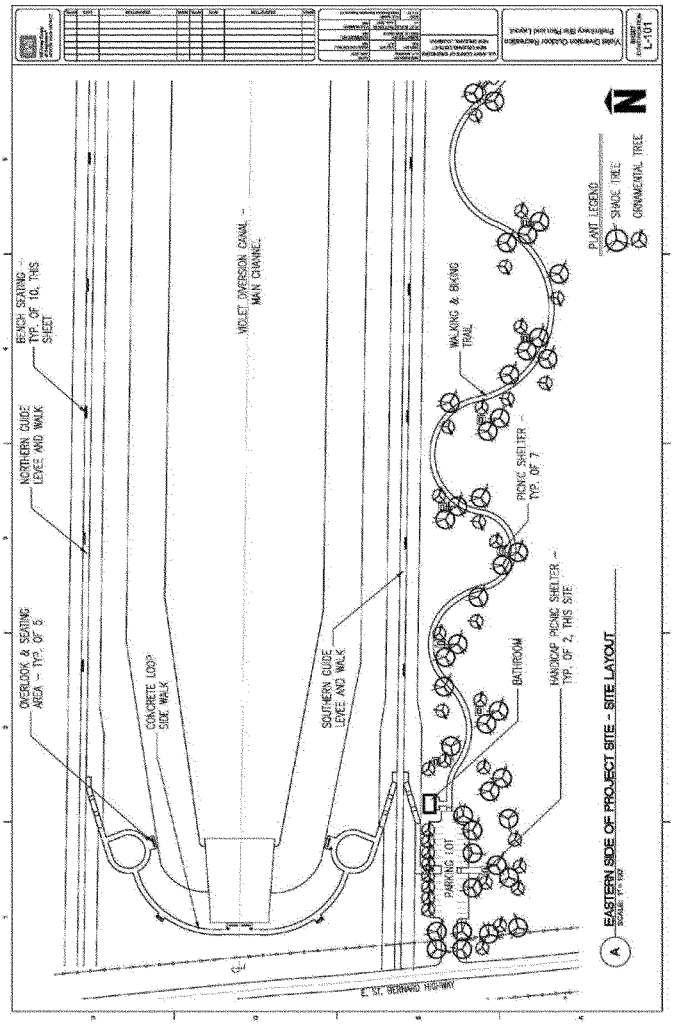
Violet Diversion Recreation Design Drawing: Option B (recommended plan): 11,000 lf of trails on and off of guide levee, 15 picnic shelters (including 3 HC accessible) benches, 2 bathrooms, plantings, parking and solar lighting**:** (Judge Perez side).



Violet Diversion Recreation Design Drawing: (central portion).



Violet Diversion Recreation Design Drawing: (E. St. Bernard Highway side)



1.4 Shell Beach Recreation Feature

Existing Condition
Currently, the shoreline of Shell Beach, located at the end of Yscloskey Road where it meets the MRGO, is often used by fisherman. Fishermen are confronted with a rocky, jagged shoreline and snakes in the area. The shoreline is used extensively on the weekends by many in the area. Additionally, a memorial is located at this location which lists the names of those who lost their lives as a result of Hurricane Katrina. The recreational plan will attempt to incorporate the memorial in a way that is both respectful and functional.

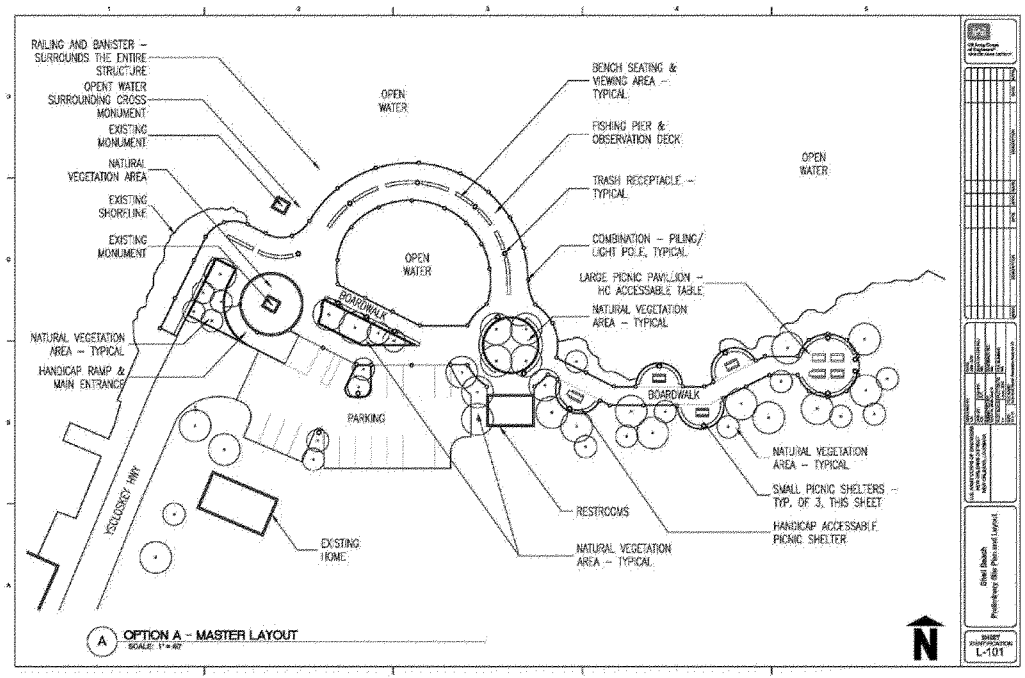
Proposed Improvement: Opportunities and Constraints
Opportunities for recreation features include a multi-use walk into the MRGO for wildlife viewing and to gain access to other spots along the shore, including picnic tables and shelters. Interpretive signage will explain the history of use in the adjacent wetland and the plan to restore and nourish marsh and swamp.

Two recreation designs at the Shell Beach, Option A and B, were evaluated in terms of benefits and costs and differ mainly in design of the multi-use path over the MRGO. Option B maximizes net benefits, has a BCR of 1.80 and is the recommended plan (see the BCR section of this appendix).

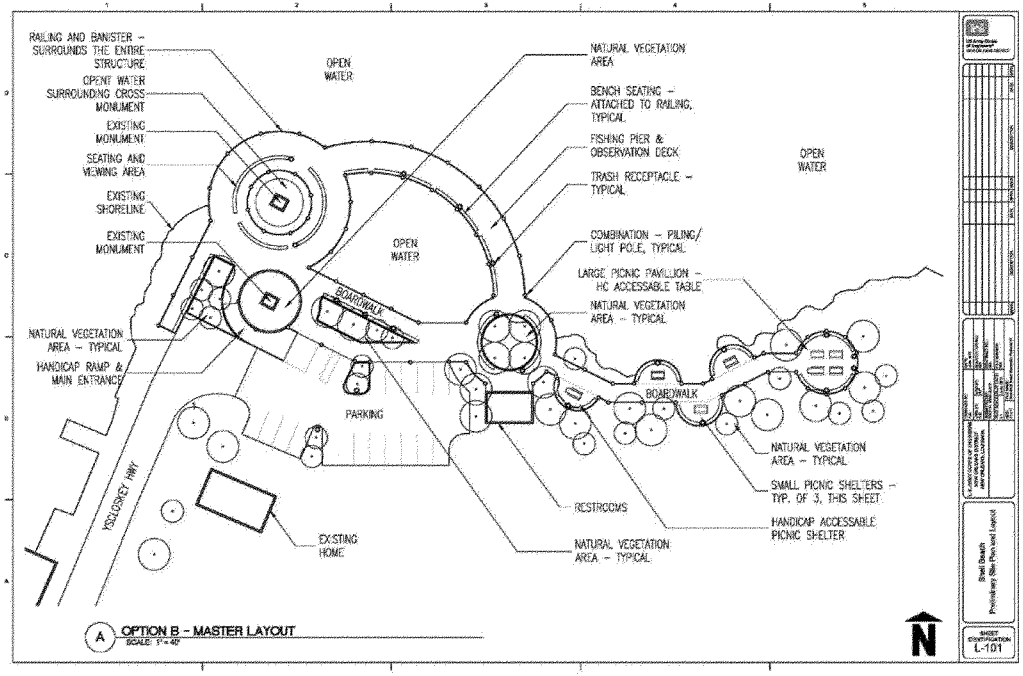
The nature trail/multi-use walk at Shell Beach is for viewing the ecosystem restoration and to use the system for recreational fishing. This experience would be greatly diminished in the future without-project condition if it were not for the restoration of the wetlands. Use of the recreation feature at Shell Beach is tied to the restoration project and would lose some of its utility and value if the ecosystem restoration would not occur and therefore would not "stand alone". Additionally, parking, bathrooms, picnic shelters are located on separable lands for public access, parking, health and safety, which is allowed as per ER1165-2-400, section 7.a. and EP 1165-2-502, Appendix B, 4.

Constraints include private property ownership of the proposed site and need for a local sponsor.

Shell Beach Recreation Feature Design Drawing: Option A: 805 lf of boardwalk, 193 lf of fishing boardwalk, 5 picnic shelters (with 2 HC accessible) and 1 bathroom, parking, plantings and solar lighting.



Shell Beach Recreation Feature Design Drawing: Option B (recommended plan): 805 lf of boardwalk, 343 lf fishing boardwalk, 5 picnic shelters (with 2 HC accessible) 1 bathroom, parking, plantings and solar lighting.



2.0 MRGO ECOSYSTEM RECREATION FEATURE BENEFIT-TO-COST RATIOS

2.1 Recreation Benefits Calculations

The benefits for recreation development for the MRGO Ecosystem Restoration project have been estimated using Economic Guidance Memorandum 11-03, Unit Day Values for Recreation. The Average Annual Recreation Value (AARV) is calculated from the determined Unit Day Value (UDV) and the Annualized Visitation (AV) for both the existing conditions and proposed alternative. The Average Annual Recreation Benefits (AARB) is the difference between the AARV for existing conditions and AARV for the facility improvements.

2.2 Bienvenue Triangle Recreation Feature

Existing Facility Value

The UDV is converted from the assigned point value for the existing site. The assigned point value is determined using judgments factors for each of the criteria. For Bienvenue Triangle, Existing Conditions, the assigned point value is 18, which is converted to the UDV of $4.61 for general recreation and $6.18 for general fishing and hunting, using the conversion table in EGM 11-03. Assigned points, criteria and judgments factors are in Table Rec 1.

Table Rec 1: Bienvenue Triangle (BT) Recreation Point Value, Existing Conditions

Criteria (Maximum Points)	Judgment Factors (Range of Points)	Assigned Point & Rational
Recreation Experience (30)	Several general activities (5-10)	5 - The BT currently offers a platform for viewing the remnants of a cypress swamp. Additionally, fishing takes place along the shore on either side of the platform and there is a canoe launch nearby.
Availability of Opportunity (18)	Several within 1 hour travel time; none within 30 minutes travel time (4-6)	4 - The BT offers viewing opportunities of the swamp and associated wildlife; a comparable experience would include Jean Lafitte National Park and Bayou Sauvage.
Carrying Capacity (14)	Minimum facility (0-2)	2 - Existing platform provides minimum facilities at this site.
Accessibility (18)	Fair access, poor quality roads to site; limited access within site (4-6)	4 - Access to this site is fair with many side roads in complete disrepair, access to the marsh platform is across a railroad and not ADA accessible, no parking.
Environmental (20)	Average esthetic quality; factors exist that lower quality to a minor degree (3-6)	3 - The water in the BT is of lower quality due to runoff pollution and salinity impacts. Resulting esthetic quality is degraded with all of the cypress trees gone.
Total Points (100)	Range for factors (16 - 30)	Total Assigned Points 18

The total annualized visitation for the existing site is 3,792 and includes general recreational activities as well as fishing activities. The University of Wisconsin, Madison performed a survey of visitors to the platform site during the month of June 2010 when elementary and high school students were not in season. Sixty-six surveys were completed while 118 refused during a 7 day period which included three Fridays, two Sundays, one Monday and one Tuesday and the results are shown in Table Rec 2. Each respondent indentified how many times a month they participated in general recreation activities or in fishing activities.

Table Rec 2: Bienvenue Triangle Annual User Days for Existing Conditions

General Recreation Activity	Monthly User Days*	Annual User Days
Picnic, walking/hiking, birding, relaxing, viewing	223	1,766
Student Use	250	1,485
General Fishing/Hunting Activity		
Fishing	68	541
Total All Activities	541	3,792

* Intercept survey administered at Bienvenue Triangle platform performed on seven days by University of Wisconsin during June 2010. Approximately 66 intercept surveys completed during period while 118 refused survey. Student use not part of survey since school was out of session.

A total of 184 people visited the platform during the seven day period of surveying. The respondents (66) stated that they currently visit the platform for a variety of reasons including fishing, picnicking, hunting, boating, hiking, birding, relaxing and viewing. The respondents said they visited the site for general recreation purposes a total of 80 times a month or 1.21 visits per person and 24.5 times per month for fishing or 0.37 times per person. These rates were multiplied by total visits during the survey period (184) to derive monthly user days for each type of activity.

In addition to users identified in the intercept survey, school children visit the platform during the school year for educational and recreational purposes. The MLK School in particular uses the platform on a regular basis which is not included in the intercept survey results. Monthly use is estimated at 250 students based upon an interview with school staff who said they use the platform for recreation and educational classes related to the marsh and dependent wildlife. Students visit the site during the months of January through May and September through December.

Both the intercept survey monthly user days and the student monthly users days are assumed to take place 2/3 of the year (or school year), which represents the days that are suitable for visitation given climate conditions.

The AARV of the existing facility is $18,340. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results. Picnicking, walking/hiking, birding, relaxing/viewing and student use are general recreation activities and are valued at $4.61 while fishing is valued at $6.18.

AVERAGE ANNUAL RECREATION VALUE (EXISTING) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	= 1,766 USERS x $4.61 UDV	=	$ 8,147
± GEN. F&H	= 541 USERS x $6.18 UDV	=	$ 3,344
STUDENTS GEN. REC	= 1,485 USERS X $4.61 UDV	=	$ 6,849
TOTAL AARV		=	$18,340

Facility Improvement Value – Development with Improved Platform, Boardwalks, Interpretive Signage, 5 Picnic Shelters, Parking, Bathroom and Vegetative Plantings

Option A

The UDV is converted from the assigned point value for the proposed facility. The assigned point value is determined using judgments factors for each of the criteria. For the proposed improvements at Bienvenue Triangle, the assigned point value is 74, which is converted to the UDV of $9.09 for general recreation and $9.90 for general fishing and hunting, using the conversion table in EGM 11-03. Assigned points, criteria and judgment factors are in Table Rec 3.

Table Rec 3: Bienvenue Triangle (BT) Recreation Point Value with Option A		
Criteria (Maximum Points)	Judgment Factors (Range of Points)	Assigned Points & Rational
Recreation Experience (30)	Numerous high quality activities; some general activities (24-30)	26 - BT, once restored, will be a premier cypress marsh and wetland in an urban environment offering opportunities for education and wetland research and recreation. Already, universities use this area for wetland research and development and are expected to continue using the area once improved. The BT will offer wetland education and research for nearby school children as well and interpretive signing, fishing and picnicking for the community.
Availability of Opportunity (18)	One or two within 1 hour travel time; none within 45 minutes travel time (7-10)	10 - BT is primarily urban and offers unique opportunities for educating school age children as to wildlife habitats, wetlands restoration as well as ecological planning. There are few other locations offering this type of experience and education so close to an urban area.
Carrying Capacity (14)	Optimum facility (9-11)	10 - Optimum facilities to conduct activity(ies), including area for outdoor student classes and educational activities, fishing and picnicking
Accessibility (18)	Good access, good roads to site; fair access, good roads within site (11-14)	14 - Access to this site good with fair roads to site parking, access to platform will improve with landscaped walk, lighting and will be ADA accessible.
Environmental (20)	High esthetic quality; no factors exist that lower quality (11-15)	14 - Esthetics is included in the design; development will have high esthetic quality with no factors existing to lower quality and will blend in with surrounding esthetics.
Total Points (100)	Range for factors (62 - 80)	Total Assigned Points 74

The total AV for Option A is 17,479. AV for general recreation, which includes picnicking and nature walk activities, is 14,118 plus 1,856 students and general fishing and hunting, is 1,505. Table Rec 4 shows the AV calculation.

Table Rec 4: Annualized Visitation for Bienvenue Triangle, Option A		
General Recreation Activity	Monthly User Days*	Annual User Days
Picnic, walking/hiking, birding, relaxing, viewing	956	14,118
Student use	312	1,856
General Fishing/Hunting Activity		
Fishing	312	1,505
Total All Activities	1,581	17,479

* Intercept survey taken at Bienvenue Triangle platform performed on seven days by University of Wisconsin during June 2010. Approximately 66 intercept surveys completed during period while 118 refused survey.

A similar method is used to estimate user days under the with-project condition. A total of 184 people visited the platform during the seven day period of surveying. The respondents (66) stated that would visit the expanded and improved platform and new picnic areas for a variety of reasons including fishing, picnicking, hunting, boating, hiking, birding, relaxing and viewing. The respondents said they would visit the improved site for general recreation purposes a total of 343 times a month or 5.20 visits per person and 112 times per month for fishing or 1.70 times per person. These rates were multiplied by total visits during the survey period (184) to derive monthly user days for each type of activity.

In addition to users identified in the intercept survey, school children visit the platform during the school year for educational and recreational purposes. The MLK School, in particular, uses the platform on a regular basis which is not included in the intercept survey results. Under with-project conditions, monthly student use is estimated to increase 25 percent or 312 (250*1.25) based upon an interview with school staff. Students visit the site during the months of January through May and September through December. Both the intercept survey monthly user days and the student monthly users days are assumed to take place 2/3 of the year (or school year), which represents the days that are suitable for visitation given climate conditions.

The AARV of Option A is $160,142. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results.

AVERAGE ANNUAL RECREATION VALUE (NEW DEVELOPMENT) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	= 14,118 USERS x $9.09 UDV	= $128,360
+ GEN. F&H	= 1,505 USERS x $9.90 UDV	= $ 14,905
STUDENTS GEN. REC	= 1,856 USERS x $9.09 UDV	- $ 16,877
TOTAL AARV		$160,142

Facility Improvement Value – Development with Improved Platform, Boardwalks, Interpretive Signage, 5 Picnic Shelters, Parking, Bathroom and Vegetative Plantings

Option B
The UDV is converted from the assigned point value for the proposed facility. The assigned point value is determined using judgments factors for each of the criteria. For the proposed improvements at Bienvenue Triangle, Option B, the assigned point value is 82, which is 8 points higher than for Option A (carrying capacity is much greater due to more linear feet of boardwalk--adding 4 points—and 4 points higher for recreation experience). The 82 points is converted to the UDV of $9.76 for general recreation and $10.35 for general fishing and hunting, using the conversion table in EGM 11-03. Assigned points, criteria and judgment factors are in Table Rec 3.

The AARV of Option B is $171,557. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results.

AVERAGE ANNUAL RECREATION VALUE (NEW DEVELOPMENT) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	= 14,118 USERS x $9.76 UDV	= $137,847
+ GEN. F&H	= 1,505 USERS x $10.35 UDV	= $ 15,586
STUDENTS GEN. REC	= 1,856 USERS x $9.76 UDV	= $ 18,124
TOTAL AARV		$171,557

2.3 Violet Diversion Recreation Feature

The Violet Freshwater Diversion is an important component of the plan to restore historic salinity conditions and provide freshwater and nutrients to nourish existing and restored wetlands in the study area. However, additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.

Existing Facility Value

Currently, there is no recreation feature at the proposed site for the MRGO Freshwater Diversion. Since the feature will be unique in that it relates to the diversion and will incorporate educational interpretive signage about the conveyance of the freshwater to the nearby marshes, visitation data does not exist. There is no recreational value associated with the existing condition.

Proposed Recreational Feature Development with nature walk(s), benches, interpretive signage, Picnic Shelters, Parking, Bathroom and Vegetative Plantings.

Option A: 7,000 LF guide levee path with picnic areas, benches

The UDV is converted from the assigned point value for the proposed facility. The assigned point value is determined using judgments factors for each of the criteria. For Option A, the assigned point value is 66, which is converted to the UDV of $8.55 for general recreation and $9.45 for general fishing and hunting, using the conversion table in EGM 11-03. Assigned points, criteria and judgment factors are in Table Rec 5.

Table Rec 5: Violet Diversion (VD) Option A Recreation Point Value with Improvement

Criteria (Maximum Points)	Judgment Factors (Range of Points)	Assigned Points & Rational
Recreation Experience (30)	Several general activities; one high quality activity (11-16)	16 - VD, once constructed, will convey freshwater to adjacent marshland. Interpretive signage, benches and picnic tables will offer a viewing and educational experience not available in the region.
Availability of Opportunity (18)	None within 2 hours travel time (15-18)	18 - VD recreation and educational features offer unique opportunities for explaining the need for and function of freshwater for surrounding marshes. Interpretive signage will explain the Corps objectives related to the MRGO ecosystem restoration study. Additionally, picnic tables and shelters and a walking trail on the guide levee will provide recreational experiences. There are no other locations offering this type of experience and education so close to an urban area.
Carrying Capacity (14)	Adequate facilities (6-8)	8 - Adequate facilities to conduct activity(ies), including area for student education and recreational activities.
Accessibility (18)	Good access, good roads to site; fair access, good roads within site (11-14)	14 - Access to this site good with fair roads to site, parking; access to diversion will be ADA accessible with adequate lighting and bathroom facility.
Environmental (20)	Above average esthetic quality; any limiting factors can be reasonably rectified (7-10)	10 - Esthetics is included in the design; development will have average esthetic quality. Proximity of roadway to project will impact esthetics to a degree however landscaping can reasonably minimize this impact.

Total Points (100)	Range for factors (50 - 66)	Total Assigned Points 66

The capacity method of determining use for the Violet Diversion Park is used for determining with-project benefits. According to ER 1105-2-100, Section VII, page E-194, if data on use determining variables are unavailable and are not cost effective to obtain and if it can be demonstrated that sufficient excess demand exists in the market area to accommodate the additional capacity supplied by the proposed project, use may be assumed to be equal to capacity. Demand for picnicking and nature walks was found to exceed the supply in the market area. (See the Supply/Demand of recreation features in the market area following this section.)

Based upon the capacity method, the total AV for Option A is 42,454. Table Rec 6 shows the AV calculation. Option A includes 7,000 linear feet of nature walk on the guide levees, interpretive signing, benches and 16 picnic areas.

Table Rec 6: Violet Diversion Option A Annual Visitation

Activity	Facility Standards (users/day)*	Proposed Feature	Annual Visitation (241 days)**
General Recreation Activity			
Walking	40 users per day per mile	1.3 miles	12,775
Picnic Areas	7.7 users per day per site	16 sites	29,679
Total			42,454

*Source: Louisiana Statewide Outdoor Recreation Plan (SCORP)
** 241 days represent 2/3 of the year that the facility will be used, the other 1/3 it will not be used due to inclement weather.

The AARV of Option A is $363,150. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results.

AVERAGE ANNUAL RECREATION VALUE (NEW DEVELOPMENT) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	=	42,454 USERS x $8.55 UDV	=	$363,150
+ GEN. F&H	=	0 USERS x $9.79 UDV	=	$0
TOTAL AARV			=	$363,150

Option B: 11,000 LF nature walk on guide levee and at base of levee, picnic areas, benches

For Violet Diversion, Option B, the UDV is converted from the assigned point value for the proposed facility. The assigned point value is determined using judgments factors for each of the criteria. For Option B, the assigned point value is slightly higher than the point value for Option A. Option B offers two types of nature walk - on the guide levee and at the base of the levees. Another 4 points is added to the recreation experience factor yielding a point value of 70 for Option B, which is converted to the UDV of $8.74 for general recreation using the conversion table in EGM 11-03. For the other assigned points criteria and judgments factors, see Option A criteria table.

Based upon the capacity method, the total AV for Option B is 47,899. Option B includes 11,000 LF of nature walk on and at base of the guide levees, interpretive signing, benches and 15 picnic areas. Table Rec 7 shows the AV calculation.

Table Rec 7: Violet Diversion Option B Annual Visitation

Activity	Facility Standards (users/day)*	Proposed Feature	Annual Visitation (241 days)**
General Recreation Activity			
Walking	40 users per day per mile	2.1 miles	20,075
Picnic Areas	7.7 users per day per site	15 sites	27,824
Total			47,899

*Source: Louisiana Statewide Outdoor Recreation Plan (SCORP)

** 241 days represent 2/3 of the year that the facility will be used, the other 1/3, it will not be used due to inclement weather.

The AARV of Option B is $418,637. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results.

AVERAGE ANNUAL RECREATION VALUE (NEW DEVELOPMENT) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	=	47,899 USERS x $8.74 UDV	= $418,637
+ GEN. F&H	=	0 USERS x $9.52 UDV	= $0
TOTAL AARV			= $418,637

2.2 Shell Beach Recreation Feature

Existing Facility Value

The UDV is converted from the assigned point value for the existing site. The assigned point value is determined using judgments factors for each of the criteria. For Shell Beach, Existing Condition, the assigned point value is 10, which is converted to the UDV of $4.26 for general recreation and $5.83 for general fishing and hunting, using the conversion table in EGM 11-03. Assigned points, criteria and judgment factors are in Table Rec 8.

Table Rec 8: Shell Beach (SB) Recreation Point Value, Existing Conditions		
Criteria (Maximum Points)	Judgment Factors (Range of Points)	Assigned Point & Rational
Recreation Experience (30)	Two general activities (0-4)	2 - Visitors to the SB site are either viewing the ecosystem or the memorial or fishing. Currently the area does not offer picnic areas or shelters of any kind.
Availability of Opportunity (18)	Several within 1 hour travel time; a few within 30 minutes travel time (0-3)	1 - The SB area, from the site to Hopedale, offers several areas for bank fishing. None of these areas are improved.
Carrying Capacity (14)	Minimum facility (0-2)	1 - There are no facilities at the proposed site.
Accessibility (18)	Limited access by any means to site or within site (0-3)	3 - Access to this site is limited via one road, limited parking and not ADA accessible.
Environmental (20)	Average esthetic quality; factors exist that lower quality to a minor degree(3-6)	3 - Marsh in area has undergone severe erosion, shoreline has rock for protection purposes all resulting in esthetic quality that has been degraded.
Total Points (100)	Range for factors (3 - 18)	Total Assigned Points 10

Currently, there is no recreation development at the proposed site for the Shell Beach feature but recreation does occur. Rock shoreline protection has been placed along the shore at the proposed site. Because the site is currently being used to deploy boom and other equipment in response to the Gulf oil spill, survey data was not obtainable. Anecdotal information based upon interviews of local fisherman and from an interview with Campo Marina located at the site revealed usage information. Approximately 8 fishermen in the morning and 15 in the evening fish from the shoreline during weekdays. About 40 can be found on a Saturday and 30 on an average Sunday, yielding 185 per week. These averages occur most of the year and for this analysis it is assumed to occur 66% of the year. The total annualized visitation for the existing site is 6,349 which are for recreational fishing activities.

Table Rec 9: Annual User Days for Existing Conditions	
Activity	Annual User Days
General Fishing/Hunting Activity	6,349

Source: Interview of marina merchant at site year-round.

The AARV of the existing facility is $37,016. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results. Picnicking, walking/ hiking, birding, relaxing/viewing are general recreation activities and are valued at $4.26 while fishing is valued at $5.83.

AVERAGE ANNUAL RECREATION VALUE (EXISTING) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

	GEN. REC	=	0 USERS x $4.26 UDV	=	$ 0
+	GEN. F&H	=	6,349 USERS x $5.83 UDV	=	$37,016
	TOTAL AARV			=	$37,016

Proposed Recreational Feature Development with boardwalk, benches, interpretive signage, picnic shelters, parking, bathroom and vegetative plantings.

The UDV is converted from the assigned point value for the proposed facility. The assigned point value is determined using Judgments factors for each of the criteria. For the proposed improvements of Option A and B at Shell Beach, the assigned point value is 58, which is converted to the UDV of $8.16 for general recreation and $8.99 for general fishing and hunting, using the conversion table in EGM 11-03. Assigned points, criteria and judgment factors are in Table Rec 10.

Table Rec 10: Shell Beach (SB) Recreation Point Value with Improvement (Option A and B)		
Criteria (Maximum Points)	Judgment Factors (Range of Points)	Assigned Points & Rational
Recreation Experience (30)	Several general activities; one high quality activity (11-16)	16 - SB, once constructed, will offer a boardwalk to the memorial, boardwalks to fishing areas along and just off the shoreline, picnic shelters and vegetative plantings. Interpretive signage and other boardwalks will offer visitors viewing and educational opportunities of the wetland restoration as it happens and; thereafter, an excellent way to view wildlife and the serenity of the marshland.
Availability of Opportunity (18)	None within 1 hour travel time. (11-14)	12 - SB recreation and educational features offer an opportunity for recreational experiences enhanced by the ecosystem restoration work in the MRGO area, including fishing and picnicking. Interpretive signage will explain the Corps objectives related to the MRGO ecosystem restoration study. Additionally, a fishing boardwalk, picnic tables and shelters will provide recreational opportunities.
Carrying Capacity (14)	Basic facility to conduct activity (3-5)	5 - Basic facilities to conduct activity(ies), including area for marsh restoration viewing, memorial viewing, and fishing and picnicking.
Accessibility (18)	Fair access, fair roads to site; fair access, good roads within site (7-10)	10 - Access to this site good with fair roads to site parking, access to site will be ADA accessible with adequate lighting and bathroom facility; however, area is remote.
Environmental (20)	High esthetic quality; any limiting factors can be reasonably rectified (11-15)	15 - Esthetics is included in the design; development will have average esthetic quality. Proximity of roadway to project will impact esthetics to a degree however landscaping can reasonably minimize this impact.
Total Points (100)	Range for factors (43 - 60)	Total Assigned Points 58

The capacity method of determining use for the Shell Beach recreation feature is used for determining with-project benefits. According to ER 1105-2-100, Section VII, page E-194, if data on use determining variables are unavailable and are not cost effective to obtain and if it can be demonstrated that sufficient excess demand exists in the market area to accommodate the additional capacity supplied by the proposed project, use may be assumed to be equal to capacity.

Option A

Based upon the capacity method, the total AV for Option A is 27,872. Option A includes 805 LF of nature trail boardwalk, 193 linear feet of fishing boardwalk, 5 picnic areas, interpretive signage, bathroom, and parking. Table Rec 11 shows the AV calculation.

Table Rec 11: Shell Beach Option A Annual Visitation			
Activity	Facility Standards (users/day)*	Proposed Feature	Annual Visitation (241 days)**
General Recreation Activity			
Picnic Areas	7.7 users per day per site	5 sites	9,275
General Fishing and Hunting			
Fishing area	4 users per day per 10 feet of pier	193 feet	18,597
Total			27,872

*Source: Louisiana Statewide Outdoor Recreation Plan (SCORP)
** 241 days represent 2/3 of the year that the facility will be used, the other 1/3 it will not be used due to inclement weather.

The AARV of Shell Beach Option A is $242,910. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results.

AVERAGE ANNUAL RECREATION VALUE (NEW DEVELOPMENT) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	= 9,275 USERS x $8.16 UDV	=	$75,644
+ GEN. F&H	= 18,597 USERS x $8.99 UDV	=	$167,266
TOTAL AARV		=	$242,910

Option B

Based upon the capacity method, the total AV for Option B is 42,326. Option B includes 805 LF of nature trail boardwalk, 343 linear feet of fishing boardwalk, 5 picnic areas, interpretive signage, bathroom, and parking. Table Rec 12 shows the AV calculation.

Table Rec 12: Shell Beach Option B Annual Visitation			
Activity	Facility Standards (users/day)*	Proposed Feature	Annual Visitation (241 days)**
General Recreation Activity			
Picnic Areas	7.7 users per day per site	5 sites	9,275
General Fishing and Hunting			
Fishing area	4 users per day per 10 feet of pier	343 feet	33,051
Total			42,326

*Source: Louisiana Statewide Outdoor Recreation Plan (SCORP)
** 241 days represent 2/3 of the year that the facility will be used, the other 1/3 it will not be used due to inclement weather.

The AARV of Shell Beach Option B is $372,909. This is formulated by multiplying the AV by the UDV for each recreation type and summing the results.

AVERAGE ANNUAL RECREATION VALUE (NEW DEVELOPMENT) = [USERS x UDV]
= [(GENERAL RECREATION USERS x GENERAL RECREATION UDV) + (GENERAL FISHING & HUNTING USERS x GENERAL FISHING & HUNTING UDV)]

GEN. REC	= 9,275 USERS x $8.16 UDV	=	$75,644
+ GEN. F&H	= 33,051 USERS x $8.99 UDV	=	$297,265
TOTAL AARV		=	$372,909

Average Annual Recreation Benefits

The Average Annual Recreation Benefits (AARB) are derived by subtracting the AARV for existing conditions from the AARV for the alternative. Table Rec 13 summarizes the recreation values and corresponding recreation benefit for each alternative. Option B has the highest AARB for all three locations

Table Rec 13: Average Annual Recreation Benefit

	Bienvenue Triangle		Violet Diversion		Shell Beach	
	Option A	Option B	Option A	Option B	Option A	Option B
Alternative AARV	$160,142	$171,557	$363,150	$418,637	$242,910	$335,893
Existing AARV	$ 18,340	$ 18,340	$ 0	$ 0	$ 37,016	$ 37,016
AARB	$141,802	$153,217	$363,150	$418,637	$205,894	$335,893

Benefit-Cost Summary

Total Expected Annual Costs: USACE's Cost Engineering Branch used the Tri-Services Automated Cost Engineering System (TRACES MII Version 4.1) to develop the preliminary project cost based on design details provided by New Orleans District Environmental Branch. MII is the second generation of the MCASES software used as a costing tool by the USACE. The MII English Cost Book 2010 and the MII Equipment Region 3r 2009 libraries were linked to the project library in the development of these costs. Additionally, cost for land acquisition is included in total costs for both Bayou Bienvenue and Shell Beach recreation features.

An FY2012 Federal discount rate of 4 percent and a project life of 50 years were used to discount the costs to the base year and then to amortize the costs over the 50-year life of the project. After the expected annual costs were calculated, the annual operations and maintenance costs were added in order to determine the total expected annual costs for the rehab alternative.

Comparison of Benefits and Costs: The economic justification of the proposed alternatives was determined by comparing the expected annual costs to the expected annual benefits that will accrue over the life of the project (50 years). These values were converted to an equivalent time frame by using the FY2012 Federal discount rate of 4

percent. Finally, the net benefits were calculated by subtracting the expected annual costs from the expected annual benefits for the alternatives.

Table Rec 14 shows the project costs, the annual operation and maintenance costs, the expected annual costs and benefits, the benefit/cost ratios (BCR), and the net benefits derived from the three alternatives.

Table Rec 14: Benefits and Costs Comparison

	Bienvenue Triangle		Violet Diversion		Shell Beach	
	Option A	Option B	Option A	Option B	Option A	Option B
PROJECT COST*	$2,585,864	$3,419,500	$1,080,000	$1,255,500	$2,823,000	$3,581,647
INTEREST & AMORTIZATION	0.0465	0.0465	0.0465	0.0465	0.0465	0.0465
PROJECT ANNUAL CHARGES	$120,243	$159,007	$50,220	$58,381	$131,270	$166,547
O&M	$15,000	$15,000	$16,000	$16,000	$20,000	$20,000
PROJECT AVERAGE ANNUAL COST	$135,243	$174,007	$66,220	$74,381	$151,270	$186,547
TOTAL AVERAGE ANNUAL BENEFITS	$141,802	$153,217	$363,150	$418,637	$205,894	$335,893
NET BENEFITS	$6,560	($20,789)	$296,930	$344,256	$54,624	$149,347
BENEFIT/COST RATIO	1.05	0.88	5.48	5.63	1.36	1.80

* Project costs include LERRD cost, 35% Contingency and Land acquisition Costs for Bienvenue Triangle and Shell Beach.

Based upon maximizing net benefits and the BCR, Option A for Bienvenue Triangle, Option B for Violet Diversion and Option B for Shell Beach are selected as the recommended recreation features and will be included as features of the MRGO Ecosystem Restoration project.

3.0 RECREATION SUPPLY AND DEMAND ANALYSIS

3.1 Overview

Recreational needs are determined by using a regional analysis approach. The approach is a generalized way of presenting recreational supply/demand relationships for land and water use within the project market area and is similar to that used by many states in preparing their Statewide Comprehensive Outdoor Recreation Plan (SCORP).

The analysis has three objectives: first, to determine the demand for water-based and land-based recreational activities within the project market area (consultations with the local communities led to the selection of picnicking and nature walking as the most viable activities for this particular project); second, to translate these demands into facility needs; and third, to use this information in identifying potentials for recreational development in or along the project areas.

The demand-need determination equation is basically composed of three elements: demand, supply, and need. Need is defined as that amount remaining when all demand is compared with the existing supply (demand – supply = need).

3.2 Demand

Demand is commonly viewed as an expression of desire to engage in an activity by an individual in a given area. To calculate demand, two essential components must be determined: the market area and its population composition, and the individual participation rate of each activity measured. The market area in this case includes St. Bernard Parish and the population of Orleans Parish east of the Inner Harbor Navigation Canal (IHNC). The 2003 - 2008 SCORP was used to identify participation rates for both picnicking and nature walking activities, which are the main activities of the proposed recreation features.

Market area population and market area participation rates for each activity are multiplied together to yield the gross demand figure for the activity as measured in activity occasions for the high quarter of the year. These are the periods in which demand is the greatest. High quarter demands are divided by 91.5 days (the number of days in the quarter) to measure the average daily demand that occurs in the peak season of use. By planning for high quarter daily demands, the assumption is made that the facilities provided to satisfactorily accommodate this level of visitation will be more than adequate to handle the visitation that would occur during the remainder of the year.

The facility standard measures that amount of use a facility should receive under optimal conditions. These standards, as applied to the demand equation, are general guides that determine the number of facilities to be developed. Facility standards in the Louisiana SCORP and USACE guidelines were modified for use in this analysis:

Nature Walk:
Assume 10 persons/trail mile
Turnover rate = 4
= 40 User-days/trail mile
Optimum trail length = ¼ - 1 mile

Picnicking:
Assume 3.85 persons/site
Turnover rate = 2
= 7.7 User-days/site

Demand in itself is a general expression and its specific associations to the market area can be vague unless properly defined. Two additional factors to accomplish this task were developed.

One factor relates to public versus private satisfaction of demand. Demand responses in the Louisiana SCORP demand survey do not account for the level of an activity which will occur at exclusive sites not open to the public, even for a fee, such as private swimming pools or tennis courts at apartment complexes that are available to the tenants. This type of facility does satisfy some demand. The degree of demand satisfaction should be apportioned to determine the demand for public facilities. In this study effort, picnicking and nature walking activities were analyzed to determine the percent or level of demand which should then be satisfied by public facilities development. It should be remembered that both the demand for and supply of such facilities does not necessitate public ownership but includes those commercial operations that are available to the public on a fee (commercial) basis.

Not all recreational demand can or should be satisfied within a particular market area for several reasons. The public has diverse recreational interests and tends to satisfy its recreational demands at various locations that may be near or distant from the place origin. A factor was designed to measure the amount of demand that should be provided to satisfy the potential user within a geographic context. By analyzing picnicking and nature walking activities, respective percentages were derived that would reduce overall demand levels to that amount which is desired and could be satisfied in the market area, and not elsewhere in the State of Louisiana or elsewhere in the United States. These percentages are shown in Table Rec 15.

Conversely, a factor to measure the demand from outside the market area to be met in the market area was applied to the demand equation. This beyond the market area factor is based upon the original postulate that the market area population contributes only 80 percent of the total demand; 20 percent of the total demand comes from beyond the market area.

By employing all the aforementioned applied factors, gross demand is translated into a net figure that measures demand for public outdoor recreational facilities by all individuals who live in or travel into the market area to recreate.

3.3 Supply

Market area supply data used in the demand need analysis was obtained from the Louisiana Department of Culture, Recreation and Tourism and from the St. Bernard Parish Department of Recreation, Culture and Tourism. These sources provided both public and commercial supply data for multiple recreational activities, including picnicking and nature walking.

3.4 Needs

Market area needs were obtained by subtracting the market area supply for each recreational activity type from the net market area demand for each recreational activity type. A positive net need indicates that recreational development is justifiable on the basis of demand and warrants consideration. It should be noted that a needs analysis is intended to ascertain general supply-demand relationships for the project market area. The analysis was regional in nature and was intended as a tool to identify alternative types of facility development possibilities for the project. It should not be inferred that all needs for the population in the market area will be met at the project.

3.5 Summary

The needs analysis of the market area shows a surplus in recreational needs for picnicking and nature walking. The net market demand for picnicking is about 110 sites (picnic tables); however, there are only 51 sites currently available for use. Therefore the net market area need is about 59 sites. The net market demand for nature walking is about 10 miles; however, there are only 1.5 miles currently available for use. Therefore, the net market area need is about 8.5 miles.

Table Rec 15
Recreation Demand - Need Equation

		Market Area												
	Area Population[1]	Participation Rate[2]	High Quarter Activity Occasions	Days in High Quarter	High Quarter Participation Daily Rate	Facility Standard	Gross Market Demand	Additional Demand beyond Market Area	Total Demand	Percent of Total Demand to be met in Market Area[5]	Percent of Total Demand to be met by Public Facilities in Market Area	Net Market Demand	Market Area Supply[6]	Net Market Area Need
Activity Type														
Picnicking	56,458	1.41	79,606	91.5	870	7.7[3]	113.0	22.6	135.6	90	90	109.8	51	58.8
Nature Walking	56,458	0.67	37,827	91.5	413	40[4]	10.3	2.1	12.4	90	90	10.0	1.5	8.5

[1] Includes all of St. Bernard Parish and the population of Orleans Parish east of the Inner Harbor Navigation Canal for 2008

[2] Source: Louisiana Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2003- 2008

[3] User-days per site

[4] User-days per trail mile

[5] Includes public and private facilities

[6] Data supplied by St. Bernard Department of Recreation, Culture and Tourism

Mississippi River Gulf Outlet (MRGO)
Ecosystem Restoration Project
Estimation of Incidental Recreation Benefits

TABLE OF CONTENTS

Introduction and Methodology 2

Project and Study Area Characteristics 2

MRGO Ecosystem Restoration Focus Group 3

Estimating Recreational Use Using Louisiana Data 3

Estimate of Unit Day Values 4

- **Recreation Experience** 5
- **Availability of Opportunities and Likelihood of Fishing Success** 5
- **Carrying Capacity** 6
- **Accessibility** 6
- **Environmental** 7

Recreational Benefits 7

References 9

Attachment I - Model Inputs and Outputs

Attachment II – Model Description

Attachment III – Estimates of Recreation Value from Literature Review

Mississippi River Gulf Outlet (MRGO)
Ecosystem Restoration Project
Estimation of Incidental Recreation Benefits

Introduction and Methodology

The Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Project is intended to improve the ecosystem in the region around the former MRGO Navigation Channel. This is a large area from Lake Pontchartrain to the Breton Sound and is near New Orleans. This study area is a major recreation area, but has little recreational infrastructure other than boat launches. The primary recreational activities in this area are consumptive activities, fishing and hunting, which generally require a boat for access.

ER 1105-2-100 Appendix E authorizes the use of three methods to estimate the economic benefits of recreation. These methods are the contingent valuation method, the travel cost method, and the unit day value method. The first two methods require extensive data that are not readily available for the MRGO Ecosystem Restoration Project. The unit day value method is the simplest method and is appropriate for this study. The recreation benefits of this project are classified as incidental because they are not used for evaluating alternatives. The incidental recreation benefits are estimated as required by EP 1165-2-502.

Annually, Headquarters USACE publishes unit day values for both specialized recreation and general recreation. The term "general recreation" refers to an area that provides access to a variety of recreational activities, is widely used, and provides supportive facilities, such as marinas. "Specialized" refers to an area for which opportunities are limited and intensity of use is low. Similar hunting and fishing areas are available throughout southern Louisiana, in areas directly adjacent to the study area. Primarily because of the availability of similar recreational opportunities in nearby areas, the general recreation unit day values are used. The unit day values in this analysis are published in Economic Guidance Memorandum (EGM) Number 10-03

Many different types of ecosystem restoration measures are included in each of the three with project alternatives, including marsh creation, ridge creation, and swamp creation. These alternatives are intended to restore the environmental features of the study area. The project alternatives could impact recreation by impacting access to locations within the study area, and by impacting the value of recreation to users.

Project and Study Area Characteristics

Several alternatives for the MRGO Ecosystem Restoration Project are being considered. The features in each alternative are designed to create new marsh acreage, nurture existing marsh acreage, create new swamp acreage, nurture existing swamp acreage, decrease salinity, restore ridges, build earthen weirs, and protect shoreline. To develop these features, borrow pits and access channels will be built. Alternatives B, C, and D below each contain all of these features, but Alternatives C and D contain the features in more locations than Alternative B and Alternative D contains the features in more locations than Alternative C.

Alternative B: General description to be provided. Features and output have been used to estimate recreation benefits.

Alternative C: General description to be provided. Features and output have been used to estimate recreation benefits.

Alternative D: General description to be provided. Features and output have been used to estimate recreation benefits.

MRGO Ecosystem Restoration Focus Group

The MRGO Ecosystem Restoration Project focus group had several specific points related to the study area. The burrow areas used for dredge material to nourish marsh could become excellent recreational fishing locations depending upon the depth and size of the burrow sites. The restoration of trees is necessary for many migratory bird species to return to the study area. The study area is of national importance for migratory birds because of its location.

Changes in salinity levels will change the recreational fish species caught. An immediate impact of lower salinity levels would be the replacement of speckled trout with white trout. Water turbidity from river diversions also impacts fishing and duck habitat.

Bird watching is a potentially significant activity for the study area. Guides use local marinas for boat tours to bring bird watchers to the appropriate sites, and this activity could significantly expand. Since the study area is near New Orleans, with a large tourism base, there is a huge potential for this recreational use.

For local recreational users snipe hunting is a significant activity. Hunting snipe, which are defined as long billed birds, requires ridges for hunters to access them. Deer depend upon ridges for their survival, and with the restoration of ridges there is the potential for a significant increase in deer hunting.

The study area has a population of professional guides for recreational fishermen. A rough estimate of the number would be 10 guides per marina. Their success depends upon their ability to guide their clients to the best locations. If the restoration projects have varying impacts on habitat that impair the professional guide's ability to locate the better locations, they may not remain commercially viable.

The closure of channels could impact the ability of recreational users to access locations within the study area. Also, as some channels are closed, commercial fishermen and supply vessels for the offshore petroleum industry could be forced to share the remaining channels with recreational users. This heavy use of some channels could affect recreational use within the entire study area.

Estimating Recreational Use Using Louisiana Data

There are several appropriate sources of data from which to estimate the number of recreational users in the study area.

For fishing and hunting, the number of licenses issued in the parishes around the study area provides a basis for determining local use. Most of St. Bernard Parish and large portions of Orleans Parish and Plaquemines Parish are in the study area. St. Tammany Parish is adjacent to the study area, as are Hancock County and Harrison County in Mississippi. Recreational users from those counties are likely to drive to the study area and launch their boat or simply travel by boat into Lake Borgne.

Additional data about fishing and hunting is found in the Statewide Comprehensive Outdoor Recreation Plan (SCORP), which is published every five years by the Office of State Parks within the Louisiana Department of Culture Recreation and Tourism. The SCORP which is prepared to comply with National Park Service guidelines is based upon in field and telephone surveys and is used to prioritize the funding of recreation facilities within the state. The 2003-2008 SCORP contains more detailed information and more regional information than the 2009-2013 SCORP, and these data are used in this analysis.

The 2003-2008 SCORP estimates the number of recreational fishermen in Region 1, which contains all of the parishes in the study area. The 2003-2008 SCORP explains a facility use standard based upon a turnover of 20 boats per boat ramp daily, with three persons per boat. Hunting facility use is based upon a turnover of 1 hunter for every 25 acres per day. The 2009-2013 SCORP does not have a facility standard for saltwater boat ramps, but does provide a standard for freshwater boat ramps of one boat ramp per population of 3,200.

The most recent SCORP states that fishing and hunting are both declining recreational activities and specifies that fishing activity declined 20% since the last SCORP. The population of the study area has been greatly impacted by Hurricane Katrina during the period between publication of the 2003-2008 SCORP and the 2009-2013 SCORP. Also, many launch facilities were damaged, but almost all have been repaired. However, the impact of Hurricane Katrina on the recreational resource itself was temporary, as recreational catch levels have returned to pre-storm levels.

Estimate of Unit Day Values

The estimates of annual use are combined with unit day values to estimate annual recreation benefits. Unit day values were estimated using the most recent values available in EGM 10-03.

The Unit Day Value method involves assigning points in each of five categories or criteria. The five criteria are:

- Recreation Experience, the number of high quality recreational activities possible in the area.
- Availability of Opportunity, the availability of similar opportunities nearby, for fishing and hunting this is the likelihood of fishing and hunting success.
- Carrying Capacity, the degree to which an area provides services to support recreation;
- Accessibility, the degree to which the area is readily accessible.
- Environmental Quality, the aesthetic qualities of the area including water and vegetation, air and water quality, scenery, and climate.

Points were assigned for each of these five criteria. The determination of points for each criterion is described below. Two of the five criteria are impacted by the project.

Recreation Experience

A maximum of 30 points may be assigned for this criterion. Point values to be assigned are described in the following table:

Recreation Experience

Description	Two general activities available	Several general activities available	Several general activities available with one high quality	Several general activities available, more than one high quality	Numerous high quality activities available
Range of Points	0 - 4	5 -10	11 - 16	17 - 23	24 - 30

For this analysis, 23 points are assigned for all alternatives because there are three excellent activities, wildlife watching, fishing and hunting, in the study area. Fishing is a year round activity and consists primarily of fishing for speckled trout and red drum. There is also some recreational crabbing with traps and shrimp harvesting with nets, but these are primarily commercial activities. These activities are included with fishing when estimating benefits because the alternatives will have the same impact on all of these activities.

The primary hunting season is limited to two months per year for duck hunting. Other types of hunting occur in a limited way on higher elevations within the study area, specifically deer hunting, snipe hunting, and small animal hunting. Wildlife watching is the only non consumptive activity in the area. This activity has a limited numbers of nonresident participants and few local residents make trips for wildlife watching. However, there is a potential for more wildlife watching, based upon the tourist base in nearby New Orleans.

Pleasure boating is primarily in Lake Pontchartrain, which is now defined as outside the study area. The few open waterways in the study area do not lend themselves to pleasure boating or water skiing. Currently hiking is not a significant recreational activity; however, some organizations have expressed an interest in building walkways if marshes are restored at the northern edge of the study area. Camping is directly related to fishing and occurs primarily in raised structures maintained specifically for recreational fishermen.

Availability of Opportunity and Likelihood of Fishing Success

A maximum of 18 points may be assigned for this criterion. Point values to be assigned are described in the following table:

Availability of Opportunity

Description	Several similar opportunities within one hour and a few within 30 min travel time	Several similar opportunities within one hour but none within 30 min travel time	One or two within one hour travel time but none within 45 min	No similar opportunities within one hour travel time	No similar opportunities within two hour travel time
Range of Points	0 - 3	4 - 6	7 - 10	11 - 14	15 - 18

Availability of Opportunity is equated with likelihood of success at fishing and hunting, as stated in Table 2 of EGM 10-03, and is impacted by the alternatives. Fishing success is defined as catching the species sought, and the primary saltwater species sought are speckled trout and red drum. In the near term, as the alternatives are implemented, recreational fishermen seeking those species will most likely need to move eastward within the study area. However the primary freshwater species sought, largemouth bass, will most likely become more prevalent in the fresher portions of the study area.

During the focus group meeting a consensus opinion was stated that the displacement of saltwater species would have a major negative impact on recreational fishing. This opinion was based upon the experience with the Caernarvon Diversion. However, the focus group believed that over time, as the project improves the ecosystem, the likelihood of fishing success for all recreational fishermen is expected to increase.

The likelihood of hunting success is defined as capturing the species sought. With hunting regulations, there are strict bag limitations on many duck species. The probability of capturing the daily bag limit for ducks would provide 18 criteria points. Currently this level of hunting success is not likely in the study area. Therefore, 12 points are assigned for the base year as a composite for both fishing and hunting success.

Carrying Capacity

A maximum of 14 points may be assigned for this criterion. Point values to be assigned are described in the following table:

Carrying Capacity

Description	Minimum facility development for public health and safety	Basic facilities to conduct activity	Adequate facilities to conduct activity	Optimum facilities to conduct activity	Ultimate facilities to conduct activity
Range of Points	0 - 2	3 - 5	6 - 8	9 - 11	12 - 14

For this analysis, 10 points are assigned because there are optimum facilities supporting fishing, hunting, and wildlife observation. The facilities are both publicly owned and privately owned. The owners of privately owned facilities that participated in the focus group meetings expressed concerns regarding floodgate projects that could affect access to their facilities. If access problems impacted business revenue, the facilities might not remain commercially viable. The public facilities are at the state parks and wildlife refuges.

Accessibility

A maximum of 18 points may be assigned for this criterion. Point values to be assigned are described in the following table:

Accessibility

Description	Limited Access by any means to site	Fair access to site; limited access within site	Fair access to site; fair access within site	Good access to site; fair access within site	Good access to site; good access within site
Range of Points	0 - 3	4 - 6	7 - 10	11 - 14	15 - 18

For this analysis, 11 points are assigned. The study area contains several state highways to small towns. These towns support both commercial and recreational fishing and located on the best waterways. These waterways then provide access to the entire study area for sportsmen with boats.

Environmental

A maximum of 20 points may be assigned for this criterion. Point values to be assigned are described in the following table:

Environmental

Description	Low aesthetic factors	Average aesthetic factors	Above average esthetic factors	High aesthetic factors	Outstanding aesthetic factors
Range of Points	0 - 2	3 - 6	7 - 10	11 - 15	16 - 20

Esthetic factors are impacted by the alternatives. Specifically, water quality and shoreline vegetation will be impacted by the alternatives. The focus group expressed concern that these factors would deteriorate initially. However, the long-term effect after five years of the alternatives upon the wetlands is that the vegetation and wildlife habitat would be improved. Therefore, 11 points are assigned for this criterion for the base year.

Thus, the total number of points assigned to the proposed MRGO Ecosystem Restoration Project for the base year before implementation is 67.

Recreational Benefits

EGM 10-03 provides a table showing how to relate points assigned using the five criteria to dollar values. Since this project was evaluated to have a total of 67 points, using linear interpolation and the values provided by EGM 10-03 for 60 and 70 points, we assign a dollar value of $9.39 as the general recreation unit day value for the base year.

Given that the area has an estimated 351,230 unit days per year and that each unit day is valued at $9.39, the total annual monetary value of the recreational resource that would be affected by the MRGO Ecosystem Restoration Project is $3,297,352. Given that the likelihood of success with fishing will increase and that environmental factors will improve over time if the proposed project is implemented, the total annual monetary value of the recreational resource will increase in the future compared to the annual monetary value of the recreational resource should the proposed project not be implemented.

To better understand the economic impact of the proposed project on recreation, the analysis considered effects over a 50-year period. The analysis uses the Federal discount rate for FY 2012 of 0.04000. The following table summarizes the potential net present value of the proposed project for each alternative showing that the proposed project will benefit recreational opportunities. The calculations used to develop these figures and the methodology used is shown in Attachment I, Model Inputs and Outputs.

Net Increase / Decrease in Incidental Recreation Benefits

	Without Project	Alternative B ($)	Alternative C ($)	Alternative D ($)
Net Present Value	0	1,751,000	3,956,000	3,956,000
Annualized Value	0	78,374	177,070	177,070

There are large, similar areas adjacent to the MRGO Ecosystem Restoration Project Study Area to which recreational users might shift if freshwater flows negatively impact recreational fishing. These are Lake Pontchartrain to the west of the study area, the Mississippi Sound to the east of the study area, and the Barataria Basin to the south of the study area. The Barataria Basin is similar to the MRGO Ecosystem Restoration Project Study Area., but Lake Pontchartrain and the Mississippi Sound contain less marsh and more open water.

There is the possibility of recreational users shifting into the study area from outside as the ecosystem improves, especially if recreational fishing and hunting conditions outside the study area deteriorate. Since the benefits of the project will be evident within five years, the assumption is made that there will be no short term negative impacts that would shift recreational users out of the study area. A unit day value for the surrounding areas is estimated for use in the model, but the value is not used because there is no shifting of recreational users into or out of the study area.

MRGO Ecosystem Restoration Project Study Area attracts participants from outside the region, who may purchase either resident or nonresident licenses within the study area. For this reason, when estimating the number of participants, it is assumed that the higher of license holders or participants estimated by the SCORP, is the most accurate figure. This figure may still understate the number of recreational fishermen and hunters as state residents may purchase licenses in their home parishes and travel to the study area.

It is assumed that the annual number of user days in the study area does not vary during the 50 year planning period. If the population of the study area were increasing at the national rate, recreational use could be expected to increase during this time period. However, the population of the study area has increased very slowly during the past thirty years. Also, the primary recreational activities, fishing and hunting, have been in relative decline nationally.

The outputs of the project were assumed to be in place at Project Year 5. The increased recreational benefits were estimated based upon increased likelihood of fishing success and improved esthetics at the same time. Therefore no additional increases in recreational benefits are forecast after Project Year 5.

In the "without project" condition, there are many smaller environmental restoration efforts planned under the Louisiana Coastal Restoration and Protection Program. For this analysis, the assumption is made that these smaller projects will not improve habitat or recreation from base year conditions. However, these smaller projects are considered sufficient to prevent further coastal erosion and habitat deterioration in the study area. Therefore, the criteria points assigned for unit day values remain constant in the without project condition during the fifty year planning period.

References

2006 National Survey of Fishing, Hunting, and Wildlife Related Recreation, U.S. Fish and Wildlife Service Louisiana, issued March 2008

Louisiana Statewide Comprehensive Outdoor Recreation Plan 2003-2008, Louisiana Department of Recreation and Tourism, December 2004

Louisiana Statewide Comprehensive Outdoor Recreation Plan 2009-2013, Louisiana Department of Recreation and Tourism, July 2009

Net Economic Values of Wildlife Related Recreation in 2006, U.S. Fish and Wildlife Service, Report 2006-05, July 2009

USACE, Economic Guidance Memorandum 10-03: Unit Day Values for Recreation, Fiscal Year 2010, November 2009

USACE, ER 1105-2-100, Chapter 3: Corps Civil Works Missions, April 2000

Non-published GFD provided by the New Orleans District, USACE, on January 25, 2010

APPENDIX
X

LOUISIANA NATURAL AND SCENIC RIVERS SYSTEM

PERMIT APPLICATION

Permit #_____ (Assigned by Department)

The Louisiana Department of Wildlife and Fisheries' Scenic Rivers program is authorized by LRS title 56, Chapter 9 Part II. This law requires permits authorizing activities in or affecting rivers that have been designated by the Louisiana Legislature as Natural and Scenic. Information provided on this form will be used in evaluating the application for a permit. Information in this application is made a matter of public record through issuance of a public notice. Disclosure of the information requested is voluntary, however, the data requested are necessary in order to communicate with the applicant and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

APPLICANT INFORMATION

Name of Applicant	U.S. Army Corps of Engineers	Name of Agent (if any)
Address		Address
Address		Address
City, State, Zip		City, State, Zip
Phone		Phone

DESCRIPTION OF THE PROPOSED ACTIVITY

Brief summary of the description and purpose of the proposed activity (details to be attached as a separate document)

Mississippi River Gulf Outlet Ecosystem Restoration Project

Is any portion of the activity complete? YES NO (If yes indicate month and year of completion)

LOCATION OF PROPOSED ACTIVITY

Stream Name		Names, Addresses, Phone Numbers of Adjacent Property Owners
Parish		
Section		
Township		
Range		
Latitude/Longitude		

ENVIRONMENTAL ASSESSMENT

Must be a separate document. See the attached instruction sheet for completing the assessment.

CONFIRMATION OF INFORMATION ACCURACY

Application is hereby made for a Scenic River Use Permit to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that, to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities, or I am acting as the duly authorized agent of the applicant.

_____ Signature

_____ Date

Form # LSR3 May 2002

ATTACHMENTS AND ENVIRONMENTAL ASSESSMENT

1. A complete description of the proposed project (including drawings).
2. A map showing the exact location of the project on the river.
3. Photographs of the project site from both banks of the river (if possible) and an upstream and downstream view of the project site from the project side of the river.
4. A list of all other local, state and federal permits required for this project.
5. An environmental assessment which includes separate evaluation of impacts on each of the following:

a. Existing Land Use
b. Historical/Archeological Sites
c. Economic Impact of the Project
d. Wilderness/Rural Quality
e. Scenic/Aesthetic Value
f. Recreational Use/Opportunities
g. Ecological Systems Present
h. Fish and Wildlife in the Area
i. Botanical Elements (Vegetation)
j. Geological Features
k. Hydrological Features
l. Water Quality/Quantity

For each of these criteria, detail existing conditions, potential adverse impacts, if any, and mitigative measures being taken to minimize, eliminate or compensate for those impacts. Provide a statement of justification for each proposed action and a discussion of any alternative locations and/or methods that were considered. If no impacts are projected for a criterion, then state that no impact is expected and give the reasons for that conclusion.

6. The signed original of the enclosed legal agreement.
7. A statement of the applicant=s compliance history. (Has the applicant ever been cited for a violation of the Scenic Rivers Act?)
8. A detailed listing of the steps that the applicant has taken in the development of the project to minimize and/or offset potential impacts to the river.
9. A listing of alternatives to the proposed project.

FEES AND OTHER CHARGES

The administrative fee for each application is $100.00 and must be submitted with the application. A fee of $135.00/day will be assessed for site visits and field evaluations if they are necessary. Make check payable to: State of Louisiana Scenic River Fund

Mail the completed application along with six (6) complete copies, the fee, and any additional charges to:

Louisiana Department of Wildlife and Fisheries
Scenic Rivers Program
368 Century Tel Drive
Monroe, LA 71203
Telephone: (318) 343-4045

INFORMATION ON THE SCENIC RIVER PERMIT PROCESS

The Louisiana Legislature has prohibited certain uses on designated watercourses to preserve, protect, develop, reclaim and enhance their natural and scenic qualities (Act 947 of 1988). Prohibited uses are: (1) channelization, (2) channel realignment, (3) clearing and snagging and (4) reservoir construction (impoundment), (5) clearcutting of trees for commercial purposes within 100 feet of the ordinary low water mark of a designated Natural and Scenic River.

Uses other than those that are prohibited that have potential of causing direct and significant degradation to a Scenic River or its tributaries are regulated by a permit process and multi-agency review by the Department of Wildlife and Fisheries, Department of Environmental Quality, Department of Agriculture and Forestry, Department of Culture, Recreation, Tourism, and the Office of State Planning & Budget, and frequently in collaboration with other State and Federal regulatory functions. Examples of these include crossings by roads, pipelines and utilities, discharges, mining, piers, bulkheads and other non-conforming structures and activities.

After a complete and sufficient application has been assigned a permit number by the Scenic Rivers Coordinator, the copies are distributed to the review agencies for a full and thorough evaluation of thirty (30) days duration. During this time the coordinator may schedule and make a site inspection. The applicant publishes a description of the proposed use in selected newspapers and sends evidence of this to the Coordinator. The public comment period is forty-five (45) days and begins with the date of publication in the official state journal. If there is sufficient interest from the public, a public hearing may be held. The decision by the Administrator (Secretary of the Department of Wildlife and Fisheries) to grant or deny the permit will be made within fifteen (15) days after the public comment period or the public hearing (if one is held). Most permits are valid for the useful life of the project, but are invalidated if the permitted activity has not begun within eighteen (18) months. Applicants may appeal denial of a permit to the 19th Judicial District Court after an administrative hearing in accordance with the State Administrative Procedure Act.

In serious and urgent situations, the waiting periods for standard permitting procedures may be waived and an emergency permit granted by the Administrator. For these emergency procedures to be applicable, it must be clearly indicated in the application and the site inspection that circumstances are sufficiently dire, through no fault of the applicant, to represent imminent harm to human health or the immediate environment and that those circumstances would significantly worsen during the review period required by standard procedure.

CHECKLIST OF APPLICANT RESPONSIBILITIES IN THE SCENIC RIVER PERMIT PROCESS

___1. Submit the original application along with six complete copies. In addition to addressing each of the twelve (12) criteria of the environmental assessment, the application must also contain the following information:

- ___a. Project description & scaled drawings
- ___b. Vicinity map of project location
- ___c. Color photos of project site (7 sets)
- ___d. List of other permits required
- ___e. Signed legal agreement
- ___f. Statement of compliance history
- ___g. List of steps taken to minimize impact
- ___h. List of project alternatives
- ___i. $100 permit fee
- ___j. Site visit fees (if applicable)

___2. Publish public notices in the official state journal and the official parish journal of the parish where the project is located. Mail proof of publication to the Scenic Rivers Coordinator.

___3. Begin permitted activity within eighteen months of permit issuance.

INSUFFICIENT OR INCOMPLETE APPLICATIONS WILL BE RETURNED TO THE APPLICANT

INFORMATION ON PUBLIC NOTICES FOR SCENIC RIVER PERMITS

The forty-five (45) day public comment period begins with the publication of notice in the official state journal. It is the applicants responsibility to place public notice in one (1) issue of the official state journal (The Advocate, P.O. Box 588, Baton Rouge, LA 70821, Phone: 225-388-0128, Fax: 225-388-0164) and three (3) consecutive issues of the official parish journal of the parish(es) in which the project is to be done. The name of the official parish(es) journal can be obtained from the Scenic Rivers staff at (504) 765-2334 if it is not known.

Once public notices have been placed, the applicant is to send proof of publication to: Louisiana Department of Wildlife and Fisheries, Scenic Rivers Program, P.O. Box 98000, Baton Rouge, LA 70898. A permit cannot be issued until proof of publication has been received.

The suggested format for the public notice (with appropriate insertions) is as follows:

PUBLIC NOTICE

Request for Scenic River Permit on (name of Scenic River)

The Secretary of the Louisiana Department of Wildlife and Fisheries as Administrator of the Louisiana Natural and Scenic Rivers System is currently considering the application of (applicant's name) for a permit to (brief description of proposed activity) on (name of Scenic River). The decision to grant or deny this permit in the public interest will be based on an evaluation of the probable impacts of the proposed activity on (name of Scenic River).

Copies of the application can be seen by the public at the Department of Wildlife and Fisheries main office, Room 432, 2000 Quail Drive, Baton Rouge, LA and at the District Office in the District where the proposed activity is located. The public is invited to comment on this permit request for a period of forty-five (45) days. Responses should convey sound reasoning for or against the proposal and be mailed to Scenic Rivers Program, LDWF, P.O. Box 98000, Baton Rouge, LA 70898-9000.

State of Louisiana

KATHLEEN BABINEAUX BLANCO
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

BRYANT O. HAMMETT, JR.
SECRETARY

Dear Scenic River Permit Applicant:

Please review and concur on the following statement regarding the issuance of permits by the Louisiana Department of Wildlife and Fisheries. This agreement must be signed and returned before a Scenic River Permit can be issued.

"I have been advised and do understand that by applying for and accepting a Scenic Rivers permit issued by the Louisiana Department of Wildlife and Fisheries, I am being allowed to engage in an activity which would otherwise be prohibited by law or for which a permit is required. I understand that the permit is not a license and confers no property right upon me. I specifically agree to abide by all State and Federal fish and wildlife laws and regulations, and all State and Federal laws and regulations which relate to this permit or the permitted activity, and by all other terms and conditions of this permit. I understand that the permit for which I am applying may be suspended, annulled, withdrawn or revoked and that I may be assessed civil penalties, all in accordance with the provision of the Louisiana Administrative Procedure Act, and that I may be denied future permits as a consequence of my failure to fully and completely comply with the terms and conditions of the permit, as well as other laws and regulations pertinent thereto. If served with or notified of a cease and desist order signed by the Scenic Rivers Administrator, I agree to immediately and without delay cease all activities and operations which relate to the permitted activity or which are impacting the Scenic River, until such time as the matter can be resolved in an adjudicatory hearing pursuant to the Louisiana Administrative Procedure Act. I understand and agree that any permit issued to me by the Louisiana Department of Wildlife and Fisheries is in the nature of a privilege which is being voluntarily extended to me by the Department and the failure on my part to cooperate with the Department can result in the loss of the privilege conferred and the denial of future requests for permits. By accepting this permit, I evidence my agreement to be bound by all conditions and stipulations set forth herein."

_____ _____

Authorized Signature Date

REV. 12/7/98

P.O. BOX 98000 • BATON ROUGE, LOUISIANA 70898-9000 • PHONE (225) 765-2800
AN EQUAL OPPORTUNITY EMPLOYER

Basis for Analysis

Following the identification of the tentatively selected plan (TSP), a construction sequence was developed. Assumptions factoring into the construction sequence include production rates for building rock projects, dredge equipment availability, land loss rates, and the limitation of alternating dredging cycles in the lobes of Lake Borgne. The Agency coordination for the MRGO plan was based on this construction sequence and without the incorporation of Operation and maintenance (O&M). However, due to uncertainties associated with the timing and availability of funding for the plan, only those features that are sustainable without the implementation of any other feature (such as a diversion) are recommended for construction at this time. A tiered implementation approach has been developed for the TSP (Table 2-28 of EIS) based on these uncertainties. In addition, O&M has been included in the TSP. The benefits have been recalculated by tier utilizing the previously developed construction sequence and without O&M. Due to the uncertainty of when each feature will be implemented, analysis may require updating in later phases of the project. The USACE will continue to coordinate with the agencies throughout the project study and implementation.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
Construction Year 1	
LS1	47,000 linear feet (8.9 miles) of shoreline protection beginning at the terminus of the Bayou Dupre supplemental shoreline project, extending around Proctor Point to the West of Shell Beach supplemental funding shoreline protection.
MRGO1	3,850 feet of new foreshore protection between MRGO miles 56.6 and 57.4. This stone protection feature is embedded within the limits of MRGO7.
MRGO6	8,132 linear feet of new, non-continuous foreshore protection between MRGO miles 36.0 and 34.2, immediately east of the existing stone closure of the MRGO. MRGO6 ties into an existing foreshore dike immediately downstream.
LM1	3,240 acres of marsh restoration from open water and nourishment of 777 adjacent acres in the Golden Triangle, south of the IHNC Surge Barrier. Approximately 12.8 million cubic yards of borrow to be obtained from Lake Borgne Borrow Area 6.
LM4	289 acres of marsh restoration and nourishment of 95 adjacent acres of marsh in the portion of the Golden Triangle bordered by the GIWW, the IHNC Surge Barrier, and the MRGO. Approximately 1.4 million cubic yards of borrow material would be obtained from Lake Borgne Area 6.
LM2	422 acres of marsh restoration and 2,523 acres of marsh nourishment in the area between Proctor Point and the MRGO. Approximately 4.9 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 3.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
Construction Year 2	
BS1	Approximately 51,000 linear feet (9.7 miles) of shoreline protection along the southeast shore of Lake Borgne. This feature begins at the northern terminus of the Biloxi Marsh Shoreline Protection Project (PO-72) south of Point aux Marchettes and extends north to Malheureax Point.
BS2	Approximately 39,600 linear feet (7.5 miles) of artificial oyster reef development on the Chandeleur Sound side of the Biloxi Marsh between Eloi Point and the mouth of Bayou La Loutre.
CC4-A	420 acres of cypress restoration in the Bienvenue Triangle. Approximately 2.9 million cubic yards of material to be obtained from the Mississippi River.
BR1	Approximately 48 acres of ridge restoration on the south bank of Bayou La Loutre. 425,000 cubic yards of silty sand material to be obtained from the Mississippi River.
CM2	795 acres of marsh restoration and 190 acres of marsh nourishment north of Paris Road. 3.3 million cubic yards of material are required, 2.6 million cubic yards of which can be obtained from the adjacent reach of the GIWW. The remaining material would be obtained from the Michoud Canal.
Construction Year 3	
ES1	24,000 linear feet (4.6 miles) of shoreline protection from the south shore of Lake Pontchartrain to the terminus of the existing Bayou Chevee shoreline protection feature.
ES2	30,750 linear feet of shoreline protection in Lake Pontchartrain between Chef Menteur Pass and The Rigolets.
ES3	70,000 feet of foreshore protection along Lake Borgne between Alligator Point and The Rigolets.
Construction Year 4	
HM1	757 acres of marsh restoration and the nourishment of 973 acres of adjacent marsh, located in the Hopedale area bordered by MRGO to the northeast. 4.1 million cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 2.
TM1	760 acres of marsh restoration and 223 acres of marsh nourishment, requiring approximately 3.2 million cubic yards of material to be obtained from Lake Borgne Borrow Site 2.
TM2	770 acres of marsh restoration and 3,400 acres of marsh nourishment in the vicinity of Lake Ameda. Approximately 7.4 million cubic yards of borrow material would be obtained from Lake Borgne Borrow Area 2.
MRGO5	188 acres of marsh would be restored behind 14,485 linear feet of vinyl sheet pile wall to establish the shoreline. 2.7 million cubic yards of material would be obtained from Lake Borgne.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
MRGO8	200 acres of marsh restoration adjacent to approximately 20,640 linear feet of bank reclamation constructed using vinyl sheet pile wall. 3.2 million cubic yards of material would be obtained from Lake Borgne. Approximately 13,572 linear feet of new foreshore protection would also be included between approximate channel miles 51.0 and 48.3
Construction Year 5	
MRGO7	91 acres of marsh restoration adjacent to approximately 9,700 linear feet of bankline reclamation, consisting of 9,700 linear feet of vinyl sheet pile wall. 1.3 million cubic yards of material would be obtained from Lake Borgne.
EM1	1,175 acres of marsh restoration and nourishment of 2,830 acres of surrounding marsh in the area bounded by the Lake Pontchartrain shoreline, Chef Menteur Pass, and the levee. Approximately 8.1 million cubic yards of material would be obtained from Lake Borgne Borrow Area 6.
Construction Year 6	
LM3	911 acres of marsh creation and 950 acres of marsh nourishment in South Lake Borgne north of Lena Lagoon in the area bounded by the lake, Bayou St. Malo, MRGO, and Doulets Canal. Approximately 4.6 million cubic yards of borrow to be obtained from Lake Borgne Borrow Area 2.
BM1	8,295 acres of marsh nourishment along the south shore of Lake Borgne. 10.8 million cubic yards of material would be obtained from Lake Borgne Borrow Area 2.
Construction Year 7	
CM1	1,240 acres of marsh nourishment south of Paris Road between cypress restoration feature CC3 and the Chalmette Loop Levee. Approximately 3.0 million cubic yards of material would be dredged from Lake Borgne Borrow Area 5 for this feature.
CM3	300 acres of marsh restoration and 215 acres of marsh nourishment in the area north of Bayou Dupre and south of MRGO. 1.9 million cubic yards of borrow material would be obtained from Lake Borgne Borrow Area 5.
CM4	98 acres of marsh restoration and 129 acres of marsh nourishment south of Bayou Dupre. 900,000 cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 4.
CM5	245 acres of marsh restoration and 70 acres of marsh nourishment in the area north of Bayou Bienvenue and Paris Road. 1.2 million cubic yards of material would be obtained from Lake Borgne Borrow Area 4.
Construction Year 8	
TM7	2,255 acres of marsh restoration and up to 3,338 acres of adjacent marsh nourishment on the east side of Bayou Terre aux Boeufs. 11.5 million cubic yards of material would be obtained from Lake Lery if available, but it is currently assumed that material will be obtained from Lake Borgne Borrow Area 2.

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
TM8	1,511 acres of marsh restoration on the east side of Bayou Terre aux Boeufs in the vicinity of Delacroix. 5.5 million cubic yards of material would be dredged from Lake Lery if possible, but it is currently assumed that material will be obtained from Lake Borgne Borrow Area 2.
EM2	1,095 acres of marsh nourishment on Hog Island, located between the west and east mouth of the West Pearl River. Approximately 2.2 million cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 8.
EM3	861 acres of marsh restoration and 180 acres of adjacent marsh nourishment in the area bounded by Highway 433, Little Lagoon, Salt Bayou and Highway 90. Approximately 3.5 million cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 8.
EM4	2,625 acres of marsh restoration and 1,455 acres of adjacent marsh nourishment in the area bounded by Salt Bayou to the north, the West Pearl River to the east, the Rigolets to the south and Highway 80 to the north. Approximately 10.6 million cubic yards of material would be obtained from Lake Borgne Borrow Area 8.
Construction Year 9	
CC1	1,020 acres of cypress swamp restoration and 953 acres of cypress swamp nourishment in the area north of the existing Violet Canal along the Forty Arpent levee. 8.5 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 5.
CC2	250 acres of cypress swamp restoration and 250 acres of swamp nourishment to the northeast of CC1. 2.4 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 5.
CC3	370 acres of cypress swamp restoration and 790 acres of swamp nourishment along the Forty Arpent Levee south of Paris Road. Approximately 5.3 million cubic yards of material to be obtained from Lake Borgne Borrow Area 5.
CC4	1,465 acres of cypress swamp restoration in the open water areas adjacent to the Forty Arpent Levee north of Paris Road, including the Bienvenue Triangle area in Orleans Parish. 11.3 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 6.
Construction Year 10	
CC5	1,120 acres of swamp restoration and 1,645 acres of swamp nourishment south of the Violet Canal along the Forty Arpent Levee and the Chalmette Loop Levee. 9.6 million cubic yards of borrow material to be obtained from Lake Borgne Borrow Area 4.
CC6	1,028 acres of swamp restoration and 1,540 acres of swamp nourishment in the southwest corner of the Central Wetlands. 11.2 million cubic yards of borrow material would be obtained Lake Borgne Borrow Area 4.
Maintenance As Needed	

Draft Implementation Plan (used to calculate benefits without O&M)	
Measure	**Description**
MRGO2	Repair and maintenance of approximately 15,070 linear feet (2.85 miles) of foreshore protection between Mile 44.4 and 39.9 of the MRGO.
MRGO3	Repair and maintenance of existing approximately 10,420 linear feet (1.97 miles) of foreshore protection between approximately Mile 56 to 51 of the MRGO.
MRGO4	Repair and maintenance of approximately 6,690 linear feet (1.27 miles) of existing retention dike MRGO Miles 36.6 to 37.1 and MRGO Miles 33.9 to 32.9.

ATTACHMENT 1: PROJECT DESCRIPTION

LOCATION

The proposed work would be performed within portions of the Mississippi River Deltaic Plain within coastal southeast Louisiana and parts of southwest Mississippi (**figure 1-1**). The project is bounded roughly to the north by Interstate Highway 10, to the south by the Gulf of Mexico, to the east by the Chandeleur Island Chain, and to the west by the Mississippi River. Work is planned to impact the Lake Borgne ecosystem, the Breton and Grand Gossier Islands (segments of the lower Chandeleur Island chain), Bayou Terre aux Boeufs ridge, Western Mississippi Sound, and the Pontchartrain Basin.

PURPOSE

Congress authorized the Mississippi River Gulf Outlet (MRGO) in 1956 as a Federal navigation channel to provide a short route between the Port of New Orleans and the Gulf of Mexico. It was authorized as a 36-foot deep, 500-foot bottom width waterway (38-foot deep, 600-foot wide at the Gulf of Mexico entrance) extending from the Inner Harbor Navigation Canal (IHNC) to the 38-foot depth contour in the Gulf of Mexico. Construction of the channel began in 1958 and was completed in 1968. Following the aftermath of Hurricane Katrina, the depth of the channel was reduced to 22 feet impeding deep-draft navigation. As a result of the degraded condition of the channel Congress requested a plan for de-authorization of the MRGO (see Public Law 109-234) in June 2006. On June 5, 2008, the MRGO navigation channel was officially de-authorized from the GIWW to the Gulf of Mexico as a federal navigation channel. As a result of the de-authorization and to prevent deep draft navigation, a rock closure structure was constructed across the MRGO near the Bayou La Loutre ridge in St. Bernard Parish, Louisiana. The barrier structure was completed in late August 2009.

Construction and maintenance of the (MRGO) caused wetland loss and damages to estuarine habitats from the outer marshes in Breton Sound to the cypress swamps and tidal fresh marsh in the western reaches of the Lake Borgne basin. Loss of marsh and cypress swamp habitats has resulted in the loss of important ecological habitat as well as natural surge and wave buffers.

Construction of the MRGO resulted in the conversion of 19,400 acres of wetlands and 4,750 acres of shallow open water to deep open water or dredge material banks. Estimated habitat shifts caused by saline waters brought in by the MRGO caused 3,350 acres of fresh/intermediate marsh and 8,000 acres of cypress swamp to convert to brackish marsh, and 19,170 acres of brackish marsh and swamp to convert to saline marsh in areas adjacent to the MRGO. Additional losses due to erosion between 1990 and 2008 were calculated by the U.S. Geological Survey (USGS). The "without MRGO" loss rates are speculative; however, any alternative methodology would also rely on best professional judgment. A summary of the direct and indirect impacts by habitat type resulting from the construction of the MRGO is presented in **table 1-1**.

Table 1-1: Direct and Indirect Impacts of the MRGO

Habitat Type	Impacts from 1956 to 1990[a]	
	Direct Impacts (acres lost)	**Indirect Impacts (acres lost or converted)**
Cypress swamp	1,510	8,000
Fresh/intermediate marsh	3,370	3,350
Brackish marsh	10,310	19,170
Saline marsh	4,210	N/A
Shallow open water converted to deep water or disposal	4,750	N/A
	Additional impacts between 1990 to 2008	
Additional marsh lost adjacent to the channel[b]	460	3,400
Total Impacts	24,610	33,920

Notes:
[a] Direct impacts are due to construction and erosion. Indirect impacts are due to salinity or hydrological changes brought in by the MRGO (*Habitat Impacts of the Construction of the MRGO,* USACE, 1999). Habitat shifts were estimated using habitat composition data from LDNR between 1956 and 1990.
[b] Direct impacts due to additional erosion between 1990 and 2008. Indirect impacts due to increased tides and salinity.

Ecosystem restoration is one of the primary missions of the Corps of Engineers Civil Works program. Corps of Engineers Regulation (ER) 1105-2-100 Chapter 3-5 (b) (1) states:

> *The objective of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition. Restored ecosystems should mimic, as closely as possible, conditions which would occur in the area in the absence of human changes to the landscape and hydrology. Indicators of success would include the presence of a large variety of native plants and animals, the ability of the area to sustain larger numbers of certain indicator species or more biologically desirable species, and the ability of the restored area to continue to function and produce the desired outputs with a minimum of continuing human intervention. Those restoration opportunities that are associated with wetlands, riparian and other floodplain and aquatic systems are most appropriate for Corps involvement.*

Additionally, ER 1165-2-501 describes the US Army Corps of Engineers Water Resources Policies and Authorities, Civil Works Ecosystem Restoration Policy.

Restoring natural processes, such as reconnecting the floodplain with the Mississippi River system's hydrologic cycles, is the key to restoring the ecosystem damaged by the construction and operation of the partially deauthorized MRGO. Restoring some degree of these natural processes holds the best promise for significant improvements to the deltaic processes in the lower Mississippi River system. Priority was given to restoration measures that contributed to restoring natural processes.

Restoration goals of the MRGO Ecosystem Restoration Plan include:

1. Achieve ecosystem sustainability to the greatest extent possible.
2. Restore habitat in the Lake Borgne ecosystem and the area affected by the MRGO.
3. Restore natural features of the ecosystem that would reduce or prevent damage from storm surge.

PROPOSED PROJECT

The proposed project would restore approximately 54,560 acres of habitat in the study area, including 44,188 acres of marsh; 10,318 acres of cypress swamp; and 54 acres of ridge habitat. The proposed project includes approximately 71 miles of shoreline protection.

Approximately 10,221 acres of the restoration and protection features would be located in the East Orleans Landbridge/Pearl River area and approximately 9,861 acres of restoration features would be located in the Biloxi Marsh area, which have been determined to be critical landscape features with respect to storm surge. Additionally, the cypress swamp and ridge restoration feature would include forested habitat, which has been demonstrated as having some storm surge damage risk reduction benefits.

The implementation of a freshwater diversion in the vicinity of Violet is a key component of the proposed project. The freshwater diversion is a system driver to create conditions conducive to the restoration of historic habitat types in the vicinity of the MRGO. The Violet Freshwater Diversion would mimic natural processes and enhance the sustainability of the system through the input of freshwater, nutrients, and sediment.

General descriptions of the types of proposed activities that will take place in the vicinity of scenic streams are provided in the following sections including marsh restoration, marsh nourishment, swamp restoration, and swamp nourishment. Additional activities are planned as a part of this project, but do not have the potential to affect scenic streams and are not described below. For complete project details, please see the attached Draft Environmental Impact Statement for the former Mississippi River Gulf Outlet Navigation Channel Ecosystem Restoration Study.

Marsh Restoration

Marsh restoration involves the placement of dredge material in shallow open water areas and extensively broken marsh to raise the area to marsh elevation. A hydraulic dredge would be used to discharge slurry into shallow water areas and degraded marsh areas. Material would be obtained from study area borrow sites as noted for each feature. Slurry would be discharged to an elevation conducive to the development of wetlands habitat following dewatering and compaction. It is anticipated that the final result of this dredge material placement would be a combination of wetlands, mud flat, and shallow

water habitat within the placement site. Following compaction and dewatering, the area would be planted with marsh vegetation appropriate for the site. Material would be allowed to overflow over existing emergent marsh vegetation within the proposed restoration area.

In general for marsh restoration it was assumed that existing elevations within the marsh restoration site average -0.5 foot and that adjacent marsh is approximately +1.5. Maximum slurry elevation would be +4.0. Retention dikes and interior weirs were included where needed. Dikes would be constructed from adjacent borrow and would be at +6.0 feet with a 5-foot crown width and 1 vertical on 3 horizontal side slopes and a 40-foot interior berm. Interior weirs will be built from adjacent borrow to an elevation of +3.0 feet with a 5-foot crown width and 1 vertical on 3 horizontal side slopes. In some cases, closures comprised of either adjacent earthen borrow material, sheet pile or stone may be required in order to retain the dredged slurry.

Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredge material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded within 3 years, as necessary.

Canal Closures

An earthen plug would be constructed in the canal utilizing sediments from the canal. The earthen plug would serve to prevent the flow of sediment laden water from the dredging activity to flow outside of the designated area of impact. The method for plugging canals would be the same for marsh nourishment as well as swamp restoration and nourishment features.

Weirs

Interior low-level earthen weirs may be constructed within the disposal area to facilitate the deposition of sediments in a manner that would enhance wetlands development. Borrow material for weir construction would be taken from within the disposal area. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredge material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded within 3 years, as necessary.

Planting Plan

Below is a summary of the planting plan for the marsh restoration features. Refer to **appendix M**.

Fresh and Intermediate Marsh

Location within the marsh depends on their ability to withstand depth and length of flooding. The estimate for vegetative planting is 625 plants/acre planted on 8-foot center on rows 8 feet apart. Some are available commercially and can be propagated.

Some of the dominant marsh plants in freshwater and intermediate wetlands are: maidencane (*Panicum hemitomon)*, bull tongue (*Sagittaria lancifolia)*, giant cutgrass (*Zizaniopsis miliacea*) California bulrush (*Schoenoplectus californicus*), coast cockspur (*Echinochloa walteri)*, marshay cordgrass (*Spartina patens*), and roseau cane (*Phragmites australis*).

Brackish Marsh
CWPPRA estimate for vegetative planting is 875 plants/acre planted on 7-foot centers on rows 7 feet apart. Some are available commercially and can be propagated. Species usually dominant in a brackish marsh are: marshhay cordgrass (*Spartina patens),* saltgrass (*Distichlis spicata)*, American bulrush (*Schoenoplectus americanus)*, black needle rush (*Juncus roemerianus),* seashore paspalum (*Paspalum vaginatum*), and switchgrass (*Panicum virgatum*). The low marsh is typically dominated by (*Spartina alterniflora*).

Marsh Nourishment

Marsh nourishment refers to the placement of a thin layer of dredged material on broken marsh. The placement of this material facilitates the recruitment and consolidation of marsh vegetation after dewatering. For marsh nourishment it was assumed that existing marsh is between +0.5 foot and 1.0 feet and fill would be to +2 feet. Retention dikes and interior weirs were included where needed. Dikes would be constructed from adjacent borrow and would be at +6.0 feet with a 5-foot crown width and 1 vertical on 3 horizontal side slopes and a 40-foot interior berm. Interior weirs will be built from adjacent borrow to an elevation of +3.0 feet with a 5-foot crown width and 1 vertical on 3 horizontal side slopes. In some cases, closures comprised of either adjacent earthen borrow material, sheet pile or stone may be required in order to retain the dredged slurry.

Dredged material would be obtained from study area borrow sites as noted for each feature. The elevation of marsh nourishment areas varies from +1 foot to 1.5 feet. Material would be allowed to overflow over existing emergent marsh vegetation and into waterbodies within the project boundaries; some shallowing of these features would be anticipated.

Unlike marsh restoration features, no plantings are associated with marsh nourishment features. Dikes/closures would be allowed to degrade naturally and would be breached and/or degraded within 3 years following construction to provide fisheries access if they do not sufficiently degrade following settlement of dredged material.

Swamp Restoration

Swamp restoration is proposed in areas that were historically cypress-tupelo swamps and are currently shallow water. Swamp restoration areas would be planted with species typical of a cypress-tupelo swamp habitat.

The construction of swamp restoration features is similar to marsh restoration features as described above, however it would be restored to a higher dewatered and settled elevation than marsh restoration features to support cypress habitat. In general, for swamp restoration an existing average elevation of -1.0 to -3.0 was assumed based on the bathymetry available with an adjacent marsh elevation of +1.5 feet. The maximum slurry elevation would be +4.5 feet and effluent would be discharged on adjacent swamp/marsh lands for nourishment. Retention dikes would be constructed where needed. Dikes would be constructed from adjacent borrow to an elevation of +6.5 feet with a 5-foot crown width and 1 vertical on 3 horizontal side slopes and a 40-foot interior berm. In some cases, closures comprised of either adjacent earthen borrow material, sheet pile or stone may be required in order to retain the dredged slurry.

General Operations Scheme

To ensure the sustainability of bald cypress and tupelo swamp an operation scheme for the Violet Freshwater Diversion must be established.

Adaptive management for (1) habitat switching; (2) pulsing to reach target salinity.

1. No pulsing in the first 2 years to 3 years to achieve habitat switching and allow cypress seedlings time to establish.
2. After first 2 years to 3 years, ramp up pulsing from few days – one week pulse toward a two week pulsing cycle (cycle includes maximum pulsing of no more than 2 weeks with 2 weeks of no flow between pulses) to achieve target salinities.
3. Every 3 years to 5 years a drawdown should be initiated to elevation -4 to -6 below surface beginning in March for cypress regeneration. After seed fall to achieve successful reestablishment of cypress, the area should not be flooded (soils saturated but no water above the -4 elevation) during growing season (March – November) for the next two growing seasons.
4. After drawdown, flows should be introduced slowly - not more than +2 inches initially and gradually increasing over the year not to exceed +8 inches by the end of that growing year.
5. Flows for months other than pulsing or drawdown months would be at a level to achieve fresh wetlands (0 ppt to 0.5 ppt mean growing season March to November) with a maximum peak of 2 ppt or less.

Swamp Nourishment

Swamp nourishment is proposed for areas that are currently at marsh elevation, and consists of placing a layer of dredge material to nourish the area, raise elevation to approximately +2 feet, and encourage the recruitment of cypress-tupelo community species. The depth of the layer of dredge material would be determined on a site-by-site basis to adjust for varying topography.

Access Corridors

Access corridors for construction equipment and dredge pipeline are depicted in the plan view for each feature (**Attachment 2**). Access corridors would be a maximum of approximately 350 feet in width and would cross over wetlands and shallow water as necessary. Access corridors for some features may occur across existing levees and different methods would be utilized to best prevent compromise of the levee while allowing access. The level of protection provided by these levees would be maintained throughout construction, and any damage to levee vegetation would be repaired upon removal of the construction equipment. The construction, or designation, of staging areas would be necessary for construction equipment however; they have not been identified at this time. At the point when staging areas are identified, if they do not fall within the area assessed for project impacts, a supplemental NEPA document would be required prior to construction.

Where access corridors cross existing wetlands, board roads would be utilized for equipment and pulling pipe. Upon completion of construction, the wetlands impacted by the board roads would be restored by dredge material. It is anticipated that a thin layer of dredged slurry would overflow and nourish adjacent marsh.

Flotation Access Corridors

Flotation access channels would be excavated, as needed, in shallow water areas to allow construction equipment to access the project features. If necessary, flotation access channels would be excavated by a mechanical dredge. It is estimated that access channels would average approximately -2 feet. Flotation access channel material would be used in dike/closure construction or refurbishment, to backfill flotation access channels, or would be placed adjacent to and behind the dikes and closures in shallow water to a maximum initial elevation conducive to wetlands development following consolidation of the material. Flotation access channel material used to backfill the flotation access channels following completion of disposal work would be temporarily stockpiled on the water bottom adjacent to the flotation access channel.

If existing canals are used for access, they may be dredged to facilitate flotation of pipeline and other necessary equipment from the dredging reach to pipeline discharge sites within the designated staging areas. Dredge material removed from existing canals would be placed on adjacent existing levees and/or into shallow water on either side of canals. Canal dredge material placed in shallow water areas would be placed to a height conducive for wetlands development.

Figure 1-1 shows the locations of all the restoration features.

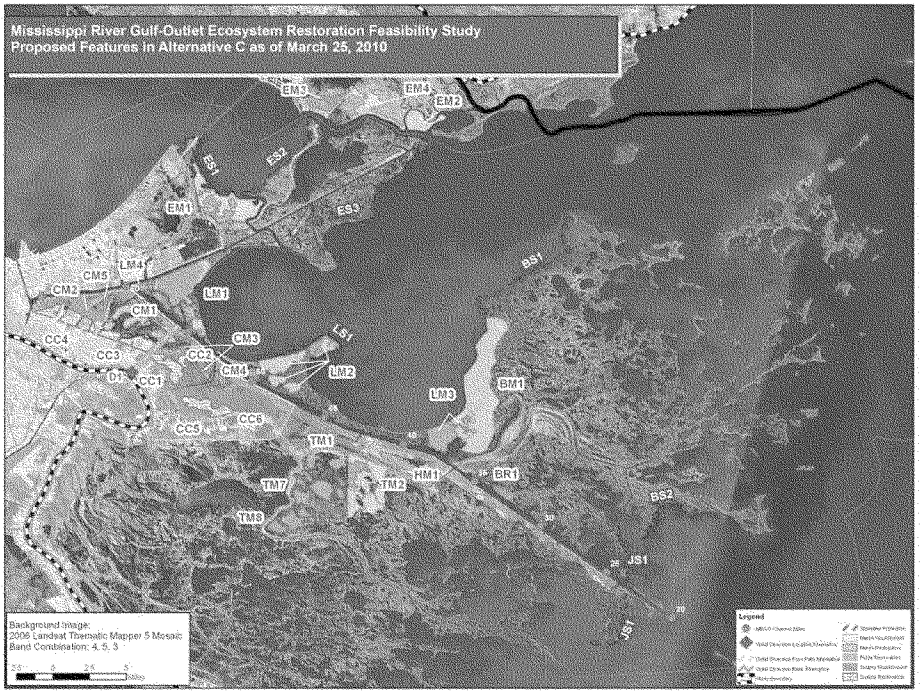


Figure 1-1 Proposed Project

The table below lists each of the designated scenic rivers in project area, and components of the proposed project that are in the vicinity of each scenic stream.

Scenic River	Project Components
Bayou Chaperon	CC1, CC2
Violet Canal	CC1, CC5
Bayou Dupre	CM3, CM4
Bashman Bayou	CM3
Terre Beau Bayou	CC6, CM4
Pirogue Bayou	CC6, CM4
Bayou Bienvenue	LM1

Further details of each of these project components are below:

CC1

Feature CC1 in the area north of the existing Violet Canal along the Forty Arpent Levee consists of the restoration of approximately 1,020 acres of shallow water to be filled to an elevation conducive to swamp restoration and approximately 935 acres of existing marsh to be restored by placement of a thin layer of sediment not to exceed +1.0 feet over marsh. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.5'. Approximately 37,700 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.5') to be maintained at a minimum 5' crown width; slopes no steeper than 1V on 3H; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. Use of weirs in not anticipated. Two canal closures consisting of an earthen plug will be constructed from adjacent borrow to prevent slurry from flowing outside project boundary and will be removed upon completion of construction. No fish-dips will be needed. Feature CC1 will require approximately 6.0 million cubic yards (mcy) of borrow to be obtained from Lake Borgne Borrow Site 5 as depicted on the plan view. Dredge pipeline and dike construction float access corridors (approximately 350 ft. wide and 102 acres) to the restoration site will be via Bayou Dupre and MRGO/GIWW.

CC2

Feature CC2 consists of swamp and marsh restoration in an area located to the north of the existing Violet Diversion and bounded by the MRGO, associated spoil areas and a pipeline canal (labeled as "ditch" also) to the east and Bayou Dupre and Violet Canal to the south. Approximately 250 acres of shallow water will be filled to an elevation conducive to swamp restoration and approximately 250 acres of existing marsh in the area would be restored by placement of a thin layer of sediment not to exceed +1.0 feet over marsh. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.5' and effluent will be discharged upon adjacent marsh. Approximately 11,500 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.5') to be maintained at a minimum 5' crown width; slopes no steeper than 1V on 3H; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. Four canal closure consisting of an earthen plug will be constructed from adjacent borrow to prevent slurry from flowing outside project boundary and will be removed upon completion of construction. Feature CC2 will require approximately 1.7 mcy of borrow to be obtained from Lake Borgne Borrow Site 5 as depicted on the plan view. Dredge pipeline and dike construction access corridors (approximately 150 ft. wide and 102 acres) to the marsh

restoration site will be via Lake Borgne, Martello Castle, MRGO, and the MRGO south bank upland disposal site and also via MRGO, Bayou Dupre and the back dike canal, and state and local highways.

CC5

Feature CC5 is located in the area south of the Violet Canal along the alignment of the Forty Arpent Levee and the Chalmette Loop Levee. Approximately 1,120 acres of shallow water will be filled to an elevation conducive to swamp restoration and approximately 1,550 acres of existing marsh would be restored by placement of a thin layer of sediment not to exceed +1.0 feet over marsh. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.5' and effluent will be discharged through spill boxes north of the site. Approximately 37,700 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.5') to be maintained at a minimum 5' crown width; slopes no steeper than 1V on 3H; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. No weirs or canal closures are necessary. Feature CC5 will require approximately 7.8 mcy of borrow to be obtained from Lake Borgne Borrow Site 4 and will require a 825 acre borrow footprint. Dredge pipeline and dike construction access corridors (approximately 150 ft. wide and 102 acres) to the restoration site will be via Lake Borgne, Martello Castle, MRGO, and the MRGO south bank upland disposal site and also via MRGO, Bayou Dupre and the back dike canal, and state and local highways.

CC6

Feature CC6 is located in the area south of the Violet Canal along the alignment of the Forty Arpent Levee and the Chalmette Loop Levee. Approximately 2,568 acres of existing marsh would be restored by placement of a thin layer of sediment not to exceed +1.0 feet over marsh. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.5' and effluent will be discharged through spill boxes north of the site. Approximately 28,160 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.5') to be maintained at a minimum 5' crown width; slopes no steeper than 1 on 3; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. No weirs or canal closures are necessary. Feature CC6 will require approximately 5.2 mcy of borrow to be obtained from Lake Borgne Borrow Site 4 and will require a 553 acre borrow footprint. Dredge pipeline and dike construction access corridors (approximately 150 ft. wide and 102 acres) to the restoration site will be via Lake Borgne, Martello Castle, MRGO, the MRGO south bank upland disposal site, Bayou Dupre, and the back dike canal.

CM3

Feature CM3 in the area north of Bayou Dupre and south of MRGO consists of the restoration of approximately 300 acres of shallow water to be filled to an elevation conducive to marsh restoration and approximately 215 acres of existing marsh to be restored by placement of a thin layer of sediment not to exceed +1.0 feet over marsh. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.0'. Approximately 26,800 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.5') to be maintained at a minimum 5' crown width; slopes no steeper than 1 on 3; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. Use of weirs in not anticipated. Multiple canal closures consisting of an earthen plug will be constructed from adjacent borrow to prevent slurry from flowing outside project boundary and will be removed upon completion of construction. Feature CM3 will require approximately 1.6 mcy of borrow to be obtained from Lake Borgne Borrow Site 5 as depicted on the plan view. Dredge pipeline and dike construction float access corridors (approximately 350 ft. wide and 102 acres) to the restoration site will be via Bayou Dupre, back dike canal, MRGO, and state and local highways.

CM4

Feature CM4 is located in the area south of Bayou Dupre and consists of the restoration of approximately 98 acres of shallow water to be filled to an elevation conducive to marsh restoration and approximately 129 acres of existing marsh to be restored by placement of a thin layer of sediment not to exceed +1.0 feet over marsh. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.0' and effluent will be discharged through spill boxes north of the site. Approximately 23,000 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.0') to be maintained at a minimum 5' crown width; slopes no steeper than 1 on 3; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. Eight canal closures consisting of an earthen plug will be constructed from adjacent borrow to prevent slurry from flowing outside project boundary and will be removed upon completion of construction. Feature CM4 will require approximately 0.6 mcy of borrow to be obtained from Lake Borgne Borrow Site 5. Dredge pipeline and dike construction access corridors (approximately 150 ft. wide and 102 acres) to the restoration site will be via Lake Borgne, Martello Castle, MRGO, and the MRGO south bank upland disposal site and also via MRGO, Bayou Dupre and the back dike canal, and state and local highways.

LM1

Feature LM1 is located in the "Golden Triangle" area. This feature is bounded by the GIWW to the north; the shoreline of the western lobe of Lake to the opening between the lake and MRGO that is near the ruins of Martello Castle and Marker 45 in MRGO (also referred to as Dupre Cut); and MRGO from near Marker 45 upstream to the IHNC Barrier south of Bayou Bienville. Approximately 3,253 acres of shallow water and 1,064 acres of adjacent areas of existing marsh will be filled to an elevation conducive to create marsh of marsh restoration. Existing marsh in the area would be restored by placement of a thin layer of sediment not to exceed +1.25 feet over marsh. Effluent would be allowed to flow into adjacent water bodies within the project boundary and water depth will be reduced by 1 to 1.25 feet. It is anticipated that the final result of this dredged material placement would be a combination of wetlands, mud flat, and shallow water habitat within the placement site. Maximum slurry elevation will be +4.0'. Effluent will be returned to the adjacent bayou via spill box weirs. Approximately 103,700 lf of retention dikes will be constructed from adjacent borrow with a 2' freeboard (+6.0') to be maintained at a minimum 5' crown width; slopes no steeper than 1 on 3; and min 40' interior berm. Earthen dikes/closures would be allowed to degrade naturally. If earthen dikes/closures do not sufficiently degrade to provide fisheries and tidal ingress/egress following appropriate settlement of dredged material placed within the disposal area, earthen dikes/closures would be mechanically breached and/or degraded as necessary. Approximately 93,700 lf of interior weirs will be constructed from adjacent borrow and to an elevation +3.0' with a minimum of a 5' crown and side slopes 1 on 3. Weirs will be removed upon completion of construction. No canal closures are needed. Feature LM1 will require approximately 14.3 mcy of borrow to be obtained from Lake Borgne Borrow Site 6 as depicted on the plan view. Dredge pipeline and dike construction access corridors (approximately 350 ft. in width and 102 acres) to the marsh restoration site will be via corridors depicted in the plan view and/or via Bayou Bienvenue, as well as MRGO/GIWW.

ATTACHMENT 2: PROJECT MAPS

Insert final versions of CC1, CC2, CC5, CC6, CM3, CM4, and LM1

ATTACHMENT 3: SITE PHOTOGRAPHS



Fragmented marsh separating Lake Borgne from the MRGO navigation channel.



Google Image of the Golden Triangle

ATTACHMENT 4: REQUIRED PERMITS

CLEAN AIR ACT – AIR QUALITY DETERMINATION

Compliance with the Clean Air Act (42 U.S.C.A. §7401) would be coordinated with the Air Quality Section of the Louisiana Department of Environmental Quality (LDEQ). As required by *Louisiana Administrative Code*, Title 33 (LAC 33:III.1405 B), an air quality applicability determination will be made for the recommended plan. This will include consideration of the proposed action for the category of general conformity, in accordance with the Louisiana General Conformity, State Implementation Plan (LDEQ, 1994). An air quality determination has been calculated, based upon direct and indirect air emissions. Generally, since no other indirect Federal action, such as licensing or subsequent actions, would likely be required or related to the restoration construction actions, it is likely that indirect emissions, if they would occur, would be negligible. Therefore, the air applicability determination analysis would be based upon direct emission for estimated construction hours. Considering that total emissions for each work item separately (or even when all work items are summed) would not exceed the threshold limit applicable to volatile organic compounds (VOC) for parishes where the most stringent requirement (50 tons per year in serious non-attainment parishes) is in effect, (see General Conformity, State Implementation Plan, Section 1405 B.2), the VOC emissions for the proposed construction would be classified as *de minimus* and no further action would be required.

CLEAN WATER ACT – SECTION 401 WATER QUALITY

Under provisions of the Clean Water Act (33 U.S.C. § 1251) of 1972, any project that involves the placement of dredge or fill material in waters of the United States or wetlands, or mechanized clearing of wetlands would require water quality certification from the LDEQ, Office of Environmental Services. An application for water quality certification describing the impacts of the proposed action to water quality, along with a copy of the Final Environmental Impact Statement (FEIS), will be provided to the LDEQ on June 1, 2012.

CLEAN WATER ACT – SECTION 404(B)(1)

The United States Army Corps of Engineers (USACE) is responsible for administering regulations under Section 404(b)(1) of the Clean Water Act. Potential project-related impacts subject to these regulations, such as the discharge of dredged material into shallow open water areas to create wetlands and the placement of rock for shoreline protection, is evaluated in accordance and compliance with Section 404(b)(1) of the Clean Water Act. The evaluation of potential impacts to water quality indicate that, on the basis of the guidelines, the proposed disposal sites for the discharge of dredged material and stone comply with the requirement of these guidelines, with the inclusion of

appropriate and practicable best management practices to minimize adverse effects to the aquatic ecosystem.

COASTAL ZONE MANAGEMENT ACT OF 1972

Section 307 of the Coastal Zone Management Act (CZM) of 1972 (16 U.S.C. 1456(c)(1)(A)) directs Federal agencies proposing activities or development projects (including civil work activities), whether within or outside the coastal zone, assure that those activities or projects are consistent, to the maximum extent practicable, with the approved state coastal zone management program. A Coastal Zone Consistency Determination will be submitted to the Louisiana Department of Natural Resources (LDNR) for consistency review prior to release of the FEIS for public review. Implementation of the recommended plan is considered consistent, to the maximum extent practicable, with the approved Louisiana State Coastal Management Program.

FARMLAND PROTECTION POLICY ACT

Congress passed the Farmland Protection Policy Act (FPPA) as a result of a substantial decrease in the amount of open farmland. The purpose of the Act is to minimize the extent to which Federal actions contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. Approximately 442 acres of soils designated as prime and unique farmland would be impacted by the construction of the diversion canal. The area is currently utilized as pasture. The Farmland Conversion Impact Rating Form AD 1006 has been prepared and submitted to Natural Resources Conservation Service (NRCS) for evaluation and the response is included in the FEIS provided for public review.

ENDANGERED SPECIES ACT OF 1973

Compliance with the Endangered Species Act of 1973 (ESA) (7 U.S.C. 136; 16 U.S.C. 460 *et seq.*) is being coordinated with the USFWS and the National Oceanic and Atmospheric Administration (NOAA) for those species under their respective jurisdictions. A draft biological assessment will be included with the public release of the FEIS. The USACE anticipates formal consultation with the USFWS on potential impacts to the endangered pallid sturgeon (*Scaphirhynchus albus)*, the threatened piping plover (*Charadrius melodus*) and its critical habitat, and the threatened Gulf sturgeon *(Acipenser oxyrhynchus desotoi)* and its critical habitat.

The Lake Pontchartrain, Lake Borgne and Mississippi Sound are designated as critical habitat for the Gulf sturgeon and the Chandeleur Barrier Island Chain is designated as critical habitat for the piping plover. The effects determination for the pallid sturgeon and piping plover and its critical habitat is not likely to adversely affect the continued existence of the species. The effects determination for the gulf sturgeon and its critical habitat is that the recommended plan may affect, but is not likely to adversely affect the continued existence of the species. Aquatic modeling for the gulf sturgeon and restoration measures and benefits analysis for the barrier islands are not anticipated until

early April, therefore the Biological Assessment is considered draft and can not be completed until these results are provided. Formal Consultation with both agencies is ongoing with submission of the Final BA prior to release of the FEIS for public review.

The use of recommended primary activity exclusion zones and timing restrictions would be utilized, to the maximum extent practicable, to avoid project construction impacts to any threatened or endangered species or their critical habitat within the project area. The USACE would continue to closely coordinate and consult with the USFWS and the National Marine Fisheries Service (NMFS) regarding threatened and endangered species under their jurisdiction that may be potentially impacted by implementing the proposed action.

LOUISIANA STATE RARE, THREATENED AND ENDANGERED SPECIES, AND NATURAL COMMUNITIES COORDINATION

The USACE reviewed the database maintained by the Louisiana Natural Heritage Program that provides the most recent listing and locations for rare, threatened and endangered species of plants and animals and natural communities within the State of Louisiana. The proposed action would not adversely impact any rare, threatened or endangered species, or unique natural communities.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT OF 1996 AND THE MAGNUSON-STEVENS ACT REAUTHORIZATION OF 2006 (ESSENTIAL FISH HABITAT)

As directed by the Magnuson-Stevens Fishery Conservation and Management Act (Public Law 104-297), the USACE has coordinated with the NMFS and that agency's experts on various marine organisms, as well as essential fish habitat (EFH). The NMFS has provided comments and recommendations, to help guide the development of the FEIS for the proposed action. The NMFS identified shrimp, red drum, reef fish, and stone crabs as species managed by the Gulf of Mexico Fishery Management Council that have EFH in the project area. They also listed estuarine emergent wetlands, mud, sand and shell substrates, and estuarine and marine water column as primary categories of EFH in the project area.

MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

No migratory birds would be adversely affected by project activities. The project is in compliance with the Migratory Bird Conservation Act, 16 U.S.C. 715-715d, 715e, 715f-715r; 45 Stat. 1222 and the Migratory Bird Treaties and other international agreements listed in the ESA of 1973, as amended, Section 2(a)(4).

NATIONAL HISTORIC PRESERVATION ACT OF 1966

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended and 36 CFR 800, Federal agencies are required to identify and consider potential effects that their undertakings might have on significant historic properties, district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Additionally, a Federal agency shall consult with any tribe that attaches religious and cultural significance to such properties. Agencies shall afford the State Historic Preservation Officer (SHPO) and tribes a reasonable opportunity to comment before decisions are made. National Register eligible sites would be avoided to the maximum extent possible and any potential adverse effects would be mitigated. A variety of mitigation measures are possible, ranging from avoidance to data recovery to other types of documentation. Mitigation can take place at the site directly affected or can be concentrated at any one site. Decisions on mitigation strategies would be made under a Memorandum of Agreement among the Corps of Engineers Mississippi Valley New Orleans District (CEMVN), the Louisiana State Historic Preservation Officer (SHPO), and any consulting Indian groups. Sites unevaluated for National Register eligibility would either have to be avoided or further research would be carried out in order to determine National Register eligibility.

Cultural surveys are currently underway for terrestrial sites and for shoreline protection. The borrow sites identified for use in the first five years of implementation are in the process of being surveyed. The results of those surveys and coordination with the SHPO would be complete prior to finalizing the FEIS or a programmatic agreement would be executed prior to finalizing the FEIS in accordance with ER 1105-2-100 C-4 (5). The FEIS would be provided to the SHPO and tribes, as well as other interested parties, during the public review period.

RESOURCE CONSERVATION and RECOVERY ACT AS AMENDED BY THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984

The Hazardous, Toxic, and Radioactive Waste (HTRW) assessment performed as part of this project complies with the requirements of the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments of 1984.

EXECUTIVE ORDER 11988, FLOOD PLAIN MANAGEMENT

This Executive Order (EO) instructs Federal agencies to avoid development in floodplains to the maximum extent feasible. The recommended plan is not a "development," but rather a floodplain restoration action. The recommended plan is being developed in compliance with EO 12898.

EXECUTIVE ORDER 11514, PROTECTION OF ENVIRONMENT

EO 11514, Protection and Enhancement of Environmental Quality, directs Federal agencies to "*initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals.*" The recommended plan complies with EO 11514.

EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

The overall goals of the recommended plan include the restoration and nourishment of habitat in the study area, including fresh and intermediate marsh, brackish marsh, cypress swamp, and saline marsh. The recommended plan complies with the goals of EO 11990.

EXECUTIVE ORDER 13186, MIGRATORY BIRD HABITAT PROTECTION

Section 3a and e of EO 13186 directs Federal agencies to evaluate the affects of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative effects to migratory birds. Implementation of the recommended plan is not anticipated to have a measurable negative effect on migratory bird populations and in fact, would benefit migratory bird population as a whole by restoring valuable wetlands, swamp barrier island and ridge habitat.

EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE

Title VI, Section 601 of the Civil Rights Act of 1964 (Public Law 88-352) states:

"No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

On February 11, 1994, President Clinton issued EO 12898 regarding Federal actions to address environmental justice issues in minority populations and low-income populations:

> *"To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands."*

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development,

implementation, and enforcement of environmental laws, regulations, and policies. EO 12898 focuses Federal attention on the environmental and human health conditions in the minority and low-income communities, enhances the provisions of nondiscrimination in Federal programs affecting human health and the environment, and promotes meaningful opportunities to the access of public information and participation in matters relating to minority and low-income communities and their environment. The EO is directed internally to all Federal departments and Federal agency heads to take the appropriate steps to identify and address any disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on minority and low-income populations.

Potential environmental justice issues have been considered throughout the entire study process, and will continue to be considered through project implementation. As part of the NEPA process, a scoping input request was provided to the public and interested parties. Four scoping comments were received and did not identify any potential environmental justice issues. The USACE is committed to ensuring that any potential environmental justice issues are addressed as the study proceeds. As project specifications were developed, one area of concern was identified in the Violet area where a proposed diversion would be located. While the proposed wetland creation and nourishment and shoreline protection measures would equally impact all potential users (e.g., commercial and recreational fishers) in the area, the Violet Diversion is located between two subdivisions that are classified as minority and/or low-income.

EXECUTIVE ORDER 13112, INVASIVE SPECIES

On February 3, 1999, President Clinton issued EO 13112 establishing the National Invasive Species Council to prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts resulting from invasive species. The recommended plan is consistent with EO 13112. Only native plant species would be utilized in the implementation of the recommended plan. Implementation of the recommended plan would adhere to programs and authorities preventing the introduction or spread of invasive species in the study area or elsewhere.

ATTACHMENT 5: ENVIRONMENTAL ASSESSMENT

This environmental assessment focuses on the potential impacts that the proposed project may have within and immediately adjacent to the Louisiana Natural and Scenic Rivers (scenic streams). For an assessment of the impacts of the entire ecosystem restoration project, please see the attached Final Environmental Impact Statement (FEIS) for the former Mississippi River Gulf Outlet Navigation Channel Ecosystem Restoration Study.

The Louisiana Scenic Rivers Act of 1988 was established to preserve, protect, and enhance the wilderness qualities, scenic beauties, and ecological regimes of rivers and streams in the state. There are seven identified scenic streams located within the project area. These are: Bayou Dupre, Lake Borgne Canal (Violet Canal), Bashman Bayou, Terre Beau Bayou, Pirogue Bayou, Bayou Bienvenue, and Bayou Chaperon.

The portion of Bayou Bienvenue classified as scenic is located within the Golden Triangle Marsh area and includes the portion of the bayou from Bayou Villere to Lake Borgne. The remaining six scenic streams are all located within the Central Wetlands area. The portion of Bayou Dupre protected as scenic is from the Violet Canal to Terre Beau Bayou; the Violet Canal is protected from the Forty Arpent Canal to Bayou Dupre; Bashman Bayou is protected from its origin to Bayou Dupre; Terre Beau Bayou is protected from Bayou Dupre to the New Canal; and Pirogue Bayou is protected from Bayou Dupre to the New Canal. Bayou Chaperon is protected as a scenic stream along its entire length.

In accordance with LDWF policy concerning the protection of those water bodies classified as scenic, any construction within 100 feet of a scenic stream requires a scenic streams permit. In those areas where the construction limits are more than 100 feet from the scenic stream, the implementation of best management practices (BMPs) would be required to prevent sediment runoff during construction. These BMPs would include, but are not limited to, the use of stacked hay bales or silt fences, mulching and reseeding, use of buffer zones, and the collection and treatment of storm water runoff prior to discharge into a scenic stream, where appropriate.

Section A: Existing Land Use

Existing Conditions

The general landscape surrounding the scenic streams within the project area consists mainly of coastal marsh habitat. As noted above, the six scenic streams are located within the Central Wetlands area which consists of flat, open marshland vegetated with numerous grass species, some scrub/shrub habitat, and the occasional medium-sized tree.

Bayou Chaperon is located in the mid-portion of the Central Wetlands area. Near the start of the bayou at the Forty Arpent Canal, the open marsh land is scattered with small to medium-sized cypress trees, giving a glimpse as to what the area looked like in the

past. As the bayou proceeds northeast the few cypress trees give way to open brackish marsh habitat that is fairly contiguous with few open water areas. The bayou terminates at a large open water body near the MRGO dredge material bank.

The remaining five scenic streams are interconnected in the southern portion of the Central Wetlands area. The scenic portion of the Violet Canal runs from the Forty Arpent Canal to its connection with Bayou Dupre. The viewshed along this stretch of the canal consists of open marsh habitat with a narrow bank that runs along both sides of the canal and rises a few feet above the surrounding marsh. The banks on both sides of the canal consist of scrub/shrub habitat including baccharis, palmetto, and elderberry with scattered small to medium-sized trees, mostly live oaks and hackberry, interspersed along the banks.

Bashman Bayou, Bayou Dupre, Terre Beau Bayou, and Pirogue Bayou all interconnect between the terminus of the Violet Canal and the MRGO dredge material bank. The surrounding viewshed consists of fairly contiguous marshland with a few open ponds and smaller tributaries off the main bayous. Just beyond the scenic portion of Bayou Dupree near its entrance to the MRGO are several fishing camps and a lock structure, all of which are visible from portions of Bayou Dupre, Bashman Bayou, and Terre Beau Bayou. For all of the scenic streams in this area, views to the east of Lake Borgne and associated marsh habitats are blocked by the dense shrub/scrub habitat of the MRGO dredge material bank and the hurricane protection levees.

Bayou Bienvenue is located just north of the Central Wetland area within the Golden Triangle Marsh. This marsh area is bordered by the MRGO to the southwest, the GIWW to the north, and Lake Borgne to the east. The scenic portion of the bayou extends from the juncture with Bayou Villere to the entrance into Lake Borgne. The habitat surrounding the bayou consists of very broken brackish marsh with large areas of open water. There is also a fairly large pipeline canal that cuts across the bayou just east of Bayou Villere.

Potential Adverse Impacts

As stated, the land surrounding the scenic streams in the project area is largely coastal marsh. The intent of the proposed project is to nourish and restore and nourish these wetlands. Therefore, the proposed project should result in a long-term benefit to the existing land-use.

Short-term impacts to land-use in the vicinity of the scenic streams include the construction of retention dikes and berms adjacent to the scenic streams to retain the sediments deposited to nourish the marshes. These dikes and berms are temporary and are expected to erode naturally or will be mechanically removed.

Mitigation Measures

No mitigation measure are proposed to offset land use changes in the vicinity of scenic streams because the long-term impact to the adjacent marshes is expected to be positive and result in higher quality marshes.

The construction of retentions dikes and berms is a short-term impact to land use. These dikes and berms will erode naturally or will be mechanically removed. No further mitigation is proposed to offset short-term impacts to land use in the vicinity of scenic streams.

Section B: Historical/Archeological Sites

Existing Conditions

Prehistoric and historic archaeological sites, as well as standing structures, are generally located along the natural levees bordering active streams and abandoned stream channels. Any projects that cross or run along such geographic features will have the possibility of impacting historic properties that may be eligible for listing on the National Register of Historic Places (NRHP). Adverse impacts to historic properties can be mitigated by either avoiding the historic properties or by performing data recovery (excavation). Identification of historic properties is made through a Phase I survey which simply identifies the location, extent, and depth of potential historic properties. If these potential historic properties cannot be avoided, then a Phase II study is required. In a Phase II study, the sites are tested by standard archaeological procedures to determine if they are indeed eligible for the NRHP or if standing structures are involved, then more detailed research will be performed. If a site is found to be eligible and the project cannot be designed to avoid such properties, full scale excavations will be conducted for archaeological sites and buildings will be recorded following the procedures of the Historic American Buildings Survey or the Historic American Engineering Record.

Although high probability areas for archaeological sites were identified within the overall project area, no high probability areas for archaeological sites were identified within the portions of the project that are within and immediately adjacent to Louisiana Natural and Scenic Rivers.

Potential Adverse Impacts

Because no high probability archaeological sites were identified within the portions of the project that are immediately adjacent to Louisiana Natural and Scenic Rivers, no adverse impacts to identified historical and archaeological sites are anticipated in these areas.

For a full discussion of the potential adverse impacts that the overall project may have on historical and archaeological sites, see the attached EIS.

Mitigation Measures

Should unanticipated historical or archaeological sites be discovered within the portions of the project that are immediately adjacent to Louisiana Natural and Scenic Rivers, work would be halted and the Louisiana State Historic Preservation Office contacted.

Section C: Economic Impact

Existing Conditions

The project footprints are located in mostly remote and uninhabited coastal wetlands within St. Bernard and Orleans Parishes. There are no communities or human populations in the project footprints; hence, there is no employment or income base. However, the project area does support sources of income related to oil and gas exploration and production, and commercial and recreational fishing.

Potential Adverse Impacts

The long-term impacts of the project are anticipated to be positive. The proposed project would create and nourish thousands of acres of emergent wetlands that would benefit, to some undetermined level, local employment in wetland-dependent jobs such as commercial and recreational fisheries, ecotourism; as well as provide benefits for supporting economic activities such as marinas, bait and tackle shops, and others. Although there are oyster leases that will be affected by the proposed project, there are no known oyster leases within or immediately adjacent to the scenic streams. It is not anticipated that the proposed project will negatively impact oil and gas exploration or production activities.

There may be a temporary increase in local employment due to the construction activities related to implementation, but no permanent effects.

There will be short-term, direct impacts that would be localized, temporary, and primarily related to construction activities that would make the areas in the immediate vicinity of the proposed action unavailable to conduct commercial fishing activities. Following completion of construction activities, those areas would become available for commercial fishery activities.

Mitigation Measures

No mitigation measures are planned because no long-term negative economic impacts are anticipated.

Section D: Wilderness/Rural Quality

Existing Conditions

The general landscape surrounding the scenic streams within the project area consists mainly of coastal marsh habitat. As noted above, six of the scenic streams are located within the Central Wetlands area which consists of flat, open marshland vegetated with numerous grass species, some scrub/shrub habitat, and the occasional medium-sized tree. Further discussion of the landscape surround each scenic stream can be found in Section A.

Potential Adverse Impacts

The intent of the proposed project is to restore and enhance the marshes in the vicinity of the scenic streams. The proposed project will not encourage development or the conversion of wilderness or rural areas in the vicinity of the scenic streams to urban or other non wilderness/rural uses. Therefore, no negative impact to wilderness/rural quality is anticipated in the vicinity of scenic streams. The proposed project will increase the quality of wetlands in the vicinity of scenic streams.

Mitigation Measures

Because no negative impacts are anticipated, no mitigation is proposed.

Section E: Scenic/Aesthetic Value

Existing Conditions

The Central Wetlands' landscape is made up primarily of marshland, wetland and swamp mixed with a variety of water bodies and canals. The terrain is predominantly flat and open with low growing grasses, some scrub shrub and the occasional medium sized tree.

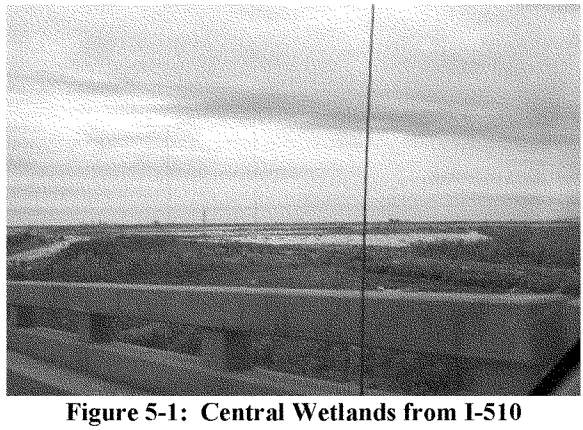


Figure 5-1: Central Wetlands from I-510



Figure 5-2: Central Wetlands from I-510

The site is very accessible. The route of Interstate 510 (I-510) traverses near the center of the proposed study area. This route offers a variety of dramatic views into the landscape. The best views come from the I-510 Bridge. There are a variety of land uses along the I-510 corridor including residential, commercial, and some industrial.

Potential Adverse Impacts

The proposed marsh and swamp nourishment and restoration, ridge restoration, and shoreline protection projects would work to reclaim former land mass that has been converted to a more open water setting. The reclamation would present the possibility of creating vertical features (derived from future landscape and vegetation growth) that, along with ground features could work to frame the large open water areas beyond. This creates an aesthetic setting that is much more desirable and contains the basic design elements of form, line, texture, and color.

As an indirect impact, the marsh nourishment and restoration projects would increase habitat for wildlife, which could include birds or land animals. Wildlife typically provides the viewer with focal points and accents that make a view shed dynamic, scenic and memorable. Increased land mass and vegetation could yield better habitat for wildlife.

The only potential adverse impact to aesthetics is the construction of temporary dikes and berms along the banks of the scenic streams. This is a short-term impact as the dikes and berms will erode naturally or will be mechanically removed.

Mitigation Measures

The project overall will result in a positive benefit to aesthetics in the vicinity of the scenic streams. Temporary dikes and berms will erode naturally or will be mechanically removed at the end of the project. No further mitigation is anticipated.

Section F: Recreational Use/Opportunities

Existing Conditions

Historically, many residents of New Orleans and the surrounding areas, such as Jefferson and St. Bernard Parishes, constructed fishing camps along the old US 90 corridor near Lake Catherine and along the natural ridges in St. Bernard Parish in communities such as Yscloskey, Hopedale, and Delacroix. As these areas grew in popularity for recreational fishing and hunting, supporting facilities such as marinas and boat launches developed. Consumptive recreational uses both in Louisiana and Mississippi waters have traditionally been saltwater fishing along with recreational crabbing, shrimping, freshwater fishing, and hunting for waterfowl, deer, and small game in wooded swamps and along natural ridges. Non-consumptive activities, hiking, boating, bird watching, camping, and picnicking, attract far fewer participants.

The study area has traditionally provided excellent saltwater fishing opportunities. Anglers have traveled from throughout the region to fish in these waters, especially for the nationally televised Redfish Cup.

As throughout much of coastal Louisiana, the study area has experienced substantial coastal erosion, loss of wetlands and increasing salinity levels. Some of the effects were exacerbated by past and recent hurricanes. As wooded swamp, marsh habitat, and submerged aquatic vegetation in the area have disappeared, waterfowl habitat has diminished and duck hunting opportunities have decreased.

Potential Adverse Impacts

The proposed project would stabilize marsh and swamp habitats and to restore deteriorated wetlands. These measures would be beneficial to recreational fishing by enhancing the sustainability of productive nursery habit for this resource. The effect of restoring marsh and swamp improves nursery habitat in the interior marshes, which could improve recreational fishing opportunities in off-shore waters as juveniles become adults and move to deeper waters. By using estuaries during their early life stages, estuarine-dependent species may increase survivorship because these habitats offer more protection from predation and damaging wave action. Another benefit of estuarine use could be access to increased food sources. This need for a protected nursery habitat with high local productivity could be especially crucial for key commercial and recreational species that are estuary dependent. Without access to estuaries during their early life stages, populations of commercial and recreational species such as brown shrimp (***Farfantepenaeus aztecus***), white shrimp (***Litopenaeus setiferus***), blue crab (***C. sapidus***), Gulf menhaden (***B. patronus***), Atlantic croaker (***Micropogonias undulatus***), and spotted seatrout (***Cynoscion nebulosus***) could likely decline over time.

Development of additional marsh and swamp habitat is potentially beneficial to bird watching as it would support more birds and increase the diversity of species in the area.

Waterfowl hunting opportunities may increase due to increased and enhanced freshwater habitat. Potential negative effects include temporary turbidity and reduced water quality associated with construction of marsh and swamp restoration projects and near borrow areas in Lake Borgne during excavation. An effect of marsh creation would be the potential for reduced access to fishing areas as boaters would have to potentially navigate around newly created land area.

Mitigation Measures

The proposed project is anticipated to have positive impacts to recreational use and not mitigation measures are anticipated.

Section G: Ecological Systems Present

Existing Conditions

The Central Wetlands area is characterized coastal marshes. The characteristics of these marshes and the potential impacts to vegetation, wildlife and fishes, and water quality are discussed extensively in other sections of this environmental assessment.

Potential Adverse Impacts

The proposed project is anticipated to have a positive long-term benefit on the ecological systems that are present in the vicinity of the scenic streams due to the restoration and enhancement of the coast wetlands.

Short-term impacts will occur during construction due to the mechanical disruption of sediments and the construction of retention dikes and berms. These features are expected to erode naturally or will be mechanically removed.

Mitigation Measures

Because the project is anticipated to result in a long-term benefit to the coastal marshes, no mitigation is anticipated.

Section H: Fish and Wildlife in the Area

Existing Conditions

Coastal Louisiana's wetlands support millions of neotropical and other migratory avian species, such as rails, gallinules, shorebirds, wading birds, and numerous songbirds, as well as many different furbearers, rabbits, deer, and alligators. The rigors of long distance flight require most neotropical migratory birds to rest and refuel several times before they reach their final destination. Louisiana coastal wetlands provide neotropical migratory birds essential stopover habitat on their annual migration route. The coastal wetlands in the study area provide important and essential fish and wildlife

habitats, especially transitional habitat between estuarine and marine environments, used for shelter, nesting, feeding, roosting, cover, nursery, and other life requirements.

Emergent brackish wetlands are typically used by many different wildlife species, including: seabirds; wading birds; shorebirds; dabbling and diving ducks; raptors; rails; coots; and gallinules; other emergent brackish marsh residents and migrants; nutria; muskrat; mink, river otter, and raccoon; rabbits; deer; and American alligator. Emergent saline marshes are typically utilized by: seabirds; wading birds; shore birds; dabbling and diving ducks; rails, coots, and gallinules; other saline marsh residents and migrants; nutria; muskrat; mink, river otter, and raccoon; rabbits; deer; and American alligator.

The bald eagle was officially removed from the List of Endangered and Threatened Species as of August 8, 2007. However, it continues to be protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Bald eagles are currently winter breeding residents in southern Mississippi and Louisiana.

Personnel from the Louisiana Department of Wildlife and Fisheries (LDWF), USFWS and Natural Resources Conservation Service (NRCS) provided recent (since 1985) trends in wildlife for the 1998 Coast 2050 Study (LCWCRTF and WCRA 1999). They assessed common wildlife in the planning subunit of the middle and lower Pontchartrain Basin. The study showed that populations of seabirds, shorebirds, dabbling and diving ducks, and raptors have been generally steady since 1985. Around Lake Pontchartrain, populations of furbearers, game mammals, and alligators have been steady. In the lower basin, these animals have generally been decreasing since 1985.

The existing emergent wetlands and shallow open water within the study area provide important habitat and Essential Fish Habitat (EFH), including transitional habitat between estuarine and marine environments used by migratory and resident fish, as well as other aquatic organisms for nursery, foraging, spawning, and other life requirements. Historically and currently, the area provides valuable recreational and commercial fishing habitat, oyster culture, and nursery areas for a wide variety of finfish and shellfish.

Potential Adverse Impacts

During construction, marsh creation and restoration activities would temporarily affect wildlife and by disrupting their activities and displacing them (and their prey) from the immediate construction zone. These impacts would be temporary and localized. Once construction is complete, most if not all wildlife and prey species would return to the area. Any habitat impacted during construction would be restored before leaving the area. Board roads and marsh buggies would be used in access routes crossing existing wetlands. When the access is no longer needed, the board roads would be removed, and the impacted wetlands would be restored by pumping dredged material onto the site to a height conducive to marsh restoration.

The proposed project would include the creation/nourishment of approximately 44,188 acres of marsh habitats. The restoration and creation of wetlands through the beneficial use of dredged material would have a positive effect on fisheries. Wetlands play an important role in providing habitat for foraging, spawning, rearing, and cover for most fish species, such as spotted and sand seatrout, red drum, atlantic croaker, and sheepshead. Fisheries are of major importance to the local and state economies.

Mitigation Measures

In the areas within and immediately adjacent to scenic streams, no long-term adverse impacts to wildlife and fisheries are anticipated, and no mitigation measures are anticipated. Short-term disturbance during construction would be offset by the long-term benefit of habitat creation.

Other measures of the proposed project, outside of the vicinity of scenic streams, do have the potential to impact wildlife and fisheries. Discussion of these impacts can be found in the FEIS.

Section I: Botanical Elements

Existing Conditions

Wetland habitats are strongly influenced by the salinity regime of the surface water. Historically, the habitats were maintained by freshwater introduced through rivers, such as the Mississippi River, and other natural water sources combined with the absence of manmade canals. The construction of flood protection levees has limited the flow of freshwater into the marsh, while the construction of canals has allowed intrusion of saltwater farther into the estuary. These and other changes have resulted in an unnatural shift of habitats inland. Soils may be highly organic and prone to settlement. Each plant species adapts to a range of environmental conditions, and those species that are adapted to similar conditions form communities or associations that are best able to grow and successfully compete for a particular site.

In habitats within a narrow range of physical conditions, such as those with extreme salinity, species diversity is reduced. Since the source of saltwater in coastal Louisiana and Mississippi is the Gulf of Mexico, salinity levels exist along a gradient, which declines further inland. Plant species richness increases from saltwater to freshwater marshes and dominance decreases. Salinity predominantly drives the change in vegetation types among fresh, intermediate, brackish, and saline habitats.

Below are descriptions of the major plant community types within the marshes adjacent to the scenic streams. The community types are based on the classification scheme developed by the USGS.

Intermediate Marsh (2-8 ppt Salinity)

Intermediate marshes have a lower species diversity than freshwater marsh, but may have higher productivity. Dominant plant species in the intermediate marsh are saltmeadow cordgrass (*Spartina patens*) with Roseau cane (*Phragmites australis*), arrowhead, and waterhyssop (*Bacopa monnieri*). This habitat provides important nurseries for brown shrimp (*Farfantepenaeus aztecus*), white shrimp *(Litopenaeus setiferus*), blue crab *(Callinectes sapidus*), and Gulf menhaden or pogy *(Brevoortia patronus*). Soils may be very poor due to very high organic content. Important species are rangia clams *(Rangia cuneata)* and Roseau cane. Clams are important for filtration and may compose a significant portion of the biomass in lakes or bays. Roseau cane is an aggressive and highly tolerant plant. Its root system is dense and resists shoreline erosion. Submerged aquatic vegetation within lakes and bays are vital to secondary productivity. Economically important natural resources include fisheries of blue crab, shrimp, catfish, and drum. Waterfowl hunting and recreational fishing are important recreational activities.

Brackish Marsh (4-18 ppt Salinity)

Brackish marshes have the lowest plant diversity, but may be the most productive type of marsh within the study area. The dominant plant species are emergent saltmeadow cordgrass, saltgrass (*Distichlis spicata*), smooth cordgrass (*Spartina alterniflora*), needlegrass rush (*Juncus roemerianus*), and three-cornered grass (*Scirpus olneyi*). Oysters *(Crassostrea virginica*) are an exceptionally significant component of the habitat due to filtration, biomass, reef building, and commercial value. Historically, natural reefs had more vertical structure and were larger than managed oyster beds. Natural oyster reefs have generally been lost due to mining or salinity increases. Presently, oysters are located further inland and generally have little vertical reef due to harvesting practices. Economically important natural resources include several fisheries such as shrimp, blue crab, oyster, drum, mullet, and Gulf menhaden. Waterfowl hunting and recreational fishing are important recreational activities. Speckled trout, redfish, and flounder are typical sport fish.

Potential Adverse Impacts

Activities in the vicinity of the scenic streams are intended to restore and nourish the existing wetlands. Over the long-term, the proposed project will benefit vegetative communities in the vicinity of the project.

Short-term impacts are related to the construction of retention dikes and berms and the addition of sediment to the wetlands. These construction activities will impact vegetation by mechanical disruption and the placement of soil on the marsh surface. However, these impacts are short-term, and are offset by the anticipated improved quality of the wetlands at the end of the project. Retention dikes and berms are expected to erode naturally or will be mechanically removed.

Mitigation Measures

The proposed project will result in a net benefit to wetland vegetation communities and no mitigation is proposed for the short-term impacts.

Section J: Geological Features

Existing Conditions

Most of the present landmass of southeast Louisiana was formed by deltaic processes of the Mississippi River. Over the past 7,000 years, the Mississippi River deposited massive volumes of sediment in five deltaic complexes. The study area lies within the Mississippi Delta Region (**figure 5-3**). The Mississippi Delta Region is comprised of three geomorphic regions, which are divided further into multiple smaller geomorphic areas.

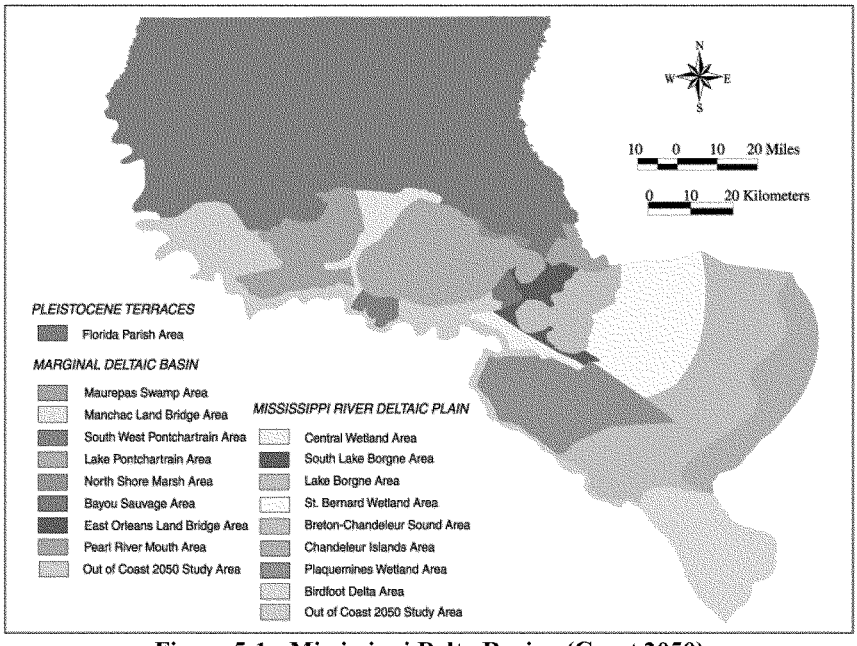


Figure 5-1: Mississippi Delta Region (Coast 2050)

The Pleistocene Terrace Region is the area north of Lakes Maurepas, Pontchartrain, and Borgne. This region is defined as the area north of the Mississippi River Deltaic Plain and the lowlands surrounding Lakes Pontchartrain and Maurepas.

The Marginal Deltaic Basin is comprised of estuarine marshes and forested wetlands of the Lakes Pontchartrain and Maurepas. This region includes some of the largest remaining tracts of forested wetlands in the Lower Mississippi River Valley. The Marginal Deltaic Basin is divided into the following eight geographic areas: Maurepas

Swamp, Manchac Landbridge, Southwest Pontchartrain, Lake Pontchartrain, North Shore Marsh, Bayou Sauvage, East Orleans Landbridge, and Pearl River Mouth (**figure 5-4**).

The Marginal Deltaic Basin lies within the coastal zone of Louisiana and is influenced by wetland loss, subsidence, saltwater intrusion and shoreline erosion. USACE data indicates relative sea level rise in the region of less than 0.5 feet per century, but in many localized areas, the rate is greater. Shoreline erosion is taking place around the entire perimeter of Lakes Pontchartrain, Maurepas, and Borgne, except at armored sections.

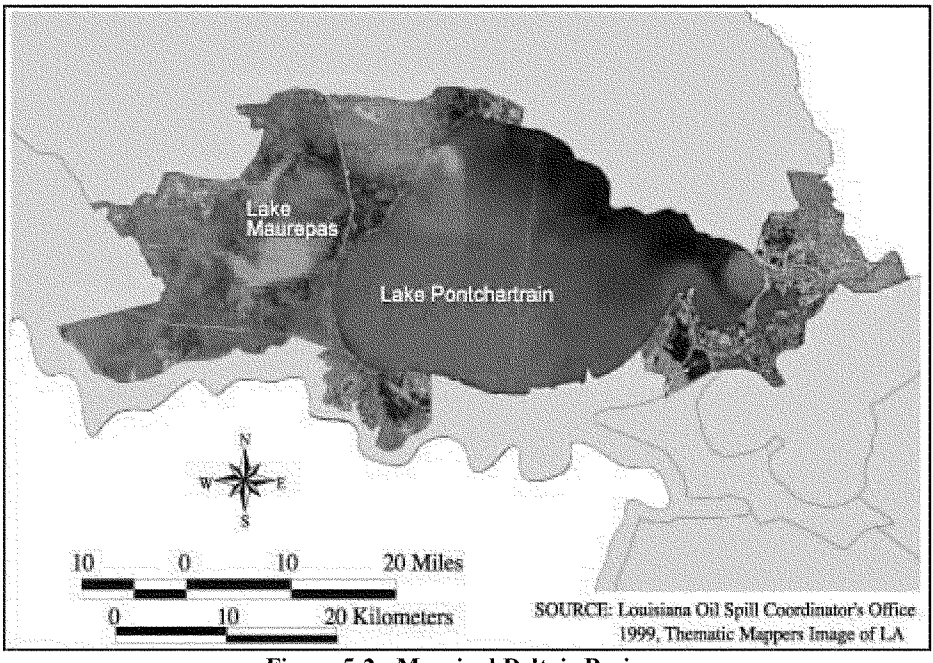


Figure 5-2: Marginal Deltaic Basin

The Mississippi River Deltaic Region lies south of the lakes. The salinity gradient within this region decreases from east (saltwater of the Gulf of Mexico) to west (fresher waters in the coastal plain) through the Pontchartrain Basin (**figure 5-5**).

The proposed restoration features of this study are located within the St. Bernard Delta Complex, the oldest deltaic complex within the Mississippi Deltaic Plain Region. The areas contained in this geomorphic region are associated with the delta-building cycle of the Mississippi River and are removed from Lake Pontchartrain.

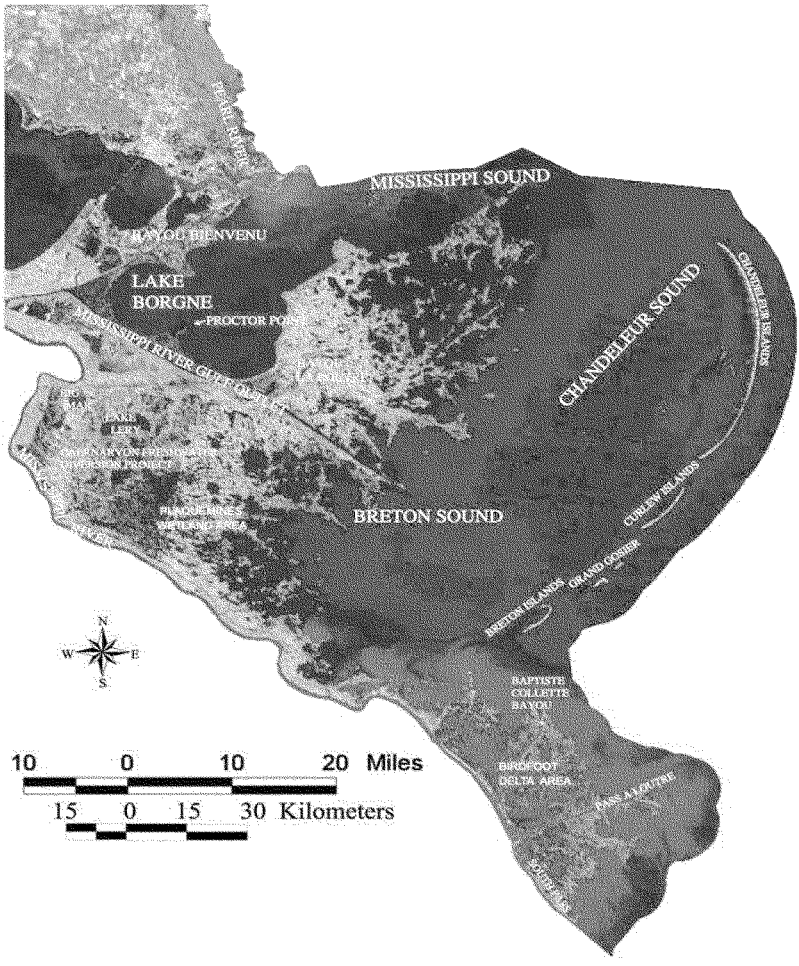


Figure 5-3: Mississippi River Deltaic Region

The Mississippi River Deltaic Plain Region is divided into the following geographic areas: Central Wetland, South Lake Borgne, Lake Borgne, St. Bernard Wetland, Breton-Chandeleur Sound, Chandeleur Island, Plaquemines Wetland, and Birdfoot Delta. The Central Wetland, Lake Borgne, South Lake Borgne and Chandeleur Island Areas are all part of the St. Bernard Delta. The Mississippi River naturally abandoned this older delta lobe when it switched its course some 2,000 years ago and began building the Lafourche Delta. Consequently, land building declined in this portion of the Lake Pontchartrain Basin well before European settlement. USACE data show relative sea level rise in the region ranging from less than 0.5 foot per century to one foot to four feet per century, making it the most rapidly subsiding portion of the Lake Pontchartrain Basin. The Chandeleur Islands mark the outer edge of this system, but they are migrating landward. Wetlands consist of poorly consolidated soils and elevations are slightly above mean gulf

level. Uplands adjacent to the deltaic plains are geologically older with higher elevation and firmer soils. Narrow alluvial ridges, resembling finger-like patterns that were formed by overbank processes, extend toward the Gulf of Mexico. The ridges serve as natural levees, having higher elevation and firmer soils and occur along active, abandoned distributaries of the Mississippi River (Coast, 2050). The natural and man-made ridges form hydrologic basin divides and are more resistant to erosion than wetlands.

Construction of the MRGO impacted the natural geomorphology and hydrology of the St. Bernard Deltaic Complex. The MRGO was breached during its construction. In an analysis of the tidal flow across the region, it was demonstrated that the Bayou La Loutre Ridge served as a basin boundary. Breaching the ridge interrupted the circulation pattern along the southeastern length of the channel and the areas between Breton Sound and Lake Borgne (Wicker et. al., 1982).

Potential Adverse Impacts

No adverse impacts to geological resources are anticipated as a result of the proposed project. The proposed project will slow erosion and the resultant loss of land in the central wetlands area.

Mitigation Measures

Because no adverse impacts to geological resources are anticipated, no mitigation is proposed.

Section K: Hydrological Features

Existing Conditions

Prior to the construction of levees on the Mississippi River, the River would overflow its banks during periodic floods. Flow from the River into Breton Sound was via various tidal passes and bayous such as Bayous Bienvenue, Dupre, and La Loutre that were part of the remnant tributary system that extended from the Mississippi River eastward to the Biloxi Marsh and Mississippi Sound. These channels were used by smaller crafts, mostly commercial fishing and recreational. With the construction of levees, and the strengthening of these levees with the Mississippi River and Tributaries (MRT) program, the River no longer overflows into the project area. The only introduction of river water into the project area is from the Caernarvon Freshwater Diversion structure to the south of the project area, a small amount from lockage at the IHNC lock, and the Bonnet Carré Spillway to the north of the project area.

The Bonnet Carré Spillway is periodically operated as a flood control structure. The frequency of operation is about once a decade. During operation of the structure, large volumes of river water (up to a capacity of 250,000 cfs) are introduced into Lake Pontchartrain to lessen flow and stages in the River. During high river stages (but not

high enough to necessitate operation of the structure) there is leakage through the needles of the Bonnet Carré structure. This leakage is on the order of 5,000 cfs to 10, 000 cfs.

The project area is an estuary in which freshwater, predominantly from run-off into the Pontchartrain basin and the Pearl River Basin, mixes with the saltwater of the Gulf of Mexico. The tide in the Gulf near the project area is mostly diurnal with a spring tide range of 60 cm to 70 cm. During periods with flood discharges in the Pearl and Pontchartrain Basins, salinity levels in the project area will tend to be reduced. During periods of drought conditions in the Basins, salinity levels in the project area will tend to increase.

There are three navigation channels in the project area, which may have modified the hydrologic regime of Biloxi Marsh. These are the IHNC, the GIWW, and the recently de-authorized MRGO.

The IHNC, connecting the Mississippi River and Lake Pontchartrain, was completed in 1923 with the construction of the IHNC lock at the Mississippi River preventing high stages in the River from producing strong currents in the channel. In the 1930s, the GIWW was constructed from the mid-point of the IHNC going east and later routed through the IHNC lock. The construction of the GIWW east of the IHNC allowed for additional tidal exchange with Lake Pontchartrain, in addition to the larger channels of the Rigolets and Chef Menteur Pass. The MRGO was completed in 1968 and deauthorized in 2008.

Prior to construction of the MRGO, a typical tidal flow internally from the Breton Sound area was reduced as it moved across the marshes and wetlands inward toward Lake. There are a number of factors resulting from construction of the MRGO that have contributed to the alteration of circulation patterns and water quality along the length of the MRGO and outward into the surrounding wetlands and marshes. The MRGO provided a more direct flow of more saline, higher density water inland toward areas of Plaquemines, St. Bernard and eastern Orleans Parishes. At high tide, the MRGO provided a direct passage for tidal exchange and allowed any freshwater surpluses to exit regularly at low tide and be replaced by the inflow of more saline water. The reduced integrity of the Bayou La Loutre Ridge, as a basin boundary, since construction of the MRGO significantly altered circulation patterns in areas along the lower southeastern length of the channel and across areas between Breton Sound and Lake Borgne. Dredging performed for construction of the MRGO to an approximate depth of 36 feet resulted in the generation of an abundance of dredge material. In most areas, the dredge material was deposited in a continuous strip along the channel's southwestern limits. Dredge material deposition interrupted the local circulation patterns of natural waterways that transect areas along the length of the MRGO. This disruption of water flow caused wetlands on the southwestern side of the dredge material to become semi-impounded.

The sector gates on the GIWW and Bayou Bienvenue presently being constructed for the authorized improvements to the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (GNOHSDRRS) would alter flow patterns in and near the western end

of the study area. Construction of this storm surge barrier structure includes dredging of an access channel on the Lake Borgne side of the floodwall. The access channel connects the MRGO with the GIWW across the Golden Triangle, but closes off an existing connection. The gates across Bayou Bienvenue and the GIWW would remain open, except when a storm surge is present or anticipated.

Construction of the storm surge barrier structure would alter the flow path of tidal propagation into the Central Wetlands area through the Bayou Bienvenue control structure. Whereas, prior to the construction of this project (which at the time of this writing, although not near completion, has reached a point of effecting the changes of tidal flow), tidal flow in and out of the Bayou Bienvenue control structure came from multiple directions (i.e. from across the MRGO as well as from north and from south in the MRGO), with this barrier in place the tidal flow no longer comes from the south in the MRGO. Likewise the completed MRGO closure structure at the La Loutre Ridge has altered tidal flow paths to the Bayou Dupre control structure. The tidal connection with Breton Sound via the MRGO has been severed. Modeling of the project area with the UNO Mass balance model has shown a slight reduction in salinities in the project area, but not sufficient to alleviate the need of a freshwater diversion.

The GNOHSDRRS barrier would prevent saltwater intrusion into the interior marshes to the west of the barrier in storm situations, while minimally impeding tidal flows under normal circumstances. This barrier would not influence salinities outside of the barrier, nor would it influence salinities within the central wetland area as the gates of the Bayou Dupre and Bayou Bienvenue control structures are closed during tropical events.

Modeling scenarios for the barrier structures indicate that the proposed flood protection levee could raise the water levels by 0.1 foot (0.03 m) or less. However, the authors of this modeling study caveat their results as follows: "this change in average water volume represents a difference of less than 1 inch of water depth distributed across the region. This difference in volume may be smaller than the precision achievable with present computational resources."

Potential Adverse Impacts

Proposed wetland creation and nourishment and features associated with the proposed project would not directly alter existing hydrology and hydraulics. Hydrologic connectivity between the wetland creation and nourishment sites and Lake Borgne would be temporarily disrupted by the construction of retention dikes. However, retention dikes would be designed to naturally degrade following completion of construction thereby restoring hydrologic connectivity with Lake Borgne and other associated waterbodies. Fish access gaps incorporated into shoreline protection features would maintain hydrologic connectivity between the shoreline and adjacent waterbodies.

The Violet Diversion flow regime is for a flow of 1,000 cfs ten months of the year with a pulse to 7,000 cfs during the months of April and May. The two-tiered diversion scheme is to address two separate project goals. The 7,000 cfs flow is to meet salinity goals for

the month of May in the Biloxi Marsh area. For the other months of the year the existing salinity levels in the Biloxi marsh meet the specified criteria for enhanced oyster production. Because of the distance from the diversion location relatively large flows are required to effect a relatively small (but significant) salinity reduction in the Biloxi marsh area. The 1,000 cfs flow is designed to maintain the Central Wetlands area as a fresh system so as to enable the establishment of a cypress swamp.

The introduction of Mississippi River (fresh) water into the project area from the proposed Violet Diversion would change flow patterns, water levels, and salinities in the project area. Each of these three items (flow patterns, water levels, and salinities) will be discussed separately for both the 1,000 cfs flow and the 7,000 cfs flow. The preliminary design for the diversion consists of culverts under the Mississippi River levee and the highway and railroad adjacent to the levee, a channel through the Central Wetlands area and culverts under the hurricane levee adjacent to the MRGO. By adjusting the opening of the culverts under the hurricane levee, water levels in the Central Wetland Area can be managed for optimal growth and regeneration of the cypress swamp. By throttling the opening size during the 7,000 cfs flow the cypress swamp can be totally inundated for the purpose of reducing competition from other plants that are not as flood tolerant as cypress. By totally opening the culverts during the 1,000 cfs flow, it would be possible to lower the water level below ground elevation to allow for cypress regeneration.

Inside the Central Wetlands area flows from the diversion would not produce large currents. A diversion channel sized to carry the 7,000 cfs flow with velocities of 2 feet per second would be dug through the Central Wetlands area. This channel would be more than adequate to handle the smaller 1,000 cfs. Flows through the culverts would be of a larger magnitude (approximately 6 feet per second for the 7,000 cfs flow). However these flows would discharge into the MRGO, which would act essentially as a large reservoir. There would be flow from the discharge point out to sea, but the volume of flow would be significantly less than the tidal volume of flow. Thus, the flow velocities in and beyond the MRGO reservoir would be very slow. The only significant velocities would be at the discharge point where the flow from the culverts dumps into the MRGO reservoir. This would create local eddies, but the flow velocity would rapidly diminish away from the discharge point. If the 1,000 cfs flow is directed toward the existing control structures (Bayou Bienvenue Control Structure and bayou Dupre Control Structure), assuming an equal distribution, the velocities in the throat of the structures would be increased (or decreased on the incoming tide) by about one foot per second. These velocities would be significantly less than the existing tidal velocities and are less than the currents needed to impede fish passage.

Mitigation Measures

The hydrologic features associated with the proposed project are anticipated to have a positive impact on the ecosystem in the vicinity of the scenic streams. Therefore, no mitigation is anticipated.

Section L: Water Quality/Quantity

Existing Conditions

The general water quality statistics for the Central Wetlands area over the time period of 1990 to 2010 from aggregated samples are presented in **table 5-1**. The Central Wetlands area is a large tract of marsh habitat located within the hurricane levee protection system between the MRGO and communities along the Mississippi River in St. Bernard Parish. DO concentrations fluctuate widely, with values ranging from 1.01 mg/L to 12.73 mg/L. Measured DO in the Central Wetlands area averaged 6.1 mg/L during the period of 1990 to 2010, and violations of the State DO standard of 4.0 mg/L were noted in 24 percent of the 240 observations reported. The State of Louisiana has not published numerical standards for chloride (CL), sulfate (SO_4) and total dissolved solids (TDS). A pH range of 6.5 to 9.0 and temperature criteria of 35°C have been established by the State of Louisiana for this water segment (**table 5-1**). Data were not available for chloride at the stations and time period of this investigation. The average water temperature was 22°C with a maximum of 32°C. The average sulfate concentration was 836 mg/L, and values were reported up to 2,756 mg/L. The pH averaged 7.3 with a range from 6.28 to 8.24. TDS averaged 9,822 mg/L with a maximum value of 22,460 mg/L. The specific conductance averaged 15,786 µmhos/cm with a range of 227 µmhos/cm to 30,900 µmhos/cm. Therefore, the Central Wetlands area fluctuates between freshwater and brackish to marine salinities.

Table 5-1: Central Wetlands Area Group General Summary Statistics from 1990-2010

General	Units	Mean	Number of Observations	Max	Median	Min
Dissolved Oxygen	mg/L	6.11	240	12.7	5.8	1.01
Water Temperature	C	22	248	32.2	23.5	6.71
Sulfate	mg/L	836	248	2,756	789	38.6
Total Dissolved Solids	mg/L	9,822	248	22,460	9,730	72.0
pH	SU	7.34	248	8.2	7	6.28
Specific Conductance, Field	µmhos/cm	15,786	240	30,900	15,600	227
Nitrate+Nitrite Nitrogen	mg/L	0.16	193	1.7	0.08	0.01
Total Organic Carbon	mg/L	9.99	144	28.9	8.5	2.0
Turbidity	NTU	13.29	248	140	11.0	1.0
Total Suspended Solids	mg/L	23.93	248	260	18.8	4.0

SOURCE: USACE, 2010

The average NO_x concentration in the Central Wetlands area was 0.157 mg/L with values ranging from 0.01 mg/Lto 1.72 mg/L. The average total organic carbon was 9.97 mg/L with a maximum of 28.9 mg/L. The suspended sediment concentration averaged 24 mg/L, and the turbidity averaged 13 NTU during the period 1990 through 2010. The maximum turbidity level was 140 NTU. The maximum turbidity level established by the State of Louisiana for estuarine lakes, bays, bayous, and canals is 50 NTU. The Central Wetlands area exceeded this criterion in two percent of the 248 samples collected.

The sanitary quality of the waters in the Central Wetlands area, as characterized by observed fecal coliform bacteria densities, was 92 cfu/100mL, and the primary contact and oyster propagation standards were exceeded (five percent and 44 percent respectively). Several pesticides have been detected in the Central Wetlands area. It is important to note that the Central Wetlands area is not designated for drinking water or oyster propagation. Additionally, vinyl chloride was found to exceed the drinking water supply in 100% of the samples. No pesticide concentrations exceeded the acute or chronic aquatic life criteria for freshwater, marine, or brackish water in the Central Wetlands area. However, 1,2-dichloroethane was found to exceed the human health standards for drinking water supply in three percent of the samples. Several trace metals have been detected in the Central Wetlands area. Mercury and lead exceeded the chronic freshwater aquatic life criteria (100 percent and one percent respectively). Additionally, mercury exceeded the marine and brackish chronic criteria.

Potential Adverse Impacts

The majority of the direct impacts would be associated with dredging, placement of borrow material, and placement of rock during project construction. These activities would result in elevated levels of turbidity, re-suspension of pollutants or other trapped sediments, hypoxic conditions at borrow locations, and rapid changes to salinity levels and temperature at the placement sites. The rapid changes in salinity levels could result from mixing of the water column, while temperature could be affected by turbidity as well as mixing of the water column. Colder and more saline water would be deeper in the water column and could be brought to the surface during construction efforts. The majority of the borrow material would be placed in existing open water habitats, so that once the material has dispersed and settled to project goal elevations, water quality would begin to return to ambient conditions several hours after dredging operations ceased. Therefore, the adverse impacts during project construction would be temporary and localized. However, the long-term results of the restoration measure would include increased vegetation growth and productivity of marsh habitat, which would in turn benefit water quality in terms of increased DO, reduced turbidity, and filtration and trapping of pollutants once all project construction was completed.

Mitigation Measures

The project is anticipated to benefit water quality in the central wetlands area over the long-term and no mitigation is proposed.

ATTACHMENT 6: SIGNED LEGAL AGREEMENT

Insert legal agreement when signed by Corps

ATTACHMENT 7: APPLICANT COMPLIANCE HISTORY

Insert a statement of the Corps' compliance history

ATTACHMENT 8: STEPS TAKEN TO MINIMIZE AND/OR OFFSET POTENTIAL IMPACTS TO THE RIVER

In order to prevent impacts to scenic waterways within the Central Wetlands as a result of Marsh Creation and Swamp Restoration features being proposed under the MRGO Ecosystem Restoration feasibility study, the following precautions will be taken as a means of preventing impacts to these waterways.

First off, the waterways will be protected from dredge effluent deposition through the construction of earthen retentions dikes that will be specified and constructed along these waterways. The retention dikes will be set back a sufficient distance from the top of bank of these waterways in order to prevent any uplift of the banks as a result of overburden pressure resulting from the construction of these adjacent earthen dikes. A minimum berm will be specified to be maintained between the top of bank of the streams and the stream side toe of the retention dikes. Borrow for construction of the retention dikes shall come strictly from inside the wetland creation/nourishment sites that are to be occupied by dredge material disposal and access for construction equipment will be prohibited within these streams.

During discharge operations, continuous monitoring of the retention dikes, along with a constant reliable source of communications, will be maintained between the dredge and the Contractor's field personnel working within the wetland restoration areas for reporting any dike failures and/or any signs of imminent dike failures. Should a dike failure or leakage result from disposal operations, the dredge shall be immediately notified and shut down (operations cease) until proper repairs to the dike have been performed. The scenic waterways shall be monitored prior to and during disposal operations, with survey profiles of the waterways taken before and after disposal operations, in order to detect sedimentation within the waterways as a result of the disposal operations. Appropriate measures will be taken to restore the streams as best to pre-construction condition in the event material should enter the streams due to the Contractor's negligence and/or as a result of a dike failure or seepage.

ATTACHMENT 9: DESCRIPTION OF ALTERNATIVES CONSIDERED

9.1 Alternative A - No Action Plan

The no action alternative is required by the National Environmental Policy Act (NEPA) and represents the Future Without Project (FWOP) condition by which alternatives considered in detail are compared. The no action alternative considers restoration programs that would continue into the future, and that in the absence of this restoration plan, would continue to be proposed and implemented under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), Coastal Impact Assistance Program (CIAP), Louisiana Coastal Area (LCA), and other programs.

As a result of the devastating effect of Hurricane Katrina which made landfall in 2005, several important hurricane protection projects are under construction in the study area that are expected to have significant impacts on the future conditions of the area without implementation of this restoration study.

An important project in the area includes the Inner Harbor Navigation Channel (IHNC) sector gate for flood control and navigation. A surge barrier, similar to a floodwall but much larger, would be constructed near the confluence of the Gulf Intracoastal Waterway (GIWW) and the Mississippi River Gulf Outlet (MRGO), generally running north-south from a point just east of Michoud Canal on the north bank of the GIWW and just south of the existing Bayou Bienvenue flood control structure. Navigation gates would be constructed where the barrier crosses the GIWW and Bayou Bienvenue to reduce the risk of storm surge coming from Lake Borgne and/or the Gulf of Mexico.

Another navigation gate would be constructed near Seabrook, where the IHNC meets Lake Pontchartrain, to block storm surge from entering the IHNC from the lake.

The MRGO closure structure was constructed and completed in July 2009. The projects described above individually and cumulatively are anticipated to change the future environmental conditions of the basin regardless of whether a restoration plan is implemented or not. Important among the anticipated changes is the reduction in salinity levels in the area as demonstrated by hydrologic modeling.

Hurricanes Katrina and Rita resulted in a total marsh loss of over one third of the total wetland losses predicted by the Coast 2050 Report. Within the Lake Borgne and MRGO area, approximately 663 acres of wetlands were converted to open water. This loss rate exceeded the average background loss rate of approximately 144 acres per year from 1988 to 2004. In the northern and eastern shorelines of Lake Borgne, new water bodies formed and existing water bodies expanded.

In the FWOP conditions, wetland losses would be offset to some extent by other Federal, state, local, and private restoration efforts. Under the 2007 WRDA Section 7006, the LCA program has authority for feasibility-level reports of six near-term critical

restoration features. The projects that are considered a part of the FWOP conditions for this study include:

- **Medium Diversion at White Ditch** – The draft recommended plan includes diverting up to 35,000 cubic feet per second (cfs) of freshwater from the Mississippi River left descending bank at river mile 64.5 into the Breton Sound basin as well as restore thirty-two acres of ridge and terrace habitat and restore 385 acres of marsh. The diversion influence area is approximately 98,000 acres.
- **Amite River Diversion and Canal Modification; 500 cfs freshwater diversion**. This project is currently in the feasibility phase with a final report expected in December 2010. This project would construct gaps in the existing banks of the Amite River Diversion Canal to allow floodwaters to introduce additional nutrients and sediment into western Maurepas Swamp. The exchange of flow would occur during flood events on the river and from the runoff of localized rainfall events. Nutrients and sediment would be provided to facilitate organic deposition in the swamp, improve biological productivity, and prevent further swamp deterioration. This project is designed to complement two other LCA projects: the Hope Canal Diversion and Convent/Blind River Diversion, and one proposed CIAP project, Hydrologic Restoration in Swamps West of Lake Maurepas.
- **Hope Canal freshwater diversion; 1,000 cfs freshwater diversion**. This restoration feature involves a small diversion from the Mississippi River through a new control structure at Hope Canal. The objective is to introduce sediment and nutrients into Maurepas Swamp south of Lake Maurepas. The introduction of additional freshwater via the diversion would facilitate organic deposition, improve biological productivity, and prevent further deterioration of the swamp. Work for this feature has been initiated in engineering and design and NEPA compliance under CWPPRA.
- **Blind/Convent River Diversion; 3,000 cfs freshwater diversion**. This project is currently in the feasibility phase with a final report expected in December 2010. The project would involve construction of a small siphon(s) over the Mississippi River levee or construction of a concrete multi-barrel box culvert(s) in the Mississippi River in the vicinity of Convent. Freshwater from the Mississippi River would flow into a conveyance channel and eventually distributed through a network of small conveyance ditches in the project area.

Other restoration projects occurring in the study area that would have an effect on FWOP conditions include:

- CWPPRA PO-30 Lake Borgne Shoreline Protection project.
- CWPPRA PO-32 Lake Borgne and MRGO Shoreline Protection project. This project was authorized in April 2003. Phase I design was complete in 2005 and phase II design was complete in 2007. Construction is anticipated to start in November 2011. Anticipated net acres benefited are 266 acres.
- CWPPRA PO-34 Alligator Bend Marsh Restoration and Shoreline Protection. This project is currently in planning and design. Construction is anticipated to

start in October 2011 and end in September 2012. Anticipated net acres benefited would be 127 acres.

- CWPPRA PO-36 (EB) Orleans Landbridge shoreline protection and marsh restoration. The goal of the project is to protect approximately 1,400 acres.
- Lake Borgne and MRGO Shoreline Protection and accretion behind shoreline protection structures – Area 1 Doulluts Canal to Jahncke's Ditch. Construction would commence in 2010 and protect approximately 3.8 acres/year and restore approximately 17 acres by 2030.
- Lake Borgne and MRGO Shoreline Protection - Area 3 Doulluts Canal to Lena's Lagoon. Construction would commence in 2010 and is anticipated to stop land loss and restore approximately 8.2 acres per year.
- USACE 3rd and 4th Supplemental Funds - Lake Borgne Shoreline Protection and Marsh Restoration Project. This restoration project would create and nourish marsh in the Golden Triangle and Shell Beach area and protect shoreline in the Shell Beach area. Anticipated net acres benefited would be approximately 29 acres per year.
- CIAP, The Rigolets Shoreline Protection and Marsh Restoration – Grand Coin Pocket, tier 2. Anticipated net acres benefited would be 100 acres.
- CIAP, Lake Pontchartrain Shoreline Protection and Marsh Restoration – Irish Bayou to Chef Menteur Pass, tier 2. Anticipated net acres benefited would be 46 acres.
- CIAP, Fritchie Marsh Stormwater Diversion.
- State shoreline protection project along the Interior Biloxi Marsh funded with Federal surplus funds
- WRDA 07 - The Violet Freshwater Diversion Project – Project to construct a freshwater diversion to meet or maximize the ability to meet the benefits identified in the Bonnet Carre' Feasibility Study and Report prepared in 1984. The Violet WRDA project is pending the findings of this study.
- Orleans Parish Sewage and Water Board plan to redirect wastewater effluent from the Mississippi River into the Central Wetlands to provide nutrients and freshwater to restore cypress swamp.

As a result of the LCA diversion projects in the Upper Pontchartrain sub-basin and the Hurricane and Storm Damage Risk Reduction System (HSDRRS) storm barriers, the salinity regime in the Lower Pontchartrain sub-basin is anticipated to significantly change from baseline conditions. **Table 9-1** demonstrates the projected FWOP salinity range based on the hydrology and hydraulics (H&H) modeling results.

Table 9-1: Base and Predicted Future Without Project Salinity Range for Lake Borgne Ecosystem

	1		2		13		14		73		74	
BOX	**Base**	**FWOP**	**Base**	**FWOP**	**Base**	**FWOP**	**Base**	**FWOP**	**Base**	**FWOP**	**Base**	**FWOP**
January	4-6	3-5	5-8	5-7	8-10	7-11	14-21	13-19	7-11	7-10	13-19	11-16
February	2-4	1-3	4-7	4-6	5-8	5-8	12-18	10-15	5-8	5-7	11-17	9-13
March	2-3	1-3	3-5	3-5	5-8	5-7	11-17	10-15	4-7	4-6	10-15	8-12
April	2-4	2-3	3-5	3-4	6-9	5-8	13-19	11-17	5-8	4-7	11-16	7-11
May	3-6	3-5	3-5	3-4	8-10	7-10	15-22	13-19	6-9	5-8	11-17	8-11
June	4-7	3-6	3-6	3-5	9-14	8-12	16-24	14-21	7-10	6-9	12-18	8-12
July	5-8	4-7	4-6	3-5	10-14	8-12	17-24	15-22	7-11	6-9	13-18	9-14
August	6-10	5-8	4-7	4-6	11-16	10-14	18-26	16-24	8-13	7-11	14-21	12-17
September	7-10	6-9	5-8	4-7	11-17	10-15	18-26	17-25	9-13	8-12	15-22	13-19
October	7-11	6-10	5-9	5-7	12-18	11-17	19-27	18-25	10-14	9-13	17-24	15-21
November	7-11	6-10	6-9	5-8	12-18	11-16	19-27	17-25	10-14	9-13	17-24	15-21
December	6-9	5-8	6-9	5-8	10-15	10-14	17-25	16-23	9-13	8-12	16-23	14-20

The Box numbers correspond to the numbers assigned to the boxes in the H&H model and represent specific areas within the Lower Pontchartrain sub-basin. For instance, Box 2 refers to the Lake Borgne area; box 14 represents the Mississippi Sound, box 73 is the Interior Biloxi Marsh. As is demonstrated in the table, salinity levels are projected to change for the Lake Borgne area in 1 ppt to 2 ppt on average.

9.2 Action Alternatives

9.2.1 Violet Freshwater Diversion

Four alternative locations were evaluated in the vicinity of Violet. These sites are numbered 1 to 4 from north to south moving downriver. Locations 1, 2, and 4 are located in undeveloped areas. Location 3 is the existing Violet Canal. Because hydrodynamic modeling indicates that all of the locations would produce the same benefits, the locations were evaluated to determine differences in potential costs and impacts.

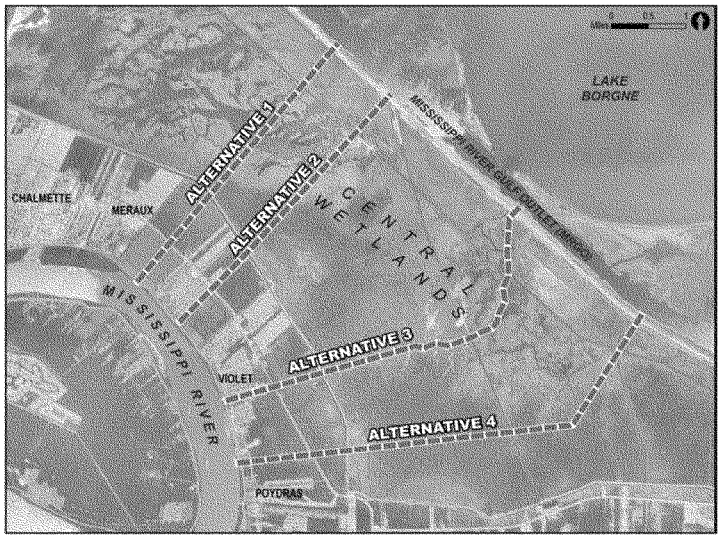


Figure 9-1: Alternative Locations for the Violet Freshwater Diversion Considered in Initial Analysis

The team identified eleven site selection factors to consider in evaluating the potential diversion locations. These factors are identified in **table 9-2**. Each of the factors was identified to help highlight significant considerations for site comparison including sizing, costs, impacts, and construction considerations. The team employed a GIS system to overlay diversion footprints between the river and the MRGO within each of the four corridors. Using the GIS system and field observations, the team quantified each of the factors and tabulated the results for comparison of the alternative locations.

Table 9-2: Alternative Violet Freshwater Diversion Location Comparison

Site Selection Factor	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Number of Businesses, Residences and Secondary Structures (Relocations)	0	1	121	0
Number of Scenic Streams	0	0	4	2
Number of Roads	2	2	10	2
Wetland Acres	227	267	738	836
Number of Levees	2	2	4	2
Number of Cultural and Historic Resources	0	1	3	2
Docks/Maritime Infrastructure	0	0	7	1
Utilities & Pipelines	2	2	4	5
Diversion Channel Length (miles)	4.19	4.32	5.53	6.27
Community Facilities	0	1	1	0
Number of Bridge Replacements	0	0	1	0

Alternative Location 1 was determined to be the best hydraulic location for the freshwater diversion, because it is the shortest, most-efficient route to the MRGO. The distribution of freshwater throughout the Central Wetlands is more efficient at this location because it is centrally located. Alternative 1 also has the fewest wetland impacts of all four locations and does not involve any potential cultural or historic resources. Alternative Location 2 is a comparable hydraulic location to Location 1. However, Alternative 2 would impact historic oak trees and a pecan grove. The pecan grove includes an area designated for local schools to use as an outdoor learning center, and therefore impacts business and community facilities. Alternative 2 also has greater wetland impacts than Alternative 1. Because Alternatives 1 and 2 are hydraulically similar, and Location 1 has less wetland impacts and no cultural/historic or community impacts, Location 2 was removed from further consideration.

Alternative Location 3 is the site of the existing Violet Canal. The use of this site would require the relocation of approximately 121 structures. Alternative 3 has the greatest potential impacts to businesses, homes, scenic streams, roads, bridges, levees, cultural and historic resources, docks and other maritime infrastructure. The existing Violet Canal site would impact 738 acres of wetlands, and is over a mile longer than Locations 1 and 2. Despite these potential impacts, this location was retained for further evaluation with Location 1 due to stakeholder interest.

Location 4 is the longest route, and the land between the Mississippi River and the Forty Arpent Levee is at a higher elevation than at the other locations, which would require the largest structures of all four locations. Additionally, distribution to the northern portion of the Central Wetlands would be difficult from this location. Alternative 4 would require the largest structures due to its location on the river. Alternative 4 has the greatest potential impacts to existing wetlands, utilities and pipelines. The site includes in-river maritime infrastructure used for docking vessels that support the Sealift Operations. Therefore, Location 4 was removed from further consideration.

The Violet Freshwater Diversion is an important component of the plan to restore historic salinity conditions and provide freshwater and nutrients to nourish existing and restored wetlands in the study area. However, additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083. For the purposes of this study, the Violet Freshwater Diversion is anticipated to cost approximately $500 million.

9.2.2 Alternative B - MRGO Restoration Plan 2

Alternative B would restore approximately 54 acres of ridge habitat along Bayou La Loutre in the Biloxi Marsh area, provide 122 acres of shoreline protection, restore, and nourish 10,318 acres of cypress swamp habitat in the Central Wetlands, and restore and nourish 19,630 acres of wetlands in the Lower Pontchartrain sub-basin. The freshwater diversion, pulsing 7,000 cfs from April to May would influence approximately 115,078

acres. Reference **figure 9-2** for alternative B features and **table 9-3** for alternative acres by habitat type. When conducting the analysis for the wetland value assessment, the imagery utilized by the USGS for their land to water determinations and habitat type classifications is more current than that utilized by the USACE engineering department. Because of this, acreages between the footprints and the habitat analysis vary somewhat, but it does not affect the outcome benefit cost analysis. The diversion channel would result in the permanent loss of 302 acres of prime/unique farmland and 227 acres of wetland. Restoration of the Bayou La Loutre ridge would result in permanent impacts to 54 acres of wetland.

Table 9-3: Alternative B – MRGO Restoration Plan 2

Feature	Average Annual Habitat Units (AAHU)	Net Acres (Target Year [TY] 50)	TY 1 Acres FWOP	TY 1 Acres Future With Project (FWP)	TY 50 Acres FWOP	TY 50 Acres FWP	Habitat Type
A-Biloxi	11.7	19	58	61	43	62	Intermediate/Brackish
D-Central Wetlands	7,365.6	9543	16324	18212	11841	21384	Fresh
E-East Orleans Landbridge	4,419.1	6138	44750	42282	33016	39154	Brackish
F-Terre Aux Boeuf	1,811.8	3358	9651	10459	6923	10281	Brackish/Saline
TOTAL PLAN 2	**13,608.1**	**19058**	**70783**	**71014**	**51823**	**70881**	
Diversion Only Influence		14,637	115,078	115,078	86,095	100,732	

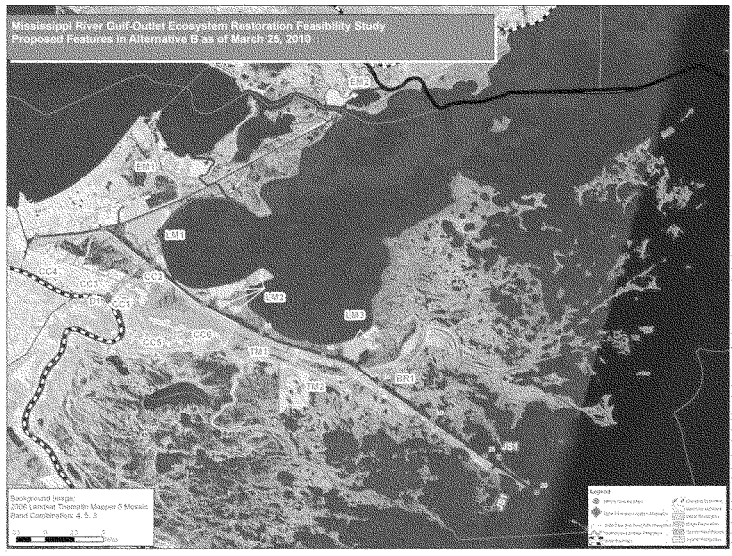


Figure 9-2: Alternative B – MRGO Restoration Plan 2

9.2.3 Alternative C - MRGO Restoration Plan 7

Alternative C would restore approximately 54 acres of ridge habitat in the Biloxi Marsh area, provide 1,937 acres of shoreline protection, create, and nourish 10,318 acres of cypress swamp habitat in the Central Wetlands, and create and nourish 44,188 acres of wetlands in the Lower Pontchartrain sub-basin. The freshwater diversion would influence approximately 115,078 acres. The diversion channel would result in the permanent loss of 302 acres of prime/unique farmland and 227 acres of wetland. Restoration of the ridge would result in permanent impacts to 54 acres of wetland. Reference **figure 9-3** for alternative C features and **table 9-4** for alternative acres by habitat type.

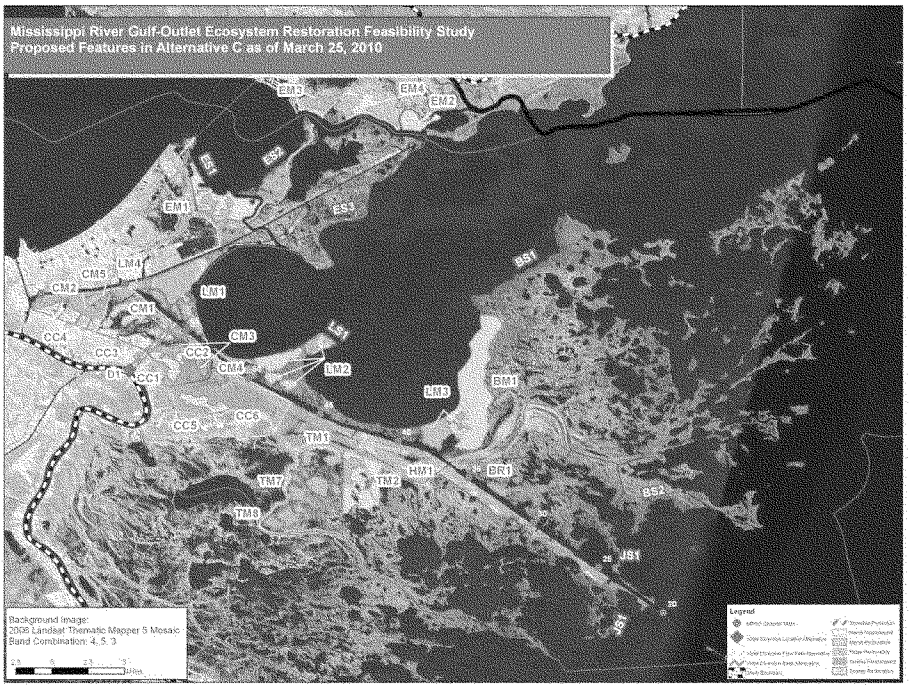


Figure 9-3: Alternative C – MRGO Restoration Plan 7

Table 9-4: Alternative C – MRGO Restoration Plan 7

Feature	AAHU	Net Acres (TY50)	TY 1 Acres FWOP	TY 1 Acres FWP	TY 50 Acres FWOP	TY 50 Acres FWP	Habitat Type
A-Biloxi	1,948.6	3,013	56237	55930	42602	45615	Intermediate/Brackish
D-Central Wetlands	7,463.4	9,543	16324	18218	11841	21384	Fresh
E-East Orleans Landbridge	5,120.1	7,546	48570	42788	36323	43869	Brackish
F-Terre Aux Boeuf	3,043.6	5,566	10823	10846	7763	13329	Brackish/Saline
H-21-Hopedale	164.3	299	1363	1365	1064	1363	Brackish
TOTAL PLAN 7	**17,575.7**	**25,967**	**133317**	**129147.0**	**99593.0**	**125560**	
Diversion only (no features)		115078	115078	86095	100732	14637	

9.2.4 Alternative D - MRGO Restoration Plan 10

Alternative D would restore approximately 54 acres of ridge habitat in the Biloxi Marsh area, provide 2,494 acres of shoreline protection, create, and nourish 10,318 acres of cypress swamp habitat in the Central Wetlands, and create and nourish 44,892 acres of wetlands in the Lower Pontchartrain sub-basin. The freshwater diversion would influence approximately 115,078 acres. The diversion channel would result in the permanent loss of 302 acres of prime/unique farmland and 227 acres of wetland. Restoration of the ridge would result in permanent impacts to 54 acres of wetland. Reference **figure 9-4** for alternative C features and **table 9-5** for alternative acres by habitat type.

Table 9-5: Alternative D – MRGO Restoration Plan 10

Feature	AAHU	Net Acres (TY50)	TY 1 Acres FWOP	TY 1 Acres FWP	TY 50 Acres FWOP	TY 50 Acres FWP	Habitat Type
A-Biloxi	2,018.6	3,197	56749	57239	42848	46045	Intermediate/Brackish
D-Central Wetlands	7,616.7	9,543	16324	18217	11841	21384	Fresh
E-East Orleans Landbridge	4,408.9	7,699	48570	29102	36323	44022	Brackish
F-Terre Aux Boeuf	2,907.8	5566	10823	10846	7763	13330	Brackish/Saline
H-21-Hopedale	164.3	299	1363	1365	1064	1363	Brackish
TOTAL PLAN 10	**17,116.3**	**26304**	**133829**	**116769**	**99839**	**126144**	
Diversion Only (no features)		115078	115078	86095	100732	14637	

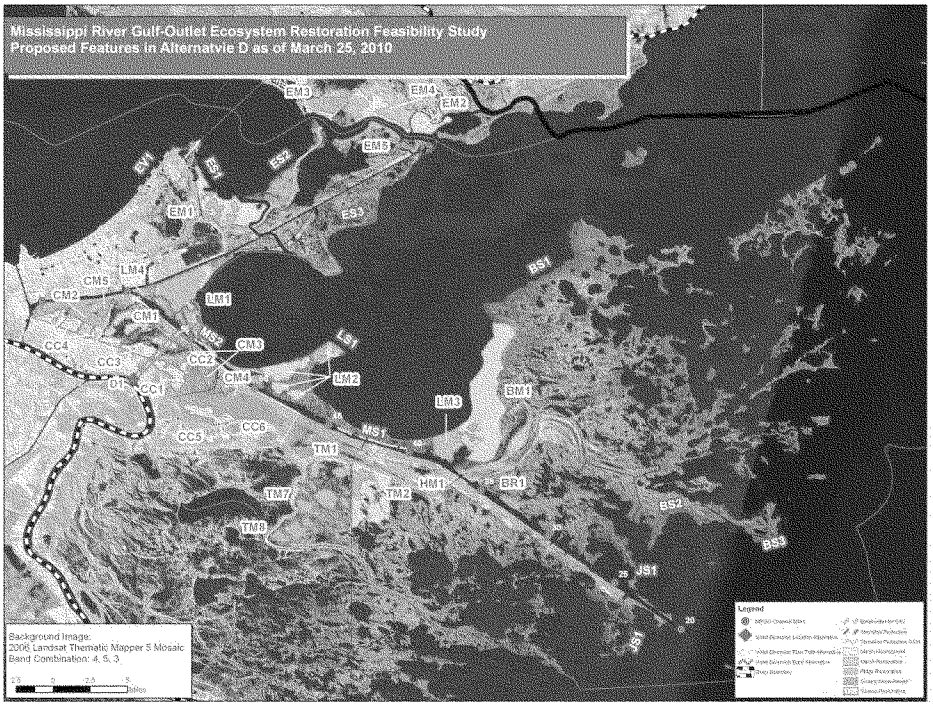


Figure 9-4: Alternative D - MRGO Restoration Plan 10

EVALUATION OF ALTERNATIVE PLANS

The evaluation of effects, or comparison of the future without-project and with-project conditions for each alternative, is a requirement of NEPA and Engineer Regulation (ER)-1105-2-100. The evaluation was conducted by assessing or measuring the differences between each without- and with-project condition and by appraising those differences. The evaluation consisted of four general tasks described below:

1. Forecast the most likely with-project condition expected under each alternative plan,
2. Compare each with-project condition to the without-project condition and document the differences between the two,
3. Characterize the beneficial and adverse effects by magnitude, location, timing and duration, and
4. Identify the plans that will be further considered in the planning process, based on a comparison of the adverse and beneficial effects and the evaluation criteria.

Plans were evaluated based on the following criteria: all relevant resources, outputs and plan effects; contributions to the Federal objective (NER), the study goals and objectives, compliance with environmental protection requirements, the Planning Guidance Notebook's four evaluation criteria (completeness, effectiveness, efficiency and acceptability), and other criteria deemed significant by participating stakeholders.

Ecosystem restoration alternatives must also be evaluated based on cost effectiveness and incremental cost analysis (CE/ICA) and significance of ecosystem outputs must be determined. Display of the environmental quality account is required for this study using a minimum of two categories of effects: costs and ecosystem restoration outputs.

MRGO Ecosystem project was evaluated first by individual measures. Then plans were combined based on cost effectiveness. Three plans were selected as the final array of plans for further evaluation. The final three plans were evaluated by a combination of measures within subunits for each of the three final array plans. There were five subunits including A-Biloxi, D-Central Wetlands, E-East Orleans Landbridge, F-Terre aux Boeuf, and H-Hopedale. The subunits that are influenced by the diversion (A-Biloxi, D-Central Wetlands, and E-East Orleans Landbridge) were evaluated with the diversion. There were a total of 74 Wetland Value Assessment (WVA) evaluations completed to date.

Habitat acreage, shoreline erosion, and interior marsh loss rate data were obtained from the USGS. WVA projections were made by members of the Habitat Evaluation Team (HET), which included representatives of the Corps of Engineers Mississippi Valley New Orleans (CEMVN), United States Fish and Wildlife Service (USFWS), Office of Coastal Protection and Restoration (OCPR), National Marine Fisheries Service (NMFS), Natural Resources Conservation Service (NRCS), and the Louisiana Department of Wildlife and Fisheries (LDWF). Prior to making those projections, HET members made onsite field inspections in June and October 2009.

Field data, results from similar projects in the area, Storm-induced Beach Change (SBEACH) models, and Hydrologic models were used in conjunction with the above-discussed mathematical models to compute a habitat site index (HSI) value for each target year (TY). Target years were established when significant changes in habitat quality or quantity were expected during the 50-year project life, under Future With Project (FWP) and FWOP conditions.

The product of an HSI and the acreage of available habitat for a given target year is known as the Habitat Unit (HU). The HU is the basic unit for measuring project effects on fish and wildlife habitat. Future HUs change according to changes in habitat quality and/or quantity. Results are annualized over the project life to determine the Average Annual HUs (AAHUs) available for each habitat type.

The change in AAHUs for each FWP scenario, compared to FWOP project conditions, provides a measure of anticipated impacts. A net gain in AAHUs indicates that the project is beneficial to the habitat being evaluated; a net loss of AAHUs indicates that the project is damaging to that habitat type. In determining FWP conditions, all project-

related direct (construction) impacts were assumed to occur from TY 1 through TY10 for marsh restoration and nourishment, TY1 through TY5 for the diversion, and TY1 for shoreline protection and the ridge.

Using the WVA methodology, impact assessments were conducted by the HET for the Final Array of Alternative Plans with the following resulting benefits:

Table 9-6: Final Array of Alternative Plans

Feature	AAHU	Net Acres (TY50)	TY 1 Acres FWOP	TY 1 Acres FWP	TY 50 Acres FWOP	TY 50 Acres FWP
Alternative B – MRGO Restoration Plan 2						
A-Biloxi	11.7	19	58	61	43	62
D-Central Wetlands	7,365.6	9543	16324	18212	11841	21384
E-East Orleans Landbridge	4,419.1	6138	44750	42282	33016	39154
F-Terre Aux Boeuf	1,811.8	3358	9651	10459	6923	10281
TOTAL PLAN 2	**13,608.1**	**19058**	**70783**	**71014**	**51823**	**70881**
Alternative C – MRGO Restoration Plan 7						
A-Biloxi	1,948.6	3,013	56237	55930	42602	45615
D-Central Wetlands	7,463.4	9,543	16324	18218	11841	21384
E-East Orleans Landbridge	5,120.1	7,546	48570	42788	36323	43869
F-Terre Aux Boeuf	3,043.6	5,566	10823	10846	7763	13329
H-Hopedale	164.3	299	1363	1365	1064	1363
TOTAL PLAN 7	**17,575.7**	**25,967**	**133317**	**129147.0**	**99593.0**	**125560**
Alternative D – MRGO Restoration Plan 10						
A-Biloxi	2,018.6	3,197	56749	57239	42848	46045
D-Central Wetlands	7,616.7	9,543	16324	18217	11841	21384
E-East Orleans Landbridge	4,408.9	7,699	48570	29102	36323	44022
F-Terre Aux Boeuf	2,907.8	5566	10823	10846	7763	13330
H-21-Hopedale	164.3	299	1363	1365	1064	1363
TOTAL PLAN 10	**17,116.3**	**26304**	**133829**	**116769**	**99839**	**126144**

COMPARISON OF ALTERNATIVE PLANS

Alternative plans (including the no action plan) were compared against each other, with emphasis on the outputs and effects (beneficial and adverse) with respect to study goals and objectives and NER benefits and costs. **Table 9-7** provides a summary of how each alternative plan meets the study objectives.

Table 9-7: Comparison of Alternatives to Study Objectives

Study Objective	Meets Study Objective?			
	Alternative A	Alternative B	Alternative C	Alternative D
1. Salinity Target	Yes	Yes	Yes	Yes
2. Cypress Swamp Restoration (Minimum 9,500 acres)	No	Yes 10,318 acres	Yes 10,318 acres	Yes 10,318 acres
3. Fresh/Intermediate Marsh Restoration (Minimum 6,800 acres)	No	Yes 9,778 acres	Yes 13,770 acres	Yes 13,975 acres
4. Brackish Marsh Restoration (Minimum 18,100 acres)	No	No 11,455 acres	Yes 37,392 acres	Yes 38,096 acres
5. Additional Marsh, e.g. Saline, Restoration (Minimum 3,900 acres)	No	Yes 8,372 acres	Yes 8,838 acres	Yes 9,071 acres
6. Habitat Switching (switch restored elsewhere)[a]	No	No –18,069 acres	Yes +7,253 acres	Yes +7,957 acres
7. Ridge Habitat Restoration	No	Yes 54 acres	Yes 54 acres	Yes 54 acres
8. Landscape Features for Surge Reduction[b]	No	Yes 5,100 acres	Yes 11,222 acres	Yes 11,926 acres

[a] The habitat switching metric is measured by the amount of existing the habitat type switched compared to the amount of that habitat type restored or nourished elsewhere beyond the target amount.
[b] Landscape features for surge reduction include acres restored, nourished or protected on the East Orleans Landbridge and the Biloxi Marsh.

APPENDIX Y

DRAFT
PUBLIC HEARING RECORD
AND
DEIS COMMENT SUMMARY

Table of Contents

1.0 Public Notices **1**

1.1 Notice of Availability 1
1.2 Public Meeting Notices 1

2.0 Public Hearings **1**

2.1 Public Hearing Locations and Attendance 1
2.2 Public Hearing Format 2
2.3 Public Hearing Displays 2
2.4 Public Hearing Verbal Comments 3

3.0 Public Comment Period **3**

3.1 Formal Comment Period 3
3.2 Method of Commenting 3

4.0 Comment Summary **4**

4.1 General Comments Received 4
4.2 Comment Summarization Methodology 5
4.3 Frequency of Comments 7
4.4 Comment and Responses 10

Tables

Table 1 MRGO DEIS Public Hearing Summary 2
Table 2 Summary of Major Topics and Recurring Themes 5
Table 3 Summary of Multiple and Single Comments by Most Frequent Theme 9
Table 4 Magnitude of Comments Received Relative to Support of Plan Elements (Theme ID E) 10
Table 5 Summary of General Comments (All Themes) ..... Table 5-1 to Table 5-8
Table 6 Summary of Comments – Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X) ..... Table 6-1 to Table 6-7
Table 7 Summary of Comments – Specific Additional Components (Theme ID D6) ..... Table 7-1 to Table 7-6
Table 8 Summary of Comments – Displacements / Real Estate / Compensation (Theme ID O) ..... Table 8-1 to Table 8-3

Figures

Figure 1 Frequency of Individual Comments by Most Frequent Theme 8

Appendices

Appendix Y1: Public Notices - Notice of Availability (*Federal Register* and USACE Letter), Public Meeting Notices, Newspaper Articles

Appendix Y2: Public Hearing January 20, 2011 – Attendance / Sign-in Sheets, Comment Cards, List of Speakers, Transcripts

Appendix Y3: Public Hearing January 25, 2011 – Attendance / Sign-in Sheets, Comment Cards, List of Speakers, Transcripts

Appendix Y4: Public Hearing February 8, 2011 – Attendance / Sign-in Sheets, Comment Cards, List of Speakers, Transcripts

Appendix Y5: Federal and State Agency and Elected Officials Comments / Letters

Appendix Y6: Local Agency and Elected Officials Comments and Letters (St. Bernard Parish)

1.0 PUBLIC NOTICES

1.1 Notice of Availability

The MRGO Ecosystem Restoration Study Draft Environmental Impact Statement (DEIS) was made available for public review and comment in mid-December 2010. A Notice of Availability (NOA) was published in the *Federal Register* (Vol. 75, No. 242) on December 17, 2010. The purpose of the NOA was to inform the public and agencies that the DEIS was available for public review and comment. The NOA provided contact information and a deadline for submitting comments which was established as January 31, 2011, that was consistent with a 45-day formal comment period. See **appendix Y1** for the *Federal Register* NOA.

A notice of availability letter was mailed to the USACE New Orleans District stakeholder and NEPA mailing lists on December 17, 2010. This notice provided a description of the proposed action including the project features, a point of contact to obtain more information regarding the DEIS, and a means of commenting on the MRGO Restoration Plan Feasibility Study (Feasibility Study) and the DEIS. See **appendix Y1** for the USACE NOA.

On December 14, 2010, numerous MRGO Study Products were uploaded to the MRGO website (www.mrgo.gov) for public review including the DEIS and its associated technical appendices, as well as the accompanying Feasibility Study.

1.2 Public Meeting Notices

Three Public Hearings were scheduled on January 20, 2011, January 25, 2011 and February 3, 2011. Due to inclement weather, the February 3, 2011 meeting was rescheduled for February 8, 2011. Public meeting notices were published in advance of each meeting in local newspapers including *The Times-Picayune*, *The St. Bernard Voice*, and *The Sun Herald,* which serves Biloxi-Gulfport and south Mississippi. Additional public meeting notices were published in *The Times-Picayune* on February 6, 2011 and February 8, 2011 to advise the public of the rescheduled February 8th meeting. The notices provided the location and time for each meeting, an outline of the MRGO ecosystem restoration plan features, contact information (phone number and web site addresses) to obtain more information regarding the MRGO Restoration Plan and the DEIS. Public meeting notices were also placed on the MRGO website. See **appendix Y1** for the public meeting notices and three news articles that were published and/or online regarding the project during the comment period.

2.0 PUBLIC HEARINGS

2.1 Public Hearing Locations and Attendance

Following the NOA of the MRGO DEIS, the USACE held three Public Hearings as an opportunity for the public, resources agencies, and elected officials to participate in the NEPA planning process, to provide input regarding the proposed restoration features, and to provide

comments on the DEIS and Feasibility Study. Information on the locations and participation at the Public Hearings are shown in **table 1.** The number of attendees at each of the Public Hearings was recorded for those individuals that signed-in at each venue. Sign-in sheets for each of the Public Hearing venues are contained in **appendix Y1**, **Y2**, and **Y3** respectively, for each of the three meeting dates.

Table 1: MRGO DEIS Public Hearing Summary

Date	Location	Attendees	Speakers/Commenters
January 20, 2011	C.F. Rowley Alternative School; Chalmette, LA	261	19
January 25, 2011	Leo Seal Community Center; Waveland, MS	73	14
February 8, 2011	Light City Christian Academy; New Orleans, LA	104	22
Total		**438**	**55**

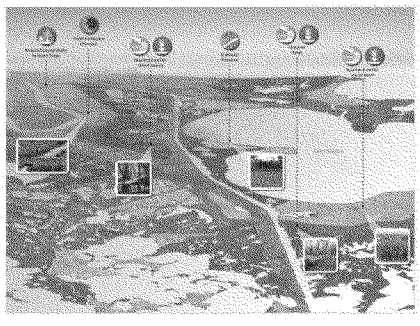
2.2 Public Hearing Format

The Public Hearings followed a "traditional format public meeting" with an open house from 6 to 6:30 p.m., followed by a presentation on the project by the USACE, ending with discussion and comment opportunity. Large-scale graphic display boards and exhibits were set up within each meeting venue to allow the public to review project features prior to the formal presentation. The formal presentation included: opening remarks by the USACE meeting facilitator; an introduction by Colonel Ed Fleming, District Commander for the USACE New Orleans District (January 20, 2011 - Chalmette meeting); an overview of the NEPA process by USACE Environmental Manager, Ms. Tammy Gilmore, and a PowerPoint presentation by Mr. Greg Miller, Chief of the Plan Formulation Branch and LA Coastal Restoration Team.

2.3 Public Hearing Displays

Public Hearing displays and graphics included, just to name a few:

- Planning process;
- Problems and opportunities within the ecosystem;
- Proposed restoration plan features;
- Impacts of the MRGO and other existing conditions in the ecosystem;
- Reference material and fact sheets related to the project; and
- A aerial model of the study area and proposed restoration features.



SOURCE: MRGO Website, En Vision Studio

Similar graphics are currently on the MRGO website, under the Images page.

2.4 Public Hearing Verbal Comments

Following the formal presentation, meeting attendees were provided the opportunity to comment on the restoration plan and its associated features. Meeting attendees desiring to provide a verbal comment were asked to complete a comment card and were then called to the microphone (to ensure that their comment could be heard by all and made a part of the meeting transcript) to provide their comment.

A brief summary of the general comments expressed at the Public Hearing included:

- Concern for construction of the diversion structure in St. Bernard Parish at its current proposed location through the Sinclair Tract and the potential for increased flooding.
- Inquiries regarding alternative locations that were considered for the diversion structure and whether the USACE considered the old water plant at the historic battlefield to the north or measures to utilize the existing Violet Siphon.
- Concerns regarding adverse impacts of freshwater on recreation and commercial fisheries.
- Concern regarding the cost of the project.
- Positive comments regarding the extensive restoration measures proposed, but participants wanted the study to move more quickly toward constructible features.

Comment cards, list of speakers, and transcripts prepared for the Public Hearings are contained in **appendix Y1**, **Y2**, and **Y3** respectively, for each of the three meeting dates.

3.0 PUBLIC COMMENT PERIOD

3.1 Formal Comment Period

The 45-day formal comment period began with the filing of the NOA on December 17, 2010, ending on January 31, 2011. The comment period was then extended twice by the USACE due to special requests to provide additional time to comment, coupled with an overwhelming response. The date for the first extension was February 14, 2011 and the final date for the acceptance of comments was established as March 5, 2011, resulting in an overall 78-day comment period.

3.2 Method of Commenting

Comments were submitted through the MRGO website www.mrgo.gov; submitted by email to Tammy.H.Gilmore@usace.army.mil; submitted by phone to Tammy Gilmore, Environmental Manager at 504-862-1002; and submitted by mail to US Army Corps of Engineers, New Orleans District, c/o Tammy Gilmore, PDR-RS, Mississippi River Gulf Outlet Ecosystem Restoration, P.O. Box 60267, New Orleans, LA 70160-0267. The predominate method of submitting comments was through the USACE website and through emails supported by various non-

government organizations (NGOs). Verbal comments were also received at each of the Public Hearings as noted above.

4.0 COMMENT SUMMARY

4.1 General Comments Received

Although 438 people attended the Public Hearings, the number of comments returned during the comment period far exceeded the hearing attendance. During the comment period, over 31,400 commenters provided written comments (via email, letter, and fax) and/or verbal comments on one recurring subject matter alone – Support of Plan Elements. The large comment response was primarily attributed to approximately 31,270 individual commenter's associated with 4 non-government organizations that submitted multiple form letters, with each set being identical in content. These form letters represented 99.5 percent of the comments received on the most common recurring comment theme.

A brief summary of the general comments received during the comment period include, but are not limited to the following:

- Concern regarding the diversion structure - do not want another canal cut through their community.
- Since the MRGO has been closed, the system has started to freshen; hence, constructing a diversion will disrupt the local community for no apparent good reason and waste funding that can be used for other restoration efforts.
- Diversion canal is not wanted because it would be another Corps "MRGO"
- Be sensitive to the community requirements and community dynamics and cohesiveness with respect to the location of the proposed diversion structure.
- Use of existing Violet Canal has a church located along the canal that could be impacted.
- Concerns about access impacts to economic resources, such as to professional recreational fisheries (guides, etc.); and to oysters and oyster industry because the diversion would destroy existing oyster reefs, thereby destroying the oyster industry.
- Concern regarding impacts of the diversion on the state oyster seed grounds in Lake Borgne.
- Diversion canal not wanted because it would be another Corps "MRGO"
- Be sensitive to community requirements, community dynamics, and cohesiveness with respect to the diversion.
- Culture of wetland resources uses (oysters, fish, etc.) being destroyed or adversely modified.
- Some NGOs would rather see oyster reefs as shoreline protection rather than sheet pile or stone.
- Work from the barrier islands first before working the interior portions of the Pontchartrain Basin.
- Fill in the MRGO instead of restoring areas impacted by the MRGO.

- Louisiana public believes the proposed action would benefit Mississippi residents at the expense of Louisiana residents.
- Dredging Lake Borgne for restoration features could cause increased storm surges into adjacent inhabited areas.
- Obtain sediment from the Mississippi River instead of Lake Borgne, which will have potential costs increases (i.e., increased distances to pump dredged material from the river results in increased costs). Sediment availability is an issue.
- Use of alternative fuels that could potentially impact local suppliers of oil and gas.
- Implement the project faster; tired of slow government pace of getting projects on line.

As noted, this summary is similar to the comments that were received at the Public Hearings.

4.2 Comment Summarization Methodology

As comments were received by the USACE, each was read and entered into a database. Names, organizations, addresses, and emails were all entered. Comments were initially identified under "major topics" and then for "recurring themes" to gain an understanding of key issues. Major topics included the diversion; sediment; additional plan features; and funding; just to name a few. Since each commenter generally commented on more than one issue, the comments were categorized among the 64 recurring themes or similar issues. All comments were reviewed to determine significance of each comment regardless of the recurrence of the comment. **Table 2** presents a summary of the major topics, where applicable, and the 64 recurring themes used to categorize each comment. Each of the recurring themes was assigned a theme identification (Theme ID). Since the majority of commenters generally commented on more than one issue, the respective comments were categorized among the individual 64 themes.

Table 2: Summary of Major Topics and Recurring Themes

Topic	Theme ID	Theme Description
Diversion Comments	A1	Restore or mimic natural hydrology / historic salinity regimes / implement freshwater diversions
	A2	Do not implement freshwater diversions
	A3	Freshwater diversions may adversely impact fisheries
	A4	Freshwater diversion makes marsh more susceptible to storm surge
	A5	Do not implement the Violet Freshwater Diversion at the Sinclair Tract / use Violet Canal
	A6	Question effectiveness of diversion
	A7	Supports alternative methods of delivering water
	A8	Diversion other
	A9	Diversion water quality concerns
	A10	Diversion is to benefit MS, not LA
	A11	Diversion will introduce water hyacinths
	A12	Comment on OMRR&R of diversion
	A13	Diversions do not build land
	A14	Freshwater benefits marsh
	A15	Freshwater benefits fisheries
	A16	Diversion may cause flooding
-	AB	Restore Barrier Islands / Outer areas to control salinity

Table 2: Summary of Major Topics and Recurring Themes

Topic	Theme ID	Theme Description
Outside / In MLOD	B1	Restore Barrier Islands
	B2	Protect / restore Outer Biloxi Marsh (from the outside in)
	B3	Restore natural features for storm risk reduction – Multiple lines of defense (MLOD)
	B4	Fund projects outside the levees / with direct protection value first
Sediment	C1	Concern about dredging Lake Borgne - storm surge
	C2	Concern about dredging Lake Borgne – fisheries
	C3	Use Mississippi River sediment
	C4	Sediment diversion is preferred
	C5	Concern about use of Lake Borgne (other) / alternative sediment sources
More is Needed	D1	Plan is not extensive / comprehensive enough
	D2	More oyster reef restoration is needed
	D3	Restore more of Bayou La Loutre Ridge
	D4	Restore the Bayou Terre aux Boeufs Ridge
	D5	Restore to pre-disturbance / historical conditions (fill-in channel)
	D6	Specific additional components
	D7	Restore banklines and constrict the channel
	D8	More planting
-	E	Support of plan elements
Funding	F1	Disagree with cost share interpretation by USACE
	F2	Plan should not be subject to cost effectiveness evaluation
	F3	Need to spend restoration funds wisely
	F4	Comment on cost of plan
	F5	Plan elements are a waste of money
Process	G1	Coordinate with other projects
	G2	Study process / Corps process takes too long
	G3	Need for citizen input in the decision-making process
	G4	Process other
	G5	Project is important / needs to be expedited
Recreation	H1	Positive comment on recreation features
	H2	Negative comment on recreation features
	H3	Concerns about maintenance of recreation features
-	I	Socio-economic impact concerns
-	J	Navigation concerns
-	K	Need for a diversity of habitats
-	L	Need to monitor / adaptively manage
-	M	Implement / incorporate existing plans
-	N	MRGO contributes to storm surge damage / was destructive
-	O	Displacement / real estate / compensation
-	P	Miscellaneous
-	Q	Use best science to make decisions
-	R	Use alternative fuels in construction
-	S	Requesting hard copy
-	T	Question
-	U	Restore Central Wetlands
-	V	Concern to particular species
-	W	Specific comment in reports / revisions
-	X	Agency recommendations / technical

4.3 Frequency of Comments

The 64 categories were further analyzed to determine the most frequently commented upon theme or issue. There were 15 similar recurring themes that captured an overwhelming majority of the comments. The 15 major issue categories listed in descending order of frequency include:

1. Support of Plan Elements;
2. More Oyster Reef Restoration is needed;
3. Need to Monitor / Adaptively Manage;
4. Restore Banklines and Constrict the Channel;
5. Restore or Mimic Natural Hydrology / Implement Freshwater Diversions;
6. Use Mississippi River Sediment;
7. MRGO Contributes to Storm Surge Damage / was Destructive;
8. Project is Important / Needs to be Expedited;
9. Concern about Dredging Lake Borgne – Fisheries;
10. Opposition to Location of Freshwater Diversion;
11. Suggested Specific Additional Components;
12. Restore the Central Wetlands;
13. Use Alternative Fuels in Construction;
14. Concern about Dredging Lake Borgne – Storm Surge; and
15. Diversion Water Quality Concerns.

Figure 1 graphically illustrates the ranking of the 15 most frequent theme comments and **table 3** provides a numerical account of the comments received for each of these 15 categories.

Figure 1: Frequency of Individual Comments by Most Frequent Theme

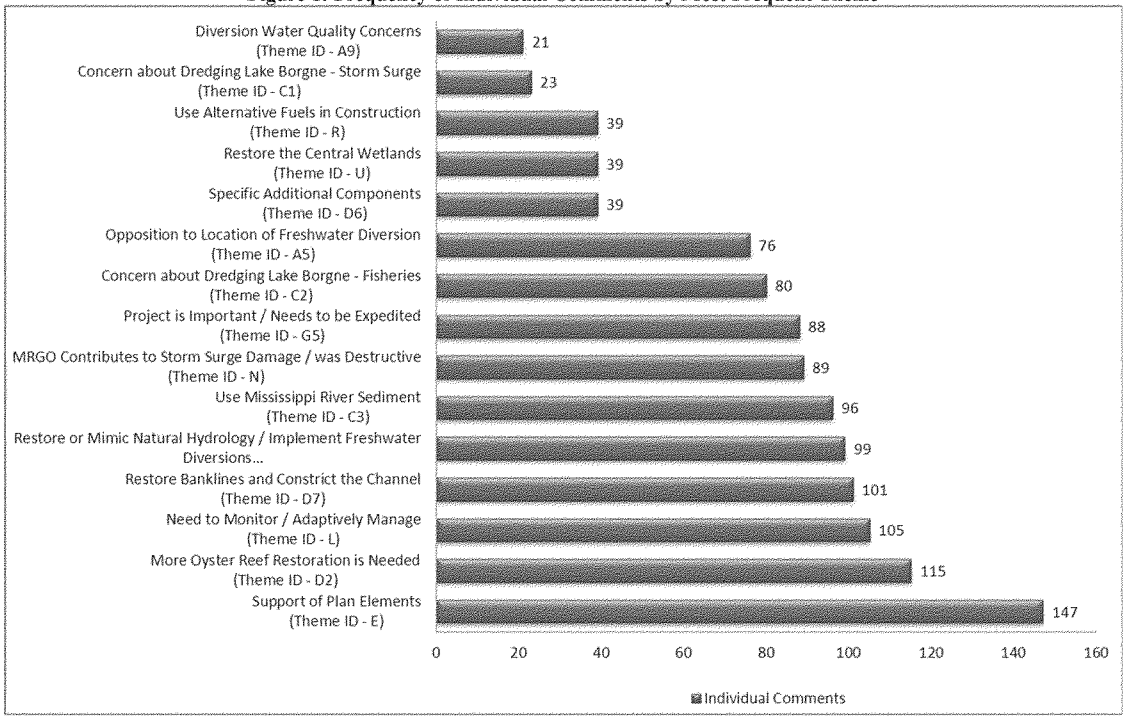


Table 3: Summary of Multiple and Single Comments by Most Frequent Theme

Major Topic	A - Diversion Comments			C - Sediment			D - More is Needed			-	G - Progress	-	-	-	-
Theme ID	A1	A5	A9	C1	C2	C3	D2	D6	D7	E	G5	L	N	R	U
	Restore or Mimic Natural Hydrology / Historic Salinity Regimes / implement Freshwater Diversions	Do not Implement the Violet Freshwater Diversion at the Sinclair Tract / Use Violet Canal	Diversion Water Quality Concerns	Concern about Dredging Lake Borgne - Storm Surge	Concern about Dredging Lake Borgne - Fisheries	Use Mississippi River Sediment	More Oyster Reef Restoration is Needed	Specific additional Components	Restore Banklines and Constrict the Channel	Support of Plan Elements	Project is Important/Needs to be Expedited	Need to Monitor/Adaptively Manage	MRGO Contributes to Storm Surge Damage / was Destructive	Use Alternative Fuels in Construction	Restore Central Wetlands
Number of Multiple Commenters	10,325	39	5,661	243	44	44	44	5,661	10,325	44	44	10,325	243	243	39
	39	5,661		39	10,325	10,325	10,325		243	10,325	10,325	243	39	39	5,661
	5,661			50	243	243	243		39	243	243	39	50	50	
	9,249			5,661	39	39	39		50	39	39	50	5,661	5,661	
					50	50	50		5,661	50	50	5,661	9,249		
					5,661	5,661	5,661		9,249	5,661	5,661	9,249			
					9,249	9,249			122	5,661	9,249	122			
							9,249			9,249					
							122								
Sum of Multiple Commenters	25,274	5,700	5,661	5,993	25,611	25,611	25,733	5,661	25,689	31,272	25,611	25,689	15,242	5,993	5,700
Total Number of Single Commenters	95	74	20	19	73	89	107	38	94	139	81	98	84	35	37
Number of Commenters	25,369	5,774	5,681	6,012	25,684	25,700	25,840	5,699	25,783	31,411	25,692	25,787	15,326	6,028	5,737
Number of Individual Comments	99	76	21	23	80	96	115	39	101	147	88	105	89	39	39

As shown in **table 3**, a significant number of multiple comments that were identical in content, were submitted through non-government organizations (NGOs). These NGO's included the National Wildlife Federation, Gulf Restoration Network, Audubon Society, and Environmental Defense Fund. Due to similarity, these NGO comments were considered a single comment for each set of identical comments submitted.

Table 4 summarizes just one of the comments received by all commenters under the recurring theme - Support of Plan Elements (Theme ID E). A review of the comments under this theme indicated 31,272 comments were derived from form letters/emails submitted by 4 NGOs. Individuals associated with the National Wildlife Federation alone submitted 10,325 identical comments, representing 33 percent of the total comments received on this specific subject matter. For tabulation and response purposes, because these 10,325 emails were exact duplicates of one another, this was considered only 1 comment regarding the particular subject matter.

In addition, 139 additional comments were received by 139 individuals or edited versions of the NGO comments on the same subject matter. This resulted in a total of 147 distinct comments submitted for this recurring theme.

Table 4: Magnitude of Comments Received Relative to Support of Plan Elements (Theme ID E)

Commenting Organization / Form Letter / email Designation	Number of Similar Comments Submitted under Support of Plan Elements (Theme ID E)
National Wildlife Federation 1	44
National Wildlife Federation 2	10,325
Gulf Restoration Network 1	243
Gulf Restoration Network 2	39
Audubon Society 1	50
Audubon Society 2	5,661
Audubon Society 3	5,661
Environmental Defense Fund	9,249
Sum of Multiple Commenters	31,272
Number of Single Comments	139
Number of Multiple Comments *	8
Number of Individual Comments	147

* The total is 8 for each of the similar NGO form letters submitted under Theme ID E, with each set being identical in content.

4.4 Comments and Responses

Note: Comment and response summary tables are included together at the end of this section.

Table 5 presents an overview of each of the recurring theme comments received during the comment period. In most cases the comments could generally be combined due to their similarity and individual responses have been provided for the similar comment. Where comments required detailed review or were more extensive, individual comment summary tables

were developed; i.e. **table 6** through **table 8**. Where comments did not require a response, the USACE response is noted as "Comment Acknowledged".

Table 6 lists the general comments received that were categorized under Specific Comment in Report / Revisions, Theme ID W and Agency Recommendations / Technical, Theme ID X. Comments included in this table were submitted by resource agencies such as the US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and US Environmental Protection Agency (EPA). Many of these comments required detailed review and individual responses that have been provided in the table and locations where they were addressed in the FEIS are noted.

Table 7 lists the comments received that were categorized under Specific Additional Components, Theme ID D6 that lists suggested plan components that the USACE should consider in future planning and design for the project. Many of St. Bernard Parish comments are included in this table.

Table 8 summarizes comments received relative to Displacements, Real Estate, and Compensation issues, Theme ID O.

Copies of Federal and State agency and government comment letters are included in **appendix Y5**. A copy of the St. Bernard Parish comments is included in **appendix Y6**.

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
DIVERSION COMMENTS	A1	Restore or mimic natural hydrology / historic salinity regimes / implement freshwater diversions	See Sections 2.3 and Section 2.9	The purpose of this study is to develop a comprehensive ecosystem restoration plan to restore the Lake Borgne ecosystem and the areas affected by the MRGO. The management measures outline in Section 2.3 were identified to address the ecological and man-made issues affecting the project area. A key item which is the Violet Diversion has the goal of restoring the natural hydrology of the area by reconnecting the Mississippi River which in turn would restore historic salinity levels.
	A2	Do not implement freshwater diversions	Discussing need for a diversion in Section 2.3.1.1; Benefits to Wetlands Section 2.4.1.1. See 2.6.2.1 for description and implementation of diversion.	The MRGO Restoration Project will be implemented in phases with the Violet Diversion being constructed in a later phase due to the need for additional study and design. The diversion is an important component of the project in terms of restoration and maintaining existing and created wetlands.
	A3	Freshwater diversions may adversely impact fisheries	See Section 2.12.6 about CASM Model; Sections 4.14.2; 4.15.2; 4.19.2 discuss impacts to fisheries.	Aquatic modeling results and the Preliminary Hydrodynamic and Hydraulic Modeling for a Proposed Freshwater Diversion in the Vicinity of Violet, Louisiana confirm that no significant impacts to net productivity for key fishery species would occur.
	A4	Freshwater diversion makes marsh more susceptible to storm surge		Comments acknowledged.
	A5	Do not implement the Violet Freshwater Diversion at the Sinclair Tract/Use Violet Canal	See Section 2.7.2 of FS	The site of the existing Violet Canal was evaluated. This location is less hydraulically efficient than the preferred site identified in the EIS and has the greatest potential impacts to businesses, homes, scenic streams, roads, bridges, levees, cultural and historic resources, docks and other maritime infrastructure. The existing Violet Canal site would impact 738 acres of wetlands, and is over a mile longer than the preferred site identified in the EIS. However, the Violet Freshwater Diversion is recommended for additional analysis, and site selection will be re-evaluated in future studies.
	A6	Question Effectiveness of Diversion	See Section 2 of FS / EIS	USACE modeling results show that the diverted water will effect the Biloxi marsh area. The diversion size selected is appropriate for the required purposes which are freshening the Central Wetlands and providing salinity reductions in Mississippi Sound.
			See Section 2 of FS / EIS	USACE initial modeling work indicated that the freshwater would get to those areas in the Central Wetlands where it was required to achieve the stated benefits. Additional modeling will be done to confirm this and to analyze whether a diversion at the Violet location could achieve the same benefits.

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
DIVERSION COMMENTS	A7	Supports Alternative Methods of Delivering Water	-	See Selected Specific Comments 1 to 6 Below
	1	Alternative method suggested - Piping system	-	Siphon systems are not as economically efficient as an gated structure for flows above 2,000 to 3,000 cfs. Closed canals are considerably more expensive than open canal systems. Once the diversion analysis moves forward, the USACE can do an economic comparison between the open and closed systems.
	2	Alternative method suggested - Pump with a pump outside the wall or build a levee along the side this structure	-	Alternative methods to deliver freshwater will be investigated in the study for the Violet Diversion which will be completed at a later date.
	3	Alternative method suggested - need an alternative way to reduce salinity	-	We are open to any alternative ways to reduce salinity. Alternative methods can be evaluated during the study for the Violet Diversion which will be completed at a later date.
	4	Alternative method suggested - Use the Bonnet Carre' Spillway	-	Use of flow from Bonnet Carre flow could be analyzed as a replacement to diversions. Currently there is concern about the effects of the Bonnet Carre flow on Lake Pontchartrain especially with regard to algal blooms.
	5	Alternative method suggested - Use of the Industrial Canal then back to MRGO	-	This option can be investigated during the Violet diversion study which will be completed at a later date.
	6	Alternative method suggested - Use the Bonnet Carre' Spillway, Fernier wetlands /Maurepas Land bridge then Lake Maurepas	-	Use of flow from Bonnet Carre flow could be analyzed as a replacement to diversions. Currently there is concern about the effects of the Bonnet Carre flow on Lake Pontchartrain especially with regard to algal blooms.
	A8	Diversion Other	See Section 2.6.2.1	The Violet Freshwater Diversion is undergoing further review and analysis.
	A9	Diversion water quality concerns	See Sections 3.7.1.1 and 3.7.1.5 for existing Mississippi River and Lake Borgne water quality respectively; Section 2.4.2 for effects of diversion on water quality.	Overall conclusion is that water quality impacts would not be of sufficient concern to override the value of the diversion to the project; however, water quality impacts would include a decrease in salinity in Lake Borgne, lower water temperatures the Central Wetlands and MRGO, and the potential for elevated levels of metals, bacterial, and other compounds equivalent to the Mississippi River.
	A10	Diversion is to benefit MS, not LA	-	One of the purposes of the diversion is to control salinity in the Mississippi Sound. Restoration of the Biloxi Marsh is an added benefit.
			-	The Violet diversion was authorized and designed to provide oyster benefits to the Mississippi Sound. The diversion will also provide benefits to the Central wetlands and the Biloxi marshes.
			-	The diversion can provide the larger flows needed to produce the proper salinity for oysters in Mississippi Sound. It is also capable of being operated at lower levels for benefits to the Central Wetlands, Biloxi Marsh and other surrounding areas. Further investigations will be done under a separate diversion study which will be completed at a later date.
	A11	Diversion will introduce water hyacinths	See Appendix T	As the diversion is finalized and operational, it would be monitored and any issues related to introduced species would be addressed as part of the Adaptive Management.

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
DIVERSION COMMENTS	A12	Comment on OMRR&R of Diversion	-	A detailed operational plan will be developed for structure operations. While the State will be in charge of the actual operations they will be required to operate in accordance with the operational plan.
			-	Part of the operational plan would be to monitor water levels at certain locations and to shut the structure down when those levels reach a certain elevation to restrict flooding of existing developed areas.
			-	With regard to an operational plan for the Violet Diversion to include more flexibility of flow (flow between 1,000 cfs and 7,000 cfs) and the need to further assess future hydrological and fisheries modeling and updated habitat assessments - A detailed operational plan will be developed for structure operations. The additional modeling and habitat assessment can be a part of the development of this plan.
	A13	Diversions do not build land	See Section 2.3.2.1 and 2.3.2.2	The overall goal of the Violet Freshwater Diversion is to bring freshwater into the ecosystem allowing marsh and swamp habitat to flourish. Healthy marsh would work to create a more stable coastal ecosystem.
	A14	Freshwater benefits marsh	See Section 4.12	A key goal of the project is marsh restoration and nourishment. The Coastal Vegetation section goes into detail on how freshwater and the nutrients contained therein would benefit the marsh.
	A15	Freshwater benefits fisheries	See Section 4.14 and 4.15	These sections detail the effects that a diversion would have on the fisheries resources in the project area. Overall, the introduction of freshwater and associated nutrients would lead to a long term benefit.
	A16	Diversion may cause flooding	-	Part of the operational plan would be to monitor water levels at certain locations and to shut the structure down when those levels reach a certain elevation to restrict flooding of existing developed areas. There would be no additional flooding of these areas over what currently occurs.
			-	Any new structures and gates will be closed during tropical storm events so that there will not be a way for the storm surge to enter the leveed area.
			-	The current plan calls for a combination of both marsh/swamp creation by dedicated dredging and diversions to sustain and enhance the created marsh/swamp. The diversion will be reanalyzed as part of a separate diversion study that will be completed at a later date.

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
OUTSIDE / IN MLOD	AB	Restore Barrier Islands/Outer Areas to control salinity	See Section 2.3.4.1 and Appendix J	Preliminary modeling efforts of the proposed alternatives indicate that additional study is warranted for the Chandeleur and Breton Barrier Island Chain. While variables utilized in preliminary modeling efforts were valuable and feasible, the cost per AAHU deemed it necessary to not include in the TSP for this project and for the engineering team to further develop feasibility design and costs in other studies at a later date.
	B1	Restore Barrier Islands	-	The impact to the islands from the MRGO, if any, is difficult to quantify with any degree of certainty because the erosion and migration patterns in place since the late 1800s were still operating in 2005, with no obvious change after construction of the MRGO (Britsch 2009). Barrier islands were not identified as critical landscape features with respect to storm surge risk reduction in the LACPR ADCIRC analyses (USACE 2009). Barrier island restoration was ultimately eliminated for implementation under this authority because of the insufficient nexus to MRGO effects, the Lake Borgne ecosystem, or storm surge damage risk reduction. Restoration of the barrier islands would not directly benefit the area targeted for restoration under this authority.
	B2	Protect/restore Outer Biloxi Marsh (from the outside in)	-	Restoration features in the Outer Biloxi Marsh were eliminated from further study due to insufficient nexus to MRGO effects, the Lake Borgne ecosystem, or storm surge damage risk reduction.
	B3	Restore natural features for storm risk reduction (Multiple Lines of Defense).	-	Areas located in the Biloxi Marsh and the East Orleans Land bridge were targeted for restoration due to the demonstrated contribution of these areas to storm surge risk reduction. Restoration in areas adjacent to risk reduction structures also contribute to the Multiple Lines of Defense and were included in the recommendations for this study.
	B4	Fund projects outside the levees/with direct protection value first	See Feasibility Report Section 4.0	The implementation of features is dictated by the borrow schedule which was developed to minimize impacts with Lake Borgne that could affect the Gulf Sturgeon.

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
SEDIMENT	C1	Concern about dredging Lake Borgne - Storm Surge	-	USACE is currently performing modeling to analyze the impacts of the proposed borrow pits on the wave climate.
	C2	Concern about dredging Lake Borgne - Fisheries	See Sections 2.9.1.11; 4.14.3; 4.15.3; 4.16.3; 4.17.3; 4.20.3	These sections outline both the process of borrow selection areas and the location and size of the proposed borrow sites. All of the sections from Chapter 4 outline the potential affects the borrow areas could potential have on the aquatic species and habitats of Lake Borgne.
	C3	Use Mississippi River Sediment	-	USACE is using the Mississippi River as a source for some of the marsh creation features. We have performed an analysis comparing the cost of using the Mississippi River as a borrow source to that of using the proposed Lake Borgne borrow and the Mississippi River borrow is a much more costly alternative. Should the use of the river borrow be determined to be more economical in the future the borrow plan can be adjusted and supplements to the environmental documentations can be prepared at that time.
			-	USACE considered the beneficial use of sediment from the Mississippi River maintenance but the only areas on the river that currently are being maintenance dredged and are close enough to be economically feasible do not provide enough material to be considered useful.
	C4	Sediment Diversion is Preferred	-	While USACE agrees that sediment diversion is a worthy goal, as pointed out in the comment sediment diversions are specifically located at sites in the river where they will be able to capture more sediment. The design of a sediment diversion structure is also different than that of a freshwater diversion. The amount of water required for a successful sediment diversion would also be larger than that required for salinity control.
			-	Permanent pipelines for sediment delivery have been considered. To be effective they need to be located in an area of the river where the sediment could be counted on to redeposit on a regular basis. They also require a permanent pipeline corridor and operation and maintenance costs.
			-	USACE agrees that sediment delivery is important and as the project goes forward we will develop designs to produce as much sediment delivery as possible.
	C5	Concern about use of Lake Borgne (other)/ Alternative Sediment sources	-	Additional modeling has been performed to analyze the impacts of the proposed borrow pits on the wave climate. We are also designing the borrow areas to minimize the effects on fish habitat and to address other concerns. We have also investigated the use of other sediment sources and will continue to investigate these other sources.
			-	USACE agrees that dedicated dredging is needed to accomplish the project objectives.
			-	Analysis conducted to date does not indicate the presence of heavy metals and toxins in Lake Borgne sediments. Further analysis would be done before dredging would begin.
			-	We are using the Mississippi River as a source for some of the marsh creation features. We have performed an analysis comparing the cost of using the Mississippi River as a borrow source to that of using the proposed Lake Borgne borrow and the Mississippi River borrow is a much more costly alternative. Should the use of the river borrow be determined to be more economical in the future the borrow plan can be adjusted and supplements to the environmental documentations can be prepared at that time. We considered the beneficial use of sediment from the Mississippi River maintenance but the only areas on the river that currently are being maintenance dredged and are close enough to be economically feasible do not provide enough material to be considered useful.

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
MORE IS NEEDED	D1	Plan is not extensive/comprehensive enough	See Section 1.4.2 of FS	The environmental impacts of the MRGO were documented in *Habitat Impacts of the Construction of the MRGO*, and plan objectives were developed based on these impacts. While many more areas in the study area require restoration, the study authority limits the plan to the restoration of areas affected by the MRGO and the Lake Borgne ecosystem.
	D2	More Oyster Reef Restoration is Needed	See Section 2.6.2 of FS	Areas were identified in the Biloxi Marsh for oyster reef restoration in the initial evaluation of measures. Oyster reef development in Lake Borgne is not feasible, because the restoration of the historic salinity regime will not provide an environment conducive to oyster reef development.
	D3	Restore more of Bayou La Loutre Ridge.	See Section 2.6.2 of FS	Coastal ridge restoration is very costly and involves several uncertainties. Additional ridge restoration measures were not included in the selected plan because they were among the least cost-effective features considered.
	D4	Restore the Bayou Terre aux Boeufs Ridge	See Section 2.6.2 of FS	The Bayou Terre aux Boeufs Ridge was removed from further consideration because it was determined that the negative impacts to existing upland and marsh habitats were greater than the ecosystem benefits of ridge restoration in this location.
	D5	Restore to pre-disturbance/historical conditions (fill-in channel)	See Section 2.5.5. of FS	Full restoration to pre-MRGO conditions would require infilling the entire MRGO channel, restoring all land lost in the study area between 1958 and the present (wetlands, natural ridges, and barrier islands), planting the area with vegetation types present prior to the construction of the MRGO, and eradication of invasive species that have appeared since 1958. Restoration to pre-MRGO conditions was eliminated from further consideration due to: 1) the inefficiency involved with backfilling the MRGO channel and 2) the length of time required for implementation.
	D6	Specific additional Components	See Section 2.6.2 of FS	See Specific Comments and Individual Responses in Table 7
	D7	Restore Banklines and constrict the channel	See Section 3.1 of FS	The plan includes 21 miles of shoreline protection and bank reclamation in the MRGO channel. Additional constrictions in the channel were not evaluated in detail because they would not contribute to ecosystem restoration.
	D8	More Planting	See Section 2.6.2 of FS	Initially, 11 stand-alone vegetative planting measures were considered, which involved planting trees on the banks of the MRGO navigation channel. All of these measures were screened out. Measures to plant trees on the north bank of the MRGO were screened out because tree planting in that location is inconsistent with both the existing and historic marsh habitat. Measures to plant trees in front of the levee were screened out because they could potentially affect the structural integrity of the levee. Measures to plant trees on the spoil bank were screened out because the spoil banks are already well vegetated . Additional vegetative planting measures are being carried forward as integral components of other measures such as marsh, swamp, and ridge restoration.
SUPPORT	E	Support of Plan Elements	-	Comment acknowledged and received by

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
FUNDING	F1	Disagree with cost share interpretation by USACE	See Section S.2.2 and 1.2 of FS	In accordance with Section 103 of the WRDA 1986, as amended by section 210 of WRDA 1996, (33 USC 2213(c)), implementation of the ecosystem restoration plan requires a non-Federal sponsor responsible for providing 35 percent of the costs assigned to ecosystem restoration (except for the Violet Freshwater Diversion, for which Section 3083 of WRDA 2007 provides for a 25 percent non-Federal cost share); providing the lands, easements, rights-of-way, and dredged or excavated material disposal areas required for the plan, and performing all necessary relocations (LERRDs); and paying 100 percent of the costs of operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The value of LERRDs provided by the non-Federal sponsor will be credited toward the non-Federal share of the costs of implementing the ecosystem restoration plan.
	F2	Plan should not be subject to cost effectiveness evaluation	S 2.1. and 1.2 of FS	The study authorization requires that the plan be cost-effective.
	F3	Need to spend restoration funds wisely.	See Section 2.7.3 of FS	Plan formulation for the study incorporated cost-effectiveness and incremental cost analysis to ensure the benefits of the plan were worth the cost.
	F4	Comment on cost of plan	See Section 2.7.3 of FS	Any plan that restores the areas affected by the MRGO will be large and costly due to the environmental impacts of the channel. The selected plan is the most cost-effective plan that achieves the study objectives, which were developed from the mandate of the study authority.
	F5	Plan elements are a waste of money	See Section 2.7.3 of FS	Cost-effectiveness and incremental analyses were performed for this study that confirm the efficiency of the selected plan.
PROCESS	G1	Coordinate with other projects	See Section 1.5, 2.9, and 3.1 of FS	The PDT coordinated with other local, state, and Federal agencies as well as NGOs and community groups to ensure consistency with other plans.
	G2	Study process/Corps process takes too long	-	While the study process may seem lengthy, necessary actions to complete a feasibility study take time and resources. The USACE has implemented initiatives to streamline the planning process and will continue to apply lessons learned to expedite studies.
	G3	Need for citizen input in the decision-making process	See Sections 5.6.1 and 5.6.2 on page 5-5	There were several public hearings and an extended comment period for the general public to comment on the DEIS and make recommendations. The comment summary gives a detailed listing of the types of comments received and how these comments were incorporated into the FEIS.
	G4	Process other		Acknowledged
	G5	Project is important/needs to be expedited	See Feasibility Report Section 4.3, 4.4 and 4.5	The project relies on a cost sharing agreement between the Federal and state entities which is still in the process of being resolved.
RECREATION	H1	Positive comment on recreation features	Section 2.7.5 Summary of Recreation Features	USACE acknowledges the positive comments on the proposed recreation development plans. The recommended recreational features are ancillary to the ecosystem restoration project, work harmoniously with the measures of the restoration project and are proposed on fee title lands for cost-sharing. All of the recreation features recommended were first identified through USACE meetings with community and non-governmental organizations (NGOs) from St. Bernard and Orleans Parishes. Additionally, this report refers to the Louisiana Department of Culture, Recreation and Tourism's Statewide Outdoor Recreation Plan (SCORP), which presents findings from focus group meetings regarding locally preferred outdoor recreation activities. A third source, University of Wisconsin (UW), prepared a recreation needs report for St. Bernard and part of Orleans Parishes. All three of these resources are used in identifying the recommended recreation features, including development of the benefits of each recreation development. All three sites offer American Disabilities Act (ADA) accessible features, including parking, bathrooms, boardwalks, ramps and picnic shelters.
	H2	Negative comment on recreation features	Section 2.7.5 Summary of Recreation Features	As of the printing of this report, non-federal sponsors of the proposed recreation developments have not been identified. If a non-federal sponsor is not identified, the recreation development proposed in this plan will not take place. The non-federal sponsor is responsible for 50% of the construction cost and 100% of the land costs associated with the recreation development. The type of recreation features proposed meet an unmet demand for outdoor recreation land activities. Additionally, the costs associated with the recreation developments is a very small percentage of the total cost of the ecosystem project. Finally, once a local sponsor is found, public meetings will be held to discuss the details of implementing the recreation development plan.
	H3	Concern about maintenance of rec features	Section 2.7.5 Summary of Recreation Features	Non-Federal sponsors are responsible for 100 percent of operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) of cost-shared recreation development. Any sponsor who agrees to cost share the recreation plans must agree to provide 100% of their OMRR&R.

DRAFT

Table 5: Summary of General Comments (All Themes)

	Theme ID	General Comment	Reference in FEIS or FS	Response
MISCELLANEOUS	I	Socio-economic impact concerns	See Section 4.21	The socioeconomic and human environment sections discuss the effects of each of the four alternatives for the project in terms of population; community cohesion; infrastructure; employment and income; oil, gas, and utilities; and flood control and protection.
	J	Navigation Concerns	See Section 4.5	Navigable waterways were reviewed and potential impacts addressed.
	K	Need for a diversity of habitats	See Section 2.3	All of the natural habitats currently and historically present were evaluated and incorporated.
	L	Need to monitor/adaptively manage	See Section 2.10	Nine types of management measures were identified to restore the diverse habitats that are and were historically present in the Lake Borgne ecosystem.
	M	Implement/incorporate existing plans	3.1 of FS	The goal of the USACE is to ensure that when conducting a feasibility study for a project for ecosystem restoration, the recommended project includes a plan for monitoring the success of the ecosystem restoration. This section details the adaptive management plan for the MRGO Ecosystem Restoration Study.
	N	MRGO contributes to storm surge damage/was destructive	See Section 1.4.1	The majority of measures in the selected plan are identified in other planning documents for the study area.
	O	Displacement/real estate/compensation	-	See Specific Comments and Individual Responses in Table 8
	P	MISC	-	The USACE has reviewed each statement and acknowledges each individuals position and options on the project. The USACE appreciates each comment and has incorporated it into the public record.
	Q	Use best science to make decisions	-	The USACE worked with Federal and state agencies, local universities, and Non-Government Organizations (NGOs) to incorporate the best available science, findings, and studies in the development of this report.
	R	Use Alternative fuels in construction	See Section 4.8	The impacts to air quality would be within the current regulated levels based on the use of typical fossil fuel burning equipment.
	S	Requesting Hard Copy	-	
	T	Question	-	Comments acknowledged.
	U	Restore Central Wetlands	See Section 2.9.1.3	The Central Wetlands are a key component of the project with several features included that will return the Central Wetlands to pre-MRGO status.
	V	Concern for particular species	See Section 4.13 and 4.20	Improving habitat for wildlife is a key goal of the project. All of the species within the project area would benefit from the overall project.
	W	Specific comment in reports/revisions	-	See Specific Comments and Individual Responses in Table 9
	X	Agency Recommendations / Technical	-	See Specific Comments and Individual Responses in Table 9

DRAFT

Table 6: Summary of Comments - Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X)

Source	Comment	Reference in FEIS	Response
NMFS	NMFS is concerned that the localized impacts associated with the restoration of the Central Wetlands Ecosystem have not been adequately discussed in the DEIS. The DEIS states there are no impediments to fishery access to the Central Wetlands. However, it also states in the environmental consequences discussion of the recreational resources section (Page 4-123) that node 75 (Central Wetlands) will observe reverse tidal flow impeding passage of blue crab into the area. Both maintenance and pulse flows may result in continuous or long term outgoing water movement through the existing water control structures at Bayou Bienvenue and Bayou Dupre. Such water flows would impede immigration of most young marine fishery species, not just blue crab, into the Central Wetlands. Smith (2008) reports swimming speeds of small teleost fishes may have burst speeds of 1.6 to 4.9 feet per second (fps) over very short periods, their normal maximum swimming speed would be much less. The maximum sustained swimming speed for blue crab megalopae is 0.4 fps with the burst speed of 0.7 fps (Luckenbach and Orth 1992). The maximum swimming speed for oyster larvae is approximately 0.01 fps (North et al. 2008). Because the migration of post larval and juvenile forms of most estuarine-dependent marine fisheries species would not be possible due to flow velocities, the Central Wetlands frequently would be eliminated as nursery habitat for many species. Impacts to the access of most estuarine-dependent marine fisheries species into the Central Wetlands should be discussed and analyzed in the appropriate sections of the FEIS.	See Section 4.14	The text has been added and revised, in combination with comments received from USFWS.
NMFS	NMFS recognizes that the NOD quantifies environmental impacts and benefits with the implementation of all alternatives in multiple chapters of the DEIS. However, the acreages associated with both impacts and benefits are not consistent with the description of the TSP. NMFS recommends correct acreages for the impacted and benefited habitats be consistent in the FEIS. The habitats acreages should include impacts during construction of the freshwater diversion canal, ridge restoration, shoreline protection flotation and access channels, as well as for retention dikes for marsh creation and nourishment. Specific references identifying these inconsistencies are located in the specific comments below.	See Section 4	All of the impact numbers have been updated per engineering refinements and replaced throughout the document.
NMFS	Potential Water Quality Impacts to Fisheries Chapter 4.14-18,24 AQUATIC AND FISHERY RESOURCES, COMMERICAL FISHERIES, OYSTER RESOURCES, WATER BOTTOMS AND BENTHIC RESOURCES, ESSENTIAL FISH HABITAT, and RECREATIONAL RESOURCES Pages 4-64 through 4-91 and Pages 4-122 through 4-126 Sections titled "Direct Impacts" and "Indirect Impacts" NMFS recommends the FEIS include the following information under the direct impacts and indirect impacts analyses for each of the resource sections identified above for all action alternatives. Low DO levels could be a potential impact during construction activities in Lake Borgne and continue to persist after construction. In addition, there is a concern that the diversion could exacerbate low DO conditions in Lake Borgne due to the high level of nutrients causing algal blooms. The potential for this impact should be monitored to a greater extent than is indicated in the DEIS or Supporting Documentation and addressed with adaptive management, if needed. These impacts should be identified in the FEIS as direct and/or indirect impacts to these resources. The diversion should be operated to avoid and minimize adverse impacts to aquatic and fishery resources in the project area to the maximum extent practicable. Revisions to the CASM MRGO report that were not included in the DEIS should be updated in each of these sections for inclusion of the FEIS. Localized impacts should be identified by node in the direct impacts of each of these resources, even if there is a regional gain in net productivity for the project area as a whole.	See Sections 4.14, 4-15, 4-16, 4-17, 4-18 and 4-24	The text has been revised for each of the pertinent sections called out.
NMFS	Potential Hydrologic Impacts to Fisheries Chapter 4.14-15,24 AQUATIC AND FISHERY RESOURCES, COMMERICAL FISHERIES, and RECREATIONAL RESOURCES, Pages 4-64 through 4-71, and pages 4-122 through 4-126 Sections titled "Direct Impacts" NMFS recommends the FEIS include the following information under the direct impacts for each of the resource sections identified above for Alternatives B, C, and D. The restoration of the Central Wetlands area involves an alteration of the existing hydrologic conditions that may result in: a) reverse tidal flow at the water control structures at Bayou Bienvenue and Bayou Dupre; and b) the construction of 1,149 acres of retention dikes for swamp creation and nourishment. These impacts likely would result in the loss or reduction in marine fishery productivity in the Central Wetlands area, and the potential conversion of EFH to an area no longer supportive of federally managed marine fishery species.	See Sections 4.14, 4-15, and 4-24	The text has been revised for each of the pertinent sections called out.
NMFS	Capping and Degrading Retention Dikes Chapter 2.9 IDENTIFICATION OF THE TENTATIVELY SELECTED PLAN 2.9.1.1 Marsh Restoration Page 2-98 Chapter 4.12 COASTAL RESTORATION RESOURCES 4.12.2 Alternative B - MRGO Restoration Plan 2 Page 4-54 Chapter 4.12 COASTAL RESTORATION RESOURCES 4.12.3 Alternative C-MRGO Restoration Plan 7 Page 4-56 The DEIS indicates that earthen dikes and closures would be breached or degraded if necessary; however, no time frame for such actions is provided. The above sections of the FEIS should indicate that these features would be breached or degraded within three years of construction, if necessary.	See Section 2.9.1 and 4.12	The text has been revised for each of the pertinent sections called out.
NMFS	Inconsistency among Environmental Impacts with TSP Chapter 4.3 HYDROLOGY AND HYDRAULICS 4.3.2 Alternative B - MRGO Restoration Plan 2 Page 4-13 Section titled "Indirect Impacts" Chapter 4.5 NAVIGABLE WATERWAYS 4.5.2 Alternative B - MRGO Restoration Plan 2 Page 4-30 Section titled "Direct Impacts" The extent of impact of the retention dike to be constructed under the TSP is not consistent among all sections in the document (ranging from 6,515,8,871, and 10,020 acres). NMFS recommends the NOD verify the correct acreages are provided in the appropriate sections of the FEIS.	See Sections 4.3 and 4.5	The text has been revised for each of the pertinent sections called out. The impact numbers for all features and resources have been checked and revised as necessary.
NMFS	Page ES-8 WATER QUALITY This section of the table suggests that project implementation has the potential to increase DO levels in the area. Considering concerns regarding DO levels in the borrow areas described above, NMFS recommends this section be revised to indicate that DO levels in borrow areas could be reduced, especially during warmer months, and that adaptive management efforts would be undertaken to limit the geographic extent of such impacts.	See Section 4.4	Addressed the decreased DO levels in the Water Quality section. Noted that there is the potential for decreased DO levels at the borrow locations during the 10 year construction period as well as lingering effects post construction.
NMFS	Page ES-9 COASTAL VEGETATION RESOURCES NMFS recognizes that Alternatives B, C and D would reduce the rate of loss of coastal vegetation in the project area. However, given the extent of the project area (3.86 million acres), the system as a whole will continue to encounter coastal vegetative losses that should be quantified in the description of the action alternatives in this table. Lacking such information, readers may believe that project implementation would result in a net gain over the wetland acreage present today, and that additional restoration efforts may not be warranted.	See Table S-1	The text has been revised.
NMFS	Page ES-10 AQUATIC AND FISHERY RESOURCES, COMMERCIAL FISHERIES While NMFS agrees that project implementation may not result in adverse impacts to marine fishery resources over the entire 3.86 million acre project area, CASM MRGO model results suggest there would be localized impacts to some species in some areas. This table should be revised to indicate the potential for localized reductions in marine fishery species in areas closest to the Violet diversion, as well as the potential for increased production in areas further from the diversion.	See Table S-1	The text has been revised.
NMFS	Page ES-11 ESSENTIAL FISH HABITAT While NMFS agrees that project implementation would create and protect vegetated habitats that are very productive categories of EFH, it should be recognized in this section that it is likely that the creation of the cypress swamp in the Central Wetlands, combined with reverse tidal flows through the Bayou Dupree and Bayou Bienvenue floodgates, could convert EFH in the Central Wetlands to an area that is no longer supportive of federally managed marine fishery species.	See Table S-1	The text has been revised.

Table 6: Summary of Comments - Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X)

Source	Comment	Reference in FEIS	Response
NMFS	Chapter 1\.3 Pages 1-6 INTRODUCTION STUDY AREA NMFS recommends the FEIS include a map, with each node clearly labeled, to illustrate the revised study area as described in this section, including the spatial limits of analysis and results. The map should include the designated numbers labeled for each node to observe more closely as they are referenced during future sections of the FEIS	See Figure 1-2	The FEIS lists which nodes shown on Figure 1-2 are part of the "project area", the area of which Chapter 3 and 4 are focused on.
NMFS	2.9 IDENTIFICATION OF THE TENTATIVELY SELECTED PLAN 2.9.1.3 Swamp Restoration Page 2-99, paragraph 5 This section of the DEIS indicates that dikes would be constructed to an elevation of +6.5 ft. Dikes at this elevation would impede drainage from the swamp area, potentially leading to wetland degradation. NMFS recommends the TSP include plans to breach containment dikes, following sediment compaction and tree planting, to assist in tree survival and the health of the swamp vegetative community.	See Section 2.9.1.3	The text has been added and revised.
NMFS	2.9\.1.5 Shoreline Protection Page 2-101, paragraph 1. NMFS recommends the following be included in this paragraph: "The shoreline protection will include 25-foot wide fish ingress and egress gaps, which will be open to pre-project construction bottom elevations, every 1,000 linear feet." The fish gap designs can be further refined through coordination with NMFS during the PED phase of the project.	See Section 2.9.1.5	The text has been added and revised in combination with comments received from USFWS.
NMFS	2\.11 ENVIRONMENTAL COMMITMENTS Page 2-119 The third paragraph in this section quantifies environmental impacts and benefits with the implementation of the TSP. However the acreages associated with both impacts and benefits are not consistent with the description of the TSP throughout the entire DEIS. For example, the DIES in this sections states that there will be 277 acres of intermediate marsh, 363 acres of shallow open water and five acres of bottomland hardwoods impacted with the construction of the diversion canal. In previous sections of the document, it states 245 acres of impact to wetlands. It also states that there will be 32 acres of ridge restoration, where in previous sections it states 46 of acres ridge restoration. In addition, not all impacts and benefits associated with implementation of the TSP were identified in this section. As previously recommended in the general comments of our letter, NMFS recommends the NOD verify correct acreages are provided and identify all adverse and beneficial impacts to habitats for consistency in the FEIS.	See Section 2.11	The impact numbers have been corrected.
NMFS	Chapter 4 4.2 ENVIRONMENTAL CONSEQUENCES ENVIRONMENTAL CONSEQUENCES SUMMARY TABLE Table 4-1, pages 4-3 through 4-9. This is the same table as presented in the executive summary (Table S-I). NMFS recommends the same revisions to Table 4-1 as recommended above for Table S-I.	See Table 4-1	The Tables S-1 and 4-1 were updated with the same revisions. All text has been added and revised.
NMFS	4.4 WATER QUALITY . 4.4.2 Alternative B - MRGO Restoration Plan 2 Direct Impacts Borrow-Sites Page 4-19, paragraph 1. This paragraph should be revised to indicate that DO impacts could occur throughout the ten years of dredging activity and could continue long term post construction. As previously referenced in Sections 3.7.2.2 and 3.7.2.5, there are low DO areas in the southeastern portion of Lake Pontchartrain due to water depths of borrow pits being greater than 15 feet below the water surface (i.e., total water depth) and salinity stratification. If borrow pit design remains at 10 to 12 feet below existing bottom elevations, the potential for Lake Borgne to reach anoxic and hypoxic conditions could result. Due to the spatial and temporal extent of borrow needed for the TSP, this could potentially be a significant adverse impact that should be monitored or scientifically researched to a greater extent than is indicated in the DEIS or Supporting Documentation. To avoid the potential for this impact, the depth of cut could be revised with adaptive management to a depth where hypoxia does not occur. This is of particular concern with the anticipation of a freshwater layer from the Violet Diversion in the shallow water depths of Lake Borgne that may cause salinity stratification. This section of the FEIS should commit to allowing borrow pits to be no deeper than 15 feet below the water surface. The dredging program should be adaptively managed to minimize adverse impacts on DO levels and water quality in the borrow pits should be monitored during the ten year construction period to allow for design changes if needed.	See Sections 4.4.2, 4.4.3, and 4.4.4	The text has been revised for each of the pertinent sections called out.
NMFS	Violet Freshwater Diversion Channel Page 4-21 The high level of nutrients in water diverted from the Mississippi River could lead to algal blooms in Lake Borgne which could contribute to low DO conditions. In addition, the fresh water from the diversion could help stratify water levels in Lake Borgne. also contributing to low DO conditions. The FEIS should discuss this potential impact.	See Section 4.4.2	The text has been added and revised.
NMFS	Placement and Construction Sites Page 4-24, paragraph 4 The duration of construction impacts due to dredging in Lake Borgne will persist over a period of ten years. NMFS recommends that the last sentence of this paragraph in this section be revised to indicate the ten year duration of construction.	See Sections 4.4.2, 4.4.3, and 4.4.4	The text has been revised for each of the pertinent sections called out.
NMFS	Appendix T: Monitoring and Adaptive Management Plan (MAMP) Page 9 The MAMP identifies four questions that, when answered appropriately, suggest proposed actions being taken which could benefit from adaptive management. As it pertains to the questions shown on Page 9: 1) the dredging of borrow pits is not well understood in their long term impacts on benthos and water quality; 2) the most effective design of the pits is not easily identifiable; and 3) the measures of how those options would perform are not well understood. Since management actions can be revised by changing the depth of the borrow pits or the configuration, and because the dredging of borrow pits is expected to proceed in a piecemeal fashion over a period of approximately ten years, NMFS believes that borrow pit dredging qualifies for adaptive management. As such, NMFS recommends the MAMP be revised to include a plan for monitoring benthic community structure and water quality until a depth and design that limits adverse impacts can be identified and used for future borrow pit dredging efforts.	See Appendix T	Adaptive Management & Monitoring Plan (AM&M) was revised to include water quality, DO and benthic communities sampling for the borrow design trials.
NMFS	Objective 1 Page 12. Monitoring Design This section indicates that a nutrient sampling plan would be developed, if needed, in coordination with the Louisiana Department of Environmental Quality. Given the potential for high freshwater flow rates to cause eutrophication in Lake Borgne, NMFS believes a nutrient sampling plan is necessary. Because high nutrient levels could result in phytoplankton blooms, which could eventually impair DO, NMFS believes Objective 1 of the MAMP should be revised to include monitoring of nutrient levels, phytoplankton populations and DO in Lake Borgne. Such monitoring should be undertaken at least during the spring, summer, and fall months for a sufficiently long period of time to determine the potential for adverse impacts and identify measures to limit such impacts.	See Appendix T	AM&M plan was revised to include sampling of nutrients, DO, and Chlorophylls to monitor for Lake Borgne freshwater flow impacts.
NMFS	Objective 2. Page 13. Monitoring Design Given sediment loads in the Mississippi River, it is not clear whether diverting river water through the Central Wetlands and into Lake Borgne would provide sufficient sediment to create and maintain swamp and marsh elevations in those areas. NMFS recommends the monitoring design be revised to include the establishment of sediment erosion tables or some other measure of accretion, at a number of sites in the Central Wetlands and marsh habitats on the southwestern perimeter of Lake Borgne. Those accretion stations should be established for several years prior to construction and sampled at least annually until pre-construction and post-construction patterns of accretion have been established.	See Appendix T	AM&M plan was revised to include a place holder for the inclusion of accretion measurements. The monitoring protocol will be developed and specifics included during PED.
NMFS	In addition, there is some concern over the impacts of high nutrient levels in Mississippi River waters impacting shear strength of marsh soils, potentially leaving them more vulnerable to storm generated erosion. NMFS recommends this objective be revised to include pre- and post construction monitoring of marsh soil shear strength at a number of sites in the Central Wetlands.	See Appendix T	AM&M plan was revised to include a place holder for the inclusion of marsh soil strength measurements. The monitoring protocol will be developed and specifics included during PED.

Table 6: Summary of Comments - Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X)

Source	Comment	Reference in FEIS	Response
NMFS	Section 1502.9(c)(1)(ii) of the Regulations for implementing Provisions of the National Environmental Policy Act specifies that agencies shall prepare supplements to either draft or final environmental impact statements if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. In the paragraph 3 of "Direct Impacts" on page 4-74 in the DEIS, the NOD states that: "access channels, shoreline protection, borrow sites and wetland creation/nourishment sites would be designed to avoid oyster leases and nearby Louisiana Oyster Seed Grounds." NMFS recommends that should any of these design features change resulting in impacts to identified oyster resources, the NOD should prepare a supplemental National Environmental Policy Act document. The commitment to perform environmental monitoring and undertake adaptive management as needed to protect and restore EFH and federally managed fishery resources is essential to the determination that adverse impacts to EFH will be sufficiently averted and offset. As such, any future action that would curtail environmental monitoring and adaptive management of the project would also necessitate preparation of supplemental National Environmental Policy Act documentation.		Concur. No action needed at this time.
USFWS	Page S-24, S-25, and 4-7, Tables S-5, S-6 and 4-1 – The item labels in these tables are not reflective of common terminology used for the project. For instance there is not a barrier island component to the plan and the item "17 Beach Rep" would seem to indicate a beach component. In Louisiana, beach is predominately found on barrier islands or barrier headlands. The Department understanding is that the "17 Beach Rep" label is meant to represent marsh creation or nourishment. The Department recommends re-labeling the items to be more reflective of the project components.	Feasibility Report	The text has been revised.
USFWS	Page 2-16, Section 2.2.4.2 Habitat Types – This section describes the habitat types of the project area. Ridge habitat is a component of the plan but is not mentioned in this section. The Department recommends including a description on ridge habitat.	Feasibility Report	The text has been revised.
USFWS	Page 2-162, 2-163, and 2-164, Figures 2-35, 2-36, and 2-37 – These figures show the plan components for Alternative Plan B, C, and D, respectively. Each plan has a ridge restoration component that isn't represented on the figure. The Department recommends adding the ridge feature to the figures.	Feasibility Report	The ridge feature was in the legend for each figure; however, a bold, colored, line will be added in order for the location of the feature to stand out on all three figures.
USFWS	Chapters 2 Plan Formulation and Chapter 3 Tentative Recommendations – The report briefly discusses existing conditions and future without project conditions but does not include a discussion of future with project impacts. The Department recognizes that Table 2-28 lists impacts to significant resources for each alternative plan. However, the Department feels it would also be appropriate to include a summary of the future with project impacts in the text of the document.	Feasibility Report	The text has been revised.
USFWS	Page 2-29, Section 2.3.2.7 Barrier Island Restoration – This section describes the barrier island restoration feature that was proposed and states it was eliminated from implementation under this authority because of the "insufficient nexus to MRGO effects." However, recent studies (Lavoie, D. ed., 2009; Thomson et al., 2009) indicate there were long-term impacts to Breton Island, a National Wildlife Refuge (NWR) of National importance, as a result of the MRGO channel. The Department believes restoration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the Tentatively Selected Plan for the MRGO Ecosystem Restoration Project.	See Section 2.3.4.1 and Appendix J	Preliminary modeling efforts of the proposed alternatives indicate that additional study is warranted for the Chandeleur and Breton Barrier Island Chain. While variables utilized in preliminary modeling efforts were valuable and feasible, the cost per AAHU deemed it necessary to not include in the TSP for this project and for the engineering team to further develop feasibility design and costs in other studies at a later date.
USFWS	Page 2-85, 2-86, and 2-87, Figures 2-85, 2-86, and 2-87 – These figures show the plan components for Alternative Plan B, C, and D, respectively. Each plan has a ridge restoration component that isn't represented on the figure. The Department recommends adding the ridge feature to the figures.	See Figures 2-19, 2-20, and 2-21	The ridge feature was in the legend for each figure; however, a bold, colored, line will be added in order for the location of the feature to stand out on all three figures.
USFWS	Page 2-101, Section 2.9.1.5 Shoreline Protection – This section describes the specific components of the shoreline protection features. The Department recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed with a 25 ft bottom width set to the pre-project water bottom elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points. Fish dips are not discussed and the Department recommends including this component in the description.	See Section 4.14.2 and 2.9.1.5	The inclusion of fish dips into the shoreline protection features has been addressed in the FEIS.
USFWS	Page 2-128, Section 2.12.7, Oil Spill Uncertainties – This section describes the impacts of the Deepwater Horizon oil spill on coastal Louisiana as of August 2010. Since then more information has become available. The Department recommends updating this section to reflect more recent knowledge of the oil spill impacts to the project area.	See Section 2.12.7	The text has been updated.
USFWS	Page 3-69, Section 3.14.3 Plant Community Types – This section describes the plant community types of the project area. Ridge habitat is a component of the plan but is not mentioned in this section. The Department recommends including a description of ridge plant communities.	See Section 3.14.5.5 and 3.14.5.6	These two unique vegetative communities, live oak forest and coastal live oak-hackberry forest, describe "ridge" habitat.
USFWS	Page 3-79, Section 3.15.1, Wildlife Resources – This section describes the historic and existing conditions of wildlife resources in the project area. The end of the third paragraph makes reference to a USFWS, 1997 document however; the reference is not listed in the literature cited section. The Department recommends including the reference in the literature cited section.	See Section 3.15.1	The incorrect reference was listed and has been replaced with the correct one (LCWCRTF & WCRA, 1999).
USFWS	Page 3-79, Section 3.15.1, Wildlife Resources – The last paragraph on the page discusses brackish wetlands and the species associated with them. Some of these species are not typically found in brackish areas or use brackish marsh because they are on the periphery of their range. Also fresh and intermediate wetlands are not discussed. Many of the species discussed use fresh, intermediate and some brackish habitats. The Department recommends revising the discussion to include all relevant wetlands for these species.	See Section 3.15.1	The text has been revised.
USFWS	Page 3-80, Section 3.15.1, Wildlife Resources – The first paragraph describes wildlife resource use in open water habitats. Some species, such as rails, do not predominantly use open water habitat. The Department suggests re-checking the species indicated to be associated with open water habitats.	See Section 3.15.1	The text has been revised.
USFWS	Page 3-80, Section 3.15.1, Wildlife Resources – The third paragraph describes wildlife resource use on the Chandeleur barrier island chain. Some species, such as reddish egrets, great blue herons, great egrets and peregrine falcon, do not use barrier island habitats. The Department suggests re-checking the species mentioned as being associated with barrier island habitats. At the end of this paragraph there is reference to a USFWS, 2008 document however, the reference listed in the literature cited section is for black bear critical habitat. The Department suggests revising the literature cited.	See Section 3.15.1	The text has been revised.
USFWS	Page 3-80, Section 3.15.1, Wildlife Resources – The fourth and fifth paragraphs supposedly describe the recent wildlife trends in the project area since 1985. The trends data is from 1985-1999, which do not reflect the past ten years or more. The Department suggests removing the word "recent" from this description. Furthermore, the middle of the fourth paragraph and the first line of the fifth paragraph conflict with each other. One states that species numbers have been steady since 1985 and the other states that numbers have declined for many of the same species. The Department suggests revising this description to be more consistent.	See Section 3.15.1	The text has been revised.

Table 6: Summary of Comments - Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X)

Source	Comment	Reference in FEIS	Response
USFWS	Page 3-101, Section 3.19.1, Threatened and Endangered Species, Historic and Existing Conditions, West Indian Manatee and Gulf Sturgeon – This section describes the historic and existing conditions of the West Indian manatee and Gulf Sturgeon in the project area. The top of the page for manatee and the middle of the Gulf Sturgeon paragraph uses the reference USFWS, 2006 however, the reference is not listed in the literature cited section. The Department recommends including the reference in the literature cited section.	See Section 3.15.1	Included the appropriate reference in the literature cited section.
USFWS	Page 3-102, Section 3.19.1, Threatened and Endangered Species, Historic and Existing Conditions, Pallid Sturgeon – This section describes the historic and existing conditions of the Pallid Sturgeon in the project area. The paragraph at the top of the page uses the reference USFWS, 2009 which references a piping plover website. It appears that USFWS, 2009b may be the more appropriate reference. The Department recommends checking and revising the reference.	See Section 3.15.1	The text has been revised.
USFWS	Page 4-95, Section 4.20.1, Threatened and Endangered Species, Alternative A – No Action Plan – This section describes indirect impacts of Alternative A – No Action Plan on Threatened and Endangered Species in the project area. The last paragraph in this section discusses the Chandeleur and Breton Islands but references appendix J, which is the appendix for Navigation and Potential for Shoaling. The Department suggests updating the reference.	See Section 4.20.1	The paragraph containing the incorrect reference was removed during revisions for the FEIS.
USFWS	Page 4-97, Section 4.20.2, Threatened and Endangered Species, Alternative B – MRGO Restoration Plan, Direct Impacts – This section describes indirect impacts of Alternative B – MRGO Restoration Plan on the threatened Gulf sturgeon in the project area. The last sentence of the second to last paragraph states "Access from borrow sites to marsh restoration sites would not involve any dredging in critical habitat." Since all of Lake Borgne is designated critical habitat, the sentence should be revised to state "...would not involve dredging any primary constituent elements within critical habitat."	See Section 4.20.2	The text has been revised.
USFWS	Page 4-101, Section 4.20.2, Threatened and Endangered Species, Alternative B – MRGO Restoration Plan, Indirect Impacts – This section describes indirect impacts of Alternative B – MRGO Restoration Plan on the pallid sturgeon in the project area. The end of the page states there is potential for entrainment of small sized sturgeon in the diversion but the extent of impacts to the sturgeon population from entrainment in the diversion structure is currently not quantifiable. It also states that the Corps concludes that there is a risk of entrainment and therefore the proposed MRGO ecosystem restoration project "May Affect" the species. The Department recommends including a statement indicating the Corps will analyze the project effects to determine whether or not to pursue formal or informal consultation. Should the project adversely affect the pallid sturgeon, formal consultation under the Endangered Species Act of 1973 (as amended) will be necessary.	See Section 4.20.2	The text has been revised.
USFWS	Page 6-4, Section 6.7, USFWS Positions and Recommendations – This section lists the Department positions and recommendations for the proposed MRGO Restoration Plan. Typically when the Department provides our recommendations, wording and format remains as it was originally provided. Though the only changes that were made appear to be ones for consistency with the rest of the DEIS (using "USFWS" rather than "Service," adding "Department of Commerce – National Marine Fisheries Service (NMFS)" rather than "NMFS" alone, etc.), the Department would like this section to reflect our original document.	See Section 6.7	The USFWS Positions and Recommendations have been revised to reflect the original USFWS document. Update still required as part of draft FWCAR.
USFWS	Page 6-5, Section 6.7, USFWS Positions and Recommendations – This section list the Department's positions and recommendations for the proposed MRGO Restoration Plan. The Department's first recommendation states that we believe the barrier island alternative warrants inclusion in the TSP. The Corps response is that given uncertainties of conditions at this time due to the Deepwater Horizon oil spill and recovery efforts, the Corps would seek additional authority for further study before recommending a viable restoration plan. This is in conflict with the reason for eliminating the barrier island component from the TSP provided in Section 2.3.2.7, which states it was eliminated because of the "insufficient nexus to MRGO effects." The Department would like to further encourage including a barrier island component in the TSP. We feel the design and evaluation was sufficient and this is the appropriate authorization, as the MRGO was shown to have had long-term impacts to Breton Island (Lavole, D. ed., 2009, Thomson et al., 2009). In addition, preliminary results show that there were minimal impacts to Breton Island as a result of the oil spill (J. Harris, USFWS Southeast Louisiana Refuges, Personal Comm. Jan 24, 2011). The Department supports the measures proposed for the MRGO Ecosystem Restoration Plan and encourages the inclusion of a barrier island alternative in the TSP to restore impacts to Breton Island. We appreciate the opportunity to provide comments this comments.	See Section 6.7	Preliminary modeling efforts of the proposed alternatives indicate that additional study is warranted for the Chandeleur and Breton Barrier Island Chain. While variables utilized in preliminary modeling efforts were valuable and feasible, the cost per AAHU deemed it necessary to not include in the recommended plan for this project and for the engineering team to further develop feasibility design and costs in other studies at a later date.
Southeast Louisiana Flood Protection Authority East L-24 FEB	Oyster productivity in the Biloxi Marsh is the primary index to measure success in achieving target salinities and in re-establishing a self sustaining ecosystem. Nevertheless, it must be clearly understood that oysters are not the only biological benefit. Ducks, alligators, fur-bearers, and many fisheries will benefit from a sustainable basin.	See Section 4.13	Acknowledged. The goal of the project is to enhance habitat for numerous species that utilize coastal marshes.
Louisiana Coastal Protection and Restoration Authority L-5 MAR	Caernarvon Freshwater Diversion: The sections of the Draft Feasibility Report that discuss Hydraulics and Hydrology (H & H) modeling state that input flows for the Caenarvon diversion were increased by roughly 25 percent, consistent with the projected increase in the capacity of the structure. However, because there have been no plans to increase the physical capacity of the diversion through the currently authorized LCA feasibility study, we recommend that this language be modified to note that no increase in the capacity of the structure is expected.	See Feasibility Report Section 2.10	Acknowledged.
St. Bernard Parish	Minimize the dredging of access channels for placement of shoreline protection.	See Appendix U	Acknowledged.
NMFS	The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton Island NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Breton Island NWR.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	The Service recommends, with support from LDWF, a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study should be utilized to address this issue. The Service and other natural resource agencies should be involved in this study.	See Section 6.7	The USACE response is documented in the EIS. Update still required as part of draft FWCAR.
NMFS	The Service recommends, with support from LDWF, establishment of a committee similar to the Caernarvon Interagency Advisory Committee or Davis Pond Advisory Committee to review the operation and the monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies should be on this committee.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and Louisiana Department of Wildlife and Fisheries (LDWF) for continued review, comment, and input.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.

Table 6: Summary of Comments - Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X)

Source	Comment	Reference in FEIS	Response
NMFS	If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.	See Section 6.7	The USACE response is documented in the EIS. Update still required as part of draft FWCAR.
NMFS	Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EP A), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	The Service recommends minimizing impacts to marsh from marsh buggy activities. One way is to limit repetitive use of the same marsh buggy route to prevent ruts and lasting damage while at the same time reducing the amount of marsh buggy tracts as much as possible. Another option is to build temporary boardwalks over marsh where feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Boeufs marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LD WF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10 feet below the existing sediment surface and 1000 feet from the shoreline.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	The aquatic modeling, Comprehensive Aquatic Systems Model (CASM) used to help evaluate the impacts of the freshwater diversion on representative fish species as well as the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne was developed and had produced initial results. The Service, LDWF, and NMFS support the CASM modeling effort and agree the trends may provide reasonable results. However, because the model results represent the first draft and have since been provided corrected assumptions and interactions to better represent Louisiana waters, a final model run is necessary to obtain more accurate results relative to Louisiana. The assumptions were corrected in consultation with NMFS and LDWF. Because of funding constraints the CASM modeling efforts were halted. The Service recommends completion of the CASM model to achieve more accurate results that will be used to fully address impacts to aquatic resources.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	In addition the Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
NMFS	Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated flotation access and construction access impacts to shallow open water habitat.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton Island NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Breton Island NWR.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The Service recommends, with support from LDWF, a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi River Hydrodynamic and Delta Management Study should be utilized to address this issue. The Service and other natural resource agencies should be involved in this study.	See Section 6.7	The USACE response is documented in the EIS. Update still required as part of draft FWCAR.
USFWS	The Service recommends, with support from LDWF, establishment of a committee similar to the Caernarvon Interagency Advisory Committee or Davis Pond Advisory Committee to review the operation and the monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies should be on this committee.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and Louisiana Department of Wildlife and Fisheries (LDWF) for continued review, comment, and input.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season (i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles). • To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the nonnesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). • For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods very considerably among Louisiana's brown pelican colonies, however, so it is possible that this activity window could be altered based upon the dynamics of the individual colony. • For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this window depending on species present). • If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeastiesbaldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.

Table 6: Summary of Comments - Specific Comment in Report / Revisions (Theme ID W) and Agency Recommendations / Technical (Theme ID X)

Source	Comment	Reference in FEIS	Response
USFWS	Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.	See Section 6.7	The USACE response is documented in the EIS. Update still required as part of draft FWCAR.
USFWS	Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EP A), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The Service recommends minimizing impacts to marsh from marsh buggy activities. One way is to limit repetitive use of the same marsh buggy route to prevent ruts and lasting damage while at the same time reducing the amount of marsh buggy tracts as much as possible. Another option is to build temporary boardwalks over marsh where feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Boeufs marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LD WF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10 feet below the existing sediment surface and 1000 feet from the shoreline.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	The aquatic modeling, Comprehensive Aquatic Systems Model (CASM) used to help evaluate the impacts of the freshwater diversion on representative fish species as well as the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne was developed and had produced initial results. The Service, LDWF, and NMFS support the CASM modeling effort and agree the trends may provide reasonable results. However, because the model results represent the first draft and have since been provided corrected assumptions and interactions to better represent Louisiana waters, a final model run is necessary to obtain more accurate results relative to Louisiana. The assumptions were corrected in consultation with NMFS and LDWF. Because of funding constraints the CASM modeling efforts were halted. The Service recommends completion of the CASM model to achieve more accurate results that will be used to fully address impacts to aquatic resources.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	In addition the Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
USFWS	Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated flotation access and construction access impacts to shallow open water habitat.	See Section 6.7	The USACE concurs with the recommendation and the response is in the EIS. Update still required as part of draft FWCAR.
EPA	EPA is also concerned that the extensive use of rock shoreline protection (approximately 63 miles) would represent a large-scale and unnatural landscape intervention which could have unintended adverse impacts. It appears the proposed rock shoreline protection measures would range in elevation from +3 to +8 feet. Even with periodic gaps, rock barriers of this height and extent could interfere with fish access, marine processes, and marsh hydrology.	See Section 2.9.1.5	Based on recommendations from USWS and NMFS language has been added into the document concerning the placement of "fish dips" or low points every 1000 feet in the shoreline protection features to allow access to the marsh by aquatic species.
EPA	For example, has the Corps evaluated whether the proposed shoreline erosion control features might reduce the input of suspended sediments to marsh areas via storms and frontal passages? Such sediment inputs can be vital for marsh sustainability.	See Section 2.12	Additional hydrologic modeling and aquatic modeling are proposed for the detailed planning, engineering and design phase following approval of the TSP.
EPA	Even under an optimistic funding and schedule scenario, full implementation of the proposed ecosystem restoration plan would be phased over approximately 10-15 years or perhaps many more. This situation poses substantial uncertainties from both fiscal and scientific perspectives. The implications of an unfunded and costly program to be implemented over a long timeframe should be dealt with head on from an environmental review standpoint. The scientific advancements and likelihood of significant changes in habitat condition that could occur over such a time period would indicate that aspects of the current NEP A review will need to be supplemented. A tiered process should be laid out in the FEIS whereby a commitment is made to subject significant restoration measures to additional NEPA and public review whenever the fill.J.ding is secured, the engineering feasibility is addressed, and the scientific issues are reassessed. The current document appropriately lists a number of scientific studies that are currently unavailable (.)r in progress. These are studies or data that will be required prior to launching engineering feasibility studies. An example is the LeA Mississippi River Hydrodynamic Study, which will include a sediment budget and sediment sources inventory. As the document notes, "[l]imitations in analytical tools to assess ecosystem responses also exist, and were compounded by the short timeframe in which the MRGO ecosystem restoration study was formulated." "In addition, our understanding of the effects of the proposed restoration measures will likely change during the implementation period, as will the landscape itself. The DEIS also provides limited and generalized information for certain measures. For example, there is relatively limited site-specific detail on shoreline protection and marsh creation measures. The quantity of borrow material needed for marsh creation is based on assumptions as opposed to site-specific data and analysis. As noted in the DEIS, the engineering for such features is "considered preliminary and has not yet reached full feasibility level of design." This is further justification for committing to a process of tiered NEP A studies for this restoration program. The DEIS states that "supplemental NEP A documentation may be necessary for unidentified impacts resulting from project changes." EPA believes that this is such a strong likelihood that a firm commitment to incorporate the additional environmental reviews and analyses of alternatives should be made at this time. In addition, a conceptual process of tiered studies should be proposed. The Corps is encouraged to continue to coordinate with us and our other partner agencies to determine when such additional NEPA analysis is warranted due to substantial changes in restoration measures and	Concur. No action needed at this time.	
EPA	Marsh nourishment, cypress swamp restoration, and other proposed activities should not result in adverse impacts to existing wetlands. For example, the DEIS states that, "[d]redged material from the flotation channels would be side cast onto adjacent marsh ... " In the absence of clarifying information, it would appear that the Corps is proposing to create spoil banks on existing marsh. These types of wetland impacts would be particularly unacceptable in the context of a restoration plan, and must be avoided to the maximum extent practicable.	See Appendix U	Reference in the EIS has been revised per the comment. Flotation is not being constructed for marsh features. The only flotation access would be for rock work associated with shoreline protection features.
EPA	The Corps also proposes to construct up to 1 0,000 acres of temporary retention dikes and earthen weirs. Such features are often a necessary component of marsh creation projects. However, if left in place too long, retention dikes can limit estuarine exchange, reduce marsh drainage, and potentially trap saltwater brought in by a storm surge. The Corps has proposed to degrade the retention dikes after three years (if the dikes have not already naturally degraded). Three years might be longer than necessary for successful marsh restoration. The Corps should re-evaluate this timeline to determine whether retention dikes could be degraded sooner, thereby minimizing the aforementioned potential adverse impacts.	See Section 2.9.1.1 and 4.12	Based on recommendations from USFWS and NMFS language has been added into the document concerning the mechanical degrading of rentention dikes and earthen weirs within three years if they have not degraded naturally.

Source	Comment	Reference in FEIS	Response
EPA	EPA supports the concept of marsh nourishment (e.g., a thin layer application of sediment to extend the life of existing marsh). However, if too much sediment is placed on an existing marsh, existing vegetation is smothered, causing short-term adverse impacts and hindering or possibly precluding natural re-vegetation. It would appear the proposed marsh nourishment could involve additional fill of up to 1.5 feet. Appendix E contains the following statement in that regard: "For marsh nourishment it was assumed that existing marsh is between +0.5 foot and 1.0 feet and fill would be to +2 feet." To minimize potential adverse impacts, EPA generally recommends no more than six inches of sediment be placed on existing marsh. EPA recommends the Corps review its proposed marsh nourishment specifications and protocols to ensure that such measures do not result in excessive and damaging discharges onto existing wetlands.	See Appendix U and Section 2.9	The goal of the project is not to nourish for the short term, nut for longevity as the marsh features do not include any O&M during the project life. Around 1 ft. of fill is generally what has been used successfully in Corps O&M dredging projects for nourishment of adjacent wetlands and has been approved by the federal and state agencies when sent out for comment during the preparation of the consistency determinations. Also due to the nature of the project area, in order to achieve .75 to 1 ft. of fill will require about 1.25 ft initially as most of the nourishment sites include shallow water acres in which more than 1 ft could easily be accommodated.
EPA	The population of Violet, LA has a 46.5% minority rate (slightly below the 50% minority rate normally used to consider a community to be an "environmental justice" community), while Louisiana has a 38.6% minority population. The poverty rate of 21. 7% (slightly over the 20% rate used to normally consider a community an "environmental justice" community), and has therefore received a more careful consideration. The only "adverse" impacts detailed in the EIS are that dust, noise, traffic, and traffic delays would increase during the construction period and because traffic on two highways will have to be rerouted, temporarily changing them from four lane highways to two-lane highways. Because the channel will be constructed in a large vacant field, no residences or businesses will have to be relocated, and the noise and dust impacts will be greatly decreased for anyone living or working in the general area. The Executive Order 12898 mandates that low income or minority residents not be disproportionately and adversely impacted by our environmental policies and laws; however, the delays in traffic will be felt by all the travelers on those highways, and not just by the low-income residents of Violet. Information should be included about the procedures used or to be used regarding notification of the State-Recognized Tribes about this project. State and federally recognized tribes may have burial mounds, fishing hunting rights and/or use areas in this region for cultural, subsistence or other traditional purposes.	See Section 4.22	The USACE generally does not consult with state recognized tribes, only federally recognized tribes. Federally recognized tribes were notified by letter. One letter requested information that they might have and another asking if they wanted to participate in the drafting of the PA. Only the Jena Choctaw and the Chitimacha responded. In accordance with the regulations implementing Section 106 of the National Historic Preservation Act, state recognized tribes may participate as consulting parties (36 CFR 800.2(c)(5)). In accordance with NEPA, Federal, state, parish and local government agencies, Indian tribes, and interested parties were notified through the Federal Register (17 Dec 2012). Any interested party may request a copy of the FEIS.
Gulf of Mexico Fishery Management Council	New multi-dimensional, numeric fishery modeling allows for informed decision-making based on the risk to the environment, fish populations, productivity, and users. Depending on the extent of potential impacts of marine fishery productivity, the Council believes that fishery modeling is necessary to evaluate the full impact of levee projects and sediment and freshwater diversions and to provide for informed decision-making on the selection of alternatives. The White Ditch and Myrtle Grove diversions, the Violet diversion associated with the Mississippi River-Gulf Outlet Ecosystem Restoration project, increased diversion flows being evaluated under the Modification to Davis Pond and Modification to Caernarvon projects, and the Donaldsonville to the Gulf Hurricane Protection Project, all have the potential to impact marine fish populations, individually and cumulatively. The extent of these impacts is currently unknown. The Council feels that the analysis of a project's impacts on marine fishery production and water quality should be commensurate with the level of potential impacts associated with the project. Therefore, the Council recommends that money and time for numeric, multi-dimensional fishery modeling be budgeted when analyzing the impacts of some levee projects and selected sediment and freshwater diversions in coastal Louisiana. Modeling results would inform the public and managers as to what the impacts would be and allow an open discussion on the impacts instead of ignoring the impacts.	See Section 2.12	Additional hydrologic modeling and aquatic modeling are proposed for the detailed planning, engineering and design phase following approval of the TSP.
Louisiana Coastal Protection and Restoration Authority L-5 MAR	Integration of Restoration Measures With Flood Protection System: We recommend the utilization of a system approach to integrating restoration with flood protection during PreConstruction Engineering and Design (PED). When specific restoration measures are further evaluated during PED, flood protection benefits should be maximized whenever possible.	See Appendix U	Acknowledged. All efforts would be made during the PED process to maximize the flood protection benefits where possible.
Louisiana Coastal Protection and Restoration Authority L-5 MAR	Comprehensive Aquatic Systems Model (CASM) Modeling: A CASM modeling study was undertaken to determine the impacts of the MRGO Ecosystem Restoration Plan on fishery productivity. However, the DFR indicates that the modeling results presented in this study were preliminary; modifications to the CASM were not able to be done prior to release of the DEIS for public comment. We recommend that potential changes to the CASM results be included in the Final EIS.	See Section 2.12	Additional hydrologic modeling and aquatic modeling are proposed for the detailed planning, engineering and design phase following approval of the TSP.
St. Bernard Parish	Scale down acreage of cypress swamp restoration and use extra dredged material to restore more marsh habitat.	See Section 2.9.1.3	Acknowledged.

Table 7: Summary of Comments - Specific Additional Components (Theme ID D6)

Theme ID	Source	Comment	Response
Suggested Plan Component		**Cypress along Violet Canal**	
D6	Audubon Society 2	Restore the cypress swamp along the existing Violet Canal	Some cypress swamp is proposed in the vicinity of the Violet Canal. Based on the findings of further analyses conducted for the Violet Freshwater Diversion, additional cypress restoration may be considered in this location in the future.
D6	NGO-5 MAR	Restore or nourish cypress swamp along the existing Violet canal corridor by utilizing diversion discharge in the immediate outfall area (see Central Wetland comments).	Cypress restoration is planned in the vicinity of the Violet Canal as part of measures CC1 and CC3.
Suggested Plan Component		**Additional Dams**	
D6	Audubon Society 2	Consider an additional rock dam in the MRGO channel north of the diversion and evaluate lessons learned from Caernarvon and Davis Pond diversions.	An additional rock dam in the MRGO would not provide ecosystem restoration benefits, therefore, these types of features were not considered under this study.
D6	L-16 FEB	Consider an additional rock dam in the MRGO channel north of the diversion	
Suggested Plan Component		**Additional Closure to Direct Violet Diversion Discharge**	
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Consider an additional dam (rock or earthen) in the MRGO channel north of the diversion to help direct discharge toward the Proctor Point area (additional closure with a small boat crossing could also help reduce wave generation from storm surge in the channel).	Additional water control structures will be considered in future analyses conducted for the diversion.
Suggested Plan Component		**Evaluate Lessons Learned from Caernarvon and Davis Pond**	
D6	Audubon 2 Edited	12 similar comments were received: Restore the cypress swamp along the existing Violet canal, consider an additional rock dam in the MRGO channel north of the diversion, and evaluate lessons learned from Caernarvon and Davis Pond diversions.	Future analyses of the Violet Freshwater Diversion should incorporate findings from existing diversions.
Suggested Plan Component		**Additional Oyster Reefs**	
D6	V-20 Jan	"In terms of the shoreline protection, we talked a little bit about that, and the map that I'm talking about, all of the -- from Bay Eloi, Christmas Camp Lake, Lake Treasure Bay, if we use the artificial oyster reefs, we believe that that can not only help to provide wave energy reduction, but it also can help to provide marsh edge and shoreline stabilization so that the marsh behind it can have an opportunity grow."	The draft TSP includes oyster reef restoration in Eloi Bay. Additional oyster reef restoration investigations are part of the monitoring and adaptive management plan.
D6	NGO-5 MAR	Locate reefs on the east side of the Biloxi marsh where they provide shoreline protection and detritus to local marsh.	Additional oyster reef restoration investigations are part of the monitoring and adaptive management plan
D6	St. Bernard Parish	Biloxi Marsh - Use of bioengineered oyster reefs for shoreline stabilization and estuarine sculpturing	
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Locate reefs primarily on the east side of the Biloxi marsh, where they provide shoreline protection and detritus to local marsh.	-
D6	St. Bernard Parish	This newly developed understanding of the role of oysters as reef building organisms led to the parish's request for implementation of an emergency plan for the introduction of oyster cultch to the tidal flat and near-shore areas of the Oyster Zone to increase the supply of shell and further reduce erosion. Cultch spreading on exposed mudflats damaged by oil from the BP incident was initially proposed to prevent excessive hurricane and winter storm erosion and island breaching. The plan works as well for long-term reduction of edge erosion within the Oyster Zone and other estuarine areas with conditions conducive to oyster growth.	-
D6	St. Bernard Parish	The eastern perimeter of the Oyster Zone from Isle aux Pitre on the Mississippi Sound to Mozambique Point on Breton Sound and encompassing Bay Boudreau, Drum Bay, Morgan Harbor, Eloi Bay, Lake La Fontaine and interconnected smaller lakes and fringing wetlands is an elongated dynamic edge area which would benefit from enhancement as a Shoreline Barrier Zone. The outer protected element of the Shoreline Barrier Zone would be a segmented barrier-draped artificial headlands and fringing islands. The barrier forms could consist of a combination of hard structural techniques including rocks and stable erodible concrete barges across wide gaps and around tidal channels and softer living shoreline techniques such as sand and artificial oyster reefs to restore and sustain shorelines of islands along the alignment. The inner element of the barrier zone would use artificial oyster reefs to control expansion of large channels and to reduce expansion of the tidal prism inside of the leaky "structural" barrier to the greatest extent possible. Creation of a Shoreline Barrier zone would also include the restoration and maintenance of sand/shell islands with salt marsh and mangrove vegetation for use of colonial nesting seabird and migratory birds. Candidate islands for restoration for bird habitat include Breton Island, Martin Island and Chandeleur Island.	-
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Consider alternatives to enhance 3-dimensional oyster barrier reefs, reef blocks, reef balls, etc.) considering the economic and hydrological benefits of these 3-D oyster reefs, multiples of the area currently suggested by the Plan should be installed, thus approaching historic conditions.	Additional oyster reef restoration investigations will be considered.
Suggested Plan Component		**Spoil Bank Plantings**	
D6	V-20 Jan	There is not a part in the plan to deal with Chinese tallow on the Mississippi River spoil bank. That is 60 percent to 90 percent Chinese tallow in those areas.	
D6	V-8 FEB	One concern that I have with the plan is that Chinese tallow on the spoil banks is not addressed.	Initially, 11 stand-alone vegetative planting measures were considered. Measures to plant trees on the spoil bank were screened out because the spoil banks are already well vegetated. The costs associated with removing well-established invasive species and replacing them with native vegetation outweigh the benefits. Additional vegetative planting measures are being carried forward as integral components of other measures such as marsh, swamp, and ridge restoration. Invasives species control is included as part of the monitoring and adaptive management plan.
D6	St. Bernard Parish	Easements could be acquired on selected portions of the 10,700-ac MRGO subunit and planted with tree vegetation to restore an oak ridge maritime forest ridge habitat with the lower-lying portions of the ridge planted with cypress. These actions would result in lower cost, higher sustainable fresh-to-intermediate wetlands and a linear oak-maritime forest "pocket size "cypress swamp. These types of habitats would be less expensive and more sustainable under conditions of rising sea level and input of higher salinity waters during extreme storm events and periods of drought when freshwater flow through the Central Wetlands would be reduced.	
D6	St. Bernard Parish	Development of a maritime forest on the MRGO dredge material disposal area.	
D6	St. Bernard Parish	Establishment a maritime forest along the higher segments of the MRGO dredge material retention areas.	
D6	V-20 Jan	I've been looking mainly at the Orleans side by Bienvenue area and there's an area up there where we think would be a nice oak forest restoration area between the north side of the Bayou Bienvenue and the south side of the intercoastal waterway, that whole strip in there, we feel that needs to be restored, also. This Corps hasn't looked at it because the other Corps that wants to build these docks wants to put all of the contaminated sediment in that area.	Vegetative plantings were considered in this area in the initial phase of alternatives analysis. It was determined that disposal areas are already well vegetated and will likely develop into mature stands that could serve basically the same function as more desirable tree species.
D6	St. Bernard Parish	Dredge Material Disposal Ridges along the MRGO offer special opportunities for cost effective restoration of oak ridge habitats. Within the Central Wetlands area, portions of these disposal sites could be planted with live oaks and associated species. This would provide further habitat diversity to the restoration plan and as wind protection for the Urban Corridor.Outside of the Levee Protected Corridor, the enhanced ridges should be managed as oak ridges, maritime forests, providing habitat for trans-gulf migrating birds, indigenous birds and terrestrial animals.	
D6	NGO-5 MAR	The MRGO spoil-bank is an ecological disruptor that now represents opportunities for restoration. It should be evaluated and included in the final recommended plan. Its presence blocks the movement of water, nutrients and estuarine organisms. It has become colonized in many cases by exotic invasive vegetation. In addition, it is an untapped sediment resource. Any modification to the spoil bank should not jeopardize the hurricane protection levee or T-wall, and done in concert with land use planning of St. Bernard and Orleans Parishes.	Modification of the spoil banks was considered in initial planning for the study. However, these measures were screened out due to impacts to the hurricane and storm damage risk reduction system.
D6	V-8 FEB	Actually, the key factors are to restore some of the features that were destroyed by when you dug MRGO. Now, on this little chart here, the red is where MRGO is, wider than it used to be, of course, when it was first dug. Now, one thing a lot of people forget about, this purple area, that's where the spoiled banks are where they dug the MRGO, and they effectively cut off the ecosystem. And that's one of the problems that has never been really looked into much, in my opinion. After talking to the Campos and some other people and just from my general knowledge of oceanography, some of the features I would suggest as an alternative is you can break it up in two parts.	

Table 7: Summary of Comments - Specific Additional Components (Theme ID D6)

Theme ID	Source	Comment	Response
Suggested Plan Component		**Alternative Methods for Salinity Reduction / Freshwater Diversion**	
D6	V-28 Jan	But it may be difficult to fill in the MRGO -- and I'm going to end after this -- but if you at least restore these two areas, you get rid of the dead zone in that area. And also if you rebuild the marsh out here, you reduce the salinity that moves in. And the last page, and if you do that, this is where the salinity used to look like because you had wetlands out here and it reduced it in there. And finally one thing the Corps has not talked about is saltwater barriers such as they use in Texas. If they really want to control the salinity, you could do that instead and harm the system a whole lot less.	The MRGO closure is effectively a saltwater barrier, as it keeps more saline waters from entering the upper estuary through the MRGO channel. Additional water control structures were considered in the planning for the MRGO project; however, it was determined that additional water control structures would be further studied in conjunction with freshwater diversions in the future.
D6	V-6 FEB	Now, if saltwater is still a problem, the Corps of Engineers has a lot of experience with this, you can put saltwater barriers at the mouth at Bayou (inaudible). And this is just a prototype. You can do this in other areas further west if you wish.	
D6	V-25 Jan	But they really should restore the lagoon system. And if you do that, just right there and there you'd get the salinity back down to the way it used to be.	
D6	V-8 FEB	Now, another component that's often forgotten is that Bayou La Loutre used to be a lot narrower. If you narrow it, you reduce the salinity coming in, and since you want to restore it anyway, put some components in there to reduce the influence of La Loutre.	
D6	V-8 FEB	Now, east of the dam, to me, I know it's unrealistic probably to fill it in, but you could probably hammer the key features. And what they've done is they've cut off the main north-south bayous right here, okay -- I'm almost done -- and what I would recommend is just to bring them some what we would call, leaky, earthy damm, rocks, weirs, cut into this system, maybe get some of this spoiled bank that's not being used for anything and just restore the flow to reduce saltwater from going in, restore marsh and also you reduce the dead zone, eliminate a dead zone that occurs there every summer. And I have some maps if anybody wants them.	
D6	Map 29-Jan	Restore stagnant lagoon system so it can freshen by rainfall. More marsh restoration and nourishment than in current plan. Isolate with earthen dams or fill in part of MRGO using Restore main north-south branches using "leaky" earthen dams, rocks, and weirs. Use some back-levee material. sediment pipe from river. This restores the ecosystem, reduces westward movement of salty water, and eliminates summertime dead zone.	
D6	St. Bernard Parish	The parish requests that the Corps consider delivery of freshwater through four 48- inch siphon tubes. The existing 48-inch siphon pipe at Violet can deliver 250 cfs	
Suggested Plan Component		**Additional Restoration Areas**	
D6	V-20 Jan	I want to move it to each pond, Spanish Lake, Graham Lake, just like we doing on the Delacroix side, we do it on the same side. Christmas Camp Lake, same thing. We dig borrow pits, build it up, prop it with shoreline restoration project.	Restoration was considered in every portion of the study area. However, only cost-effective projects in the areas affected by the MRGO and/or part of the Lake Borgne ecosystem were included in the recommended plan.
D6	NGO-5 MAR	Strongly recommended to be added to the MRGO TSP 6. Maintain and restore the Biloxi Marsh Land Bridge and barrier reefs (South) 7. Maintain and restore the Biloxi Marsh Land Bridge and barrier reefs (North) Very important but outside the scope of the MRGO FS 8. Maintain and enhance the Maurepas Land Bridge with Maurepas Reintroduction 9. Restore the Chandeleur Barrier islands 10. Construct the Jefferson/Orleans Parish fringe marsh buffer	
D6		I can understand why some of the MS government officials are not in support of this project since there are no direct restoration or protection features to be constructed in Mississippi. We ask and we don't receive...We ask and we don't receive... Perhaps we ask again and hope you listen this time? Directly protect the MS Gulf Coast please....	
D6	E-20 JAN	My area of interest is generally the swamp areas bordered by the Forty Arpent Canal Levee to the south, Paris Road to the east, Bayou Bienvenue to the north and the New Orleans St Bernard Line @ the National Guard Barracks. When I was a young fellow back during the Pre Hurricane Betsy years of 1962 thru 1965 I explored these areas of cypress swamp, ponds and pumping station canals. At that time there were levees that ran perpendicular from the forty arpent canal. One levee ran from the border of Orleans and St. Bernard Parishes (@ The barracks). The others ran perpendicular to the forty arpent levee and ran from the pumping stations behind Buccaneer Villa Subdivision and Chalmette Near Paris Road. These levees intersected a "back levee" approximately 1 mile from the Forty Arpent levee. These levees were approximately 6 feet above the water level in Bayou Bienvenue. When it rained and the pumping stations ran their pumps the urban runoff/rain water would be contained inside these levees. When the water inside these levees rose too high the water would over top them. The water from Bayou Bienvenue never rose above these leveed to allow salt water to enter these ponds/ swamp. Post hurricane Betsy these levees were heavily damaged. Though we could still walk the Forty Arpent Levee from Arabi eastward towards the pumping station behind Buccaneer Villa Subdivision and get on the levee at the pumping station and walk completely around the levee system until we were back behind Arabi where we started.	Bank reclamation of Bayou Bienvenue is included as part of the recommended plan.
D6	E-20 JAN	But in the short term I believe a simple inexpensive way to build these areas back is to build these small levees back to pre Hurricane Betsy configuration. I have attached a sketch of the levees of which I have spoken.	
Suggested Plan Component		**Specific Materials / Methods to be Used in Construction**	
D6	E-25 JAN	I'm writing this letter to introduce ROOTZOON HUMUS which is a cured compost an innovative way for bioremediation and pollution prevention. It also is used for a organic plant food for feeding plants, grass, and trees. Compost restores soil lith correcting soil physics, builds the soil restoring vital lifeforces(microorganisms) by improving soil biology, and amends soil chemistry by adding a well balanced diet of nutrients and the building of humic acid resulting from metabolizing tribes of microorganism . That's a mouth full! Humus will bring sustainability to mrgo by amending the soil that is used, by feeding all plant life, and bioremediating any contaminants that will be in the soil. Take a look at our web page www.tridentworld.org <http://www.tridentworld.org/> - ROOTZONE HUMUS has been used in grow bags as a filter by the Louisiana Wildlife and Fisheries at Pass a Loutre on Dec. 17 2010. They plan on doing two more test sites. Thanks for taking the time to read this.	Specific materials used in restoration projects would be decided in future phases of project development.
D6	E-25 JAN	I'm writing this letter to introduce ROOTZOON HUMUS which is a cured compost an innovative way for bioremediation and pollution prevention. It also is used for a organic plant food for feeding plants, grass, and trees. Compost restores soil lith correcting soil physics, builds the soil restoring vital lifeforces(microorganisms) by improving soil biology, and amends soil chemistry by adding a well balanced diet of nutrients and the building of humic acid resulting from metabolizing tribes of microorganism . That's a mouth full! Humus will bring sustainability to mrgo by amending the soil that is used, by feeding all plant life, and bioremediating any contaminants that will be in the soil. Take a look at our web page www.tridentworld.org <http://www.tridentworld.org/> - ROOTZONE HUMUS has been used in grow bags as a filter by the Louisiana Wildlife and Fisheries at Pass a Loutre on Dec. 17 2010. They plan on doing two more test sites. Thanks for taking the time to read this.	
D6	St. Bernard Parish	Figure 16 illustrates a proposed restoration plan whereby crushed concrete oyster cultch would be spread on denuded marsh floor areas along the edges of the island, along the scarp and in the adjacent near shore areas...A second stage of the restoration plan would be to install induced high-vertical-profile oyster reefs parallel to and a short distance from the shore (Figure 17).	-
D6	St. Bernard Parish	Use dredged material from the Mississippi River, the Violet Canal, and lakes or lagoons excavated within the Central Wetlands to elevate the substrate sufficiently for replanting or natural re-establishment of marsh vegetation and cypress trees. The primary source should be Mississippi River sand bars.	Alternative sediment sources were considered in the plan formulation process. Lake Borgne was determined to be the most cost-effective borrow source.

Table 7: Summary of Comments - Specific Additional Components (Theme ID D6)

Theme ID	Source	Comment	Response
D6	NGO-5 MAR	include the outer Biloxi Marsh within the final recommended plan because of the WRDA language requires storm damage reduction and because it also fulfills the language of the WRDA language of the Violet diversion authorization to sustain coastal wetlands such as those targeted by the diversion project (see map below);	There are several features in the TSP that contribute to the storm surge risk reduction objectives of the study. Several features were initially evaluated in the outer Biloxi Marsh, but were screened out as they were not related to MRGO impacts or part of the Lake Borgne ecosystem.
D6	NGO-5 MAR	Project authorized by the River and Harbors Act of 1938 and completed in 1956. For this project the Pearl River Canal was constructed as a lateral (bypass) canal along the west side of the lower Bogue Chitto and West Pearl Rivers. The Bogue Chitto River is a major tributary of the Pearl River. Sills were placed in the Pearl and Bogue Chitto Rivers to impede flow in the rivers and therefore create backwater in the navigation bypass canal to maintain a minimum depth for navigation. Locks were also constructed on the Pearl River Canal and have not generally been operated. In 1974, the project was nominated for de-authorization because of a decline in barge traffic. This deauthorization failed but the COE also has not been able to initiate maintenance dredging and desnagging. In November 2003, the Vicksburg District of the U.S. Army Corps of Engineers completed an "Initial Appraisal Report" to de-authorize the project, and includes the following record: - The last maintenance dredging was in 1989. - The last recorded barge movement was in 1991. - The project has been officially in a "caretaker" status since 1995. - The project has no commercial traffic. - Little prospect exists for the project to return to becoming a viable commercial waterway. - The reach near Poole's Bluff (near Bogalusa) still includes three wildlife management areas (two in Louisiana), the Bogue Chitto National Wildlife Refuge, the Pearl River WMA, and five rivers (or streams) designated as "natural and scenic" by the state of Louisiana. - The three locks were determined to be "marginally safe due to continuous erosion of the sheet pile walls" and one lock were predicted to become unsafe possibly as early as 2004. - Accidental drowning deaths have occurred by boaters attempting to cross a partially submerged sill. - Due to understaffing of facilities vandalism is significant. - $2.7 million has been spent to "minimally maintain" the West Pearl River Navigation Project over the past ten years. - An EIS completed in 1994, identified 23 species and 1 subspecies either threatened or endangered that possibly exist in the study area, including Gulf Sturgeon.	This area was not considered for restoration because it is not in the area affected by the navigation channel or the adjacent Lake Borgne ecosystem.
D6	St. Bernard Parish	Initiate development of the proposed East Biloxi Shoreline Barrier using a combination of rocks, submersible concrete barge breakers, imported sand, and induced oyster reefs.	Shoreline protection measures in the eastgern portion of the Biloxi Marsh were considered in the plan formulation process. However, due to deeper water depths, these measures were not cost-effective.
D6	St. Bernard Parish	Table 2-28 pg. 2-57 shows that within the Central Wetlands, 4,226 acres of swamp will be restored and 5,178 acres of swamp will be nourished, using a total of 48.3 mcy dredged from Lake Borgne. Within the Central Wetlands subunit southeast of Paris Road there were only 7459 ac of swamp habitat in 1956, 574 ac in 1978 and 93 ac in 1998. It does not appear that there are actually 5,178 ac of existing cypress swamp to be nourished in this area today. It would appear more responsible to create a narrow band of higher cypress swamp at the base of the 40-Arpent Canal - Chalmette Loop Levee and create a low-lying fresh-to-intermediate marsh between this newly created swamp and the landward side of the MRGO subunit. This action would reduce the amount of material dredged from Lake Borgne, or from a dedicated dredge material site on the Mississippi River, and would result in less impacts to benthic communities and hydrologic processes within the lake.	Restoration measures were developed to achieve the objectives of the study. A reduced cypress footprint would not restore the cypress habitat affected by the channel.
D6	St. Bernard Parish	Re-establish a mineral soil base for the restored cypress swamp with dredge material. Use proven planting measures and herbivory control to restore marshes and cypress swamps.	Planting and herbivory control measures will be developed in detail in the final design phase of the project.
D6	St. Bernard Parish	Segment the abandoned MRGO channel into a series of lakes interconnected by smaller channels.	Segmenting the MRGO would not provide ecosystem restoration benefits and was therefore not considered in detail.
D6	St. Bernard Parish	Evaluate the construction of a submersible concrete barge surge breaker in Lake Borgne for the dual purpose of reducing height and intensity of storm surge against the 100-year hurricane levee/wall on the west side of the MRGO channel and enhancing fisheries habitat through the compartmentalization of Lake Borgne.	Ecosystem restoration is the primary purpose of this study. Hurricane and storm damage risk reduction through the protection and restoration of natural features contributes to the need for the plan and is a goal of the study. The proposed measure is not a natural feature, and therefore is not within the scope of this study.
D6	St. Bernard Parish	Restore grass beds along Lake Borgne shoreline.	Pilot projects to investigate various methods of SAV restoration were investigated in the initial planning for the study, but were ultimately not included in the TSP because they were not found to be cost-effective. There are a number of uncertainties surrounding the re-establishment of SAV beds. For example, it is unknown if efforts to create habitat conditions that are suitable for SAV are sufficient for restoration or if more targeted approaches, such as planting, would also be necessary to re-establish SAV beds. Salinity level and water clarity have been determined to be two of the main factors that affect SAV in Lake Pontchartrain (Chu and Poirrier 2005).
D6	St. Bernard Parish	Biloxi Marsh - Selective restoration of eroded marsh areas using transported dredged material	Several areas in the Biloxi Marsh were considered for restoration. Because these measures were not as cost effective as other measures, they were not included in the TSP.
D6	St. Bernard Parish	Biloxi Marsh - Support of implementation of management plans developed by the area landowner and managers of the Biloxi Wildlife Management Area that are designed to retard erosion and enhance and diversify wildlife and fisheries habitat.	All measures in the Biloxi Marsh Stabilization and Restoration Plan prepared for the Biloxi Marsh Lands Corporation were considered, as the report was submitted during the scoping process. Several measures are part of the TSP, including the Violet Freshwater Diversion, BS1, and BM1. Measures that were not included in the TSP were either screened out or determined to be less cost-effective than other measures as documented in the Feasibility Report.
D6	St. Bernard Parish	Customized management measures related to site characteristics and habitat maintenance and sustainability goals such as installation and management of small water control structures, vegetation planting in estuar and storm damaged areas, terracing, and maintenance of plugs on pipeline canals plugs to prevent scouring of substrate.	Management measures were developed for individual sites. Further refinements will be made in future project phases. In addition, the plan includes a robust monitoring and adaptive management component to ensure project success.
D6	St. Bernard Parish	Block unused drilling rig access canals to reduce tidal exchange and bank erosion.	
D6	St. Bernard Parish	Feature BS1 calls for 9.7 miles of shoreline protection along the eastern shore of Lake Borgne extending from south of Point aux Marchites to Matheuxeax Point. If rocks are placed along this shoreline, construction channels should be backfilled. Living shoreline alternatives, such as bioengineered oyster reefs, should be evaluated.	Flotation access channel material would be used in dike/closure construction or refurbishment, to backfill flotation access channels, or would be placed adjacent to and behind the dikes and closures in shallow water to a maximum initial elevation conducive to wetlands development following consolidation of the material. Flotation access channel material used to backfill the flotation access channels following completion of disposal work would be temporarily stockpiled on water bottom adjacent to the flotation access channel.
D6	St. Bernard Parish	A program of systematic hydrologic and water quality measurements was initiated along the MRGO channel by the U.S. Geological Survey six months prior to placement of the rock dam across the MRGO channel on the east side of the Bayou La Loutre ridge. This program has continued since construction of the dam. Resulting data indicate a dead zone of low oxygen in the segment of the channel southeast of the closure dam after closure. St. Bernard requests that the Corps restore water quality within the MRGO south of the dam using all appropriate measures.	Water quality monitoring has been conducted in and around the channel following the construction of the closure, and areas of low DO have been occasionally observed in the MRGO. Based on preliminary data, these occurrences appear to be seasonal and temporary. Because there is limited water quality data from the MRGO prior to the construction of the closure, it is unclear what, if any, impacts to DO in the channel are related to the closure.
D6	St. Bernard Parish	St. Bernard proposes that a permanent hydraulic mining operation be established to utilize sand from naturally replenishable bars along the left descending bank of the Mississippi River near Wills Point in Plaquemines Parish. The sand would be utilized jointly by Plaquemines and St. Bernard Parishes for ecosystem restoration and flood protection projects. A slurry pipeline and booster pump system would be constructed to deliver dredged material to selected areas to restore and sustain wetlands.	The distance between sand bars in the Mississippi River and areas proposed for restoration make this a significantly less cost-effective alternative than Lake Borgne.
D6	St. Bernard Parish	The parish supports current adaptive management measures being considered for the Caernarvon Diversion to deliver more fresh water and sediment through the area north of Lake Lery using small channels and blockage of existing canals to restore the marsh. A slurry pipeline and booster pump system placed in the middle Caernarvon Diversion outfall area would facilitate sediment delivery to key land-building sites.	The Caernarvon area is considered outside of the areas affected by the MRGO channel and the Lake Borgne ecosystem, and therefore measures in this area were screened from further analysis in this study.
D6	St. Bernard Parish	Incorporate MRGO Ecosystem Restoration features into the ongoing adaptive management measures for the Caernarvon Diversion to deliver more freshwater and sediment through the area north of Lake Lery using small channels, training dikes and blockage of existing canals to maximize restoration of the marshes.	Transport of materials from the Caernarvon outfall area to other areas would be counter to the goals of the Modification of the Caernarvon Diversion to increase wetland restoration benefits in the vicinity of the outfall area.
D6	St. Bernard Parish	Plug pipeline canals to reduce bankline erosion and saltwater intrusion.	Some plugging of canals is proposed as part of restoration features.
D6	St. Bernard Parish	Construct revetments along eroding banklines using most suitable structural materials	

DRAFT

Table 7: Summary of Comments - Specific Additional Components (Theme ID D6)

Theme ID	Source	Comment	Response
D6	St. Bernard Parish	Use dredge material from all channel/canal maintenance operations for wetland creation and enhancement.	The USACE investigated several alternatives for use of channel maintenance dredging in restoration activities proposed as part of this project. However, due to distances and the need to barge material rather than pump it, the costs are significantly higher.
D6	St. Bernard Parish	The parish would like to see shoreline stabilization measures implemented around Gardner Island, the last area of marsh along the eastern bank of the MRGO channel. Erosion along the northeast bank of the MRGO in the broken marsh area above Lake Athanasio should be controlled through appropriate living shoreline techniques, including combined rock/bulkhead/sheet piling-dredged fill-vegetation planting and bioengineered oyster reefs.	These measures were considered in the initial array of alternatives but were ultimately screened out or determined to be less cost effective than other measures.
D6	St. Bernard Parish	Within the Corps designated Louis Robin Suburst (23) of the Oyster Zone, St. Bernard Parish wants the shorelines of island groups to be stabilized around Flister Point, St. Helena Bay, Pass Fernandez and Point Gardner. Additional areas requiring shoreline stabilization are the Mozambique Point – Bayou Palo Headland and the landbridge on the east side of Lake Calbasse. Shoreline stabilization is needed to control the tidal passes at Bayou Palo, Numa Pass, Cat Pass and three unnamed passes on west side of Lake Machias. The parish desires to have selective shoreline stabilization implemented on Lake Calbasse, Lake of Two (Second) Trees, Lake Coquille and Lake Robin. A detailed discussion of the mechanisms to stabilize shorelines and prevent marsh loss using a variety of techniques presented below.	
D6	St. Bernard Parish	The parish has identified restoration and management of the Eastern St. Bernard Estuarine Ecosystem as the highest priority of the parish for coastal restoration because of its highly endangered status, its position within the multiple lines of defense strategy and its exceedingly high productivity and economic benefit to the parish. The major geographical components of this region include Biloxi Marshes, Oyster Zone, East Biloxi Marshes Shoreline Barrier, Lake Lery-Delacroix Marshes, Chandeleur Sound and Chandeleur Islands. It is assumed that the U.S. Fish and Wildlife Service, who has responsibility for management of the Breton National Wildlife Refuge, will take the lead in restoration and management of the Chandeleur Islands. St. Bernard will work with the U.S. Fish and Wildlife Service in that regard.	
D6	St. Bernard Parish	The report also states that 6,000 to as much as 15,000 cfs of river water is needed to reduce salinities within marshes and water bodies of the Lake Borgne Area (Lake Borgne and the LakeBorgne Shore Zone), the Mississippi Sound and in the Eastern St. Bernard Estuarine Ecosystem (Biloxi Marshes and Oyster Zone) to achieve establishment of the Chatry line. The DEIS modeled freshwater discharges to determine the amount of discharges required to meet the monthly salinity targets needed to achieve the Chatry line. For the general public and property owners presentation of target salinity data in terms of lines under fall maximum and spring minimum salinity conditions within St Bernard Parish would be more useful, especially with regard to salinity dependent activities such as oyster production.	Alternative methods of graphic representation will be considered in future analyses for the Violet Freshwater Diversion.
D6	St. Bernard Parish	An evaluation should be made of the potential for introduction of Zebra mussels and other invasive species via freshwater discharges. Options for control of such invasive species should be investigated. Ribbed mussel infestation in Lake Borgne in the vicinity of Bayou Dupre has been attributed to operation of the Violet Siphon.	Potential invasive species introduction would be analyzed in future studies on the Violet Freshwater Diversion.
D6	St. Bernard Parish	Control of the saltwater wedge movement in the blocked MRGO channel and enclosure of the Central Wetlands by the flood protection levees, two conditions that currently exist, would lengthen the retention time of the proposed, as well as the normal processes of freshwater introduction into the Central Wetlands. Restoration of an intermediate-to-brackish marsh using dredge material and selected restoration of cypress swamps on elevated islands of dredged material in the vicinity of freshwater water discharge sites would restore marsh and swamp habitat while requiring smaller volumes of dredged material. This more salt tolerant habitat would be more sustainable under conditions of RSLR and freshwater discharge via the existing Violet Diversion channel; would neither remove nor bisect one of the last large, flood protected development sites in the parish and would be less expensive to implement and sustain.	Comment Acknowledged
D6	St. Bernard Parish	Factors influencing the measures available for shoreline restoration and protection, storm surge protection and flood protection include 1) availability and suitability of material for a specific feature, 2) constraints on placement of materials, such as shallow water or underlayed pipelines and flowlines, 3) authorized land uses such as easements, designated corridors, oyster leases, refuges, 4) presence of cultural resources, and 5) presence of threatened and endangered species and critical habitats. The scarcity of sand deposits for barrier island and beach restoration and clay for levee construction has led St. Bernard Parish to investigate the use of various types of hard structures for ecosystem restoration and flood protection.	Specific materials and construction methods used in restoration projects would be decided in future phases of project development.
D6	St. Bernard Parish	Rocks Limestone rock has been used extensively for protection along the shoreline of Lake Borgne and for bank stabilization. While this technique has proven to be effective, rocks are expensive and often difficult to acquire because of high demand and long distance transport costs. The placement of rocks requires dredging of barge and small tug access channels, typically about 7 to 8 feet deep, for bringing in construction equipment and rocks. Even when filled after construction, these access channels negatively impact benthic communities and tend to make the near-shore substrate less resistant to erosion. There are additional problems associated with the use of rocks including identification, owner verification, access permission and safety in crossing pipelines and flow lines When used in open water, the base of a rock dike is proportional to the crown elevation and is often very large, thus requiring large volumes of stone of sufficient size to avoid displacement of severe storms. Rocks are heavy and through time sink into soft substrate. Once placed, they are difficult and expensive to move. The rocks are inert, but because of their density are not a favored substrate for oysters and other marine organisms.	Specific materials and construction methods used in restoration projects would be decided in future phases of project development.
D6	St. Bernard Parish	A-Jax Structures This category of massive, molded concrete structures is effective in breaking waves but has limitations because of weight and size (Figure 20). It is difficult to achieve much elevation above the bottom. Like rocks, A-Jaxs require large access channels for deployment, and because of their weight, they tend to sink into soft substrate. They are more favored by oysters and other marine organisms than limestone rocks. They are difficult and expensive to move after placement.	Specific materials and construction methods used in restoration projects would be decided in future phases of project development.

Table 7: Summary of Comments - Specific Additional Components (Theme ID D6)

Theme ID	Source	Comment	Response
D6	St. Bernard Parish	Submersible Concrete Barge Surge Breakers and Breakwater Units One solution to the previous discussion of constraints to the construction of artificial barrier islands and breakwaters is the use of submersible concrete barge technology. This technology was proposed for application in St. Bernard Parish before Hurricane Katrina, but has yet to be demonstrated. Figure 21 shows a proposed surge barrier across the southern part of Lake Borgne to reduce surge and wave height and energy that impacts the outer hurricane protection levees in St. Bernard (Gagliano et al. 2008). It was proposed that this barrier be constructed with submersible concrete barges. A local manufacturer has custom-designed and built submersible concrete barges as platforms for oil and gas field production facilities for decades (Figure 22). The barges are built of reinforced concrete on a land-based drydock (Figure 23) and floated to the operation site where they are submerged and rest on the bottom of the gulf, coastal bays or lakes. A crushed rock bed is usually placed on the water bottom at the deployment site. It is not uncommon, after decades of service, to re-float a barge, update the production equipment and use the barge at a new location. Some of the barges have been in operation for more than 40 years and the barges have survived surge and waves from the most severe storms. Large platform barges are 14 feet high and can be floated in 6 feet of water. A vertical extension can be added above the barge to increase the effective height of the barge. For breakwater applications, broad beamed barges are used. "Keels" and "skirts" can be added to the bottoms of the barges to prevent skidding from wave or surge impact. Figures 24 and 25 show a barge under construction in 2007 that was 164 feet long and 72 feet wide. The barge was built as the base for a production platform but a similar design and construction could be used as a surge breaker.A smaller version is recommended for application in construction of the East Biloxi Marshes Shoreline Barrier. Drawings of the smaller barge are shown in Figure 26. Such barges can be used to bridge large open water gaps between headlands and islands along the shoreline barrier. They can also be used to control enlargement of tidal channels. Smaller barges suitable for breakwater features could be constructed to the following specifications: Breaker Unit – 15-foot high Hull Length – 80 feet Hull Width – 24 feet Hull Depth – 12 feet Draft – 5.5 feet Base Perimeter Skirt – 2.5 feet Advantages of the barges are that they can be standardized for efficient manufacture at an onshore facility. They can be moved to deployment areas through inland navigation channels byTug boats. They can usually be placed without dredging an access channel. They do not sink into the substrate. They are supportive of oyster growth and other marine encrusting organisms. If conditions change, or they are dislodged by a hurricane, the barges can be floated and redeployed. The barges are a cost effective alternative to the use of heavy rocks and massive concrete structures, as well as dredging buried sand deposits. The mobility and storm resilience of concrete barges is demonstrated by the Associated Branch Pilots SW Pass Complex which was built onshore in eastern New Orleans and deployed at the mouth of Southwest Pass (Figure 27). This barge was directly in the path of Hurricane Katrina. The only damage incurred was to the sheet metal on the barge roof. Such a structure is envisioned as a feature to ultimately be added to the St. Bernard Parish East Biloxi Shoreline Barrier Zone project. It would function as a destination point. It would be capable of housing personnel for law enforcement, emergency response, fish and wildlife management, research, technical support for data collection, coastal restoration and aquaculture such as fish farming. The concrete barges along this Shoreline Barrier would also function as a destination point for recreational and commercial fishermen and boaters in emergency situations.	This feature would not provide ecosystem restoration benefits and was therefore not considered in detail.
D6	St. Bernard Parish	Oyster Reef Bioengineering The MRGO Ecosystem Restoration study describes artificial oyster reefs as "...the ecosystem engineers of bays and estuaries" (USACOE 2010b: 2-101). With implementation of BS2, the Corps proposes to construct 7.5 miles of artificial reef along the shoreline on the western side of Eloi Bay between Eloi Point and the mouth of Bayou La Loutre as one means of shoreline protection. Three types of artificial reef features would be tested along 2.5-mile segments of shoreline to determine their effectiveness for achieving ecosystem restoration objective. The construction methods being considered include: 1) loose oyster shells, 2) interlocking, triangular welded steel structures and 3) interlocking concrete rings. Loose Oyster Shells The loose oyster shell technique involves filling mesh bags with a mixture of loose oyster shells and small pieces of broken concrete and stacking the bags in rows along the shoreline. Generally, bags are stacked to a height of 3 to 4 feet in water no deeper than 3 feet. To create 2.5 miles of reef approximately 50,000 bags would be required. A similar application in the Dauphin Island area of Alabama demonstrated that oysters grow well on this type of structure. However, a very large volume of oyster shell is required and the ratio of reef face to volume is low. A shortage of oyster shells is a limitation to the widespread application of this technique.Interlocking Concrete Rings The interlocking concrete rings consist of modified 5 feet diameter, 2 feet high concrete rings that can be stacked and placed in 4 to 5 feet of water (Figure 28). Each ring weighs about a ton when deployed. Under TSP 2.5 miles of rings would be arranged in three rows approximately 1 foot from each other. The Nature Conservancy currently has a one-eighth mile long pilot project using interlocking concrete rings in Vermilion Bay on the National Audubon Society's Paul J. Rainey Sanctuary (Figure 29). Because of the weight of the structures they are very resistant to wave energy, but are cumbersome to handle and may be inclined to sink into soft substrate. Individual units have been successfully placed with airboats.Interlocking,	Specific materials and construction methods used in restoration projects would be decided in future phases of project development.
D6	St. Bernard Parish	Triangular Welded Steel Reef UnitsA third technique identified in TSP utilizes a manufactured reef unit called ReefBlkTM. These units consist of a welded frame of steel rods that form a triangular column (Figure 30). The units are 5 feet along each leg of the triangle and are typically 2 feet high. The units can be built in larger sizes. The frames hold 9 aquaculture type mesh containers (e.g., bags). When filled with clean, seasoned oyster shell each mesh container weighs 500 pounds. The welded frame weighs 70 pounds for a total individual ReefBlkTM weight of 370 pounds. The units are typically placed in a saw-tooth pattern parallel to an eroding shore or bank (Figure 31). The units immediately reduce wave energy and turbidity. Oyster larvae become attached to the shells in the ReefBlkTM, they become "spat" that grow rapidly (Figure 32). Under average favorable conditions the oysters grow rapidly and within 12 to 18 months the oysters in one unit produce approximately one ton of new shell (Figure 33). At The Nature Conservancy's Clive Runnels Family Mad Island Marsh Preserve project in Texas the artificial oyster reef captured enough sediment behind it in 18 month to completely restore the eroded area and enabled The Nature Conservancy to replant the accreted substrate with marsh grass. Active oyster growth continued on the face of the reef (Figures 34 and 35). The BS2 measure would require approximately 1500 ReefBlkTM units for deployment over a distance of 2.5 miles. ReefBlkTM units have a solid frame which when interlocked form a stable structure with a broad footprint. They are light in weight when deployed, but gain weight and stability from rapid oyster growth. ReefBlkTM units have a large reef face to mass ratio, with approximately 50 square feet of reef exposure. This feature has the dual advantage of not requiring large volumes of shell, and providing maximum habitat for marine organisms. Because the cultch shell is loosely packed, water and food flows through the reef unit panels accelerating oyster growth and providing favorable habitat for innumerable species of reef attracted organisms. The ReefBlkTM structure provides shelter for larger fish. The individual units are like Lego pieces in that they can be configured for different erosion control and estuarine sculpturing applications. Most importantly, the ReefBlkTM units provide a favorable framework onto which living oysters can grow and produce large volumes of shell. Some shells remain on and around the unit and the shells become cemented together to produce a true high vertical profile living reef. Other living oysters and shells are ejected or break off from the units and migrate toward shore resulting in development of cluster growths of living oysters or an accumulation of finer shell particles that accumulate along the inner shoreline as beaches and oyster banks. Construction of artificial oyster reefs using ReefBlkTM units has advanced beyond the demonstration phase to the production phase. Nine projects have been completed successfully in Texas, Louisiana, Alabama and Florida and another major project is underway in Louisiana. The first stage of the NOAA-TNC project in Louisiana involved installation of 5000 feet of ReefBlkTM units on the bay side of Grand Isle. Figure 36 shows a specially designed and equipped shallow draft deployment vessel in the staging area for the NOAA-TNC project in Grand Isle, Louisiana. Figure 37 is an aerial view of newly installed reef units of the Grand Isle project.	Specific materials and construction methods used in restoration projects would be decided in future phases of project development.

Table 7: Summary of Comments - Specific Additional Components (Theme ID D6)

Theme ID	Source	Comment	Response
D6	St. Bernard Parish	The NOAA-The Nature Conservancy Oyster Reef Program in the Oyster Zone The St. Bernard Parish Government has in place a cooperative project with The Nature Conservancy, a national non-profit environmental organization, to fabricate, deploy and monitor 2.15 miles of reduced high vertical profile oyster reefs in the Oyster Zone of the Eastern St. Bernard Estuarine Ecosystem. The currently funded 2.15-mile portion of the project is part of a larger action for which a permit was acquired for construction of 4.64 miles of artificial reef along segments of shoreline in Lake Fortuna, Lake Machais, Lake Athanasio, Lake Eloi and Eloi Bay. This project was selected for American Recovery and Reinvestment Act funding by NOAA as part of the Gulf of Mexico marine habitat stimulus program in 2009. Emplacement of the artificial reef in St. Bernard Parish was delayed by the BP Deepwater oil event. The Hopedale area was selected as the staging area for deployment of the reef system. The NOAA – TNC project is intended to be the beginning of a far reaching reef building program for the Eastern St. Bernard Estuarine Ecosystem. Cultch Spreading The spreading of cultch on existing bottom reefs and oyster bottoms is a basic established technique for enhancing oyster productivity. The cultch is usually brought to the deployment area on oyster luggers or barges and washed over the side with a high pressure hose (Figure 39). Clean oyster shells are the preferred material, but crushed and size-graded concrete and other artificial cultch materials is may also be used. Because oyster shells are scarce St. Bernard, oyster fishermen have recently begun to use crushed concrete as a substitute material. Large quantities of crushed concrete are available in the St. Bernard area from slabs of homes destroyed by hurricane Katrina. Gravel-sized particles of crushed concrete have proven to be an acceptable substitute for the attachment of oyster larvae. St. Bernard oyster fishermen are very skilled mass-power source for applying cultch at designated sites through the shallow water areas of eastern St. Bernard because this is a commonly used method for enhancing oyster production on their privately owned leases.	Specific materials and construction methods used in restoration projects would be decided in future phases of project development.
D6	NMFS	The borrow pits in Lake Borgne initially shall be limited to no deeper than 15 feet below the water surface (i.e., total water depths unless monitoring and adaptive management, or modeling of the hydrology of the borrow pits, clearly indicate deeper pits would have little impact on water quality.	This suggestion would result in a greater footprint in Lake Borgne being affected. Coordination with NMFS regarding these issues is documented in the Final EIS.
D6	NMFS	The retention dikes constructed for marsh creation and nourishment areas shall be gapped and degraded within three years of use in a manner acceptable to NMFS.	Coordination with NMFS regarding these issues is documented in the Final EIS.
D6	NMFS	Shoreline protection features in the TSP shall include 25-foot wide gaps down to pre-project depth elevations for fisheries ingress and egress every 1,000 linear feet, unless otherwise refined in coordination with NMFS during PED. Scour aprons may be incorporated so as not to decrease the pre-project water depth, or offset sections of rock in front of or behind foreshore rock dikes may be included to minimize erosion in the vicinity of gaps.	Coordination with NMFS regarding these issues is documented in the Final EIS.
D6	NMFS	NMFS recommends that all retention dikes be degraded or gapped, as described in our EFH Conservation Recommendations, within three years of construction to allow for tidal connectivity of the restored areas to the adjacent system. NMFS suggests this recommendation should be included in all sections that pertain to retention dike construction in the Final Environmental Impact Statement (FEIS). NMFS has provided reference in the specific comments below.	Coordination with NMFS regarding these issues is documented in the Final EIS.
D6	NMFS	Furthermore, according to the DEIS, the 1,149 acres of retention dikes constructed for swamp restoration will not be degraded post construction and the salinity model predicts a complete freshening of the Central Wetlands unit. These hydrologic and water quality changes have the potential to convert EFH to an area no longer supportive of marine fisheries species. This impact should be discussed and analyzed in the "aquatic and fishery resources", "commercial fisheries", "EFH", and "recreational resources" sections of the FEIS. NMFS recommends the TSP include plans to breach containment dikes, following sediment compaction and tree planting, to assist in tree survival and the health of the swamp vegetative community.	Coordination with NMFS regarding these issues is documented in the Final EIS.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Consider local protection of oyster barrier/storm buffering reefs from over harvesting while providing other areas for commercial harvests.	This may be considered in future phases of project development.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Evaluate other oyster reef projects in Louisiana for lessons learned/best practices.	The Nature Conservancy is currently constructing oyster reef restoration projects in Louisiana. Louisiana State University has developed a plan to monitor both the short- and long-term success of these project as measured by reef establishment, shoreline changes and improved habitat for other marine species. The results of monitoring will be considered in the design and construction phases of the plan.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	In lieu of filling and reducing storm water storage, recommend using the areas of open water, heavily tidal marsh as borrow sites to create freshwater lagoons/lakes and Submerged Aquatic Vegetation (SA V) habitat.	Open water areas will be incorporated in the final design of Central Wetlands restoration measures.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Areas targeted for restoration in the Central Wetlands should be "nourished" to strengthen existing wetlands rather than destroy them by fill.	Several areas in the Central Wetlands are targeted for nourishment to consolidate the existing marsh.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Limit filling to critical areas such as along the Violet canal where a more mineral based soil is justified to avoid the potential weakening of soils at the direct outfall of the Violet Diversion. Fill may be better diverted to economic development projects (such as 'harbors of refuge') that could offset development losses due to the MRGO itself or the recovery process.	Economic development projects are not within the scope of this ecosystem restoration plan.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Conduct a baseline inventory of Central Wetlands conditions, including hydrology, wetland health, and soil strength for use in restoration planning.	Field surveys have been conducted in the Central Wetlands sufficient to achieve feasibility level of design. Additional surveys will be conducted in the design phase of the project. Monitoring in the Central Wetlands is part of the Monitoring and Adaptive Management Plan.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Develop a comprehensive vision for Central Wetlands, including incorporation of existing storm water discharge pumping plus planned projects such as wastewater assimilation projects, the Violet Diversion, Bayou Bienvenue restoration, and cypress swamp and marsh restoration with native vegetation.	Initial planning for the Central Wetlands considered the CIAP wastewater treatment and existing storm water discharge.
D6	Southeast Louisiana Flood Protection Authority-East L-24 FEB	Evaluate a sediment trap along the St. Bernard reach of the Mississippi River which could reduce the distance to pump sediments by more than 50%. In addition, sediment mined from the river will have zero salinity which will allow for more rapid re-vegetation by fresh plant species such as cypress.	The final plan recommends further analyses of the use of Mississippi River sediment for cypress and fresh marsh features.
Suggested Plan Component	**Additional Shoreline Protection**		
D6	Louisiana Coastal Protection and Restoration Authority L-6 MAR	For example, we suggest including in the final plan provisions for a more extensive restoration of the Biloxi Marsh.	Additional shoreline protection measures were considered. These features were not included in the TSP because other measures were more cost effective.
D6	Louisiana Coastal Protection and Restoration Authority L-6 MAR	Including the protection of the Biloxi Marsh land bridges	Additional shoreline protection measures were considered. These features were not included in the TSP because other measures were more cost effective.
D6	St. Bernard Parish	St. Bernard Parish supports TSP measures (BS3) to reduce shoreline erosion in the Eloi Bay Area of the Oyster Zone through development of artificial oyster reefs. However, the parish encourages more aggressive measures to protect larger expanses of shoreline and interior marsh habitat. Measures should be taken to reinforce the basic skeletal framework of the Oyster Zone, such as the Bayou La Loutre land bridge between Point Lydia and Point Eloi and the segmented tidal barrier between Point Eloi and the south bank of Canal Pecal. Shoreline erosion should be reduced around Lake Eloi and Lake Athanasio. The enlargement of tidal channels at the upper reaches of Lake Eloi and Lake Athanasio should be controlled.	Additional shoreline protection measures were considered. These features were not included in the TSP because other measures were more cost effective.
D6	St. Bernard Parish	Biloxi Marsh - Stabilization of shorelines	Additional shoreline protection measures were considered. These features were not included in the TSP because other measures were more cost effective.

DRAFT

Table 8: Summary of Comments - Displacements / Real Estate / Compensation (Theme ID O)

Theme ID	Source	Comment	Response
O	Our Lady of Lourdes Catholic Church Email	The two most likely sites being a channel that would be 12-feet deep by 250-feet wide through the Sinclair Tract in Meraux or widening the Violet Canal, which would displace 100 businesses and residences with its 500-foot right-of-way.	Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.
O	Our Lady of Lourdes Catholic Church L-29 JAN	But, the current draft plan of the USACE proposes four possible sites for a freshwater diversion. The two most likely sites being a channel that would be 12-feet deep by 250-feet wide through the Sinclair Tract in Meraux or widening the Violet Canal which would displace 100 businesses and residences with its SOD-foot right-of-way. As parishioners of Our Lady of Lourdes Catholic Church PLEASE rethink this project.	Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.
O	V-20 Jan	That makes me think of another thing. You are talking about the Violet Canal, what side you would take and I don't know. I never got all of that figured yet, but what kind of price are y'all going to pay for that land that I own there? Fair market value? It's for sale. We will do the deal right now.	Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083. However, any Private property impacted by the project will be appraised and an offer will be made at market value.
O	V-20 Jan	and now I live four streets from alternative one. Are you willing to buy me out? Because I do not want to live by a diversion and	Proper estates will be acquired only over private property that is located within the project footprint.
O	V-20 Jan	But, okay, y'all are talking about if y'all don't use the Violet Canal digging -- I mean digging to go through these other properties, okay, and I think there's enough property that has been taking from us already.	It is assummed this comment is in regards to the diversion. Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.
O	V-20 Jan	I'm always a fisherman that was hurt by Caernarvon.Never got a dime. They just came in and paid the people's deal. All right. So what's going to happen here? If you don't have enough funding to defend the project as it is, how are you going to pay me when you displace me?	Under the Fifth Amendment to the US Constitution, private property cannot be taken by the Federal government for authorized public purposes without the payment of just compensation. Compensation is paid for those properties that are located within the project footprint.
O	V-25 Jan	If you destroy those with this project, someone will have to pay those oyster fishermen to re-create their oyster leases into oyster farms elsewhere.	Oyster leases will be addressed in accorndance with the "Oyster Lease Acquisition and Compensation Program" ACT 425, passed by the State of LA
O	E-31 JAN	Another peeve, and I have mentioned this to Greg Miller on at least two occasions, is the loss of private property rights in the reforesting of the Central Wetlands. According to Greg and reading the Restoration Plan the landowner will not be able to harvest "his" trees. Yes, I have heard the song and dance about public money being used to re-establish the cypress forest but what the Corps and others seem to forget, we, the local landowners had a healthy, pole sized natural cypress stand before MRGO. We also had a healthy, highly productive brackish water marsh. Well, both are gone because of saltwater intrusion form MRGO. We, the landowners, were not and have not been compensated for our destroyed marsh or lost timber value nor will we be allowed to benefit from any trees that are planted with public dollars. Public dollars destroyed it so public dollars should make us whole so that we can have the full and peaceful enjoyment of our property.	Congressional authorization led to the creation of the former MRGO navigation channel and its closure, but did not authorize for compensation of environmental effects allegedly associated with the MRGO. The proposed Non-Standard estates have not been approved at this time. Therefore, the estate to be acquired will be purchased in fee title at fair market value, thus eliminating current landowner rights to future lumber harvests.

Table 8: Summary of Comments - Displacements / Real Estate / Compensation (Theme ID O)

Theme ID	Source	Comment	Response
O	E-31 JAN	Paragraph 4.1.1., Estates Section, of the Ecosystem Restoration Plan states that since these are wetlands they will fall under the full protection of Sec. 404 of the Clean Water Act. It should be made perfectly clear that in sec. 404 there is a forestry exemption, it should be honored and that Sec. 210 of the Rivers and Harbors Act should not be arbitrarily used to restrict forestry activities.	The proposed Non-Standard estates have not been approved at this time. Therefore, the estate to be acquired will be fee, including mineral rights.
O	E-31 JAN	In Paragraph 4.1.1.1 and 4.1.1.2 the Plan mentions that the Corps, on restored land, would receive fee title or perpetual easements and the landowner would retain mineral and timber rights but the mineral owner and timber owner cannot access the surface of the land for exploration, development or production. I hope I am misinterpreting these paragraphs.	The proposed Non-Standard estates have not been approved at this time. Therefore, the estate to be acquired will be fee, including mineral rights.
O	E-31 JAN	In closing, the Corps should take into serious consideration the price that the people of St. Bernard have paid over the past 50 years for the benefit of the "general public" and reconsider these major invasions of property rights that are being proposed.	It is assummed this comment is in regards to the diversion. Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.
O	E-2 FEB	How will this affect our property values? We have already taken a significant loss due to the hurricane and the recession, will your project make it worse? Will we even be able to sell our house, if we should so choose, now that it is common knowlege that this project may take place in this location? Will the Corps of Engineers offer an option for a buyout at market value plus a premium to cover cost of displacement? These are of much concern to us as I am sure that they would be to you If it was your home that was being threatened. My wife and I attended the meeting that was held at C.F. Rowley school last week. I was not impreesed with the type of critiisism that was put on the Corps of Engineers. It is niether useful or constructive and does not solve problems.	It is assummed this comment is in regards to the diversion. Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.
O	E-10 FEB	I even bought the lot next door, but that canal is going to drop my property value down so low that even if I want to sell and get the heck out of this mess you are creating I would not be able to.	It is assummed this comment is in regards to the diversion. Additional study is needed to improve decisions about where, when, and how to divert Mississippi River flows in a systems context. Therefore, the final recommendations for the MRGO Ecosystem Restoration Plan include additional analysis, design and implementation of the Violet Freshwater Diversion as authorized by WRDA 2007 Section 3083.
O	E-5 MAR	I also plead with the Corps to consider landowners' rights to this property. It has been devastating to watch the once green, thriving swamp, forests and marshland which provided income and a way of life turn into a barren, non productive wasteland. The USACE has an opportunity to make things right and give the landowner the chance to once again manage, develop and enjoy his property and at the same time provide a storm buffer, a return of oyster reefs, estuaries, water purification and other gifts which a healthy wetlands provides to humans and other living creatures.	The project goal is to restore the natural areas affected by the former navigation channel.

Table 8: Summary of Comments - Displacements / Real Estate / Compensation (Theme ID O)

Theme ID	Source	Comment	Response
O	E-11 FEB	As owner of considerable property within the project area please advise as follows: 1. Will the properties be purchased and if so by what agency and what will be the purchase procedure. 2. If the properties are not purchased will a servitude or restrictions be placed on the properties. If so, what activities will be limited and will the public be allowed to access our property without our permission. 3. Will we be allowed to lease the properties for hunting purposes. And also will we be allowed to lease the properties for oil and gas exploration. What restrictions if any will be placed on the properties regarding oil and gas or hunting activities. Please enter these questions and answers into the public comment portion of this project. And further forward your responses to me by email.	Real Estate acquisitions will be performed by the Non-Federal Sponsor. It is anticipated the marsh/swamp restoration and nourishment sites will be purchased in Fee, including mineral rights.
O	NG0-5 MAR	In all cases the costs of acquiring rights to land, either through agreement, purchase or easement, should be a project cost, and private landowners should receive just compensation.	Under the Fifth Amendment to the US Constitution, private property cannot be taken by the Federal government for authorized public purposes without the payment of just compensation.
O	St. Bernard Parish	Landowner Issues: The inability to address and resolve land rights issues in a timely manner can often derail the best intentioned restoration plan. The treatment of land rights issues was not adequately reviewed in the DEIS. Most of St. Bernard Parish consists of privately owned lands, much of which are deteriorated and eroding coastal wetlands.	Real Estate estimates/analysis can be found in the Real Estate Plan which is an Appendix to the Feasibility Report.
O	St. Bernard Parish	Some issues that should have been discussed in general include: o Will the right to access these lands, collect data, and implement, monitor, and maintain restoration projects be obtained through easements or fee title acquisitions? o If easements are to be used, what would be the expected time period of the servitude agreement? o If properties are obtained in fee, what is the general acquisition process? o Who will own the restored and enhanced wetlands? o If private property rights are retained, will there be restrictions on use in area where habitat has been restored and enhanced? o If restored and enhanced wetlands and ridges become public property or have easements, what would be the types of restrictions on use? When will the public be advised of the land rights acquisition approach that the COE intends to use for this project?	Real Estate acquisitions will be performed by the Non-Federal Sponsor. The previously proposed Non-Standard Estates have not been approved at this time, therefore, it is anticipated the marsh/swamp restoration and nourishment sites will be purchased in Fee, including mineral rights. The Non-Federal Sponsor will hold and maintain the acquired lands.
O	L	We have to maintain our duck hunting ponds and access to them as this is the only way we can pay our taxes and is the only income from the property.	The proposed Non-Standard estates have not been approved at this time. Therefore, the estate to be aquired will be fee, including mineral rights.

Appendix Y1

c. Provide a brief explanation of the applicant's ability to receive and use, or receive and distribute, Federal power as of [date]:

6. Other Information. The applicant may provide any other information pertinent to receiving an allocation:

7. Signature: Western requires the signature and title of an appropriate official who is able to attest to the validity of the APD and who is authorized to submit the request for an allocation.

By signing below, I certify the APD which I have provided is true and correct to the best of my knowledge and belief.

Signature Title

Record Keeping Requirements: If Western accepts an application and the applicant receives an allocation of Federal power, the applicant must keep all APD for a period of 3 years after signing a firm electric service contract.

B. Western's Consideration of Applications

1. Upon receipt, Western will review APD and verify that each applicant meets the general eligibility criteria set forth in Section II.

a. Western will request, in writing, additional information from any applicant whose APD is deficient. The applicant shall have 15 calendar days from the date on Western's request letter to provide, in writing, the needed information. If the requested information is not provided within that time, Western retains the right to consider the application withdrawn.

b. If Western determines that an applicant does not meet the general eligibility criteria, Western will send a letter explaining why the applicant did not qualify.

c. If an applicant meets the general eligibility criteria, Western will determine the amount of firm power to be allocated pursuant to the general allocation criteria set forth in Section III. Western will send for the applicant's review a draft contract, which contains the terms and conditions of the offer and the amount of firm power allocated to the applicant.

2. Western reserves the right to determine the amount of firm power to allocate to an applicant, as justified by an applicant's APD.

VI. Review Under the Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1980 (PRA), 44 U.S.C. 3501–3520, Western has received approval from the Office of Management and Budget to collect APD under control number 1910–5136.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

VII. Review Under the National Environmental Policy Act

Western completed an environmental impact statement on the Program pursuant to the National Environmental Policy Act of 1969 (NEPA).

The Record of Decision was published in the **Federal Register**, 60 FR 53181, on October 12, 1995. Western will comply with any additional NEPA requirements for this resource pool.

Dated: December 10, 2010.

Timothy J. Meeks,

Administrator.

[FR Doc. 2010–31749 Filed 12–16–10; 8:45 am]

BILLING CODE 6450–01–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–EFL–8994–2]

Environmental Impacts Statements; Notice of Availability

Responsible Agency: Office of Federal Activities, General Information (202) 564–1399 or *http://www.epa.gov/compliance/nepa/.*

Weekly receipt of Environmental Impact Statements.

Filed 12/06/2010 through 12/10/2010.

Pursuant to 40 CFR 1506.9.

Notice: In accordance with Section 309(a) of the Clean Air Act, EPA is required to make its comments on EISs issued by other Federal agencies public. Historically, EPA met this mandate by publishing weekly notices of availability of EPA comments, which includes a brief summary of EPA's comment letters, in the **Federal Register**. Since February 2008, EPA has included its comment letters on EISs on its Web site at: *http://www.epa.gov/compliance/nepa/eisdata.html.* Including the entire EIS comment letters on the website satisfies the Section 309(a) requirement to make EPA's comments on EISs available to the public. Accordingly, on March 31, 2010, EPA discontinued the publication of the notice of availability of EPA comments in the **Federal Register**.

EIS No. 20100462, Draft EIS, FWS, CA, Santa Clara Valley Habitat Plan, To Protect and Enhance Ecological Diversity and Function in the Greater Portion of Santa Clara County, Implementation, Santa Clara County, CA, Comment Period Ends: 01/31/2011, Contact: John Robles 916–414–6731.

EIS No. 20100463, Draft EIS, HUD, WA, Sunset Area Community Planned Action, Proposal to Redevelopment of the Sunset Terrace Public Housing Community and Associated Neighborhood Growth and Revitalization, City of Renton, WA, Comment Period Ends: 01/31/2011, Contact: Erika Conkling 415–430–6578.

EIS No. 20100464, Final EIS, NPS, FL, Everglades National Park Tamiami Trail Modifications: Next Steps Project, To Restore More Natural Water Flow to Everglades National Parks and Florida Bay, FL, Wait Period Ends: 01/18/2011, Contact: Dan Kimball 305–242–7712.

EIS No. 20100465, Final EIS, NRC, NY, Generic—License Renewal of Nuclear Plants, Supplement 38 to NUREG–1437, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Westchester County, NY, Wait Period Ends: 01/18/2011, Contact: Andrew Stuyvenberg 301–415–4006.

EIS No. 20100466, Draft EIS, BLM/DOE, 00, Programmatic—Solar Energy Development in Six Southwestern States, To Establish a New BLM Solar Energy Program applicable to Utility-Scale Solar Energy Development and DOE's Proposed Action to Develop new Program Guidance Relevant to DOE Supported Solar Project, AZ, CA, CO, NV, NM and UT, Comment Period Ends: 03/17/2011, Contact: Linda Resseguie 202–912–7337. BLM and DOE are Joint Lead Agencies for the above project contact for BLM is Linda Resseguie, 202–912–7337 and contact for DOE is Jane Summerson, 202–287–6188.

EIS No. 20100467, Final EIS, BLM, NV, Emigrant Mine Project, Proposed Open Pit Gold Mine, Plan-of-Operation, South of Carlin in Elko County, NV, Wait Period Ends: 01/18/2011, Contact: Tom Schmidt 775–753–0200.

EIS No. 20100468, Draft EIS, USACE, MS, Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Study, To Develop a Comprehensive Ecosystem Restoration Plan to Restore the Lake Borgne, Implementation, MS, Comment Period Ends: 01/31/2011, Contact: Tammy Gilmore 504–862–1002.

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

DEC 17 2010

Regional Planning and
Environment Division South
New Orleans Environmental Branch

NOTICE OF AVAILABILITY

A draft environmental impact statement (EIS) for the Mississippi River-Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study, Louisiana, project prepared by the U.S. Army Corps of Engineers, New Orleans District is available for your review. The draft EIS and the associated Feasibility Report is located at www.mrgo.gov.

The proposed action consists of various combinations of marsh restoration, marsh nourishment, ridge restoration, swamp nourishment, and shoreline protection. Also included is a freshwater diversion at or near Violet, Louisiana as a necessary component to meet the study goals and objectives. Along with these restoration components, three recreation features are being considered as part of the proposed action. These include recreation features at the Bienvenue Triangle, Violet Freshwater Diversion, and at Shell Beach.

A copy of the EIS is available upon request. Please contact Ms. Tammy Gilmore; U.S. Army Corps of Engineers; Regional Planning and Environment Division South; New Orleans Environmental Branch; CEMVN-PDR-R; P.O. Box 60267; New Orleans, Louisiana 70160-0267; to request a copy.

Requests also can be made by calling (504) 862-1002, by E-Mail to tammy.h.gilmore@usace.army.mil, or by fax to (504) 862-2088. Comments on this Environmental Impact Statement should be provided within 45 days of the date stamped on this letter.

Joan M Exnicios

Joan M. Exnicios
Chief, New Orleans Environmental Branch



US Army Corps of Engineers
New Orleans District

MRGO Ecosystem Restoration

The U.S. Army Corps of Engineers, New Orleans District, is hosting public meetings to discuss the Draft Environmental Impact Statement and Feasibility Study for the Mississippi River Gulf Outlet ecosystem restoration plan. The recommended plan would restore over 58,000 acres of wetlands in areas affected by the MRGO navigation channel.

What: These meetings, per the National Environmental Policy Act, will provide an opportunity for the public to learn about the recommended plan and provide a venue for community members to submit formal comments on the proposed plan.

Meeting 1
When: **Thursday, Jan. 20, 2011**
Open House from 6 to 6:30 p.m.
Presentation at 6:30 p.m.
Discussion to follow
Where: CF Rowley Alternative School
49 Madison Ave
Chalmette, LA 70043

Meeting 2
When: **Tuesday, Jan. 25, 2011**
Open House from 6 to 6:30 p.m.
Presentation at 6:30 p.m.
Discussion to follow
Where: Leo Seal Community Center
529 Highway 90
Waveland, MS 39576

Meeting 3
When: **Thursday, Feb. 3, 2011**
Open House 6 to 6:30 p.m.
Presentation at 6:30 p.m.
Discussion to follow
Where: Light City Church
6117 St. Claude Ave.,
New Orleans, LA 70117

The MRGO ecosystem restoration plan outlines methods to:

- Restore and create wetlands and cypress swamp habitat using dredged material
- Protect 70 miles of eroding shorelines
- Construct a diversion of Mississippi River water to reduce salinity and provide sediment and nutrients for marshes
- Create 7.5 miles of oyster reefs
- Develop three public recreation sites in collaboration with community groups

More information on the recommended plan and the draft MRGO ecosystem restoration report are available online at www.mrgo.gov or by request.

Contact: Public Affairs (504) 862-2201 AskTheCorps@usace.army.mil

Learn more at www.mrgo.gov


US Army Corps
of Engineers
New Orleans District
MRGO
Ecosystem Restoration
The U.S. Army Corps of Engineers, New Orleans District, is hosting public meetings to discuss the Draft Environmental Impact Statement and Feasibility Study for the Mississippi River Gulf Outlet ecosystem restoration plan. The recommended plan would restore over 58,000 acres of wetlands in areas affected by the MRGO navigation channel.
What: These meetings, per the National Environmental Policy Act, will provide an opportunity for the public to learn about the recommended plan and provide a venue for community members to submit formal comments on the proposed plan which is currently available for comment through Feb. 14, 2011.
When: Thursday, Feb. 3, 2011
Open House 6 to 6:30 p.m.
Presentation at 6:30 p.m.
Discussion to follow
Where: Light City Church
6117 St. Claude Ave.,
New Orleans, LA 70117
The MRGO ecosystem restoration plan outlines methods to:
• Restore and create wetlands and cypress swamp habitat using dredged material
• Protect 70 miles of eroding shorelines
• Construct a diversion of Mississippi River water to reduce salinity and provide sediment and nutrients for marshes
• Create 7.5 miles of oyster reefs
• Develop three public recreation sites in collaboration with community groups
More information on the recommended plan and the draft MRGO ecosystem restoration report are available online at www.mrgo.gov or by request.
Contact: Public Affairs (504) 862-2201 AskTheCorps@usace.army.mil
Learn more at www.mrgo.gov

2NN06NMA0208 DRS 13

WORLD & NATION

Puerto Rican lottery craps out

No prizes claimed in sales tax incentive

By Danica Coto
The Associated Press

SAN JUAN, PUERTO RICO — Don't throw out that lunch receipt. It could be worth $1,000.

That's the idea behind a campaign to force Puerto Rico's many tiny markets, food stalls and other mom-and-pop businesses to collect sales tax.

Puerto Rico's Treasury Department is transforming receipts into lottery tickets, printing contest numbers on each receipt and holding weekly drawings for prizes ranging from $100 to $1,000. It also plans to have a monthly drawing for a car.

A pilot program started in December in the second-largest city, Ponce, and will be expanded island-wide in July.

The government wants consumers to demand receipts, discouraging businesses from dodging the 7 percent sales tax by making unrecorded cash sales.

Businesses refusing to use the state-issued receipt machines will be fined $20,000.

Initial results in Ponce aren't encouraging: Eight winning tickets have been drawn and not a single consumer has come forward to claim a prize.

"It's a challenge," concedes Jose Carlos Colon de Jesus, a special assistant in the Treasury Department. "We have to change the mentality of the Puerto Rican so they demand their receipt."

The government plans a media blitz to promote the program, adding to heavy coverage by local newspapers, TV and radio. So far, though, it's been to little avail in Ponce.

Wanda Colon, manager of a Church's Chicken restaurant in the city, said many people don't seem aware of the program. She has had to remind them to take their receipt. Four of Church's customers in Ponce have won $1,000. But none has collected.

On the other hand, a few shoppers are divvying up their purchases to claim more receipts.

Puerto Rico, a U.S. territory, has a formal economy that looks much like the mainland, with many of the same chain restaurants and stores. But it also has a large and varied underground economy — one where people deal in cash, keep few records and don't pay all the taxes the government thinks it should collect.

Puerto Rico took in $1 billion in sales tax last year, but authorities estimate the government is only collecting about 62 percent of what it's owed under the law.

Southern Sudan has long to-do list for new country

It has no embassies, few paved roads

By Jason Straziuso and Maggie Fick
The Associated Press



JEROME DELAY / THE ASSOCIATED PRESS

Clothes dry in the sun outside a shack in Juba, Southern Sudan. Juba is oil-rich but lacks the embassies and skyscrapers of other world capitals. There was only a mile or two of pavement here just a year ago, and the local archives are stored in a tent.

JUBA, SUDAN — The mud-hut town of Juba has earned a promotion to world capital later this year. Only Southern Sudan needs far more than its own currency and a national anthem. Most of the roads here are dirt, and even aid workers live in shipping containers.

Juba is oil-rich but lacks the embassies and skyscrapers of other world capitals. There was only a mile or two of pavement here just a year ago, and the local archives are stored in a tent. Many, though, see great potential and are excitedly looking forward to controlling their own destiny.

Entrepreneur Soloman Chaplain Lui, 42, is overseeing the construction of 160 apartments and hotel rooms on a rocky bluff overlooking Juba. The country's largest swimming pool sits here, though its water is murky. His arm points toward empty fields where he hopes to one day build a mall and a golf course.

"As I talk to you now there are many people flowing here," he said. "A new country is being born."

Two decades of war between the predominantly Muslim north and rebels in the Christian-animist south killed at least 2 million people before a 2005 peace agreement was reached. Residents are jubilant to have their own country at last, though much work remains.

Decades of war and poverty have kept Southern Sudan in a decrepit state, and its 8.7 million people live in one of the least developed regions in the world. The U.N. says a 15-year-old girl here has a higher chance of dying in childbirth than finishing school. An estimated 85 percent of the population is illiterate.

Adding to the challenges, the prices of some everyday goods like sugar, soap and cooking oil have increased by more than 50 percent in recent weeks.

"The list is long," said Athoi Peter, 25, as he stood at a job advertisement board outside a U.N. agency on Monday. "The roads are no good in many places that we have very high food prices."

A new currency must be established. Diplomatic missions need to be opened. And a country must be chosen.

Critical negotiations still must be held with the north to decide on citizenship rights, oil rights and even the final border demarcation.

The U.S. national intelligence director warned last year of a possible new mass killing or genocide in Sudan over the referendum. That no longer looks likely.

Sudan President Omar al-Bashir backed the final results Monday and said he wanted to be the first to congratulate the south on their new state. His remarks seemed designed to help ensure a continuous flow of southern oil through the pipelines in the north.

Jordanian tribesmen issue call for reform

Rare statement warns of revolt

By Ethan Bronner
© 2011 The New York Times

JERUSALEM — Several dozen Jordanian tribesmen, historically core loyalists to the monarchy, have issued a rare statement calling for urgent and far-reaching political reform in Jordan. They said that without it, the country was headed down the path taken by Tunisia and Egypt.

"Before stability and food, the Jordanian people seek liberty, dignity, democracy, justice, equality, human rights and an end to corruption," said the statement, signed by 36 members of tribes, mostly Bedouins.

The statement, ignored by most Jordanian media, was published Monday on Ammonnews, the country's most popular news website. But the site was hacked and out of commission for four hours Monday, restored only after about 50 journalists held a sit-in in Amman, the capital.

"The intelligence police called us and told us they were taking down our site because it was against national interests," Basil Okour, the publisher and editor of Ammonnews, said in a telephone interview. "But we are not going to accept this way of dealing with journalists."

The statement said: "We saw on the path where the floods of Tunisia and Egypt will reach Jordan sooner or later, whether we want it or not." It called on King Abdullah II to no longer appoint Cabinet members but rather for them to be elected.

Jordan is a country of 6 million, more than half of them Palestinian, and 40 percent tribes, also known as East Bankers. The two groups maintain an uneasy coexistence under Abdullah's rule. The country has fared not only weeks of protests over prices and subsidies but also calls for wholesale political reform.

The king named a new prime minister last week in an effort to calm the waters.

Few consider either the monarchy or the country at imminent risk of serious unrest. But there is a clear undercurrent of unease, and the statement was a sign of that. It was careful not to attack Abdullah himself but did not spare his wife, Queen Rania, who is of Palestinian origin and has been accused of insensitivity and of funneling business and money to her family.

The statement mentioned three concerns, calling on Abdullah to return farmlands rumored to have ended up in the hands of the queen's family. Referring to a lavish party she threw in September in southern Jordan for her 50th birthday, it said, "We reject outrageous birthdays that come at the expense of the poor and the treasury."

"This statement was very important because it sent a clear message to everyone," said Okour, of Ammonnews. "It reflects the sentiments of the majority of Jordanians."

Bipartisan scalpels slash state budgets

It's the biggest crisis since the Depression

By Michael A. Fletcher
The Washington Post

Faced with the most severe budget crisis since the Great Depression, governors across the ideological spectrum are embracing the politics of austerity in a desperate effort to balance the books.

Democratic and Republican governors alike are sounding similar themes, as they slash once-sacrosanct programs such as education, health care for the poor and aid to hard-pressed local governments.

Some of the deepest and most politically painful cuts have been proposed by Democratic governors in traditionally liberal states that offer a wide range of programs for the poor and generous benefits to public employees. With federal stimulus money being phased out and state tax receipts only beginning to recover from the steep economic downturn, these governors say they're left with little choice.

"You are seeing some interesting scrambling of partisan politics," said Steven Urahn, managing director of the Pew Center on the States. "Governors do not have the luxury of being ideological, particularly when they have huge budget gaps to close."

On Tuesday, New York Gov. Andrew Cuomo called his state "functionally bankrupt" as he proposed closing most of a $10 billion budget gap by reducing both education and Medicaid.

In California, new Gov. Jerry Brown has proposed closing a $25 billion budget gap by cutting salaries for nonunion state employees by 10 percent and slashing money for higher education by as much as 20 percent. He also has threatened to cut K-12 education unless voters approve extending a series of temporary tax increases already in place.

Brown and Cuomo are among 29 new governors who have taken office as states face a collective budget deficit of $175 billion through 2013. That amount comes in addition to $260 billion in budget gaps states filled between fiscal years 2009 and 2011. Many experts say state tax revenue will not fully recover for several years.

LOUISIANA CONTRACTORS
NEW CONSTRUCTION & REMODELING
Home Elevations
"We Handle All Mitigation Grants"
• Siding • Windows • Roofing
• Gutters • Steel Rock
• Cabinets & Carpentry
• Additions & Patio Covers • Concrete
• Wrought Iron & Wood Fencing
504-202-0413
www.louisianacontractorsinc.com
Member B.B.B. Business Interest

3 TON A/C
CONDENSER & INSTALLED
TRANE $1399
5 YEAR WARRANTY
EER 10-11
REBATES $495.00
GULF STATES AIR
464-1267

SUPERIOR SALES EVENT
Save on Every Car!
HURRY! Superior LIMITED TIME!
HONDA
(504) 368-5640
Westbank, Destrehan, Houma, Thibodaux
www.SuperiorHonda.net

Looking for a New Home?
It's a Great Time to Buy!
Mark your calendar – This Sunday is
SUPER OPEN HOUSE SUNDAY!
Call 504-826-3509 to Place Your Open House Ad
See the Open House Directory in Sunday's Real Estate Section To Find Your Perfect Home!
The Times-Picayune
Additional open house listings throughout Real Estate Section.

US Army Corps of Engineers
New Orleans District
MRGO
Ecosystem Restoration
The U.S. Army Corps of Engineers, New Orleans District, is hosting the third and final public meeting to discuss the Draft Environmental Impact Statement and Feasibility Study for the Mississippi River Gulf Outlet ecosystem restoration plan. The recommended plan would restore over 8,000 acres of wetlands in areas affected by the MRGO navigation channel.
What: The meetings, per the National Environmental Policy Act, provide an opportunity for the public to learn about the recommended plan and provide a venue for community members to submit formal comments on the proposed plan which is currently available for comment through Feb. 14, 2011.
When: Tuesday, Feb. 8, 2011*
Open House 6 to 6:30 p.m.
Presentation at 6:30 p.m.
Discussion to follow
Where: Light City Church
6117 St. Claude Ave.,
New Orleans, LA 70117
The MRGO ecosystem restoration plan outlines methods to:
• Restore and create wetlands and cypress swamp habitat using dredged material
• Protect 70 miles of eroding shorelines
• Construct a diversion of Mississippi River water to reduce salinity and provide sediment and nutrients for marshes
• Create 7.5 miles of oyster reefs
• Develop three public recreation sites in collaboration with community groups
More information on the recommended plan and the draft MRGO ecosystem restoration report are available online at www.mrgo.gov or by request.
*This meeting was originally scheduled for Thursday, Feb. 3 but was re-scheduled due to inclement weather.
Contact: Public Affairs (504) 862-2201 AskTheCorps@nosace.army.mil
Learn more at www.mrgo.gov

7NN11NMA0206

CONTINUED

Neighborhood population data for N.O. display a study of dramatic contrasts

Some areas bleak, others booming

By Katy Reckdahl
Staff writer

Before the nearby Industrial Canal poured into her Upper 9th Ward neighborhood in 2005, Dorothy Scott's block buzzed with activity. From the front of her house on Mazant Street, she ran Dorothy's Sno-Ball Stand.

"I did very well," said Scott, 82, whose stand fueled the Florida public housing complex, which 10 years ago had 734 apartments.

But now Scott's customer base has shrunk almost to zero. It's the city's most emptied neighborhood, according to an analysis of 2010 census data by the local consulting firm GCR & Associates. The population of the Florida development neighborhood dropped from 1,604 in 2000 to a mere six in 2010.

A few years ago, Millie Fayard, 54, moved into what the data show has been the city's fastest-growing neighborhood: the Warehouse District. Fayard and 352 other new residents boosted the district's population by 43 percent between 2000 and 2010, according to GCR.

"My kids are all grown up," she said Saturday as she walked her dogs, Voodoo and Lady, outside her residence in the Cotton Mill building and within walking distance of her office.

Eugenie Birch, co-chairwoman of the Penn Institute for Urban Research in Philadelphia, has found a distinct demographic in her studies of downtown residents in four dozen cities. Nearly three-quarters fall into a category that Birch calls "nonfamilies."

Fayard said her neighbors fit that description: lots of young professionals and medical workers, mixed with a few senior citizens and, like her, empty-nesters.

And while most everything she needs is within walking distance, Fayard said, she's looking forward to the planned South Market District, and particularly to the Rouses grocery that will open in the former Sewell Cadillac building on Baronne Street.

And despite all the new apartment and condo buildings that have opened in the Central Business District since 2005, the population is still not quite enough to sustain some businesses on weekends, said a pair of workers at a neighborhood coffee shop. While they have to scramble during the week, weekend afternoons are "dead," they said.

For New Orleans, the first decade of the 21st century offered vast differences, depending on neighborhood. But even though population swings largely can be traced to the level of post-Katrina flooding, changes also hinged on where each community was headed before the storm.



ERIN KIRKNER / THE TIMES-PICAYUNE ARCHIVE

With developments such as the Cotton Mill condominium building, shown in 2004, the Warehouse District is New Orleans' fastest growing neighborhood. It is attracting young professionals and empty-nesters, a demographic trend seen in other urban downtowns.

Katrina accelerates trends

The Florida and other public housing developments, for instance, were being redeveloped before the 2005 disaster, while the Warehouse District and nearby areas were steadily adding residential units as part of a trend prompted by the 1984 world's fair, said Allison Plyer of the Greater New Orleans Community Data Center.

Ordinarily, those few places might be the only areas where population change diverted dramatically from the parish's overall rate of population growth or decline, she said. But while the city's overall population plummeted 29 percent during the period, neighborhoods saw a vast range of population changes, from virtual abandonment to a 49 percent increase in residents.

"Katrina hit and accelerated the redevelopment" already going on in the city, Plyer said. "And then every homeowner in town was in a position to have to redevelop their own property — or abandon it."

Although the Housing Authority of New Orleans has been fleeing with rebuilding something on the Florida site, it is now basically abandoned. Its only regular visitor is Residents Council President Diane Connerly, whom HANO pays to mow the lawn outside the complex.

HANO began demolishing the Florida complex in 2001, with plans to rebuild it on a smaller scale. A few years before the storm, 127 wooded townhouses opened, but they have been officially shuttered since 2005, their paint-colored siding plastered with graffiti.

"We're isolated," Scott said. The only other sign of human life visible from her home is across the street, where Willie Mae Woolridge, 78, has lived for more than 40 years.

With the depopulation came a loss of services. For instance, the Desire bus used to make frequent runs down their street and stop at the corner. "No more," Woolridge said. Like Scott, she either walks several blocks to the Galvez Street bus or relies on children and grandchildren to get to church, doctor's appointments and the grocery store.

Signs of progress

Across the Industrial Canal in the flood-ravaged Holy Cross neighborhood, Kim and Mark Ford opened their door in the 900 block of Keyser Street on Saturday for two deliverymen lugging mattresses and other furniture from a yellow rental truck.

For years, Kim Ford, 50, has seen such trucks drive up to other nearby houses. "When I saw them, I'd hope and pray that they'd be coming to my house someday," she said.

That day came Saturday, thanks to the nonprofit rebuilding group Project Homecoming, Ford said. But about half of her neighbors haven't had that day yet. According to GCR, Holy Cross has only half of the residents it had in 2000, a drop from 5,597 to 2,714 in the past 10 years.

"I think it's really sad," said Ford, counting which former neighbors have passed away and which ones are still dealing with Road Home, insurance companies and mortgage holders.

And if Ford drives 12 blocks to see her daughter Kris, who works at the nearby Dr. Martin Luther King Jr. Charter School, she crosses into the Lower 9th Ward, which lost nearly 90 percent of its population between 2000 and 2010, according to GCR.

So Ford is always looking for signs of progress. She awoke on Saturday to hear four children playing in the empty green space where Holy Cross School had its baseball diamond and track field before it pulled up stakes for Gentilly.

As the four boys walked past her house, Ford rushed outside. "Good morning!" she said. "I was so glad to see you playing there. Please come back soon."

Other neighborhoods returned to normal much more quickly.

Outside his house on Delgado Drive, Russell Preston, 56, spent Saturday morning gardening and playing with his big white dog, Marigny. According to GCR's census analysis, Preston's neighborhood, Parkview near City Park and Bayou St. John, is one of the city's least changed neighborhoods since 2000.

Preston said his area feels "almost identical" to what it was before Katrina.

"I feel that everybody who left came back, and fairly quickly," Preston said. Only the renters seem to change. "Sometimes a for-rent sign pops up," he said.

• • • • • • •

Katy Reckdahl can be reached at kreckdahl@timespicayune.com or 504.826.3386.

FOOT NOTES

ARTHRITIS AND THE FOOT

by Joan T. Watkins, DPM
Podiatric Medicine & Surgery

There are three types of arthritic conditions that can affect the foot. Osteoarthritis is associated with wear and tear, brought on by age or being overweight. Cartilage covering the ends of bones becomes worn, resulting in inflammation, swelling and pain. Rheumatoid arthritis, which causes the patient's immune system to destroy cartilage, can develop after an injury to the foot or ankle. It is similar to osteoarthritis, and can develop years after a fracture or severe sprain or dislocation. Following an injury, the body can secrete hormones that stimulate the death of cartilage cells. Tilting the foot to compensate for the pain can cause misalignment, which can worsen joint difficulties.

GOUT: Arthritis is the leading cause of disability in the United States.

Editor's Note: Dr. Joan T. Watkins is a board Board Certified foot specialist serving the entire greater New Orleans Area. Watkins Foot Center is located at 2520 Harvard Ave. Suite 2B, Metairie. Phone 454-8004.



Sound advice: the difference between getting a loan and getting the right loan.

At Regions, we are building better banking experiences with smart and responsible solutions for your borrowing needs. And with rates at historic lows, now is the time to explore your options. Whether it's for unexpected expenses or to consolidate high-interest debt, we're here to help you save.

apply online today at regions.com/myloan, call 1.888.in.a.snap or visit a Regions branch.

REGIONS
it's time to expect more.

Personal | Home Equity | Mortgage | Auto

MEMBER FDIC ©2010 Regions Bank. Equal Housing Lender. Regions and the Regions logo are registered trademarks of Regions Bank. The Right Way to Grow is a trademark of Regions Bank. All rights reserved.

US Army Corps of Engineers, New Orleans District

MRGO
Ecosystem Restoration

The U.S. Army Corps of Engineers, New Orleans District, is hosting the third and final public meeting to discuss the Draft Environmental Impact Statement and Feasibility Study for the Mississippi River Gulf Outlet ecosystem restoration plan. The recommended plan would restore over 58,000 acres of wetlands in areas affected by the MRGO navigation channel.

What: The meetings, per the National Environmental Policy Act, provide an opportunity for the public to learn about the recommended plan and provide a venue for community members to submit formal comments on the proposed plan which is currently available for comment through Feb. 14, 2011.

When: Tuesday, Feb. 8, 2011*
Open House 5 to 6:30 p.m.
Presentation at 6:30 p.m.
Discussion to follow

Where: Light City Church
6117 St. Claude Ave.,
New Orleans, LA 70117

The MRGO ecosystem restoration plan outlines methods to:

- Restore and create wetlands and cypress swamp habitat using dredged material
- Protect 70 miles of eroding shorelines
- Construct a diversion of Mississippi River water to reduce salinity and provide sediment and nutrients for marshes
- Create 7.5 miles of oyster reefs
- Develop three public recreation sites in collaboration with community groups

More information on the recommended plan and the draft MRGO ecosystem restoration report are available online at www.mrgo.gov or by request.

*This meeting was originally scheduled for Thursday, Feb. 3 but was re-scheduled due to inclement weather.

Contact: Public Affairs (504) 862-2201 AskTheCorps@nsace.army.mil

Learn more at www.mrgo.gov

Everything New Orleans

$2.9 billion plan restores MR-GO's environmental damage

Published: Thursday, December 16, 2010, 10:06 PM Updated: Friday, December 17, 2010, 1:16 PM

By **Mark Schleifstein, The Times-Picayune**

The **Army Corps of Engineers** has unveiled a sweeping $2.9 billion plan to restore the environmental damage caused by the construction and operation of the now-closed **Mississippi River-Gulf Outlet**, which includes a new freshwater diversion near Violet; restoration of cypress swamp in wetlands adjacent to the Lower 9th Ward, Algiers and Chalmette; protection of shorelines along the eastern New Orleans land bridge; and restoration or nourishment of wetlands along Lake Borgne.



View full size

Michael DeMocker, Times-Picayune archive

The proposed diversion would first move Mississippi River water and sediment into the Central Wetlands Unit, which is sandwiched between the 40 Arpent Canal and the levee along the Gulf Intracoastal Waterway and the MR-GO. The water would then flow out into the MR-GO and into Lake Borgne.

If approved, the project would take 10 years to complete, with construction beginning as early as 2012. It would restore, nourish or protect about 92 square miles of wetlands and land.

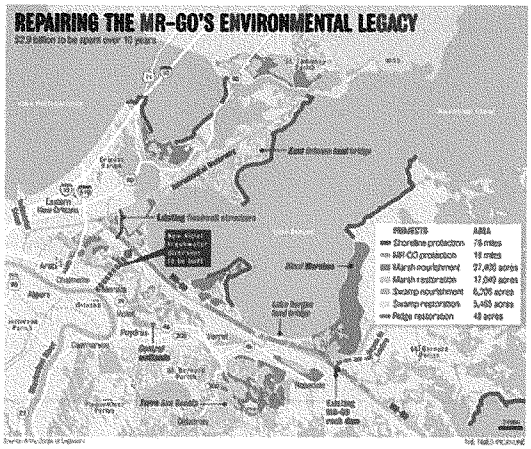
Included are three new recreation areas: a boardwalk and picnic shelters at the northern end of Caffin Avenue that would also be used for wetlands education programs; a walking and bicycle path and picnic area along the new Violet diversion, and a pier, walkway and picnic area incorporating the **Hurricane Katrina** memorial at Shell Beach in St. Bernard Parish.

Each recreation area would be provided with solar lighting, parking and bathrooms.

Construction of the projects would be staged, with those projects providing most protection from storm surge being built first, according to the plan.

The plan -- which Congress ordered the corps to develop after deauthorizing the MR-GO as a navigation channel in 2007 -- still must clear a variety of major hurdles, including whether Louisiana would be required to pay 35 percent of the cost of most of the projects. Coastal Protection and Restoration Authority Chairman

Garret Graves, the state's senior coastal official, in August notified the corps that the state believes the federal law authorizing the restoration plan requires that the federal government pay 100 percent of all costs.



View full size

Corps officials threatened to hold off on the restoration plan until the state agreed to the 35 percent split, Graves said. But then they backed off, and included a statement in the written plan explaining the disagreement.

Graves said that's an important concession because the state and the federal government can now offer the restoration plan as a project that could be financed with fines and mitigation costs that BP and other responsible parties will pay for the **Macondo oil spill**.

The corps also contends that its rules require the state to provide all land used for individual projects, including the more than 150 million cubic yards of mostly underwater sediment needed for restoration. Again, the state disagrees.

The plan calls for most sediment to be dredged from the bottom of Lake Borgne in what corps project manager Greg Miller calls a checkerboard configuration. No area would be dredged deeper than 10 feet below its existing surface below the water, and the pattern should alleviate concerns that the dredging will funnel storm surge or waves towards the shoreline, he said.

St. Bernard Parish officials also are expected to object to the plan to cut the Violet diversion through the unpopulated Sinclaire Tract in Meraux, rather than using the existing Violet Canal two miles to the south. The diversion channel will be 12 feet deep and 250 feet wide at its bottom, and would include five culverts for roads, a railroad and utilities.

Miller said the selected path is shorter and less expensive, and would destroy fewer acres of existing wetlands. The report indicates using the existing canal would require relocating 121 businesses, residences or structures, and still would not deliver enough water to adequately freshen Lake Borgne, the Biloxi Marshes and portions of Mississippi Sound.

The diversion must deliver 1,000 cubic feet per second of water and sediment during most of the year, increasing to about 7,000 feet per second from mid-April through May. The existing canal could only handle

Y1-8

2,000 cubic feet per second.

The Lake Pontchartrain Basin Foundation also favors using the existing Violet Canal, if possible, and has serious concerns about the Lake Borgne sediment borrow pit plan, said spokesman John Lopez.

Overall, however, the organization favors the plan.

"This restoration project, if realized to any degree, will be the largest one ever contemplated in this part of the coast and has tremendous promise to do some good," he said.

The proposed diversion would first move Mississippi River water and sediment into the Central Wetlands Unit, which is sandwiched between the 40 Arpent Canal and the levee along the Gulf Intracoastal Waterway and the MR-GO. The water would then flow out into the MR-GO and into Lake Borgne.

The design is based on historic salinity levels at various locations along the MR-GO, with the goal to restore water's salt content to levels found before the channel was built. At Bayou Dupre, that was 2 to 3 parts per thousand, which rose to 6 to 10 parts per thousand when the channel was opened, and has dropped to 4 to 7 parts per million with the recent construction of barriers on the canal at Bayou la Loutre and the Golden Triangle wetlands.

The diversion plan also has been opposed by oyster growers and shrimp fishers, who fear damage to existing oyster leases or to the timing of shrimp fishing. Such disruptions occurred this year because the state opened as many diversions as possible in an attempt to keep oil from the Macondo spill out of wetland areas.

Miller said the corps is aware there will be some changes in fisheries, but pointed out that some oyster leases in Lake Borgne did not exist prior to the opening of the MR-GO because the area was too fresh for oysters. The changed water conditions are expected to increase oyster production in other areas, he added.

The Violet diversion will be financed with a different federal-state split than the rest of the projects, thanks to a separate line item in a recent federal bill. Local sponsors would be required to pay 25 percent of its cost, and the state of Mississippi may be partly on the hook because of the reduced salinity expected in Mississippi Sound.

Federal officials have attempted to pair the individual projects within the plan with other already authorized projects.

For instance, plans to restore cypress forest within the Central Wetlands Unit tie in with a project to allow New Orleans and St. Bernard Parish to pour treated wastewater into the wetland area. The freshwater and nutrients promote cypress growth.

Another key goal of the restoration plan is to protect shoreline that buffers populated areas from hurricane

storm surge.

A lengthy stretch of the northwest Lake Borgne coastline from Alligator Point to the Rigolets in New Orleans would be armored with rock. A mirror area along easternmost Lake Pontchartrain also would be armored, with wetlands reconstruction and nourishment planned just north of Venetian Isles.

Wetlands nourishment consists of spraying a layer of sediment above existing, but weak, wetlands. The material gets absorbed into the soils in which wetland grasses are growing, extending their lifetime.

In designing the projects, the corps used three estimates of the relative rise of sea level -- the combination of the effects of subsidence and rising water levels -- expected through 2065. The estimates range from a rise of 1.8 feet to a high of 3.7 feet.

The project will have the most impact if global warming effects are at the low end of predictions. At the highest level, the value of the projects drops significantly, as rising water would drown more wetlands.

Corps officials considered thousands of individual restoration projects in the plan, combining them into a variety of alternatives, and then selecting from among three "best buy" combinations.

A 45-day public review of the plan and an accompanying environmental impact statement begins today, and ends Jan. 31, Miller said. The plan also will be reviewed by an independent peer review team appointed by the corps to look at all restoration projects in this area.

Public meetings on the plan are scheduled for Jan. 20 at 6 p.m. at C.F. Rowley Alternative School, 49 Madison Ave., Chalmette; and Jan, 25 at 6 p.m. at Leo Seal Community Center, 529 Highway 90, Waveland, Miss.

Following the reviews, an updated version of the plan and environmental statement will undergo a 30-day review, and then the report will be submitted to the chief of the corps.

Miller said the corps is targeting completion of that process by the end of September 2011, when it will be submitted to the White House for a final review before being transmitted to Congress.

Unlike other corps planning documents, which require Congress to vote to authorize the project and then hold a separate vote, often years later, to appropriate money for construction, Congress already has authorized the MR-GO restoration and need only begin appropriating money for its construction.

More information about the plan is available on the web at **www.mrgo.gov**, or by contacting Lee Muller, 504.862.1759.

SATURDAY, FEBRUARY 12, 2011 THE TIMES-PICAYUNE B-3

MR-GO comment period extended

Corps welcomes input through March 5

From Staff Reports

The Army Corps of Engineers has extended through March 5 the public comment period for its proposed $2.9 billion plan to restore environmental damage caused by the now-closed Mississippi River-Gulf Outlet, in response to requests from St. Bernard Parish political leaders, local residents and others.

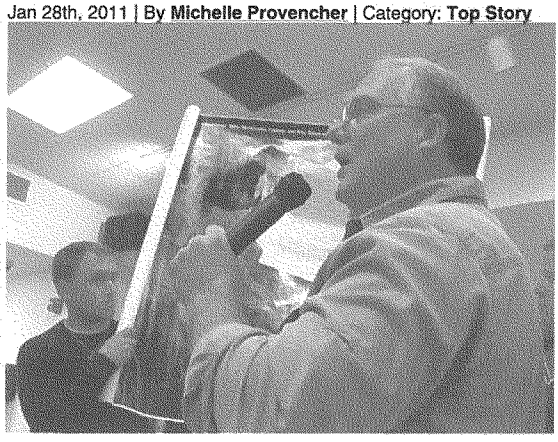
Comments on the plan and environmental impact statement can be filed until midnight March 5 on the website www.mrgo.gov, or by contacting Tammy Gilmore, Environmental Manager, at tammy.H.Gilmore@usace.army.mil, 504.862.1002, or by mail, US Army Corps of Engineers, New Orleans District, C/O Tammy Gilmore, PDR-RS, Mississippi River Gulf Outlet Ecosystem Restoration, P.O. Box 60267, New Orleans, LA 70160-0267.

The plan includes a new freshwater diversion near Violet; restoration of cypress swamp in wetlands adjacent to the Lower 9th Ward, Arabi and Chalmette; protection of shorelines along the eastern New Orleans land bridge; and restoration or nourishment of wetlands along Lake Borgne.

If approved, the project would take 10 years to complete, with construction beginning as early as 2012. It would restore, nourish or protect about 92 square miles of wetlands and land.

Diversion shot down by community

Jan 28th, 2011 | By **Michelle Provencher** | Category: **Top Story**



Fabian Guerra brought a map of the area to demonstrate the affect that he said he believes a freshwater diversion will have on St. Bernard Parish. "Too much freshwater killed the St. Claude brackish marshes," said Guerra. "You're going to annihilate the recreational fishing industry, the commercial fishing industry. All you're going to be able to catch is catfish."

Residents who say a freshwater diversion would cut the parish in half almost universally combated the man-made waterway Army Corps of Engineers says will restore St. Bernard Parish's eroding coastline.

It was standing room only during a public meeting on the diversion, held in the cafeteria of the C.F. Rowley Alternative School on Jan. 20, but that didn't stop dozens of concerned citizens from speaking out.

"It's like your right arm's broken, so you put a cast on the left," said Kathy Ziegler, one of the many locals opposed to the water diversion. "We don't need to lose any more land in St. Bernard Parish. We can get pipeline in, and pump what (sediment) we need."

The Army Corps of Engineers is behind the project, which is an effort to move freshwater out of the Mississippi River into the coastal marshes of Lake Borgne, building up land with river sediment and reducing the salinity of the water.

If successful, the freshwater diversion would balance out intruding salt water, thus preventing further land deterioration and protecting new dredged mud.

The project is expected to restore and protect 58,861 total acres of marsh and wetlands, according to Greg Miller, the chief of the Plan Formulation Branch and Louisiana Coastal

Restoration Team with the Corps.

Miller said more than 157 million cubic yards of dredge material, enough to fill 34.3 Superdomes, will be brought in to build up the washed away land.

Perhaps as a consolation, Miller presented an idea to put in a boardwalk and picnic area to the waterway, but gained only chuckles from the crowd in response to the recreational addition.

St. Bernard residents in general have skepticism when it comes to the effectiveness of Corps plans. Exhibit one is the Corps' admitted failure of the Mississippi River Gulf Outlet (MRGO).

The proposed water diversion is to "[restore] damage done by MRGO," Colonel Ed Fleming, with the Corps in the St. Bernard area, said at the public meeting.

MRGO stretches lengthwise along the east side of St. Bernard, and was built during the 1960s to be a shortcut between the Port of New Orleans and the Gulf of Mexico.

Massive flooding from Hurricane Katrina in 2005 caused the MRGO channel to shallow out, limiting its use for deep-draft vessels. It was de-authorized in 2008 as a federal navigation project.

For years, parish residents blamed the MRGO for land loss and the increased probability of flooding. Finally Congress passed a law in Nov. 2007 directing the Corps to restore Lake Borgne and the MRGO affected areas, said Miller.

Many blame MRGO for wiping out the parish's brackish marshes and cypress trees.

"You will never see Cyprus trees back in that marsh," said Robert Campo, a local fisherman who had spoken with Miller about the project before the meeting. "I haven't seen one project by the Corps worth a damn."

Others in attendance echoed Campo's sentiment.

"We are the Corps' experimental monkey," exclaimed Raymond Couture, a commercial fisherman since age 13, and now a member of the Coastal Zone Advisory Committee. "Every time [the Corps] wants to try something new, they take it to St. Bernard."

While the majority of speakers vehemently opposed the project, some people were willing to make a concession if the water diversion were built using the existing Violet Canal.

"Since we live in a delta, we need to let it start functioning like a delta, and that is by pumping freshwater into it," said one audience member before recommending Violet as the site.

Four potential sites where the water diversion could be built have been selected; one uses the Violet Canal, another is in Poydras and two are in Meraux.

The Corps' first choice is in Meraux, the Sinclair Tract, since it is the shortest and most direct route between the Mississippi River and Lake Borgne. Also, no homes or businesses would need to be moved.

The second pick is the Pecan Grove in Meraux, which is a slightly farther distance, and one structure would have to be moved.

Expanding the Violet Canal is the third option, and would likely be the costliest choice as 120 homes and businesses are in the way.

"I have interacted with folks interested in this," said Miller.

The last – and least desired – alternative is in Poydras between the Violet Canal and River Bend. It is the longest distance, would have the largest impact to wetlands, and would require the most dirt to move.

Construction of the water diversion alone is nearly $3 billion, not including operational costs, design costs and land acquisition. The funding is not currently in place.

St. Bernard Parish President Craig Taffaro anticipates the total cost to be closer to $4-5 billion.

Taffaro spoke at length against the Corps-recommended methods.

"This plan fails to meet the comprehensive standards of St. Bernard Parish," said Taffaro. "The plan sacrifices needed components," for financial reasons.

Rather, Taffaro suggested using pipelines, following suit with Ziegler's and many other's preferred tactic.

Though a system of pipes to pump water would bear a higher price tag, Taffaro said it would not split the parish physically or culturally the way a water diversion would.

"We believe St. Bernard Parish deserves restoration regardless of the cost," said Taffaro. "Are we spending the dollars as wisely as we can, or as conservatively as we can?"

The physical divide caused worry over transportation as well, especially for fire and emergency medical services.

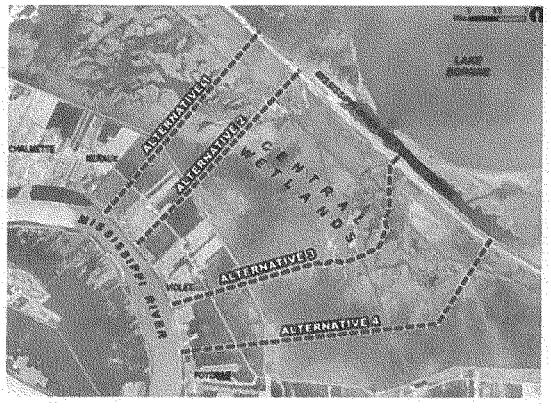
Yet Fleming said the roadways would be taken care of.

"We will maintain two routes in and out of St. Bernard Parish no matter what we look at," he said.

This was only the first of three civic meetings scheduled before the end of the public comment period, which was extended by 15 days to end Feb. 14. Miller said all comments will be noted and taken into account before a final draft of the project or a decision has been made.

After, the Corps will take their findings and conclusion to Washington D.C. for authorization.

The second public meeting took place on Jan. 25 in Waveland, Miss. The third will be at the Light City Church in New Orleans on Feb. 3 at 6 pm.



A map provided by the Corps shows the four alternatives of the potential diversion. Alternative 1, in Meraux, is the most desirable due to its short distance and lack of homes and businesses nearby.

Leave a Comment

You must be **logged in** to post a comment.

Appendix Y2

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11 | Meeting Name | Location: CF Poultry

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	MELEINE	1401 3RD ST.	Violet	LA	70092		909-3803	
2	Brend Robin	2324 Florestan					296-8912	
3	Jerry Estagind	1328 Bayard St Bernard		LA	70085	jestagind@aol.com	504-722-5746	
4	Kimberlyn Bright	2904 Angelique Dr	Violet	LA	70092	kmwbright@yahoo.com	5043098889	
5	George Jackson III	6184 Lovisa Ct RD St Bernard			70085		5046283707	
6	ADELE FOLES	7425 E. St. Bernard	Violet	LA	70092		504-452-2157	
7	EMANUEL Alphonso	1901 Couture St	St Bernard	LA.	70085			✓
8	JOHN MARKS	1513 Bayou Rd	St Bernard	LA	70085		504/454/0012	
9	Andrew Baker	2912 Burgundy St #C	NO	LA	70117			
10	Mike Gnadt	2104 Olivia St	Meraux	LA	7007S		504 373-6537	
11	Terri Garland	455 Alfadel Ln	Soquel	CA	95073			
12	Dia Kreiter	2156 Quinn Ct.	Santa Clara	CA	95051			
13	Donald J. Meraux	6177 E. St. Bernard	Hwy Violet	LA	70092		504-615-7505	
14	Mitchell Gaudet	20033 Victory Rd	N.O. LA	LA	70129	mitchellxxx@cox.net		
15	Karen & Randy Melerine	2032 Landry Ct.	MERAUX	LA.	70075	RandyMelerine@gmail.com	225-803-2083	
16	Collins FERNANDEZ	6501 JULES BROWN	VIOLET	LA	70092		504-393-7401	
17	Therese Benit	2129 Valmar Dr	Meraux	La	70075	tbenit@yahoo	504 271-2844	
18	Peggy Henry	2424 Parker Ham Rd			70092			
19	Guy Henry	2424 Parker Ham Rd			70092			

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1/20/11 | MRGO | Meeting Name ECO | Location: OF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	News
1	JUSTIN STERRAS	3401 BAYOU RD, St Bernard	LA	70085	N/A		504-682-2095	
2	Brett Escher	2216 Margaret Ln. Meraux		70075	N/A		504-782-9686	
3	Melanie Escher	2216 Margaret lane Meraux		70075	Melaniesescher@yahoo.com			✓
4	Messiah Paul Ward	724 Oakdawn Dr Metairie		70005				
5	Robert L. Campo	1319 W/SCLOSKEY HWY St. Bernard	LA.	70085	N/A		(504) 239-5165	✓
6	Zachary J Campo	1319 W/SCLOSKEY HWY	St. Bernard	LA	70085	N/A	(504) 564-3116	
7	Juanita Lafuente	2401 Etienne Dr.	Meraux	La.	70075	—	504-279-6624	✓
8	Francis Lafuente	" "	"	"	"		" "	✓
9	Kim Vandenborre	210 Charles Ct	Slidell	LA	70458	deadlydudley724@gmail	985-847-1924	✓
10	Dudley VANDENBORRE	"	"	"	"	"	" "	✓
11	Austen Graybill	121 Coney dr	Arabi	LA	70032		504-756-9234	
12	Tyler Olney	PO Box 3115	Baton Rouge	LA	70821	tyler@crafted-today.com		
13	DAVID MUNN	716 Adams St.	N.O. LA		70118	mutt de mutters		✓
14	Jamey Tripp	EDF 257 Park Ave So	NYC	NY	10010	jtripp@edf.org	212-616-1247	
15	Eric Hume	3400 Maureen Ln	Meraux	LA	70075	erichume@aol.com	504 239-7399	
16	Tim Gonzales	1941 Francis Carroll Dr. St Bernard		LA	70085	shellbeachtim@gmail	504 459-1055	
17	Sherwood Gagliano	1260 Main St, Baton Rouge		LA	70802	sgagliano@coastal-env.com	225-882-3252	
18	Lori Hix	2112 Maureen Ln, Meraux	La	70075	lorihix@gmail.com			
19	GLENN OUSSET	2012 E. BEAUREGARD ST	CHALMETTE	70043	gousset@bellsouth.net		504-495-4284	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11 | Meeting Name | Location: CF Radley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Josh Sager	2201 Blanchard Dr	Chalmette	LA	70043			
2	Vicki Holmes	3505 Despaux	Chalmette	LA	70043			
3	CHRIS Holmes	"	"	"	"	cholmes@att.net	453-4782	
4	TRACY LANDRY	2913 RUE MARCELL	MERAUX LA	7006				
5	RUSTY GAUDE	SEA GRANT				agaude@agcenter.lsu.edu		
6	RICHARD EBERHARDT	309 Highway 90 JEAN LA 70121			WA	TERWAYS JOURNAL@MSN.COM		L
7	GEORGE BARISICH	2812 Mona Lisa Ave	Violet LA	70092		MONETSNOSEAFOOD@AOL.COM	504-439-2019	
8	JOE OSTER	308 W. Magnolia ST	Mandeville	70448		JOSTERparalegal@ATT.NET	504 276-2490	L
9	Clyde DAU	4521 E St. Bernard Hwy	Violet	70092			(504)279-5932	L
10	Dorothy L. Benge	206 Decatur St	N.O.	LA	70130	dothenge@aol.com	504-554-8412	
11	LARRY WAGNER	202 WINDWARD PASSAGE			70458			L
12	Mary Ann Bazile	P.O. Box 1356	Braithwaite	LA	70040	maryann.bazile@shell.com		L
13	ella camburnbeck	5319 Magazine St.	NO	LA	7011S	ellacamburnbeck@la.gov		
14	angela lawson	829 Port St.	NO	LA		angela.lawson@la.gov		
15	Paul Kemp	633 Magnolia Woods	Baton Rouge	LA	70815	pkemp@audubon.org		
16	Robert Ariatti	6728 Memphis St.	N.O.	LA	70124			
17	Mayely Boyce	827 Bordeaux St	NO			mayely.boyce@gmail.com		
18	Thomas Exnicious Jr	6505 Jules Brown St	Violet	LA	70092			
19	Ginger Mays	3312 Sherman Dr	Violet	LA	70092	balletginger@yahoo.com		

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11	Meeting Name	Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	R. Gue	417 Friscoville	Arabi	LA	70032		504-439-8191	
2	Floyd Gue	417 Friscoville	Arabi	LA	70032		512-957[illegible]	
3	Mike & Shirley Pechon	1012 Friscoville	Arabi	LA	70032	sbpechon@hotmail	504-267-3602	
4	Ellen Eschette	2007 W Beauregard	Chalmette	LA	70043	Jodiee.70146@yahoo.com	504-267-4229	
5	Mike Bayhem	P.O. Box 1X66	Chalmette	LA	7043	Mike.Bayhem@cnd.com	504-258-4467	
6	Bill Kappel	2045 Lakeshore Dr #463 70125	NO	LA	70125			
7	Ben Alexander-Block	The Times-Picayune				bblock@timespicayune.com	504-352-2552	
8	Wanda Allen	4521 E. St. Bernard Hwy	Meraux		70075		504-279-5482	
9	Charles Constein	3316 Delille St	Chalmette	LA	70043	Cconstein@cox.net	504 277-6495	
10	Monty Montelongo	2104 Sylvia Blvd	St. Bernard	LA	70085	mmontelongo@cox.net	504 583 1389	
11	Junior Rodriguez	on file						
12	Kathy Beaudette	518 Labarre Rd	Jefferson	LA	70121		504-828-1265	
13	Pete Balzer	7522 Paceenham	Violet	CA	70092	PBalzer@cshold.com	512-6831	
14	Mike Voss	7500 E St. Bernard Hwy	Violet	LA	70092	MVOSS@COX.NET	452-0882	
15	Chris Pulaski	3343 Bayou Black Dr	Houma	LA	70360	pulaskicenwf.org	985 360 6257	
16	Charles Cimbonas	332 Richelieu Blvd	Chalmette	LA	70043	CJTMBERN1@AOL.com		
17	Judy Noffsinger	2304 Creely Dr.	Chal		70043	aceatthemaxx@yahoo.com	500-800-3651	
18	Brian Kelly	3600 State St. Apt	New Orleans		70119			
19	Ivy Gaudet	4232 San Remo N.O.		LA	70124			

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11 | Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Rosemary Gibia	2909 Golden Dr	Chalmette	LA	70043	rgibia@yahoo.com	504-421-5051	
2	Kim Nunez	2305 Judy Dr.	Meraux	LA	70075	Knunez2@gmail.com	232-0377	
3	Gleeda Guillot	P.O. Box 425	Violet LA		70092		504-682-1112	
4	Patricia Baune	2001 Webster	Meraux	La	7007[illegible]		504 9084044	
5	Gary [illegible]	2001 Webster	Meraux	LA	70075	P. baynes corp.net	48	
6	Raymond Cantrell	ON FILE						
7	Jordan Macha	714 Adams St	New Orleans	LA	70118	jordan.macha@sierraclub.org	504.861.4837	
8	SAM SOLIS	2532 Bend Rd	St Bernard	LA	70085	SAMSOLISMD@CMAIL.com	504 439	
9	RAYMOND DORN	232 Bleam Dr	Chalmette	La	70043	rdorn@whitneybank.com	517-4794	
10	[illegible]	16 Pecan Grove	Meraux	La	70075			
11	Lloyd Lyons	1828 TOUP DR.	ST. BERNARD	LA			504/251 6322	
12	Doug "	"	"				"	
13	David Breland	3005 ST. MARIE	MERAUX	LA.	70075		628-4263	
14	Kenny Desselle	2720 may flower Dr.	Meraux		70075		481-8096	
15	PATTI MULLER	218 BORDEAUX ST.	METAIRIE		70005		833-6097	
16	Tony Ricks	PO Box 5063	Covington	LA	70434	tony@pin-engr.com	985 635-9597	
17	STV WILLIAMS	920 PONTCHARTRAIN #170	NEW ORLEANS	LA	70117	swilliamson@bbland.com	504 962 2594	
18	Johnny ATKINSON	1514 LA 46	ST. BERNARD	LA	70085		504-554-0700	
19	STAN GELA	3625 Canal St. 3RD Floor	NOLA		70119		5046693403	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11 | Meeting Name | Location: CF Rawley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Duran Pat	3112 Table St	Meraux	LA	700		504-237-9815	
2	Joshua Lewis	3709 Bark SS St	NOLA	LA	7014	jlewis9@tulane.edu	504-488-1976	
3	CM. Swanner	948 Fris court H.	[illegible]	LA	7003		504 371 2467	
4	Pat Fitzpatrick	180B Lakeview Dr.	Slidell	LA	70458	drpjfitz@yahoo.com		X
5	Maria Bodine	1369 Magazine St	NOLA	LA	70130	mbrodine@gmail		
6	Dean Sager	2301 Blanchard,	Chalm	LA	7008	Bcguan2792a.o.c		
7	Polly Campbell	4212 Florida Ave	Meraux	LA	70075	pollycampbell5@yahoo	554-7134	
8	Monique Verdin	2824 Bayou RD	St. Bernard	LA	7008	moniqueverdin@gmail.com		
9	Linda Delaney	304 Parish Dr.	Arabi	LA	70032		836-2209	
10	Annelke Clark	2035 Bayou Rd.	St. Bernard	LA	7008			X
11	Brewer, Angel	9521 Birch ST	Ventr	La	70092	angelbrew@cox.net	5042780783	
12	~~Anthony J Cuccia Jr~~	7101 Brigade	Chalm La		70043		504/5771072	
13	Fred Henderson	2229 Bobolink	St Bern LA		7008		~~504-9~~	
14	Nora Henderson	2229 Bobolink	St Bern LA		7008		717 3749	
15	~~ERTIN~~ ESTEVES JR	2508 GINA DR	St BERNARD		70085		504-439-1828	
16	Janet Perez	PO Box 783	Violet	LA	70092	mrsguzzie@yahoo	504 682-0804	
17	Vera Nunez	2039 Deos Racins	BRAITHWAITE	LA	70040			
18	Ralph J. Perez	6535 E St Bernard Hwy	Violet		70092	guzzie1a@yahoo	504-494-1948	
19	Stephen Wicks	9576 Robert Dr	Slidell		70461	tidechaser101@yahoo	985-259-2304	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: 1.20.11 | Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newspa
1	Linda Barrett	2533 Bayou Rd	St. Bernard	LA	70085			
2	Louis Barrett	2537 Bayou Rd.	St. Bernard	LA		mrs.no1i2539@comcast		L
3	Trent Campo	1301 YSCLOSKEY ST	[illegible]	LA			5042396377	
4	Kathy Ziegler + Ralph	2732 S. Lake Blvd.	Violet,	LA	70092			L
5	Michael Campo	3221 MAUREEN, LN	MERAUX	LA	70092		504 442 2395	L
6	Jeff Mills	2101 Sylvia	Blvd				504-682-6272	L
7	Logan Fox	2105 Sylvia	Blvd				504-682-9151	L
8	John A Lopez	387					504421-7348	
9	Wayne Burgess	8201 W Judge Perez Dr					504-508-9289	
10	David Crosson	12241 Industriplex	Blvd BR,	LA	70809	david@ccalouisiana.com	225-923-5200	
11	Eileen Leitz	4421 Genie	MERAUX	LA	70075		504-228-1866	
12	Nate Cutura	4117 AUDUBON ST	SHDEL		70461		985 502 0240	
13	Bruce Guerra Sr	Bruce Land	1900		70085		504-272-0909	
14	Patsy Serpas Romero	1558 Bayou Rd.	St. Bernard,	LA	70085		504-682-2436	
15	Manuel Paul Guerra	1553-B Bayou Rd.	St. Bernard,	La	70085		504-421-2999	
16	Chris Cummings Jr	8300 SARD LN	ST Bernard	La	70085		504-228-2463	
17	Jules Raggio Jr	8213 Fremin	LA ST Bernard	LA	70085		985 291 0885	
18	Richard Boyer	25216 Buckhorn Rd	Jackson	LA	70748		225-936-6168	
19	Frank Auderer	2120 Ballard Dr.	Chalmette	LA	70043	FAUDERER@ahod.com	(504)756-8563	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11	Meeting Name	Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	News
1	SIDNEY TORRES	8121 SAN LO	POYDRAS	LA	70043			
2	GRETCHEN BONFERT	5500 Prytania St #510	NEW ORLEANS		70115	gbonfert@hansen-inc.com	504-355-8107	
3	Mike Hunnicutt							
4	William McCarthy							
5	Al Glennan	2020 OLIVIA ST	MERAUX				279 4264	
6	Lori & George Hutton	25871 Curie	Warren, MI			LORIGHUTTON@AOL		
7	Bill Carroll	2312 ETIENNE DR	MERAUX	LA				
8	Debbie Tracy Metivier	7500 Debouchel	Meraux			WilliamDanaDeb@Yahoo.com	279-5141	
9	CAROLYN LANDRY	2913 Rue MARSEILLE					278-5902	
10	TRACY LANDRY	2913 Rue MARSEILLE					278-5902	
11	Michael Guerra	1553 D BAYOU RD.					875-0016	
12	Jessica Robins	7420 Saturn Ct						
13	Angel Brenelle							
14	Rose Nunez	209 E Urquhart St	Chalmette	LA	70043			
15	Tina Torres	209 E Urquhart St	Chalmette	LA	70043			
16	Claude ROME	2413 Parkenham Dr.	Chal		7004[illegible]			
17	Sharon Williams	2413 Parkenham Dr	Chal	La	7004[illegible]	SHARON@WILLIAMS+ROME.com		
18	Erin Blackwell	1929 Francis Conrad		La	70085			
19	Sandra Blackwell	" " "		"	"			

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11 | Meeting Name | Location: CFRowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Catherine S. Williams	2412 Farmsite Rd	Violet	LA	70092	WILL2412@AOL.COM	504-682-2755	
2	Cornell Alfonso	412 Palm Dr	Braithwaite	LA	70046		504 417 3131	
3	Huey M. Pizani	1569 Bayou Rd	St. Bernard	LA	70085		504-682-3308	
4	Lisa Bourgeois	1205 St Charles Ave	New Orleans		70113		504-605-3527	
5	Andre' Neff	1205 St. Charles Ave	"		70130			
6	Albert Cook	1808 Linda Lou	St Bernard	LA	70085	[illegible]	[illegible]	
7	Peggy Cook	"	"	"	"		504-682-7153	
8	Becky Livaudais	4626 E. St. Bernard	Hwy Meraux	LA	70075	RLivaudais@AOL.com	504-271-2837	✓
9	Donna Breaux	2824 Farmsite Rd	Violet	LA	70092		870-834-9289	
10	Hilton Preau	3112 Fabre Dr	Meraux	LA	70075	HPREAU@AOL.com	309-1524	
11	Richard Tamor	1408 Bayou Rd	St. Bernard	LA	70085		453-6159	✓
12	Tommy Cook	2541 Judy Dr	Meraux	LA	70075		220-7813	
13	Kenny Henderson	3804 Palmisano	Chalmette	LA	70043		417-3752	
14	Stephen N LeRouge	35 Packenham Ave	Chalmette	LA	70043		915-5422	
15	Joey G. Englert	3725 Galla Dr	Chalmette	LA	70043	englertj@cox.net	277-6683	
16	Melanie Koons	617 E St Bernard	Chalmette		70043		236-3710	
17	Dolores Landry	3001 Maureen	Lora Meraux		70075		277-2861	
18	Co Ducnz	3709 Kent Ave	Meraux		70006			
19	Bruce Palmer	3613 Corinne Ave	Chalmette		70043			

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: 1.20.11	Meeting Name	Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	CHARLES LEON	2525 BAYOU Rd	ST. BERNARD	LA	70085	CHARLESLEON@COMCAST.NET	504/460-3270	
2	Kenneth Boos	LOT 70 Hopedale	"	"	"	KennethBoos83@GMAIL	" 393-7107	
3	Adele Nunez	P.O. Box 418	Violet,	LA	70092		504 554-2469	
4	DONNA STRADA	4421 OLIVE DR.	MERAUX	LA	70075		504-512-2521	
5	GLENN ALFONSO	2813 DeBouchel Blvd	MERAUX	LA	70075		504-277-0393	
6	ANGELA RIZANI	P.O. BOX 331	ST. BERNARD	LA	70085	freedie70085@yahoo.com	504-682-3308	
7	PETER FOLES	7429 E. St. Bernard Hwy	Violet	LA	70092		504-460-2271	
8	Robin Crist	1205 ST CHARLES				Robin.crist@hotmail.com	504-729-0706	
9	Pat Poucin	3116 Legend St	Meraux	LA	504		858 5858	
10	Suzanne Tan	Lr	same			crescentcitygal@yahoo.com		
11	Philip Livaudais	4628 E. St. Bernard	Meraux	LA	70075	LGP86@COX.NET	504 303 3977	
12	Monica Pezzola	3022 Desoto	New Orleans	La	70119	bpezold@uno.edu	504-228-0244	
13	Darrell Holmes	6116 Flood St	NO	LA	70117	Jhanell.newbb@yahoo	504 235-4580	
14	Karen Clancy	9213 Torres Dr	St. Bernard	LA	70085			
15	Glenn Sarah	9213 Torres Dr	St. Bernard	LA	70085			
16	Jared Guerra	1553 Bayou Rd	St Bernard	LA	70085			
17	Linda Swanner	948 Friscoville	Arab	LA	70032	swanlanz@hotmail.com		
18	William Landwehr	2532 Judi DR	meraux	La	70075	billylandwehr@yahoo		
19	Susan Montgomery	3433 maureen ln	meraux	LA	70075	smontgomery21@cox.net	504-621-3060	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1/20/11 | MRGO ECO Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone
1	Walter Cuva	2604 Packenham Rd	V.I.O.E.T	LA.	70092		504 583 0830
2	Edward S. Chauppette	2213 Munster Blvd	Meraux	LA	70075		504-202-1319
3	April English	3301 W. Esplanade	Metairie	LA	70002		214-914-5192
4	Chris Maculuso	2253 Hollydale 53 Ave	Baton Rouge	LA	70808	chris@lawildlifefed.org	225 344-6707
5	Chris Haines	118 Shadowlawn Ave	Pass Christian	MS	39571	chrishaines@cableone.net	504415 3718
6	ALFRED BORN	2513 ROSETTA	CHALMETTE				277 6867
7	Donny Bourgeois	2104 Lanoux St	Meraux	LA	70075	Bourgeois9@comcast	504 276-8518
8	Mike Girard	2104 OLIVIA	"	"	"	gINAA@cox.net	271-0421
9	Rodney Ourso	4528 E. St. Bernard Hwy	Meraux	LA	70075	Moky@aol.com	504-415-6449
10	Fabian Guerra	6217 Hopedale Hwy	St. Bernard	LA	70085		504-494-7258
11	Michelle Provencher	7962 Hwy 23,	Belle Chasse	LA		michelle@theStbernardvoice.com	
12	Sandy Robin	2700 2nd St	St. Bernard	La.			
13	Lori Serpas	2033 Valma	Lo.	70075	La		
14	Betty Collard	2521 Bayou Rd	St. Bernard	LA	70085	—	504-682-8060
15	Tammie Favorito	on file					225 229 1994
16	Amanda Moore						
17	Micaela Coner	506 Carriage Way	BK	LA	70808		225-931-3932
18	Jane Lanley	2028 Margaret Ln	Meraux		70075		504-650-9631
19	Debra Meaux	4405 Genie St	Meraux	LA	70075		504 421-2029

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1/20/11 | MRGO ECO Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone
1	GARRY McKELVY	26298 TAYLOR CREEK RD	ANITE	LA	70422	CAPTAINGARRY@hughes.NET	985-517-3745
2	JIM BRYAN	211 TEDDY LN	PICAYUNE MS		39466	JIBB@CHARTER.NET	985-640-0117
3	DOREE MAGIERA	3700 N. Causeway Blvd	Met. LA	LA	70002		5042180855
4	Jonathan McKinney	3500 N. Causeway Blvd.	Met LA		70002		5042180856
5	Jace Sirgo	96 Lake Clarborne Sq	Chalmette LA		70043		504 720-5972
6	James Kieffer	2416 GINA DR	ST. BERNARD		70085		504-272-0101
7	Patrice Cusimano	433 Angela Ave	ARABI		70032	pdc1211@cox.net	
8	Bill Haines	417 Friscoville	Arabi		70032	billhaines@rocketmail.com	504-415-3684
9	Barney Callahan	302 Amis St.	Thibodaux, La		70301	barney.callahan@shell.com	(225)445-6826
10	Nicholas Alfonso	2306 Gina St	St Bernard		70085		504-439-0284
11	DAVE PERALTA	4408 Newport	Chalmette		70075	dpJDC1@AOL.com	—
12	Catherine Menesses	2125 Maureen Lane	Meraux		70075		504-654-8325
13	Joseph F. Hulse	2110 Tourneifort	Chalmette		70043	—	—
14	DAN ARCENEAUX	2912 TOURNEFORT	Chalmette		70043		2215448
15	Catherine Serpas	2012 Bayou Rd	St. Bernard	LA	70085		
16	Lawrence Alagnesia	6021 SHORE ALCENY	St. Bernard		70085	KSTASINK@VZW.BLACKBERRY.NET	985-960-0882
17	EDGAR F. VERRETT	905 HARRISON AV, METAIRIE LA			70005		833-9298
18	DONALD MONTOY	217 AVALON BLVD					
19	Pete TUFARO	518 MARINA Rd	Chalmette		70043	PTUFARO@bellsouth.net	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: 1.20.11 | Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	SA Prather	31507 Sulphur Pine	Springfield	LA		sprather@kellercostello.com	985-320-1078	
2	Rhonda Hannan	2009 Olivia St.	Meraux	LA		RhondaHannan@yahoo	615-9322	
3	ALBERTA LEWIS							
4	REBECCA MARTIN	100 Post Blvd #10	Chalmette		70043	r.martin@stbernardfirst.com		
5	T. Dooley	#4 Brittany Pl	Arabi		70032	Dooley@chapter.com		
6	Pete Matthews	1615 Poydras St Suite 1250	New Orleans	LA	70112		592-4600	
7	Joseph Arcuri	6536 Jules Brown St	Violet	LA	70092		985-709-4124	
8	Dennis Chaix	4800 Bird	Violet	LA	70092		504/231-3459	
9	Leslie Holden	2704 Blanchard	Chalmette	LA	70043		504 252-6919	
10	Mark Abshire	3813 Palmisano Blvd	Chalmette	LA	70043	ktmmdn.422@bellsouth.com	504 382 6937	
11	Margie Matranga	96 Jupiter Ct	Violet	La	70092			
12	Rikki Matranga	96 Jupiter Ct.	Violet	La	70092			
13	Glenn Bacher	3313 Pecan Dr	Chalmette	LA	70043		504-473-8947	
14	Summer Martin	OCPR	Baton Rouge	LA		Summer.martin@la.gov	225-342-1594	
15								
16								
17								
18								
19								

Page Y2-13

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: 1.20.11 | Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Adam Gettys	1914 Schnell Dr	Arabi	LA	7003[illegible]		2343681	
2	GLENN LANDRY	3001 MAUREEN	MERAUX	LA	70075		277-2261	
3	Phyllis Diecidue	P.O.Box 282	Violet	La	70092		296-9850	
4	M Voss	7500 E St Bernard Hwy	Violet	La	70092			
5	M Voss	7500 E St Bernard Hwy	Violet	La	70092			
6	[illegible]	3900 M	council	&	Fred	Everhardt		
7	Brian Adams	2105 Livaccari	Violet	La	70092			
8	Darcy Treaylor	8401 Paris Place	Chalmette	LA	70043		277-7060	
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								

Page V2-14

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: 1.20.11 | Meeting Name | Location: CF Rowley

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Karen Bazile	3616 Karen	Chalmette	LA	70043	KBAZILE@BRE	net 524-8740980	
2	Howard Anna	3200 Karen	Chal	LA	7004[illegible]	hjlunaC@yahoo.com	504-271-1632	
3	Edward Hannan	2009 Olivia ST	Meraux	LA	70075		504-445-2183	
4	Gina Swanson	WDSU						
5	Bradley Cantrell	1433 Bayou Rd	St. Bernard	LA		BTC6009@aol.com	504-913-3587	
6	Carlton Dutreuil	[illegible]	[illegible]			[illegible]		
7	Jason Sutton	8616 Plum St				JASONKSUTTON@GMAIL.COM		
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								

Page Y2-15

AILSAL	MAILFIRST	MAILLAST	Name 1	Name 2	Address	City	State	Zip	Phone
Mr.	Robert	Campo			1319 Yscloskey	St. Bernard	LA	70085	504-239-5165
Mr.	Dudley	Vandenborre			210 Charles Ct.	Slidell	LA	70458	985-847-1924
Mr.	Chris	Macaluso		Louisiana Wildlife Federation	2293 Hollydale Ave. 5B	Baton Rouge	LA	70808	225-344-6707
Mr.	Walter	Cuo, III			2604 Packenham Rd.	Violet	LA	70092	
Mr.	Darryl	Ward		Garden of Eden	724 Oaklawn Dr.	Metaire	LA	70005	504-234-9936
Mr.	Fabian	Guerra			6217 Hopedale Hwy	St. Bernard	LA	70085	504-494-7258
Mrs.	Lori	Serpas							
Ms.	Kathy	Ziegler	Kathy & Ralph Ziegler		2732 S. Lake Blvd.	Violet	LA	70092	
Mrs.	Catherine	Serpas		Eastern St. Bernard Association	2012 Bayou Rd.	St. Bernard	LA	70085	504-494-1363
Mr. & Mrs.	Louis	Barrett			2533 Bayou Rd.	St. Bernard	LA	70085	504-376-4829
Ms.	Linda	Barrett		Eastern St. Bernard Association	2533 Bayou Rd.	St. Bernard	LA	70085	
Mr.	Frank	Campo, Jr.	Robert and Zachary Campo		1301 Yscloskey Hwy.	St. Bernard	LA	70085	504-239-6377
Mr.	Edgar	Veillon		Jefferson Rod and Gun Club	905 Harris Ave.	Metaire	LA	70005	504-833-9298
Mr.	James	Kieff			2416 Gina Dr.	St. Bernard	LA	70085	
Mr.	Sherwood	Gagliano		Coastal Environments, Inc.	1260 Main St.	Baton Rouge	LA	70802	225-892-3252
Mr. & Mrs.	Alfreda	Pizani	Huey and Alfreda Pizani		1569 Bayou Rd.	St. Bernard	LA	70085	504-682-3308
Mr.	James	Tripp		Environmental Defense Fund	257 Pak Ave. South	New York	NY	10010	212-616-1247
Mr.	Philip	Livaudais	Philp & Becky Livaudais	Borgnemouth Realty	4628 E. St. Bernard Hwy	Meraux	LA	70075	
Mr.	Pete	TuFaro			518 Marina Dr.	Chalmette	LA	70043	
Mr.	David	Muth		National Wildlife Federation	716 Adams St.	New Orleans	LA	70118	504-872-5993
Mr.	Albert	Loar			1808 Linda Lou Dr.	St. Bernard	LA	70085	504-682-7153
Mr.	Raymond	Couture, Jr.			2121 Francis Ave.	Violet	LA	70092	504-450-8711
Mr.	Blaise	Pezold		SBWF	3022 Desoto St.	New Orleans	LA	70119	
Mr.	Darrly	Malek-Wiley		Sierra Club	716 Adams. St.	New Orleans	LA	70118	504-861-4835
Mr.	Dan	Arceneaux		CZAC Chairman					
Mr.	Sidney	Torres			8121 Saro Ln	Poydras	LA	70085	504-271-8421
Dr.	John	Lopez		Lake Pontchartrain Basin Foundation	387 Carr. Dr.	Slidell	LA	70458	504-421-7348
Mr.	Pat	Fitzpatrick		Mississippi State University	18013 Lakeview Dr.	Slidell	LA	70458	985-788-9486
Mr.	Nicholas	Alfonso			2306 Gina St.	St. Bernard	LA	70085	504-272-0038
Ms.	Polly	Campbell		Lexington Place Civic Corp	4212 Florida Ave.	Meraux	LA	70078	504-554-7134

Dr.	Paul	Kemp		National Audubon Society	6160 Perkins Rd.	Baton Rouge	LA	70808	225-768-0826
Mr.	George	Jackson, III			618 Florissant Rd.	St. Bernard	LA	70085	504-628-3707
Mr.	Joe	Oster			308 W. Urquhart St.	Chalmette	LA	70043	504-228-2140
Mr.	George	Barisich		United Commercail Fisherman	2812 Mereax Ln.	Violet	LA	70092	
Mr.	Joseph	Holse		St. Bernard CZM	2110 Tournefort St.	Chalmette	LA	70043	225-573-8929
Mr.	Jules	Reggio, Jr.			2213 Francis Ave.	St. Bernard	LA	70092	985-291-0885
Mr.	Fred	Everhardt		St. Bernard Council District F					
Mr. & Mrs.	Reed	Henderson		La State Represenative Distrtict 103	PO Box 739	Chalmette	LA	70044	504-278-6599
Mr.	Ricky	Melerine							
Mr.		Robin			2324 Florissant Rd.	St. Bernard	LA	70092	504-296-8912
Mr.	Jerry	Estopinal			1328 Bayou Rd.	St. Bernard	LA	70085	504-722-5746
Ms.	Kimberlyn	Bright			2904 Angelique Dr.	Violet	LA	70092	504-309-8889
Mr. & Mrs.	Adele	Foles	Peter & Adele Foles		7425 E. St. Bernard Hwy	Violet	LA	70092	504-452-2751
Mr.	Emmanuel	Alphonso			1901 Couture St.	St. Bernard	LA	70085	
Mr.	John	Marks			1513 Bayou Rd.	St. Bernard	LA	70085	504-494-0012
Mr.	Andrew	Baker			2412 Burgundy St. #C	New Orleans	LA	70117	
Mr. & Mrs.	Alice	Ginart	Mike & Alice Ginart		2104 Olivia St.	Meraux	LA	70075	504-373-6537
Ms.	Terri	Garland			455 Alfadel Ln	Soquel	CA	95073	
Ms.	Diane	Kreiter			2156 Quinn Ct.	Santa Clara	CA	95051	
Mr.	Donald	Merwin			6177 E. St. Bernard Hwy	Violet	LA	70092	504-615-7505
Mr.	Mitchell	Gaudet			20033 Victory Rd.	New Orleans	LA	70129	
Mr. & Mrs.	Randy	Melerine	Randy & Karen Melerine		2032 Landry Ct.	Mereaux	LA	70075	225-803-2083
	Collins	Fernandez			6501 Jules Brown	Violet	LA	70092	504-343-7901
Ms.	Therese	Benit			2129 Valmar Dr.	Meraux	LA	70075	504-271-2844
Mr. & Mrs.	Guy	Henry	Guy & Peggy Henry		2424 Packenham Rd.	Violet	LA	70092	
Mr.	Justin	Serpas			3401 Bayou Rd.	St. Bernard	LA	70085	504-682-2095
Mr. & Mrs.	Brett	Escher	Brett & Melanie Escher		2216 Margaret Ln.	Meraux	LA	70075	504-782-9686
Mr. & Mrs.	Juanita	Labarde	Maurice & Juanita Labarde		2401				
Mr. & Mrs.	Kim	Vandenborre	Dudley and Kim Vandenborre		210 Charles Ct.	Slidell	LA	70458	985-847-1924
Mr.	Ruston	Graybill			121 Coney Dr.	Arabi	LA	70032	504-756-9234
Mr.	Tyler	Ortego			PO Box 3115	Baton Rouge	LA	70821	

Mr.	Eric	Hume			3400 Maureen Ln.	Meraux	LA	70075	504-239-7399
Mr.	Tim	Gonzales			1941 Francis Carrol Dr.	St. Bernard	LA	70085	504-439-1055
Ms.	Lori	Hix			2112 Maureen Ln.	Meraux	LA	70075	
Mr.	Glenn	Ousset			2012 E. Beauregard St.	Chalmette	LA	70043	504-495-4282
Mr.	Josh	Sayer			2301 Blanchard Dr.	Chalmette	LA	70043	
Mr. & Mrs.	Charles	Holmes	Vicki & Charles Holmes		3505 Despaux Dr.	Chalmette	LA	70043	
Ms.	Tracy	Landry			2913 Rue Marcell	Meraux	LA	70075	
Mr.	Rusty	Gaude							
Mr.	Richard	Eberhardt		Waterways Journal	309 Highway Dr.	Jefferson	LA	70121	
Mr.	Clyde	Alen			4521 E. St. Bernard Hwy	Meraux	LA	70075	504-279-5432
Ms.	Dorothy	Benge			206 Decatur St.	New Orleans	LA	70130	504-524-8412
Mr.	Larry	Wagner			202 Winward Passage St.	Slidell	LA	70458	
Ms.	Mary Ann	Bazile			PO Box 1356	Braithwaite	LA	70040	
Ms.	Ella	Camburnbeck			5319 Magazine St.	New Orleans	LA	70115	
Ms.	Angela	Lawson			829 Port St.	New Orleans	LA	70117	
Mr.	Robert	Ariatti			6728 Memphi St.	New Orleans	LA	70124	
Ms.	Mayley	Boyce			827 Bordeaux St.	New Orleans	LA	70115	
Mr.	Thomas	Exnicious, Jr.			6504 Jules Brown St.	Violet	LA	70092	
Ms.	Ginger	Mays			3312 Shannon Dr.	Violet	LA	70092	
Mr. & Mrs.	Flloyd	Gue			417 Friscoville Ave.	Arabi	LA	70032	504-439-8191
Mr. & Mrs.	Mike	Pechon	Mike and Shirley Pechon		612 Friscoville Ave.	Arabi	LA	70034	504-267-3602
Ms.	Ellen	Eschette			2007 W. Beauregaurd St.	Chalmette	LA	70043	504-267-4229
Mr.	Mike	Boyham			PO Box 1866	Chalmette	LA	70043	504-258-4967
Mr.	Bill	Kappel			2045 Lakeshore Dr. Rm 443	New Orleans	LA	70125	
Mr.	Ben	Alexander-Bloch		Times-Picayune					504-352-2552
Ms.	Wanda	Alcon			4521 E. St. Bernard Hwy	Meraux	LA	70075	504-279-5482
Mr.	Charles	Ponstein			3316 Delille St.	Chalmette	LA	70043	504-277-6495
Mr.	Monty	Montelongo			2104 Sylvia Blvd	St. Bernard	LA	70085	504-583-1389
Mr.	Junior	Rodriguez							
Ms.	Kathy	Beaudette			518 Labarre Rd.	Jefferson	LA	70121	504-828-1265

Mr.	Pete	Bauer			2522 Packenham Rd.	Violet	LA	70092	504-512-6331
Mr.	Mike	Voss			7500 E. St. Bernard Hwy	Violet	LA	70092	504-452-0882
Mr.	Chris	Pulanski		National Wildlife Federation	3353 Bayou Black Rd.	Houma	LA	70368	985-360-6257
Mr.	Charles	Imbornone			3312 Palmisano Blvd.	Chalmette	LA	70043	
Ms.	Judy	Hoffoneisfer			2304 Creely Dr.	Chalmette	LA	70043	504-400-3651
Mr.	Brian	Gaudet			3604 State Street Dr.	New Orleans	LA	70139	
Ms.	Ivy	Gaudet			4232 San Remo St.	New Orleans	LA	70129	
Ms.	Rosemary	Gioia			2909 Golden Dr.	Chalmette	LA	70043	504-421-5051
Ms.	Kim	Nunez			2305 Judy Dr.	Mereaux	LA	70075	504-232-0377
Ms.	Glenda	Guillot			PO Box 425	Violet	LA	70092	504-682-1112
Mr. & Mrs.	Patricia	Bayne	Gary & Patricia Bayne		2001 Webster Dr.	Mereaux	LA	70075	504-908-4044
Mr.	Raymond	Courture							
Mr.	Jordan	Macha			716 Adams St.	New Orleans	LA	70118	504-861-4837
Mr.	Sam	Solis							
Mr.	Raymond	Doran			232 Beaver Dr.	Arabi	LA	70032	504-554-4794
Mr. & Mrs.	Bob	Baudin	Bob & Gayle Baudin		10 Pecan Grove Ln.	Meraux	LA	70075	
Mr.	Lloyd	Serigne	Lloyd & Doris Serigne		1828 Todd Dr.	St. Bernard	LA	70085	504-251-6322
Mr.	David	Breland			3005 St. Marie Dr.	Meraux	LA	70075	504-628-4263
Mr.	Kenny	Desselk			2720 Mayflower Dr.	Meraux	LA	70075	504-481-8096
Ms.	Patti	Muller			218 Bordeaux St.	Metairie	LA	70005	504-833-6097
Mr.	Tony	Ricks			PO Box 5063	Covington	LA	70434	985-635-9597
Mr.	Stu	Williamson			920 Poeyfarre St.	New Orleans	LA	70130	504-465-2594
Mr.	Johnny	Atkinson			1514 LA 46	St. Bernard	LA	70085	504-554-0700
Mr.	Stan	Gela			3625 Canal St. 3rd Flr	New Orleans	LA	70119	504-669-3403
Ms.	Pat	Preau			3112 Fable St.	Meraux	LA	70075	504-237-9815
Mr.	Joshua	Lewis			3309 Banks St.	New Orleans	LA	70119	504-468-1976
Mr.	CM	Swanner			948 Friscoville Ave.	Arabi	LA	70032	504-271-2465
Ms.	Maria	Brodine			1367 Magazine St.	New Orleans	LA	70130	
Mr.	Dean	Sager			2301 Blanchard Dr.	Chalmette	LA	70043	
Ms.	Monique	Verdin			2824 Bayou Rd.	St. Bernard	LA	70085	
Ms.	Linda	Delany			304 Parish Dr.	Arabi	LA	70032	504-836-2209
Ms.	Annette	Clark			2035 Bayou Rd.	St. Bernard	LA	70085	
Ms.	Angel	Brewer			7521 Birch St.	Violet	LA	70092	504-278-0783

Mr.	Anthony				2101 Brigade Dr.	Chalmette	LA	70043	504-577-1078
Mr.	Bert	Esteves, Jr.			2508 Gina Dr.	St. Bernard	LA	70085	504-439-1828
Ms.	Janet	Perez			PO Box 783	Violet	LA	70092	504-682-0804
Ms.	Vera	Nunez			2039 Degracias Ln.	Braithwaite	LA	70040	
Mr.	Ralph	Perez			6535 E. St. Bernard Hwy	Violet	LA	70092	504-494-1945
Mr.	Stephen	Wicks			39578 Robert Dr.	Slidell	LA	70451	985-259-2304
Mr.	Michael	Campo			3221 Maureen Ln.	Meraux	LA	70092	504-442-2395
Mr.	Jeff	Mills			2101 Sylvia Blvd	St. Bernard	LA	70085	504-682-6272
Mr.	Roger	For			2101 Sylvia Blvd	St. Bernard	LA	70085	504-682-9151
Mr.	Wayne	Burgess			8211 W. Judge Perez Dr.	Chalmette	LA	70043	504-908-9709
Mr.	David	Cresson			12241 Industriplex Blvd	Baton Rouge	LA	70806	225-952-9500
Ms.	Eileen	Leitz			4421 Genie Dr.	Meraux	LA	70075	504-228-1866
Mr.	Anto	Cutura			4117 Audubon St.	Slidell	LA	70461	985-502-0240
Mr.	Bruce	Guerra							504-272-0909
Ms.	Patsy	Serpas-Romero			1558 Bayou Rd	St. Bernard	LA	70085	504-682-2436
Mr.	Manuel	Guerra			1553-B Bayou Rd.	St. Bernard	LA	70085	504-421-2999
Mr.	Chris	Alfonso, Sr.			820 Saro Ln	St. Bernard	LA	70085	504-228-1263
Mr.	Jules	Reggio, Jr.			2213 Francis Ave.	St. Bernard	LA	70092	985-291-0885
Mr.	Richard	Goyer			25216 Bickham Rd.	Jackson	LA	70748	225-936-6168
Mr.	Frank	Auderer			2120 Gallant Dr.	Chalmette	LA	70043	504-756-8563
Ms.	Gretchen	Bowfert			5500 Prytania St.	New Orleans	LA	70115	504-355-8107
Mr.	Mike	Hunnicut		FEMA					
Mr.	William	McCartney		St. Bernard Parish Government					
Mr.		Hannon			2020 Olivia St.	Meraux	LA	70092	
Mr. & Mrs.	George	Hutton	George & Lori Hutton		25871 Curie Ave	Warrens	MI	48091	
Mr.	Gil	Carliri			2313 Etienne Dr.	Meraux	LA	70092	
Mr. & Mrs.	Tracy	Methcin	Tracy & Debbie Methcin		2800 Debouchel Blvd.	Meraux	LA	70092	504-279-5141
Mr. & Mrs.	Tracy	Landry	Tracy & Carolyn Landry		2913 Marcelle Dr.	Chalmette	LA	70043	504-279-5902
Mr.	Michael	Guerra	Michael & Jared Guerra		1553 D Bayou Rd.	St. Bernard	LA	70085	504-875-0016
Mr.	Jerrie	Robin			7240 Saturn Ct.	Violet	LA	70092	
	Angel	Brewer							
Ms.	Lina	Torres			209 E. Urquhart St.	Chalmette	LA	70043	
Ms.	Lina	Nunez			209 E. Urquhart St.	Chalmette	LA	70043	

Mr.	Claude	Rome			2413 Packenham Rd.	Chalmette	LA	70043	
Ms.	Sharon	Williams			2413 Packenham Rd.	Chalmette	LA	70043	
Ms.	Erin	Blackwell	Erin and Sandra Blackwell		1929 Francis Carroll	St. Bernard	LA	70085	
Ms.	Catherine	Williams			2412 Farmsite Rd.	Violet	LA	70092	504-682-2755
Mr.	Cornell	Alfonso			412 Palm Dr.	Braithwaite	LA	70046	504-417-3131
Ms.	Lisa	Bourgeois			1205 St. Charles Ave.	New Orleans	LA	70130	504-615-3527
Mr.	Andre	Neff			1205 St. Charles Ave.	New Orleans	LA	70130	
Mr. & Mrs.	Albert	Loar	Albert & Penny Loar		1808 Linda Lou Dr.	St. Bernard	LA	70085	504-682-7153
Ms.	Donna	Breaux			2824 Farmsite Rd.	Violet	LA	70092	870-834-9289
Mr.	Hilton	Preau			3112 Fable St.	Meraux	LA	70075	504-309-1524
Mr.	Richard	Tamor			1408 Bayou Rd.	St. Bernard	LA	70085	504-453-6159
Mr.	Tommy	Cook			2541 Judy Dr.	Meraux	LA	70075	504-220-7813
Mr.	Kenny	Henderson			3804 Palmisano Blvd.	Chalmette	LA	70043	504-417-3752
Mr.	Stephen	LeRouge			35 Packenham Ave.	Chalmette	LA	70043	504-915-5422
Mr.	Joey	Englert			3725 Gallo Dr.	Chalmette	LA	70043	504-277-6683
Ms.	Melanie	Koons			617 E. St. Bernard Hwy	Chalmette	LA	70043	504-236-3710
Mr. & Mrs.	Dolores	Landry	Glenn & Dolores Landry		3001 Maureen Ln	Meraux	LA	70075	504-277-2261
	Co	Duonl			3705 Kent Ave.	Metaire	LA	70006	
Mr.	Bruce	Palmeri			3613 Corinne Ave.	Chalmette	LA	70043	
Mr.	Charles	Leon			2525 Bayou Rd.	St. Bernard	LA	70085	504-460-3270
Mr.	Kenneth	Boos			Lot 70	Hopedale	LA	70085	504-343-7107
Ms.	Adele	Nunez			PO Box 418	Violet	LA	70092	504-554-2469
Ms.	Donna	Strada			4421 Olive Dr.	Meraux	LA	70075	504-512-2521
Mr.	Glenn	Alfonso			2813 Debouchel Blvd.	Meraux	LA	70078	504-277-0392
Ms.	Robin	Crist			1205 St. Charles Ave.	New Orleans	LA	70130	504-729-0706
Ms.	Pat	Pourcieu			3116 Legend St.	Meraux	LA	70075	504-858-5858
Ms.	Suzanne	Taylor			3116 Legend St.	Meraux	LA	70075	
Ms.	Janelle	Holmes			616 Flood St.	New Orleans	LA	70117	504-232-4580
Mr. & Mrs.	Glenn	Sanchez	Glenn & Karen Sanchez		2213 Torres Dr.	St. Bernard	LA	70085	
Ms.	Linda	Swanner			948 Friscoville Ave.	Arabi	LA	70032	
Mr.	William	Landwehr			2532 Just 1 Dr.	Meraux	LA	70075	
Ms.	Susan	Montgomery			3433 Maureen Ln.	Meraux	LA	70075	504-621-3060
Mr.	Walter	Cure			2604 Packenhan Rd.	Violet	LA	70092	504-583-0380

Mr.	Edwards	Chaupetta			2213 Munster Blvd.	Meraux	LA	70075	504-202-1319
Ms.	April	English			3301 W. Esplanade Ave.	Metaire	LA	70002	214-914-5192
Mr.	Chris	Haines			118 Shadowlawn Ave.	Pass Christian	MS	39571	504-415-3718
Mr.	Alfred	Born			2513 Rosetta Dr.	Chalmette	LA	70043	504-277-6867
Mr.	Donny	Bourgeois			2104 Landry Ct.	Meraux	LA	70075	504-276-8518
Mr.	Rodney	Ourso			4528 E. St. Bernard Hwy	Meraux	LA	70075	504-415-6449
Ms.	Michelle	Provencher		St. Bernard Voice	7962 Hwy 23	Belle Chasse	LA	70037	
Ms.	Carolyn	Robin			2700 2nd St.	Chalmette	LA	70043	
Ms.	Betty	Collord			2521 Bayou Rd.	St. Bernard	LA	70085	504-682-8060
Ms.	Jammie	Favorite							225-229-1944
Ms.	Amanda	Moore							
Ms.	Micaela	Coner			506 Carriage Way	Baton Rouge	LA	70808	225-931-3938
Ms.	Josie	Landry			2028 Margaret Sue Ln.	Meraux	LA	70075	504-650-9631
Ms.	Donna	Maas			4405 Genie St.	Meraux	LA	70075	504-421-2029
Mr.	Garry	McKelvy			26298 Taylot Creek Rd	Amite	LA	70422	985-517-3795
Mr.	Jim	Bryan			211 Teddy Ln	Picayune	MS	39466	985-640-0111
Ms.	Doree	Magiera			3700 N. Causeway Blvd.	Metaire	LA	70002	504-218-0855
Mr.	Jonathan	Martinez			3500 N. Causeway Blvd.	Metaire	LA	70002	504-218-0856
Mr.	Jace	Sirgo			96 W Claibrone Sq	Chalmette	LA	70043	504-722-5972
Mr.	James	Kieff, Sr.			2416 Gina Dr.	St. Bernard	LA	70085	504-272-0101
Ms.	Patrice	Cusimao			433 Angela Ave.	Arabi	LA	70032	
Mr.	Bill	Haines			417 Friscoville Ave.	Arabi	LA	70032	504-415-3694
Mr.	Barney	Callahan			302 Amis St.	Thiboadaux	LA	70301	225-445-6820
Mr.	Dave	Peralta			4408 Newport Dr.	Chalmette	LA	70075	
Ms.	Catherine	Menesser			2125 Maureen Ln	Meraux	LA	70075	504-654-8325
Mr.	Joseph	Hulse			2110 Tournefort St.	Chalmette	LA	70043	
Mr.	Lawrence	Aravolasiti			6213 Hopedale Hwy	St. Bernard	LA	70085	
Mr.	Edgar	Veilloxi			905 Harrison Ave.	Metaire	LA	70005	504-833-9298
Mr.	Donald	Manksh							
Mr.	Jay	Prather			31507 Judith Dr.	Springfield	LA	70462	985-320-1078
Mr. & Mrs.	Rhonda	Hannan	Edward & Olivia Hannan		2009 Olivia St.	Meraux	LA	70075	504-615-9322
Ms.	Alberta	Lewis							
Ms.	Rebecca	Martin			100 Port Blvd #10	Chalmette	LA	70043	504-277-4009
Mr.	Tim	Doody			4 Brittany Pl.	Arabi	LA	70032	
Mr.	Pete	Matthews			1615 Poydras St., Ste 1250	New Orleans	LA	70112	504-592-4600
Mr.	Joseph	Addison, Sr.			6536 Jules Brown St.	Violet	LA	70092	985-709-4124

Mr.	Dennis	Diaz			4800 Birch St,	Violet	LA	70092	504-231-3439
Ms.	Leslie	Holden			2709 Blanchard Dr.	Chalmette	LA	70043	504-252-6919
Mr.	Mark	Abshier			3813 Palmisano Blvd.	Chalmette	LA	70043	504-382-6937
Mr. & Mrs.	Margie	Matherne	Richard & Margie Matherne		96 Jupiter Cir.	Violet	LA	70092	
Mr.	Glenn	Bachemin			3313 Pecan Dr.	Chalmette	LA	70043	504-473-8247
Ms.	Summer	Martin		OCPR					225-342-1594
Mr.	Adam	Gettys			1914 Schnell Dr.	Arabi	LA	70032	504-234-3681
Ms.	Phyllis	Diecidue			PO Box 282	Violet	LA	70092	504-296-9850
Mr.	Brian	Adams			2105 Livaccari Dr.	Violet	LA	70092	
Mr.	Darryl	Traylor			8401 Parc Pl.	Chalmette	LA	70043	504-277-7060
Mr.	Howard	Tina			3200 Karen Dr.	Chalmette	LA	70043	504-271-1632
Ms.	Gina	Swansin		WDSU	846 Howard Ave.	New Orleans	LA	70113	
Mr.	Bradley	Cantrell			1433 Bayou Rd.	St. Bernard	LA	70085	504-913-3587
Mr.	Carlton	Dufreacheau		Greater New Orleans Causwauv Cmsn					
Mr.	Jason	Sutton			8616 Plum St.	New Orleans	LA	70118	

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Violet Diversion

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Robert CAMPO **Affiliation** _____
Street 1319 VSCLOGGER Hwy **Phone** (504) 239-5165
City, State, Zip St BERNARD LA 70085
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: What does MISSISSIPPI GOT FOR our Fresh water, DID study take into account algea blooms, Hyason out breaks, Dead spots which occure when River water comes INTO salt water (Gulf of Mexico, River water after spill way opened IN lake pontchartrain.

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name DUDLEY VANDENBORNE **Affiliation** _____
Street 210 CHARLES CT. **Phone** 985-847-1924
City, State, Zip SLIDELL LA 70458
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: I support the Caernarvon reclaimation project and the concept of restoring the ecosystem of the Violet/Shell Beach/Hopedale region. However, I have concerns about using a diversion in this process. In my 3 minute discussion, I will present results showing that the Caernarvon diversion has made the region vulnerable to storm surge and actually increased marsh loss.

☒ If you would like to speak in addition to your written comment, please check this box.

Name Pat Fitzpatrick **Affiliation** Mississippi State University
Street 1803 Lakeview Dr **Phone** 985-788-9486
City, State, Zip Slidell, LA 70458
E-mail drpfitz@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Advocate For projects/plan - advise on some aspects -

☒ If you would like to speak in addition to your written comment, please check this box.

Name Chris Macaluso **Affiliation** Louisiana Wildlife Federation
Street 2253 Hollydale Ave SB **Phone** 225-344-6707
City, State, Zip Baton Rouge, LA 70808
E-mail Chris@lawildlifefed.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: COUST OF LAND YOU NEED TO WIDEN VIOLET CANAL

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Walter Cuva III **Affiliation**
Street 2604 Packenham Rd. **Phone**
City, State, Zip VIOLET, La 70092
E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: I Love a Dream
Plant Garden of Eden you will be part of Picture
Plants + Seeds.
Wrote letters received answer from President Barack Obama
US Senator David Vitter Mary Landrieu about planting Seeds + Plants
Delgado Community College Idea Business Plan Competition to Launch.

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Darryl Paul Ward **Affiliation** Garden of Eden.
Street 724 Oaklawn Dr. **Phone** 504 234-9936
City, State, Zip Metairie
E-mail Darrylpaul@cox

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: on Freshwater Diversion

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Fabian Guevara **Affiliation** _____
Street 601 Lamoda Drive **Phone** 504-499-7558
City, State, Zip St. Bernard La. 70085
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Violet canal - dredged MRGO 2yrs. before Katrina lives 4 streets from alternative 1

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name LORI Serpas **Affiliation** _____
Street _____ **Phone** _____
City, State, Zip _____
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: _____

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Kathy Ziegler **Affiliation** _____
Street _____ **Phone** _____
City, State, Zip _____
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: - against diversion
- against Recreation - just wants that part to Mat.
as happy

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Catherine Serpas **Affiliation** Eastern St. Bernard Ass.
Street 2012 Bayou Rd **Phone** 504-944-1363
City, State, Zip St. Bernard La 70085
E-mail DON1PAS@AOL.COM

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Restore Flow / Diversion

called Tammy - Report is OK Pass long

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Louis Barrett **Affiliation**
Street 2533 Bayou Rd. **Phone** 376-4829
City, State, Zip St. Bernard, LA. 70085
E-mail Mrgwol2533@cox.net

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Against the diversion

- Not against Coastal Restoration
- this is another MRGO
- dredge in River - Cost Benefit Analysis

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Linda Barrett **Affiliation** Eastern St. Bernard Associates
Street 2533 Bayou Road **Phone**
City, State, Zip St. Bernard, La 70085
E-mail mrgo2532@cox.net

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Against freshwater diversion

Salinity = Breton Sound Area — Main pass

Camps — Property Value — Putting ppl. out of Business

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name [illegible] CAMPO Jr. **Affiliation**

Street **Phone** 504 239 6377

City, State, Zip

E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: > Jefferson Riding Club

-Congrats corps on Comprehensive plan-

Served on lots of committees -Never seen one that was completely embraced when it was first released

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name EDGAR F. VEILLON **Affiliation** JEFFERSON ROD + GUN CLUB

Street 905 HARDISTY AVE **Phone** 504-833-9998

City, State, Zip METAIRIE, LA. 70005

E-mail EDGAR VJ AT BELLSOUTH.NET

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Oyster Farmer - dead set against this - this will finish me and my family off

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name JAMES Kieff **Affiliation** _____
Street 2416 Bina Dr. **Phone** _____
City, State, Zip ST. BERNARD LA. 70085
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: General Comments on process "Woody"
1973 - first MRGO presentation - hope it will be closing

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name SHERWOOD GAGLIANO **Affiliation** COASTAL ENVIRONMENTS, INC
Street 1260 MAIN ST. **Phone** 225-892-3252
City, State, Zip BATON ROUGE, LA
E-mail Sgagliano@coastalenv.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

*

Comment: I would like to know if the COE'S is going to Maintain canal.
2005 Corps commandeered their property

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Alfredo Pizani **Affiliation**
Street 1569 BAYOU ROAD **Phone** 504-682-3308
City, State, Zip St. BERNARD LA 70085
E-mail freddie70085@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment:
Location of Violet Canal
Central Wetland restoration
Utility of oyster reef restoration

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name James Tripp **Affiliation** Environmental Defense Fund
Street 257 Park Ave So NYC 10010 **Phone** 212-616-1247
City, State, Zip NY NY
E-mail jtripp@edf.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Diversion – Built in Violet – go in Marsh area – Wayne heter from Mr. Landry –

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Philip Livaudais **Affiliation** Borgne Mouth Realty
Street 4628 E. St. Bernard Hwy **Phone** _____
City, State, Zip Meraux LA 70075
E-mail LGP86@COX.NET

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: I am concerned about splitting the parish in ½ and the Height of proposed levees within the protected area.

No
house w/ copper Rays *Concern as Bank Stabilization

B/W — + 40 apart
→ area not Restored w/ Sediment – If Restore @ Bank – Need to use River

☑ **If you would like to speak in addition to your written comment, please check this box.**

"Building Bank"

Name Pete TuFaro **Affiliation** _____
Street 518 Marina Rd **Phone** _____
City, State, Zip Chalmette LA
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: difficult – can do through existing canal

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name DAVID MUTH **Affiliation** National Wildlife Federation
Street 7th Adams St. **Phone** 504-872-5993
City, State, Zip N.O. La 70118
E-mail muthd@nwf.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: ALBERT LOAR * Sediment – 1 mile N of Violet canal – there's a sandbar truly Restore St. B. – don't worry abt MS Rebuild BIRD ISLAND – look @ Venice – WBay, Tiger Pass

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Albert Loar **Affiliation** #
Street 1808 Linda Lou DR **Phone** 682-7753
City, State, Zip St Bernard LA
E-mail BMC_Riverman@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Tired of St. Bernard - Bevins the Corps experimental Monkey.

Violet canal is Big enough

Caernaron is a disaster

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Raymond Couture Jr **Affiliation** _____
Street 2121 Iroquois St **Phone** 5044528711
City, State, Zip Violet La 70092
E-mail _____
RAYMOND COUTURE, JR **www.mrgo.gov**

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: 1) Shoreline Stabilization lake Borgne -

2) NO part in plan for Chenier fallow

3) Bird Point delta

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Blaise Perrull **Affiliation** SBWF
Street 7012 Rosch St **Phone** _____
City, State, Zip NO La 70124
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

If You Break it, You pay for it —

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: (1) BAYOU BIENVIENUE [redacted] BOARDWALK

(2) BASE LINE DATA ONGOING MONITORING

(3) NEED FOR FUNDS TO START SOME WETLAND RESTORATION

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name DARRYL MALEK-WILEY **Affiliation** SIERRA CLUB
Street 716 ADAMS ST. **Phone** 504-861-4835
City, State, Zip NEW ORLEANS LA 70118
E-mail darryl.malek-wiley@sierraclub.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: See One Pipe over the Levee —

Never want another freshwater diversion in St B

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Dean Arcenaux **Affiliation** LZAC Chairman
Street _____ **Phone** _____
City, State, Zip _____
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Lifelong Resident of St. B. NON-STARTER
Attorney for Sinclair tract - Owner of Property is
opposed to Sinclair tract - 1,000 ft. Cut in St. B. parish
takes away prime land from Residents

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name SIDNEY TORRES **Affiliation**
Street 8121 SARO LN **Phone** 504 271-8421
City, State, Zip POYDRAS LA
E-mail STORRES@TORRES-LAW-COM

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Facts on Fisherman's input on Diversion
- A lot of things WRONG
- Caernarvon diversion

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Nicky ALFONSO **Affiliation**
Street 2306 Yinn st **Phone** 504-272-0038
City, State, Zip St Bernard LA 70085
E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Science + Engineering

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name John Lopez **Affiliation** Lake Pontchartrain Found
Street 387 Carr Dr **Phone**
City, State, Zip Slidell, La, 70458
E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: 849 properties - Still haven't reached 50% population in Neighborhood - KATRINA still in their face - ONLY 6 FT! Left

EMOTIONAL ISSUE - DOESN'T want New Cut (act. 1)

Topic: The Benefits of an Overall Ecosystem Plan and The Hesitation we feel as a community toward a specific aspect.

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Polly Campbell **Affiliation** LPCC president, Director of Neighborhood Initiatives, St Bernard Community Foundation
Street 4212 Florida Ave **Phone** 554-7134
City, State, Zip Meraux, LA 70075
E-mail pollycampbell5@yahoo.com

www.mrgo.gov

Lexington Place Civic Corp

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Talk about Violet Canal diversion option

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Dr. Paul Kemp **Affiliation** National Audubon
Street 6160 Perkins Rd **Phone** 225-768-0820
City, State, Zip Baton Rouge, LA 70808
E-mail pkemp@audubon.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: No diversion – Barrier Islands –

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name George V. Georgev Jackson III **Affiliation**
Street 618 Florissant RD St Bernard **Phone** 504 628 3707
City, State, Zip St Bernard 70085 LA
E-mail 70085
Florissant Rd **www.mrgo.gov**

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Fresh Water diversion should utilize the Inner Harbor Canal Locks to Bayou Bienvenue in New Orleans, and the Bonnet Carre Spillway; Sediment Restoration via piping at various locations South of Violet in the Breton Sound Area.

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Joe Ostera **Affiliation**
Street 308 West Vaquahaut St. **Phone** 504-228-2140
City, State, Zip Chalmette, LA. 70043
E-mail JosterparaLegal@ATT.NET

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: funding - against it - & control

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Carlos Barisich **Affiliation** United Commercial Fishermen's Assoc.
Street 238 N Main **Phone**
City, State, Zip Violet LA
E-mail nunetsnu Seafood@aol.

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: I am against another cut through St. Bernard Parish. Why not use the Violet Canal as an alternate site. Why can't you put large siphon pipes over the Levee instead of cutting through the River Levee. these pipes can be similar to the ones at West Pointe a la Hache.

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Joseph F. Hulse **Affiliation** St. Bernard CZM
Street 2110 Tournefort St. **Phone** 225-573-8929
City, State, Zip Chalmette, LA.
E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: AGAINST THE PROJECT STRICKLEY SIN CLAIR Tracts 1, 2, 3, 4 Barrier island Should be #1 Project. than Bay Eloy SIN CLAIR TRACK

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name JULES REGGIO JR **Affiliation**
Street 2213 FRANCIS AVE **Phone** 985 291 0885
City, State, Zip 70092 ST BERNARD ov 279-7509
E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
January 20, 2011
NEPA Public Comment

Comment: Fresh water diversion

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name [illegible] **Affiliation** _____
Street 3401 Bayou Road **Phone** 504-682-2095
City, State, Zip St. Bernard, La 70085
E-mail N/A

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

1

MEETING MINUTES FOR THE U.S. ARMY CORPS OF ENGINEERS NEW ORLEANS DISTRICT
MISSISSIPPI RIVER GULF OUTLET RESTORATION PLAN
PUBLIC MEETING
HELD AT
CR ROWLEY ALTERNATIVE SCHOOL,
49 MADISON AVENUE,
CHALMETTE, LOUISIANA 70043
ON THE 20TH DAY OF JANUARY, 20011
COMMENCING AT 6:42 P.M.

2

MS. RODI:
Good evening. We're going to get

started. Okay. Thanks for coming everyone.
Can you hear me in the back? Good?
Okay. We'll try to speak into the mic tonight as we do have a court reporter here as well, so we ask that when you make your comments, speak into the mic and face her direction so she can get everything on the record.
My name is Rachel Rodi. I work for the Public Affairs Office for the Corps here in New Orleans. We are glad you came tonight for the Mississippi River Guild Outlet Ecosystem Restoration Plan and Project. Tonight we have a lot of -- a busy schedule and a lot of people here, so I'm going to turn it over to our commander, Colonel Ed Fleming. He's going to do the Pledge of Allegiance and give a few welcoming remarks.
COLONEL FLEMING:
Thank you, Rachel.
If you'll please join me and I'll lead you in the Pledge of Allegiance.
(The Pledge of Allegiance was conducted.)

COLONEL FLEMING:
Thank you.
As Rachel said, my name is Ed Fleming. I'm an Army Colonel and I'm the District Commander for the Corps of Engineers New Orleans District. Thank you for allowing me to come to St. Bernard Parish tonight. It's

my pleasure being here with you to discuss this project or this series of projects.

A lot of times, I like to start off with a story or maybe try and crack a joke, but let me tell you what, tonight we've got some serious business we're going to talk about, and I understand that. Restoring the coastline is important and restoring the damage that was caused by MRGO is important to us and is critical not only to St. Bernard Parish, but to the State of Louisiana.

You know, as I look around, one of the things that I talk about a lot of times in the district is you can learn some lessons from some children. And there was a book that was written back in the 1980s, it was called Everything You Need to Know, You

4

Learned in Kindergarten, and it talks about things like when you cross the street, you hold hands. Now, don't take that literally, of course, we do take that literally; but what it means is when you go to a dangerous area, you look around to your right and to your left and you hold the person's hand and you cross the dangerous area. It also says things like milk and cookies are good. But it also says things as I look here we're in the school and you look up on the wall and

they've got some rules here for middle school. "Be respectful," "Be responsible," "Be positive." And I think as we go into tonight's meeting, there are a couple of things there that we will take into consideration. And I'm only here because this is important to me, and I'm here because this is part of the process. Getting public input and getting feedback is part of the process. And I value your input. I value your feedback.

There are a lots of ways you can give feedback and you can give input. You can do it tonight in a statement. You can do it on

our webpage. You can do it through phone calls or through e-mails. So there are lots of ways you can do it, but the important thing is, do it. Because we need your feedback. Be respectful, be responsible and be positive, and we'll take a lesson from our children.

You can stand up and tell me that you hate the Corps of Engineers and I'll take a note, and I understand and I acknowledge that, but that's not helpful for these particular sets of projects that we're talking about with MRGO Ecosystem Restoration. And I know many of you have looked at the list of projects that we have, and they range from everything from shore

protection to marsh creation to freshwater diversion. Again, freshwater diversion, as you know, is critically important through restoring the ecosystem; but I'm here to tell you, we'll have some sort of diversion, but we will maintain two egress routes and two routes in and out of St. Bernard Parish. That is part of every single alternative that we have, are two routes in and out of

6

St. Bernard Parish, no matter what alternative we look at. And I understand that that's some things that we're concerned about, and we've looked at alternatives, everything from the Current Violet to other things that are out there. But we will maintain those two routes in and out of the parish.

I think that at this point, I'll cut my comments off because we do have a lot to cover, and it is my privilege to introduce somebody who doesn't need any introduction in St. Bernard Parish, who I've only known for a short six months now, but I know that he is a fighter for St. Bernard Parish and is a testament that we're in this room, standing room only because President Taffaro sees the importance of these projects and sees how strong it is and feels very strongly about this and fights for you all

the time. So I would like to introduce the President of St. Bernard Parish, President Taffaro.

MR. TAFFARO:

Thank you, Colonel. I'll be brief so we

can get to the presentation and move from there. The good news is, obviously, you're looking around, this is the biggest crowd that we've had --

UNKNOWN:

Speak into the mic. We can't hear.

MR. TAFFARO:

We --

Better, George? Thanks.

This is -- this is the biggest crowd, obviously, we've had gathered regarding coastal restoration or any activities along those lines since Hurricane Katrina, so this is a very positive sign. Probably because it's one of those issues that's going to galvanize this community again in terms of maybe a single mind of purpose.

I think the Colonel hit it on the head. You know, Colonel Fleming, just like other directors or commanders before him, are here and have a job to do. One of the things that we have been able to work through is a partnership. Because we disagree, this is part of the public comment period in the purpose. So that when Mr. Miller presents

8

or the plan is presented, take note of the parts that give you cause for concern and make sure that that's what gets into the public comment because that's the information that will move the direction of this project one way or the other. So while you have -- obviously, we share a lot emotions about this topic, but please make sure that you get to the point of what it is that you do support as well as what are the things that concern you.

So with that, I'll leave the rest of the presentation to get started and then we'll follow up with the public comment period. Thank you.

MS. RODI:

Thank you, President Taffaro.

We're going to start our formal presentation now. First up is Tammy Gilmore. She's our Environmental Manager. She's going to go over the National Environmental Policy Act, and then we'll have Greg Miller, who is senior planner extraordinaire, will talk about the project itself.

9

MS. GILMORE:

Hi. So as Rachel said, I'm Tammy

Gilmore. I'm your point of contact for all --

Is that better?

-- for all comments, written and verbal. I'm the person on the other line. I've spoken with a few of y'all already.

So as you all know, we have prepared a Draft Environmental Impact Statement for your review, and this is a requirement of the National Environmental Policy Act. The document that we prepared and that you are currently reviewing assesses impact due to several alternatives. No final decisions have been made yet, so it's important that we hear from y'all. And that is why we're here tonight. We need your suggestions, your comments, what you think is good, what you don't agree with and that will help us towards our final decision. So once the comment period has ended, I will organize all of the comments. I will propose them to the team, and we'll consider the comments and they will all be addressed in the final

10

document.

The public comment period as been extended, and it will end on February 14th. So you have an extra 15 days. This is all my contact information (indicating). You'll see it again at the end of the presentation and also in the back. I have some cards if

anyone needs those.

Thanks.

MS. RODI:

We're going to turn it over to Greg, and we're going to turn the lights off, so no one go to sleep. Just so you can see the slides better.

MR. MILLER:

Good evening. Thank you very much for the great turnout. Obviously, this is a judge of how much interest there is really here in the parish, and we really do appreciate you taking time out of your personal life to join us.

As Tammy mentioned and Colonel Fleming mentioned, you know, the point of this meeting is to have your input on the draft plan. And that's what it is this evening,

11

it's a draft plan. We're not eminently preparing to turn any dirt on this project. We're showing you what's been developed as a draft plan to restore wetlands in St. Bernard Parish and other areas that have been affected by the ship channel, and we're here to get your input on that, again, the things you like about the features of the plan, the things that you don't like about it and very importantly, the things that you would like to see changed in it or added to

it.

So when we begin a study -- and that's what this has been, a feasibility study, and you have available on the internet a Draft Feasibility Report and a Draft Environmental Statement. We derived the purpose of that study from what Congress passes as a law, and the law that they passed that directed us to develop the restoration plan for the MRGO was passed in November of 2007, so a little bit more than two years ago -- excuse me -- a little bit more than three years ago, and it directs us to restore habitat around the Lake Borgne ecosystem and

all of the areas affected by the MRGO navigation channel. We're striving at putting this plan together to try to achieve an ecosystem sustainability to the greatest extent possible, and, also, that law that was passed directing the development of the plan told us how to restore natural features that -- of the ecosystem that prevent or reduce damages from storm surges.

So what we've done in starting out with the study is define the area of interest that we're going to look at, and in this particular case, the study area is quite large. This is over 6,000 square miles of open water, tidal wetlands and developed areas along the East Bank of the Mississippi

River, roughly from the Maurepas swamp area between New Orleans and Baton Rouge across the North Shore to the area of Gulfport, Mississippi, south along the Gulf face of the Chandeleur Island and then back up down to the mouth of Mississippi River and back up the West Bank.

When we talk about ecosystem restoration, if you're familiar with the

13

Breaux Act or the CWPPRA program, we generally target very small areas with distinctive purposes of restoration. That's not what we're up to here. What we're doing here is trying to achieve the restoration of the Estuarine System, the entire system. This is a graphic that we produced that shows how the estuary is related to the developed areas of Greater New Orleans, some of the activities that occur in or around the estuary, oil and gas production, commercial fishing, duck hunting, the different types of habitats that you see, cypress swamp. So this is a picture of what we would like to see a healthy, functioning ecosystem look like.

Next slide.

Now, in the case of the MRGO, it was authorized in 1956 and so we've got some

information, habitat maps, that show us what did this area look like over 50 years ago before the ship channel was constructed, and the take-away from this is that you'll see close to the river higher ground that had

14

forested, cypress forest and swampy areas that were freshwater, wetland habitats, and that that area graded, as you moved away from the rivers toward Lake Borgne and towards the Gulf of Mexico, to higher levels of salinity. And an estuary is a mixture. It's an area where saltwater and freshwater meets, and so that diversity of habitats across that system is reflected in what we saw here 50 years ago.

Next slide.

So we'll move forward to 50 years later. This is a habitat evaluation from 2006, and what you'll notice is a great deal of change, obviously, the construction of the MRGO. In that earlier -- the previous map, you did not see the presence of MRGO because it had yet to be constructed, but you also see a significant change in the diversity of habitat. It's a decline in that diversity. What happened with the wetlands is with the presence of the ship channel, you had the introduction of saltwater from the Gulf of Mexico eliminating most of the fresh and intermediate marshes in this part of the

15

system. What you see in the light green and the darker green are brackish marsh and salt marsh that are prepped closer to -- closer in and around Lake Borgne and closer to the Mississippi River, and you also see the development of large pockets of open water using the blue areas on the left side and also below -- or at the bottom right here (Indicating) around Reggio near the commutative junction. So just examples of how habitat has changed the area over time.

So, again, I mentioned the idea of declining bio diversity. When you have a mixture of habitats across the estuary, you get a mix of fish and wildlife resources that are able to inhabit these areas and utilize them. So between the 1960s and the first decade of the 2000s, we've seen a dramatic decline in the diversity of habitat as well as species that utilize this area.

So what we've done is we've measured over time the changes in salinity in the estuary. And this is going to be difficult to read from here, but I'll call out some numbers for you. The lower right in the

16

Bayou La Loutre area near Hopedale, we saw an increase in salinity of four and a half

parts per 1,000 over what was there naturally before the ship channel was built. And you can trace that all across the Pontchartrain system. So, for example, at Chef Pass increased 2.3 parts per 1,000. The North Shore, an increase of one part per 1,000. All the way up to Pass Manchac where you had almost a half a part change.

Now, why is that important to us? The salinity in the system is what drives the types of plants that are able to grow in the estuary and the types of animals that utilize the different wetlands.

So what we've done is assemble a draft plan that puts together a number of different projects that address those changes in habitat and restore areas that were lost because of the construction of the ship channel and the operation of the ship channel. So you'll see features here -- in fact, what we did is we derived ideas from existing plans, plans such as the Coast 2050 Plan, the State of Louisiana Coastal Master

Plan, the Louisiana Coastal Area Plan, lots and lots of plans that many of you in this room have been involved in developing and also through interactive public meetings. We had a public scoping meeting in the same room back in 2008 when we first started this. So there were over 300 different

projects that were essentially nominated or recommended to us or pulled from other plans that were used in putting together what is recommended as a draft plan tonight.

Next slide, please.

So the draft plan calls for restoring almost 14,000 acres of fresh and intermediate marshes, about 34,000 acres of brackish wetlands, a little over 450 acres of salt marsh, over 10,000 acres of cypress swamp. A lot of that green area that I showed you in that 1956 area is called for restoration and reforestation in the central wetlands of cypress swamp and the restoration of some rich habitat along Bayou La Loutre. So in total, it's over 58,000 acres of coastal restoration work that is proposed as part of the plan.

18

So what this map shows -- and it's a little difficult to see for those in the back -- is that trying to restore 58,000 acres instantly is a very, very challenging and probably impossible task. So what we've recommended is a ten-year period of time over which we would build all of the components of the plan. So you'll see the different colors on this map, and each one represents a year.

Year one, we would do shoreline

protection work along the Highway 90 corridor between Lake Pontchartrain and Lake Borgne. We do shore protection work along Proctor's Point, along the Biloxi Marsh. We then follow with marsh creation behind those protective shorelines. It simply makes no sense to invest a lot of money and time to dredge material and then allow it to erode. So that's why the shore protection measures are first followed by the restoration measures.

We also have a diversion that's recommended near Violet at the Sinclair Tract and that freshwater diversion is

19

called for because even with the closure of the ship channel with the construction of the rock plug at Hopedale, although we've seen salinities decline, we' still are above what they were historically in the Lake Borgne system. So we feel based on the habitat goals that we have, which is trying to restore the areas that were changed by the ship channel, you need that freshwater input to help reduce salinity and enhance the growth of restored wetlands.

And, finally, there are pieces of the plan that involves near the Bay Eloi area of the lower right-hand part of the screen, which is oyster reef restoration in Bay Eloi.

Now, I mentioned over 58,000 acres of wetland restoration work. Now, this would be done primarily through the use of dredge material. Right now, we've targeted obtaining dredge material from areas in Lake Borgne. There's environmental considerations that we're going through to try to identify the best areas of obtaining that bio. But to just put it in

20

perspective, this is an enormous amount of material. It's over 157 million cubic yards of dredge material that would be required to rebuild these wetlands.

Now, I can't really picture this during a Saints game, but if you can imagine the Superdome full of dirt, it would take over 34 Superdomes full of dirt to rebuild the marsh that we're talking about in this particular plan.

We also have some features that are proposed that we've developed collaboratively with individuals that we've worked with over the last couple of years. We've had over 200 small group meetings with neighborhood associations, local government, interested landowners, environmental organizations, you name it. My mantra, if you will, during this study process is I'll go anywhere at any time to talk about the

study because we value the input that you provide. A lot of you folks know as much about the lake system as those folks that have worked with the Corps for years, so we've obtained a lot of valuable

information. And one of the things that's come out are the ideas that we could put recreational features to try to enhance some of the plan. This is an overview of one at Shell Beach near the Campo's Marina area. This is near the Katrina Memorial, and it's proposed as a dock, or a boardwalk that rather than children or folks having to crawl out on the riffraff, it's a safer location for them to be able to go crabbing or fishing with their families. It also has parking. It's lighted, and it's handicapped accessible. So this is a potential recreational feature as part of the plan. And I'll show you more of those.

This is a recreational feature in the lower Ninth Ward near what's called the Bienvenue Triangle, you know, Caffin Avenue, this is at the head of Caffin Avenue. This is an area that used to be cypress forest, and it's primarily turned to open water over the last 50 years or so. So this is another boardwalk system that would allow us to go over the levee that's there -- across the railroad tracks, over the levee and then be

22

able to move out into the wetlands on a safe, safe boardwalk. This is a nice feature because it's tied into a local school that actually has an effort underway to grow wetland vegetation for use in restoration projects. So it would be an educational opportunity and a nice recreational enhancement for the community.

And this, finally, it's near the -- or at the Sinclair Tract, which is the recommended site for the bio diversion, a trail system along side of the diversion channel with interpretive sites -- you see one in the lower right here (indicating) -- where folks could learn about the purpose of the diversion, the threats that we have to coastal wetlands and how important as part of our coastal culture and coastal ecosystem.

Now, I know most folks are probably here tonight to weigh in on the proposed freshwater diversion of Violet. And I want to talk to you for a few minutes about how we came to this recommendation and the things that we'd like to hear from you about

23

what is proposed at this particular site. I mentioned that we feel that because the

salinities are still over what they were historically that we have a need to introduce water to try to reduce those salinities, and the current operation plan of that is for 1,000 cubic feet per second during most of the year, except for what's called a pulse event, a 7,000 cubic feet per second operation during April and May. And that's targeted at reducing salinity in the Biloxi marsh in the Mississippi Sound in advance of when it's a real key part of this lifecycle in oysters to prevent predators from eating the settled spat on the reefs.

So what we did is we looked at over 40 site along the East Bank of the river where we could potentially locate a diversion, and we narrowed those down to four sites in St. Bernard Parish where there is little or no existing development. I'll give you an example of that: We didn't want to propose and have to go through the historic Chalmette Battlefield or through an existing neighborhood. We tried to find sites where

24

physically it would be easier to try to construct and locate this. And those sites are alternative one, which is the Sinclair Tract; alternative two, which is the Pecan Grove or the area where you have the ally of oaks, beautiful oaks, along the St. Bernard Highway; site three is in the existing canal

at Violet; and then site four is located between the Violet Canal and River Bend at the lowest site that we evaluated in detail.

Now, in evaluating these sites, what we've done is look at different aspects of, you know, how would you construct this if you built it at any of these four sites. So we looked at things like the number of residents that will be affected or the number of businesses that will have to be moved. So if you see across the top here, there were no homes or businesses that would have to be moved at the Sinclair Tract. There's no existing development there.

There's one residence or one structure at the Pine Grove. There are over 120 structures in the footprint at Violet Canal. And there are no structures at the down

25

river site.

And you can go through this and you'll see. We looked at scenic streams, which are bayous that are designated by the Legislature for special protection. There were none at the first two sites and four that you would have to cross or get permission to affect at the Violet canal site and then two down river. And you can go through that. You look at the number of roads affected, the wetland acres, the

length of channel. If you look at the map, the shortest distance between the river and MRGO is that upriver site at Sinclair Tract. So I'll go to the next site, and I'll show you a few more things.

So this is from the planning standpoint, this is a construction of right-of-way footprint. The two red lines that you see on here are overlaid across the Sinclair Tract, so that information on that first table were derived by going out in the community and looking at these sites and using GIS in order to determine what would have to be relocated in order to place a

26

diversion at any of these sites.

Now, the next one.

So this is at the Pine Grove site.

The next one, please.

The overlay here is at the Violet Canal, the existing Violet Canal. So you can see if this was how much room we needed in order to construct the channel, then we would have houses, businesses, roads, power lines and other things that would have to be moved out of the way in order to do that. Now, we've interacted a lot with folks that are interested in this, and obviously we could shift this upriver or down river and we can try to reduce that footprint some; but from a comparative standpoint, you can see

obviously that there were more structures here than there were at the upriver or the down river site.

Next one.

And then finally at the River Bend -- what I call the River Bend -- the one that's close to River Bend -- we have very little or -- excuse me -- no structures that would have to be relocated, but it's the

27

longest distance between the river and the MRGO to move the water; therefore, it's the most dirt that would have to be dug up. A lot of these areas are existing wetlands, so the largest impact of wetlands. And there's a sealift in the river, and there's some consideration because there's a docking for some sealift ships.

So the benefits of the plan and the freshwater diversion component include the ability to reduce salinity and restore cypress swamp and freshwater marshes, to reduce the intrusion of saltwater into the estuary, to restore the historic patterns of fisheries across the Basin, to improve the sustainability of the tidal wetlands in the system, to improve habitats for the waterfowl and verbears and to add reactional opportunities to the ones that we went through as well as others and to achieve

salinity reduction in the Lake Borgne system of about one to three parts per 1,000 year around and to reduce the Mississippi Sound by one part per 1,000.

So, if you remember one of the slides

28

that I used before, it shows you a decline in bio diversity in this system. Because of the increase in saltwater habitat, we've Eliminated we currently have eliminated a lot of the freshwater habitat and a lot of opportunities for species that depend on these habitats. So the vision is under a restored system. We have ridges, the Bayou La Loutre Ridge that's restored with woody vegetation, oak trees and things that were there historically, transitioning out further towards the Gulf across a mixture of gradually increasing levels of salinity until you get to the outer Biloxi marsh system.

And finally -- and I apologize. This is a little difficult to see from a large room like this, but this is a perspective looking at -- up the MRGO from the Gulf of Mexico towards Chalmette and New Orleans, and you can see, you know, how the ship channel kind of dissects this whole area. Along the lower part, we've inserted some pictures that show you what these features would look like. So on the lower left side is a river

29

diversion. This is actually a photo of the culverts at Caernarvon. So that's a similar irrespective of what you would see if a project, a freshwater project, is built at Violet or along the Sinclair Tract.

In the central wetlands, in the area between the Forty Arpent Canal and MRGO T-Wall that's being built, you would have restored cypress forest and some freshwater marshes. So that's what you see in that second picture.

On the areas outside, and in this particular case, we're highlighting areas between Lake Calebasse and Hopedale, we've restored brackish marshes in that area.

And then, finally, at Bayou La Loutre, we will have rich habitat restored, and then along the Lake Borgne shoreline, rock break waters to stop the erosion of the lake and to prevent the joining of the lake into the MRGO. And that's important because that would keep us from facing direct wave action from Lake Borgne along the newly constructed risk reduction system, the T-Walls in that area.

30

So the draft plan entails 63 miles of shoreline protection. It's has seven and a

half miles of oyster reef restoration as a component. Over 58,000 acres of the marsh and swamp restoration, rebuilding, using dredge material and planting wetland vegetation. It's got the three reactional features that we went through. I mentioned that the freshwater operation plan, the draft proposal is a 1,000 cubic feet per second with a pulse of 7,000 feet per second in April and May. And this is shocking and it shows you the challenges that we face in terms of the magnitude of the plan, but it has a construction price tag of $2.9 billion, and that's just construction. There would be other dollars that would be required for designing each of the projects, the real estate acquisition that would be required and then the O and M, what's called operation and maintenance of the features that are put in place. So price tag in total would be higher than that. That's just the construction.

UNKNOWN:

31

What is the price tag?

MR. MILLER:

And, finally, I mentioned that we tried to make a lot of information available to everyone. If you haven't had a chance to yet, you can obtain more about the features of the plan at MRGO.gov. You can download a

copy of the Draft Environmental Impact Statement, the Draft Feasibility Report and all of the details that is behind these proposals at that site. There's also an opportunity there for you to submit comments, written comments. It's got an automatic e-mail where you can write comments and send them to us. All of these will be reflected in a compiled final report. So when you give us a comment, we won't just put it in a drawer somewhere. We'll actually have it in a report, and then we'll show you what the response to that particular comment is.

All right. Just one last thing: I do very much again appreciate your time. It's very important to me and the members of the team that we have your input. I look

forward to hearing your comments this evening.

Thank you very much.

MS. RODI:

All right. Thank you, Greg.

Before we go into the formal where we take your comment part, President Taffaro prepared a presentation for his comments, and so we're going to have him go next.

President Taffaro.

MR. TAFFARO:

Okay. I'll try not be too lengthy, although I think, obviously, it's very important.

There's a couple of things, obviously, that we want to start out recognizing. One is -- Colonel Fleming talked about this and this is the concept of the partnership and some of the benefits that has happened in the St. Bernard area since Hurricane Katrina -- the Bayou La Loutre dam structure, now the Risk Reduction of Storms Device, the Inner Harbor Navigation Canal Storm Surge Barrier, the Chalmette Loop System, these are all major accomplishments

69

33

and achievements that has been long overdue and long in the making. And, certainly, those can't go unrecognized. I bring those up for more than just to give the Corps credit for the partnership, but also one of the things that Mr. Miller talked about, and this is the real concern in the plan, he talked about the 2.9 billion dollars, and that's just a construction estimate. The real costs of the entire project is an unknown number, but it's probably closer to the five -- four to five billion dollar range, especially if we start plugging everything in that we're asking for. That's important because if you recognize what the Army Corps of Engineers' budget and where it

is being spent in the last two to three years, remember that we compete for the funds from Congress to fund any project that the Corps does. What that means is, while the rest of the country has watched major dollars come to our area, I can tell you that the sense in Washington is that some areas around the country are starting to feel like they want their share back. Okay?

34

Now, that doesn't mean we're giving in, but I want that to be known.

The other part that we still have a point of contention about is that according to the Legislation, there's a 35 percent cost share that is attached to most of this. The diversion actually is a 25 percent share, but we still, on the State level, that's a non-Federal share, so the State is looking at having to identify funding for whatever projects are funded, whether that's through leveraging the outer continental shelf money or any other coastal restoration dollars. So one of the points to that is that now that puts us in the position that we're competing within the State as well because we're not the only coastal parish looking for projects.

So those two points I know are important to recognize as we move through how we

address this plan and what parts do we support.

I'll base these comments that I'm doing tonight based on a couple of things: One is this report is a tentatively recommended

49

35

plan. That means it can be changed. There are modifications that can be done to this plan. Now, the long history is do we trust that, do we not. I can tell you firsthand, it has worked, and there are people who are sitting in this room who have seen the public comment change the direction of projects. The Caernarvon Reach, the Verret to Caernarvon Reach for the levee system is a prime example of that, one of the most recent ones.

The other thing is the draft report has some flexibility, and that's important so that we can address the comprehensive nature of what this plan -- what we believe this plan should do. I'll get to the map in just a moment. The plan contains some valid projects and some very worthwhile projects. In fact, if you take any one of these projects in isolation, you would be hard pressed to say that it's not a worthwhile project in terms of its viability or what it could do as a benefit to the coast or the wetlands or the marsh. So in an isolation, we would say every project is worthwhile and

36

has some merit. What we feel and the belief here is that the plan fails to meet the comprehensive nature of what we believe is needed in St. Bernard Parish, and we'll go through that in just a moment.

We also have some concerns that the plan -- because this is the nature of this issue -- the plan sacrifices some of our needed components because of fiscal limitations or restrictions. Now, remember the Corps doesn't set their own budget. They present projects. Congress decides which projects to fund, so our argument and our push is not just with the Corps. And this is an important concept. So if all you do is write to Tammy Gilmore and let her know, we're missing one half of the equation. We need to make sure that we're writing to Congressman Landry, we're writing to Senator Vitter, we're writing to Senator Landrieu, making sure they are aware of what moneys we need in the pot as well.

The plan itself has several components, and we'll talk about this. I know there was a pointer up here. I'll try to point. I'm

37

going to get to that.

One point that I'll make, this is the

study area that Mr. Miller talked about.
And you'll hear a lot of concerns tonight, and one of the major concerns is, how did we get to this point? How did Congress authorize Word of 2007, and what was in Word of 2007? That doesn't happen without political influence, obviously. And you'll hear tonight, in very real concerns, about the benefits of St. Bernard and Louisiana versus the benefit to Mississippi.

One of the concerns that you'll hear us talk about is this study area, obviously, is much larger than the project area. And our concern is, when you look at the study area, it includes exactly what we believe needs to be included in our plan. When you get to the impact or the project area, much of what we believe is needed to be included is missing. Okay. However, when you get to the project map, you'll see how some of the concern is even more reinforced by the projects and the scopes.

So we have freshwater diversion -- we're

going to jump around if you can. Go to the project map first. This will make it easier to reference what we're talking about there. There you go.

All right. The freshwater diversion -- we'll look at that larger map in just a moment -- some of the concerns that we have

in terms of freshwater diversion, obviously, the placement. The placement through one of our only remaining undeveloped tracts of land for residential and potential commercial development into the future. Now, nobody in this room believes that we're going to have a boom of a new subdivision built in the next year. Okay. That's not what we're talking about. But this particular tract, the Sinclair Tract, is one of the most valuable pieces because it does exactly what the diversion is doing. It runs from the river to the MRGO. It runs the length or the width of our Parish, a major part of development, commerce industry and residential.

We also believe that there's a concern, and when you read through the report, part

39

of the justification of not using Violet is that there could be the need to pulse all the way up to 15,000 CFS. That was one of the comments and concerns raised in the report. Well, 15,000 CFS is, in our estimation, a potentially very destructive process.

The other part of this is that to dig out another channel again divides our parish geographically. It divides us physically and it divides us culturally. That's

something that we have a great concern about.

Another concern of this site location for the freshwater diversion is that to move water from here (indicating) down to where we believe it is most needed in the Biloxi marsh area as well as below Lake Lery, we're not sure that that hydrology actually works on its own. Will water migrate? We believe water will migrate to those areas. We don't believe it's going to migrate at the pace, the rate or the volumes that will restore what we believe needs to be restored. Again, part of that major, major difference

40

is the projects identified in this area.

If you skip over to the Violet -- I mean, to the choices for the freshwater diversion, if you would.

When Mr. Miller talked about these alternatives, obviously, the existing channel has some benefit because, obviously, it's already there. The concern of the overlay of displacement of residence and businesses, I think it's important that the comments that you make are in context of where's the priority in terms of getting the freshwater to the system that it needs to be at.

We believe that the Violet Canal, especially if we use or engineer a piping

system or the alternative to that is a multiple source where you're disrupting very little commerce, very little residential areas, but you put a piping system to deliver the freshwater where it should be and where it would be most beneficial. Alternative four can do that as well.

Again, the problem with these, when you read through the report, is a cost benefit

41

analysis. What is the best buy? In fact, those are the words that were used in the report, "What is the best buy for the project?" We believe -- and if you believe, then you should put it on the record -- that because of the damage that the MRGO created, there should not be a price tag. Now, we live in reality, obviously, and Congress is going to put a price tag; but we believe that St. Bernard Parish deserves the restoration regardless of the cost, regardless of the cost.

The other issue regarding the diversion project is that we're asking for reconsideration of the diversion engineering altogether. Word of -- and this gets into specific language of the bill. Word of 2007 basically mandated the study for a freshwater diversion. It did not prohibit; it just does not authorize a sediment

diversion. Sediment diversion, obviously, brings up a whole other set of engineering issues in terms of location on the river, where the bed loads are likely to be, what part of the river they're likely to be

42

harvested most effectively and then transported to where they need to be in the parish. Those are the issues regarding the freshwater diversion or some of the highpoints to that.

Another component of the plan is hydrologic restoration plugs, basically, and we don't have a slide for this; but if anyone who's been in the marsh, obviously, the many dozens of canals, pipeline canals, the other ditches that have been dug, in order for the oil and gas industry to thrive throughout St. Bernard. We're not suggesting that we kick the oil and gas industry out. Obviously, what happened last summer, we have seen what that impact can be. What we are saying is that those industry partners need to be responsible for the damages that they do. Within this process, though, if part of the plan is going to create plugs, going to create closures of additional canals and ditches, we need to know where those are in order to buy into the plan specifically so we know what navigational concerns will be raised or

43

that will be created. Additionally, we need to know what that will do within or behind the plug, just like we have seen with the Bayou La Loutre dam. We all supported the need to close the channel. We have now come up with additional challenges on the outside of that dam, so we need to be aware of what we're creating in order to understand what we're supporting in terms of plugs.

Another major part of the program is marsh, swamp and forest creation and nourishment. Again, by itself, we have no concern -- you can go back to the impact map -- we have no argument or disagreement about creating marsh or nourishing marsh or creating forests. We believe those are important, very important concepts. When you look at the key on this map, really what you're looking for are the green and the purple colors in this area (indicating). Okay. And the creation that is done is done primarily in the central wetlands location. This is a major -- along Lake Borgne, we support this 100 percent.

The problem is, when you look at both

44

the Shoreline Protection Plan, or the parts of the project for shoreline protection and

marsh creation and marsh nourishment, we believe we need activity that's not even on the map -- okay -- not even on the map. So shoreline protection, marsh, swamp and forest creation and nourishment, we believe we should be starting all the way down, and you've heard -- you've heard our coastal zone leaders talk about this for years -- all the way from Mawson Peak Pointe, all the way back up around to Point-A-Pitre. So that's the issue that we're talking about.

Now, the reality of that is that that costs major, major dollars. We have to be able to be innovative and add components to the plan. This section right here (Indicating) that is the artificial oyster reef, I'm going to tell you that I -- the State has supported it, the Coastal Restoration Office has supported it, the Coastal Zone Committee has now supported it, the Parish is supporting it. It has data -- the report is lacking the data to support it, but we believe that the data where these

45

oyster reefs are being productive can be and has been supplied, needs to be reviewed again. We believe that is a major component that's missing. If we run those oyster reefs, it provides us exactly with a major part of the restoration and protection efforts.

Again, part of the issue -- and Mr. Miller talked about it, and we agree wholeheartedly. You put the shoreline protection in first, and then you do the marsh creation and nourishment afterwards. That only makes sense. Our concern, obviously, is that there's no protection out here (indicating). So if there's no protection out here, the money that we're spending here becomes worthless or decreases the benefit and value to our protection and our need for growing more land.

We agree that the salinity levels have shown significant -- have shown significant improvements on the upper side of the closure structure. We agree that there needs to be some additional monitoring. Now, here's an interesting point to the

46

project and an interesting point to the plan, and I'm not suggesting at all that the Corps has devised a divide-and-conquer plan here; but this is where coastal restoration and erosion control and commercial fishing tend to part ways because it creates a situation in Lake Borgne, specifically, of what our shrimpers and our oystermen are going to experience. This is another reason why we believe if we start outside -- and we'll talk about the barrier islands in just

a moment. If we start outside and work our way in, we help mother nature to do what mother nature would normally do.

Now, we historically -- and if you talk to anyone who's been doing this for a lot longer than I have, you know that human involvement has created some of the issues that we deal with. Certainly, Government involvement helped create the MRGO, which we all know the effects of that. So when we talk about putting the marsh in place, when we talk about the shoreline protection, when we talk about delivering freshwater, we need to keep in context of what we're trying to

accomplish at the end of the day and are we really spending the dollars as wisely as we can or are we spending the dollars as conservatively as we can. That's a very different approach. Spending our dollars wisely may mean we spend more, but we do what needs to be done for the long-term benefit of the damage that was created. Spending our dollars conservatively means that we may be able to get away with fewer projects because that's what we can get through Congress. That's a dangerous slope, I believe, to go back to and beyond. We've learned that lessen many times over.

In terms of the shoreline protection, we talked a little bit about that, and the map

that I'm talking about, all of the -- from Bay Eloi, Christmas Camp Lake, Lake Treasure Bay, if we use the artificial oyster reefs, we believe that that can not only help to provide wave energy reduction, but it also can help to provide marsh edge and shoreline stabilization so that the marsh behind it can have an opportunity grow.

One other part of that marsh growth and

nourishment is you heard the target of cubic yards -- if you would go to the cubic yard slide, please. Yes, that's fine -- 157 million cubic yards. That's a whole lot of dirt. Okay. Our concern of where that comes from, if we're not going to be able to get it from bed loads in the river, we're going to be looking either to barge it in; we're going to look to dredge it in the Lake Borgne area. That gives us some additional concerns in terms of what does that do to the hydrology of Lake Borgne, especially during storm surge activity. Does it increase the wave energy? Does it include your problems in terms of being able to protect ourselves? Does it match up -- and these are questions that we're asking. Does it match up with the risk reduction system that the corps is nearing completion this summer, or are we going to create another

factor and variable that has not been accounted for in the construction of our loop system?

Additionally, this is, obviously, an impressive number. No one's arguing that,

49

and we're grateful for the creation of 58,000 cubic yards of marsh. That's -- or 58,000 acres. I think that's a wonderful concept, and we applaud that. But we have to put that into perspective of what we've lost. Okay. These 34 Superdomes is a drop in the bucket. Okay. When we look at what we've lost since the inception of the MRGO, you could take -- basically, draw a line from Delacroix, circle in, make sure you include -- go around and get Hopedale, Breton Sound, come up the river, go through the New Orleans Central Business District, include the Ninth Ward, obviously, cut over from the Central Business District, once you get past Poydras Street, cut over and go all the way to the right and include all of Lakeview and circle back around, that's the area that we've lost. So how many Superdomes would you put in that area? That's what we're talking about.

Now, in this plan, in the plan, it specifically states -- it specifically states -- and I'm going to -- let me get this quote because this is an important

50

thing for us to keep in mind. It says -- let me read it right from the report, "Full restoration of Pass, Louisiana wetland cover and function will not be possible. The natural and anthropogenic processes contributing to net land loss in Coastal Louisiana are significant and pervasive." Go figure.

"And they have been operating for decades achieving no net loss is not a feasible objective because the social, political and economic impediments are extensive. The sediment supply is limited and the affected area is large. Louisiana's Coastal Restoration plans must acknowledge these limitations prominently and adjust goals and public expectations accordingly."

Now, to me, that explains exactly what we're up against in terms of accepting a plan that doesn't look to restore what were damaged by the MRGO." In terms of the barrier islands, I'll get to barrier islands and then we'll work our way back to ridge restoration. But if you can go back to the overall map. Obviously, it's not on the map

51

here.

UNKNOWN:

We got one with it on it.

UNKNOWN:

They got one.

MR. TAFFARO:

There you go. Pull that one up. There you go.

From Breton Sound, Chandeleur Sound, the Breton Island all the way through the Chandeleur Chain, the good news about what happened during the oil spill, and there's debate that continues to go on about the building of the berms, I can tell you, standing on those islands, and ask the fishermen who saw it every day, the more land that was created on those berms, it directly impacted the amount of wave energy that got to the marsh. For us to continue to ignore and to be left out when every other coastal parish has had their barrier islands supported and rebuilt almost on an annual basis, is inconceivable for us.

Now, how do we connect that to the MRGO Ecosystem Restoration? Because the MRGO,

52

obviously, did not create barrier erosion, but if we're going to spend money here and not protect it out here, we're spending good money after bad projects. That's the issue.

Ridge restoration, Mr. Miller talked about. Mr. Miller talked about -- and you can go to the map now -- some ridge

restoration, some acreage being along the Bayou La Loutre ridge. We believe, while we support that, we believe it is in need of greater amounts of ridge because we don't have a specific plan of how we're going to do that and protect it. Likely or likewise, the Bayou Terra Buff natural ridge is out there and we're going to spend money putting this marsh restoration and nourishment back together. That's the only natural ridge we have, and it's eroding. So we believe that those two ridges are major parts or should be major parts of this program for consideration.

The submerged vegetation issue, obviously, we have no -- we have no debate concern with that. We believe that submerged vegetation component of the

53

program is positive. Obviously, we also believe that the delivery of sediment and the appropriate amount of freshwater is an important component.

One thing that has continued to be a point of discussion, when we talk about -- when we talk about freshwater diversion, oftentimes, it creates the impression that all saltwater, all salinity is bad, and that's where the balance needs to be addressed because as we have seen, some of

the brackish and some of the saltwater marsh has adapted pretty well. What we have to do is monitor and convert those areas to make sure that we keep what works and not come in and change the ecological system to a point where we actually destroy things in the process of trying to go back to pre-MRGO conditions. Now, that's obviously a much greater issue in terms of scientific data.

We believe this: That we all know that St. Bernard has played host to the MRGO from its inception. Over the last 50 years, it's been in our bedrooms and our front rooms. We don't -- and some of you, it's literal.

54

You're right. We don't believe -- we don't believe that the normal coarse of action -- we don't believe the normal course of action is in order here. What we don't want to have happen and we're requesting before this public comment period closes, we're asking the Corps at its highest levels to authorize a special service master to review to include Mississippi, to include Louisiana, to include St. Bernard and other coastal parishes at the table after the public comment period ends, not just in terms of discussion meetings, but actually allowing us to be a part of the planning, of the decision-making so that these comments don't go into a black box and the Corps decides

within the Corps how to reconcile those. We're asking that we stay involved.

We also believe that what's missing from the plan -- actually, what's missing from the projects that are proposed, it's actually stated throughout the plan in many sections, is the support of the multiple lines of defense strategy. While the Corps acknowledges that that is the most

55

beneficial way for the protection and restoration, we obviously are missing it in this delivery.

We also would ask that a strategy be adopted that funding is only -- funding is only requested for those projects that have direct protective and restoration value first. I think -- I think the walking path, I think the fishing pier, I think the overlook are wonderful quality of life things, and I don't think anybody in here if asked, wouldn't you like to have that, absolutely would like to have that. The problem is I don't want to drive my children by boat to get to it. I would like to be able to actually drive up to it and enjoy it from that standpoint. So we agree that those things are great quality of life measures, but we have to make sure that we protect the storm surge barriers and the

protection so that we can enjoy those things.

We would also ask that there be a coordination effort between what is going on, as many of you have heard, especially

56

those of you in the coastal zone world, the BP oil spill has created another level of restoration responsibility. So we need to coordinate what is going into this plan with what is going to be funded or at least requested so that we're not double-dipping and asking for the same project in multiple areas if we're going to get funding through the NRDA Process, through the BP oil spill disaster or emergency restoration funding through the Coast Guard's assistance. So we need to coordinate that and I would ask that that happen.

And the last thing is while we have the opportunity, again, partly because of the BP issues that are going on in restoration activities, to ask NOLA, to ask EPA, to ask the Corps to sit down and review the timelines of how projects get reviewed and approved so that we're not back here 13 years from now because, remember, part of our discussion, Mr. Miller talked about it when we were here in 2008, our major concern was that we had just completed a feasibility study and we're entering a new one. If we

57

wait too long -- and too long means several years in this environment -- then what is being proposed today no longer has credence for what is built tomorrow. So we would ask that that be considered as well.

Thank you guys for your attention.

MS. RODI:

Okay. Now for the fun part. Your turn.

A few ground rules: We have a lot of people here and not a lot of time, but we can get going. I think school doesn't start until 7:30. So just quickly, just to get the ground rules out of the way, we're giving each of you three minutes. We're going to ask that you come to the middle of the room in the aisle. Cheryn is going to be our -- well, she's go to try to turn that one on. We might have to use this one. Cheryn is going to be our microphone stand, our human microphone stand, and ask you to come to the middle so that she can hear you, so that the court reporter can hear you so that you can see the lights, so that you know we kind of gradually cut you off at three minutes. You can't use yield, unused

58

portions of your time, and you can speak again after we get through everyone else.

And, again, all comments are going on the record. If you don't have time tonight, we have two more meetings coming up if you need to go home or you can e-mail, fax us, call us, multiple ways to get your comment on the record.

We're going to use the comment card that you gave us earlier. I'm going to call a few at a time, just so you can get ready and then we'll go from there. We have more comment cards, if you have more comments that haven't been able to give me, Casey in the back -- she's waving her hand -- she can walk around and give you a comment card and she'll collect it and get it back to me.

Okay. Let's get started. Robert Campo, then I think this is Justice Serpas. Sorry. I'm from Plaquemines so I can pronounce some of these and I can read some of them, too. And then we have Dudley -- looks like -- Vanborgne. First is Robert, and he wants to talk about the Violet Diversion.

MR. CAMPO:

59

My name is Robert Campo. I'm a commercial fisherman, a business owner in Shell Beach, Campo's Marina, and I see Greg there pretty often. And, Greg, what you need to realize is -- and, Colonel Fleming, you spoke of those two roads, and let me tell you what those two roads are going to

be, the two roads from the Violate Canal and the businesses and the people that make a living and depend on this water are going to leave because we're not going to be able to stay in business. Not going to be able to have recreational fishing or commercial fishing. We're done. This is going to be the -- this is the lick that kills Dick right there. This is done. We're done.

And I'm going to tell you something, you know, I've been in this business a long time. I have a hundred-year-old business. And, Greg, you said something that Don De Jeaux quoted you on the radio last Saturday. You said there was no oysters on the Lake Borgne a hundred years ago and you're right. There's wasn't oysters on Lake Borgne. Whatever, he said no oysters so I'm going by

60

what he said. And you're right, there wasn't no oysters in Lake Borgne a hundred years ago, but it wasn't until 1969 we put a man on the moon. It wasn't until 15 years ago we built a space station that people live out there 365 days a year. And it wasn't until five years ago we put a car on Mars. So times change. And, hey, this is part of the change, and what I want you to understand is you will never in your lifetime, if you get bit by Edward the

vampire of Twilight, both you guys, on the neck and you live an immortal life for a thousand years, you will never ever, ever see cypress trees in that marsh. Get that out of your head because you told me that you wanted to see cypress growing back on Bayou Loutre ridge, and I promise you it will never, ever, ever happen, never happen.

And I am totally against this freshwater diversion. The rest of your projects are great. I do believe we need coastal restoration. I'm all for your rocking project. I'm for building land, dredging. We got to put our barrier islands up. As I

6

61

spoke at the Holy Cross comment meeting, I told you, you've got to build from the outside in. You can't go from the inside out. And that is what you're trying to do.

And when you do it from the inside out, you run everybody who lives and makes a living on this water, whether it's marine, it's commercial fishermen or recreational fishermen, you destroy a billion-dollar-a-year industry. The oyster industry is one of the biggest industries in the State of Louisiana, besides the oil and gas, and we've been crippled by BP, and not only crippled by BP, we are going to be totally inundated by you guys. We're done. We're done. I haven't seen one project yet

that the Corps as done that was worth a damn except the project you did to keep the Mississippi River from going into the Red River into the Atchafalaya Basin. That's the only one and y'all losing that battle, too. So I'm totally against the freshwater diversion 100 percent.

MS. RODI:

Thank you, Mr. Campo.

62

Let's see, Mr. Justin, we're talking about the diversion.

MR. SERPAS:

Yes. My name is Justin Serpas. I've been living down here my entire life. First of all, let me say, MRGO, I think right now -- well, it should have been filled up a long time ago. I think MRGO should be filled up, I think you should put a nice 35-foot levee on it, and my position on the cut, I'm totally against it being done in Miro. From what I understand, it's going to take about 30 years to do it and just for the levee and the Mississippi River and the train trestle, it's going to take three and a half years to go ahead and get that situated. So if that's three and a half years, it's going to cut the parish -- it's going to cut the parish right in half and we don't need no more mud dug out of this

parish. We've done had enough of it dug out. And if you've got to do this, do this in Violet.

And I heard somebody say that the Violet Canal is wide enough, but I don't know if

it's deep enough. And if it's not wide enough, buy the properties on both sides or do whatever you've got to do, but I'm totally against the Meraux cut, and if it's got to be done, do it in Violet.

And as far as I'm concerned, the Mississippi River Gulf outlet, whatever you want it call it, that was disaster number one. In my mind, Katrina was number two. Road Homeless was number three. I call it Road Homeless, number three. And the BP oil spill was number four.

And as far as all of this things y'all want to build for us, sure, we can use these things, but who's going to take care of these things once they are built and that? Who's going to maintain them and all of that, you know? Cost a lot of money to maintain five shelters and projects and whatever have you, you know. But like I say, that is my opinion on that and the cost of this -- and another thing, when y'all start talking about this, in 2007 they had a Congressman from Baton Rouge called Richard Baker and he had something to do with it.

64

They was going back and forth with deals, with Trent Lott, Senator Trent Lott. He's no longer senator. Mary Landrieu, Dave Vitter, and if anything becomes of this, whatever is going to happen, I think you ought to put up the four different things and let the people have some say-so in this. It's called the voting process, and if we could vote on this, if we could see what we want and what we don't want and put this in categories and maybe we can see just what this -- what the residents of the parish want, not what the Corps of Engineers want.

And that's my opinion on that, so thank you.

MS. RODI:

All right. Next up, Dudley Vandenborre talking about Mississippi.

MR. VANDENBORRE:

Yeah, I'm also against the diversion. Mr. Miller conveniently left out that this siphon could put 15,000 cubic feet through there. It was very convenient. He said 7,000 on high, but we may have to at some time put 15,000. Do you guys calculate how

65

much water it takes, how much freshwater it takes? By the way, they keep using the word

"Freshwater". Mississippi River water is not fresh. That water is the most polluted stuff. It's got every piece of crud known to man in that water.

So for him to very conveniently leave out the fact that they can't put 15,000 cubic feet on it tells me that this is Trent Lott's project over and over and over again. This is to send our water to Mississippi. You call it what it is. You paint a zebra brown, he's still a zebra. And if the people in St. Bernard can even stand for any of this, you know, I want these people to know in St. Bernard how many people are against this siphon going through here.

Raise your hand. News people take this picture right here. We need to take this picture, you know.

Do you know how many cubic of freshwater it would take to bring the Mississippi Sound down one point? Did you calculate that?

You know, this is the deal that was struck with Trent Lott that was appropriated

66

that what it is it's going to affect St. Tammany Parish. You know, we fought this coming through Lake Pontchartrain and this is the deal that Trent Lott struck that these things be appropriated. It needs to be changed. People in St. Bernard need to have their say-so. People in St. Tammany

Parish should have also been here. We should have a meeting in St. Tammany Parish. It affects St. Tammany. It affects St. Bernard big time. These people have to have a say-so in what goes on here.

Environmental studies, y'all look at the dead spots. Dead spots occur out in the Gulf of Mexico. Why do they occur? Because there's river water coming down. How many dead spots we're going to have in Lake Borgne now? What about the algae blooms that occur in Lake Pontchartrain every time you run freshwater over the top of it? Did they address that? Did you address the hyacinths that's going to fill up every one of these canals and kill the brackish that are under there if you work them over there? That happened back in canal. I don't think

67

any of these have been addressed in the environment impact study.

And here's a question that I really want answered: Are the people that made this Environmental Impact Study the same one that did the one for MRGO?

(Applause.)

MR. VANDENBORRE:

You know, I need that question answered. Who's going to control the structure? Is the State going to control it or the Corps

of Engineers? I don't trust you guys as far as I can throw you. Yeah, a lot of failures along the way. You guys took forever to realize that MRGO was a failure. It took forever for you guys to finally say you had a failure there.

And here's another thing: You know why MRGO -- I worked for the people. Do you know why MRGO was put there originally? For some rich landowners in Eastern New Orleans that wanted to build a boat terminal in there. And do you know who they worked -- that merchant's in the wind. Do you know who backed them? President Lyndon B.

68

Johnson. That's the only reason that got built. St. Bernard got dumped on. Louisiana got dumped on from Texas. Now we're getting dumped on from Mississippi.

MS. RODI:

Thank you, Mr. Vandenborre. We're going on to the next person. Thank you, sir.

(Applause.)

MS. RODI:

The next three: Mike Kenard and we have Chris Macaluso and then Walter Cuo, III.

MR. BERNARD:

Mike Kenard, I'm a councilman in District D, St. Bernard Parish.

I didn't bring any fancy maps, guys. What I do want to say is this: You know,

we're looking at a little common sense which sometimes is not so common but what I want to -- what I would like -- the point I would like to make is this: You cut us from our toes to our head and it caused all kind of destruction. We lost all kind of land and then the plan is to fix it, to cut us all the way across our chest. That doesn't make sense. You are going to take more land,

69

hard land than we're ever going to make. There hasn't been a freshwater diversion that's made land yet, so we're not making any land.

(Applause.)

MR. KENARD:

The only way to make land is you either got to drain or you have to fill. Somebody said that they have a limit to how much fill they have. There's a whole river full and it comes and it comes and it comes and it comes. We could -- we need to start dredging and running the pipes. When we talked about the BP oil spill, we had people from the Netherlands come who lead the world in dredging, and they said when they make islands, they start dredging eight miles away because if you don't, the sand's kind of like muscle memory. It goes back to where it was. And Sinclair, what is that,

two miles, not even that to Lake Borgne, a little bit more by Violet Canal, we can dredge and we can bring sediment there and actually build land.

I was in San Antonio earlier this week.

70

They had a flood there a bunch of years ago. You know what they did? They did an underground river, all the way under the whole doggone town, and every year they drain the little river that goes through, the Riverwalk goes all the way through, they drain that every year, and the water goes through. The river is too high; guess what they do? They open it up and it goes underneath. Now, have you been to San Antonio lately? There's a lot more than where the river goes to Lake Borgne at the Sinclair tract.

Guys, I cannot tell you how strongly this whole parish feels about you coming and dredging another doggone canal in our parish.

(Applause.)

MR. KENARD:

It's just not going to happen.

UNKNOWN:

It's another MRGO.

UNKNOWN:

Number two.

MR. KENARD:

71

I think the piping system would work. If we have to have freshwater diversion, if you talk to everybody around, most people would say, hey, the Violet Canal is the one. We don't like it, but if we're going to have to have it, that's probably it. If you go to the east side of the Violet Canal, I don't know if you've been there, but I haven't seen 183 businesses. The east side of the Violet Canal has -- I'm sorry, on of them boat launches there, it's a bar and I like to go there, but, you know, we don't have a lot of businesses on that side of the canal.

So I just want to inject a little common sense into this. We don't need a whole lot of plans and a whole lot at maps to see that the Sinclair tract don't work.

Thank you very much.

MS. RODI:

Thank you.

MR. MACALUSO:

Hi, I'm Chris Macaluso. I'm the Coastal Outreach Coordinator for the Louisiana Wildlife Federation.

72

I appreciate the opportunity from you guys to allow us to come make public

comments. I think this is a very important aspect of this process, and I do believe that, after witnessing the development of plans in the past, over the past several years of working with coastal restoration and hurricane protection, that these public comments will be integrated into this final plan.

Something I want to say, and I realize this is going to make me rather unpopular amongst several people in this room, but I know a lot of you guys and I know a lot of you guys make a living on the water. And I want to tell you that I approach this not just as a representative of this organization that looks out for the benefit and the welfare of Louisiana's fisheries and wildlife habitat, but also as someone who fishes this area who has spent a substantial amount of his income and his time on Lake Pontchartrain and in the Biloxi marsh and who has an interest in fishing all over coastal Louisiana, somehow the idea of the

73

freshwater from the river is bad for our marsh and bad for our fish and our wildlife habitat has been ingrained in the minds of a lot of people in Louisiana. Consider that with our freshwater and the Mississippi River, we wouldn't have saltwater marsh or freshwater marsh. We wouldn't have swamps

or cypress trees along the ancient path of the Mississippi River. We wouldn't have nearly the production of fish, oysters, crabs, ducks or the host of the other species that we have in Louisiana. We're lucky here that we have the Mississippi River. We could be Florida where they don't catch shrimp and where they're allowed to keep five speckled trout a day. Here in Louisiana we have an abundance of natural resources and species and habitats because of that river.

Now, obviously, there have been some issues with the way the river has been managed, mainly, the isolation of that river from these wetlands, but the freshwater in and of itself and the nutrients and the sediment that come with it are not a bad

74

thing. That being said, we suggest and we recommend to the Corps of Engineers that when building this diversion, it operates within the parameters of this plan; that it is operating with keeping in mind that there are freshwater sources throughout this basin that are going to freshen this area up and that also this an ecosystem that has the ability to support not just freshwater species but saltwater species as well, speckled trout, red fish, shrimp, oysters,

crab. It all thrives in this area, as well as ducks and freshwater species, if this diversion is operated right.

We want the Chandelier Sound to be addressed. We do believe it's time for the Federal government -- and I realize this is outside of the purview of the Corps of Engineers largely, but we do think it's time to address the issues in restoring the Chandelier Island. We do think that oyster reefs ought to be incorporated in this plan in every way possible to provide natural shoreline protection. We advocate that you use the Mississippi River and sediment from

49

75

the river as much as possible for your source of sediment and not just in this basin but across the coast. And, you know, we also believe that you ought to use the Violet Canal and work with these folks to make sure that you do it in a sound way.

Thank you for the opportunity.

(Applause.)

MS. RODI:

Thank you.

MR. CUO:

My name is Walter Cuo. I've been living in this parish now 74 years, and I also have a place on the Violet Canal, a little marina I have there, but there's only two boats, one of them is mine. That is the

that's been so hard now, but that's another thing.

I don't know why you would want to take any of that water out of Violet Canal and try and put it anywhere for anything to eat that you're going to eat because my wife puts crab traps. She is a fisherman. I'm not, okay. I go buy mine. But she puts five crab traps down there and when she

76

picked them a day later, they're dead. I had the water all ready to put them in the pot. Forget about it, Marie. I had to go buy some.

That makes me think of another thing. You are talking about the Violet Canal, what side you would take and I don't know. I never got all of that figured yet, but what kind of price are y'all going to pay for that land that I own there? Fair market value? It's for sale. We will do the deal right now.

And one more comment I have: I'm looking around this room see some of the politicians back there, I see that and Greg, too, and some more of them, but where is Mary Landrieu and David Vitter?

UNKNOWN:

And Trent Lott.

(Applause.)

MR. CUO:

Y'all gentlemen are all so good and y'all got a job to do and y'all get a paycheck, okay. Where's the people who pays you that's got to make these decisions?

77

That's it.

MS. RODI:

Next we have Darryl Ward, Fabian Guerra and then Lori Serpas.

Remind you have three minutes and be as constructive as you can.

MR. WARD:

Darryl Ward with the Garden of Eden. I'm going plant some seeds and this is very exciting to me. I've wrote to the President, Mary Landrieu and David Vitter about this project years ago. I was looking at a hydraulic energy source to come through there to -- for a lot of this that we want to do. We can dig down. A dam could be under water. It does not have to be on top of the water. We should use our natural resources, the air, wind, water. Louisiana has more natural resources than any state in the world, not every state in the world has got gas, oil, Mississippi River current, the gulf stream, waves, tides. We got every energy source in the world except for a leader to lead us. This is going to be an opportunity that we all can enjoy. This is

78

going to be a Disney Land if we can stand up and be counted and help them study this research. Delgado University has the ideal campus and they want launch this to study this to help us use our natural resources and have a Garden of Eden. Garden of Eden means if you see it, you know you're living in it, and when you understand that you're living in the garden, then you've got the picture of God Almighty. So let's all get together on this and stand with each other the plans. All we have to do is take the animal out and put on the cross and be the plant of God because Jesus Christ is no longer on the cross so let's be plants and make this the Garden of Eden, something that all of us would like to see this picture and not me standing by myself out there on MRGO.

Thank you very much.

MR. GUERRA:

My name Fabian Guerra. I'm from 6217 Hopedale Highway and I did come with a little map. I would like Lori to please hold up for me. Face the public with it so they can see it. Mr. Greg has already seen

79

this map. This is an U.S. geological survey map, and it shows the center line of Katrina

and it shows you how it came in a Harrison Empire and it connected right at the flagpole at the Bayou Lutre and MRGO crossing. And inside of there, what you see in red is all land, was once land before Katrina, now marked in red and taken by Katrina because this was all land that became separated because it died. It was brackish salt marsh and all of this land died due to the siphon, the Caernarvon siphon, and it was all floating. Before Katrina the landowners, the hunters, the trappers, the fishermen that frequent the area was all telling me, give me the reports that the land was floating. When they get off on it, it was buckling. It separated. Its roots died and it separated from the mud and Katrina came along. It could have been any storm, Katrina, Gustav and Ike helped decay this whole area because it was all separated due to too much freshwater killed the brackish marsh and it all floated away.

Now, how much land did we create here

with a freshwater diversion. I have a lot of stuff written down here. I don't seem to be going by it.

UNKNOWN:

We lost about 100 acres.

MR. GUERRA:

I'm nervous and I hate speaking

publicly.

Do we want to destroy an even a bigger area? This next siphon or diversion is going to be more flow of freshwater. Is it going to destroy -- if it's three times more flow, is it going to destroy an area that is three times greater than this and it's going to flow down MRGO into the Bayou Loutre area? Is this going to be our next target? Is this going to be the area that's next going to separate from its mud and float away with another storm. We get storms all the time. Don't think they 100-year storm. We get them every other year. Is this out next area that we're going to destroy?

I do a lot of work with the Parish and we come up with a lot of drafts and programs with bank stabilization, Dr. Gagliano, all

81

great ideas, the best ideas. All of this outside structure to build up Chandelier Islands and all of that, all out here we Have plans for bank stabilization, all great ideas for all of the plant and trees, good; build a fishing dock for people to fish off of them, great. It's a lot of good sales pitches to pass this diversion on. All it is is icing on the cake. This is going to be devastating if it does the same thing. Where's the scientist that studied what

happened back here? That studied can we do it somewhere else. This could be devastating to St. Bernard Parish. I'm totally against it. This could be another MRGO crammed down our throat, whether we want it or not. The people of St. Bernard need to stand up and fight against this project, the diversion only. Everything else, the shoreline stabilization and pumping in marsh and planting trees, that is all great, but you're going to adnihilare a recreational industry a commercial industry and all you're going to be able to catch out there is catfish just like in the Delacroix

82

Island body, catfish. What are we going to do with that? What you going to catch off the nice fishing pier? Catfish. Where did all the speckled trout and red fish go?

That's all I have to say. Thank you.

MS. SERPAS:

Hello, my name is Lori Serpas. I've been born and raised on Violet Canal. Two years prior to the storm, I believe they dredged the Mississippi behind our camps in Violet, and now it's gone. It's a waste of money, and now I live four streets from alternative one. Are you willing to buy me out? Because I do not want to live by a diversion and -- I lost my thought.

And I also think the scenic route and

your alternative two is in the middle of the trees, which is also a scenic historical route. What's good for the Corps is not good for St. Bernard.

MS. RODI:

Thank you, ma'am.

Okay. Next have Kathy Ziegler, Catherine Serpas and looks like Lewis Barrett.

83

I would just like to comment again, if you don't have time to stay tonight, we have another meeting on February 3rd at Lake City Church on St. Claude so if you can't stay tonight, we've always got that.

MS. ZIEGLER:

Hello, my name's Kathy Serpas Ziegler. And I've lived in St. Bernard all of my life which tomorrow will be 52 years.

Now, from what I see in the study map and just the overall view, I picked this map because it has everything here. And, number one, you have the four studies places one, two, three and four, which number one would be your first choice, but the area that all needs to work is to our left so it's like you're out, right arm's broke, let's put the cast on the left and see if it's going to work. You know, and we don't have enough water that is going to come from the

Mississippi River and the settlement that is going to take care of what needs to be fixed because if anyone could look at this map, they could see how much saltwater and loss of land we have. Like our Parish President

said, we need to start from the outside and work in, and the best thing is, get the pumps -- a pipe line from the Mississippi River, start up to and go to the Biloxi marsh and the bayou -- what's this saying? The Bayou Biloxi marsh and start pumping then. We can pump in, make a big mound and get a bulldozer there and start pushing out, pushing out. If you pack that sand, just keep pumping and you'll be able to get things on it. I've seen our parish president on the sand that was pumped in because of the oil spill and it was great to see that we can get that done. And I was praying that, you know, the higher Congress, that our President would see that, our United States President, and see that it would work and that's what we need. We don't need to lose any more land in St. Bernard Parish. We don't need to never take our mud out from somewhere, and if that should ever happen, where would the mud go? It would definitely need to stay in the Parish, but hope to God that that never happens. We can get pipeline in and pump

85

in what we need, but from what I see, digging another siphon, it would never ever bring enough sediment in to fill what we need. I don't think in our lifetime our kids, grandkids, great grandkids, or like you said, I believe it would never happen.

Thank you.

MS. RODI:

Thank you, and happy birthday tomorrow.

MS. SERPAS:

My name is Catherine Serpas and Kathy Serpas Ziegler is my daughter and she might end up taking my place one day, I hope.

Well, first of all, I told Greg earlier, I do have to say I still believe that the MRGO has to go, and when I say that, it has to be filled in and I will continue to say that at every Corps meeting that I come to.

The next thing I would like to say is I am definitely against a diversion in Miro Field. The most important reason is it's our prime developed for the future of St. Bernard Parish. It's for my children, your children, your grandchildren to bring our people back down the line, and I know

86

it's not going to happen overnight, like Greg said, but it will happen some day.

And as far as showing us the recreation, I'm totally against us even being in the program because all that is is trying to make you feel good about what we're, what you're going to do. It's not what we want to do and not just Greg because I told you before no matter what, I love you.

And y'all making me lose my thought. Let me see. Well, of course, everybody here knows I am against borrowed pits, and I can't even imagine a bigger borrow pit than digging up all of that land. So I'm definitely against digging up all of that land. Now, if this has to be done, I would have to say the Violet Canal, but I'm hoping that doesn't even have to be done because I don't want to see anybody's life be disrupted, and I think the MRGO has disrupted us, has tore our lives apart, has separated our family, has killed many of us. And we don't need a diversion or another separation of land to come into St. Bernard Parish and do that all over again in years

to come.

Thank you.

(Applause.)

MR. BARRETT:

Hello, my name is Louis Barrett and I really have some questions about this. I called Tammy and asked her to send me

information on this, on this statement, and she did and she sent most of it and then I realized when I got it, this report is over 6,000 pages long. It's worse than the health care bill. No way -- I tried to read a lot of it, but there's no way you can read all of this.

But I really wanted to ask some questions about it. I've read some of this, and I've read the conflicted things of the flow rates and et cetera that are in here, and I really want to know how much flow can you put through the existing Violet Canal? We already have a siphon there.

UNKNOWN:

It' only three feet deep right now.

MR. BARRETT:

How much flow would the existing

infrastructure there support?

MR. MILLER:

State did an evaluation of that a few years back. It was around 2,000 CFS. It's around 2,000, and that was done a while back. So like the gentleman said, it was still a little bit of -- you might have to dredge it out.

MR. BARRETT:

Okay.

MR. MILLER:

The point is that it's not as much as we think it's necessary.

MR. BARRETT:

I want to ask the question again. You can put the thousand CFS if you want to put through there now, why couldn't you put the springtime flow from the Bonnet Carre and it could flow there? I mean, you know, that is structures that are already existing and cut the price tag on this thing tremendously I'm sure, if you need to put that much flow. Why wouldn't that -- why wouldn't that be feasible alternative?

MS. RODI:

89

Mr. Barrett, we can talk to you afterwards and answer questions specifically.

MR. BARRETT:

Okay.

The other thing that I read and I couldn't get a handle on is you keep talking about the different various amount of flow rates and it seems to be correlated with the amount of land restored, how is this freshwater related to restoring that much land?

MS. RODI:

And if you would like this question answered before you leave, Josh Carson over here in the blue tie can talk to you on the

way out. We're just trying to give time for everyone to get their comments.

MR. BARRETT:

Okay. The other thing about this borrowed material to rebuild it, I think it should be looked at dredge it from the river. I've asked the question several times, and I still think it's time the Corps of Engineers pass and dump that material off

the Continental Shelf and throw it away. I think the plan really needs to be looked at to move the dredges up the river, whatever silt you pump up river, you wouldn't have to pump through the mouth of the river so it should be a cost effective alternative.

Thank you.

(Applause.)

MS. RODI:

Okay. The next few up, Linda Barrett. I think she might be related.

MS. BARRETT:

You know what they say, behind every good man...

MS. RODI:

Frank Campo and then Edgar something with a V, Veillom.

MS. BARRETT:

I'm going to say I'm not against coastal restoration. I would think if we had to

have the lesser of all evils, the Violet Canal would be the one to do, another five-foot wide cut could be devastating. Tome, it's another MRGO, and we all know what that meant.

91

I wanted to also say the last couple of years we've been going to several meetings and we have been asking about the dredge in the river and we have been told it's not cost effective. Well, then I heard "cost benefit analysis," and this project is going to cost how much versus what seems to be a lot less if we use dredge from river which is already there. And all I can is if you do this, it's not coastal restoration; it's St. Bernard devastation.

Thank you.

MR. CAMPO:

My name is Frank Campo, Jr. I own Campo's Marine at Shell Beach.

I'm against the freshwater diversion, but I have something to tell you about salinity. If you would achieve the salinity in the Breton Sound area, what you need to do is go out there and pump up the islands and pump Gaucho Island all the way back to where you control pass like it used to be when I was a little kid to Breton Island and you got to go the Breton Island and you pump all the way to the main pass

92

like it was when I was a little kid. If you do that, you are going to change the whole salinity in the Breton Sound area. I don't know why anybody can't figure that out. You pump the islands up, you close the passes off, you kill the storm surge and you change the salinity all in the same -- with the same rock. What's your problem? Why can't you see that? I know it's not going to benefit you job-wise, but so be it, you're going to put a diversion there that is going to kill me and all of the recreational fishermen, including yourself, because you've got a camp down there. Where the hell you going to get bait at? If I can't keep bait, where going to get it?

When my dad passed away couple of years ago, we built the marina back. While we were doing that, everybody from Crockers Landings in Fort Beauregard came and asked me if we were going to come back like we was. And I told them, yes, we were, and they said, if you come back we, we come back, if you're not going to build the marina back, we're not coming back because

93

there was no reason for us to. So I was the king pin for everybody going back. Now you

are going to kill the king pin and what the hell good is the camps going to be? Everybody's property back there, including yours, is not going to be worth beans. The amount of people that you are going to put out of business with this freshwater diversion is astronomical. The amount of money you're going to cost St. Bernard, people get shot over stuff like that. You can't do that to us. You can't -- the whole parish is going to suffer like nobody's business if you cut that. Yeah, you can go out there and you can put the -- you can put the rocks along the lake and you can pump that sand in. That is all well and fine. And you can even put the fishing piers. I suggested that a long time ago; but if you put the freshwater, all the fishing piers are useless. If you want to do something, think about it. Go out there and fill up the barrier island and make the passage real small like they used to be and that is why the salinity -- we didn't have a -- we

94

didn't have a freshwater diversion 50 years ago. I'm 69 years old.

As far as the cypress trees, well, that is a bunch of bull. They've been dead since was 10 years old. I was going hunting back there with my daddy when I was 10 years and all of them cypress trees were dead so they

were killed in the 1915 storm and the 1947 storm, that is what killed the cypress tress back there.

MS. RODI:

Thank you, Mr. Campo.

MR. CAMPO:

And my father is not here now, but if he was, he would tell you that.

Thank you.

MS. RODI:

Thank you.

MR. VEILLOM:

Good evening. My name Edgar Veillom. I'm representing the Jefferson Lions Men's Club of Jefferson Parish Louisiana. I'm a past president of the Louisiana Wildlife Federation and currently the representative to the National Wildlife Federation.

95

I would like to congratulate the Corps in developing this very comprehensive plan that will address most of the issues, many of which were created by a malfunctioning project of the Corps of Engineers, so hopefully, we can turn it around.

I served on Governor Edwin Edwards' Atchafalaya Basin Commission from 1975 to '78 and Governor Treen's Pontchartrain Task Force for Lake Pontchartrain, Maurepas and Borgne. Also, served under Mike Foster's

program with the Barataria Terrebonne Estuary Commission. I say all of that in a way of a background to let you know that I have looked at many plans and testified at many hearings over the years. I have never seen one that was completely embraced when it was first rolled out. That is why it's called the tentatively selected plan. I think that the basic components of this plan are very silent -- solemn rather. Some of the overlay is what's causing concern.

I would also like to acknowledge that some of the concerns were born by diversions that not functioned exactly as they were

96

planned. Yes, mistakes were made, but also lessens were learned, and I don't feel that they will be repeated. Their plan is basically silent. I would ask that everybody here keep any emotional thinking out of it. All it does is muddy up the waters and prevents you from thinking solidly. I thank you for the opportunity and I will develop some written comments by February 14th.

Thank you very much.

MS. RODI:

Thank you, sir.

Okay. Next three: James Kieff, Sherwood Gagliano and then looks like Alfreda Pizani.

MR. KIEFF:

I'm James Kieff from Hopedale. I'm an oyster farmer and I'm dead set against this thing. I wish I had known this five years ago was coming. After Katrina, I bought some land north of the lake. Wife asked me, what you going to do with this? Got to have back up. But we living in St. Bernard. We got to go back. I said, yeah, we'll go

97

back. So we did. We came back. We rebuilt two places, not one. We rebuilt two. We rebuilt our oyster leases, spent I don't know how much money on that and this thing here will finish me and my family off. We can't take any more beatings. We done got BP. We had Hurricane Katrina put a whipping us, and if -- the man said keep our emotions out of it, but it's hard to get your heart out of something that you love, you know. It's not hunting ducks. It's not -- you like to hunt ducks, you hunt ducks. You like to go fishing. I like to catch oysters. That's my -- that's what I like. That's what I love. And I see this diversion is going to just kill us. It's going to run us off because if we can't fish oysters, they are not going to fish crabs. They are not going to fish speckled trout. They are not going fish red fish.

And that's all I got to say about that.

Thank you.

MS. RODI:

Thank you.

MR. GAGLIANO:

98

My name is Woody Gagliano. There's a TV commercial that's showing on television right now about the NFL, National Football League. There is a man who says that he's been to every Superbowl since they started with a group of friends. I'm kind of in the same boat. I gave my first professional presentation at an MRGO meeting in 1973, and I don't think I have ever missed very many since then.

Colonel, I've had the pleasure of working with probably 15 or 17 of your predecessors and I look forward to doing the same with you.

I think President Taffaro expressed the views of his constituents very well tonight. You know, I've had the honor and the pleasure of working with people in this parish through the hurricanes, through the oil spill and through many, many other things. We're at a milestone here tonight.

Greg, you should be congratulated for the not too pleasant job of bringing a plan together into a context that it can be worked with and defined.

99

I would like to -- just one point that I would like to emphasize. I don't want to talk about the technical aspect at all. We'll have plenty of time to do that. But one of the things that President Taffaro said is that we need to take a fresh look at the process of how we move from where we are tonight to the final revised environmental statement, and that process I hope will be creative. I would hope that we can have a continuous dialog with the key parishes, particularly St. Bernard where most of this work will be done, working in conjunction with the planned team so that we don't come here a year from now and have the same kind of emotional venting that we've had in the past. We are all good people. The people in the Corps are my friends and colleagues. The people in this room are my friends and I enjoy -- I love them. That's why I keep coming back down here and we have an opportunity to -- a very challenging opportunity to restore and develop a sustainable plan for one of the most important ecosystems in the northern Gulf of

100

Mexico. You know, we could talk forever about that. And now we're entering that

critical period when we have to resolve tough issues and get some good science into the process. I look forward to working with you and achieving that.

Thank you.

MS. RODI:

Thank you.

MS. PIZANI:

My name is Alfreda Pizani and I live at 1569 Bayou Road in St. Bernard and the reason why I'm up here and I've come to numerous meetings and I have kept my mouth shut, everything else, okay? But, okay, y'all are talking about if y'all don't use the Violet Canal digging -- I mean digging to go through these other properties, okay, and I think there's enough property that has been taking from us already. We're going to be living on islands as it is. They took -- they come and did our property back in 2004. The Corps of Engineers come and did out property. Okay? We are faced with looking at this terrible, ugly lake every day. We

have neighbors right next to us in the subdivision that have alligators in their yards, snakes in their yard. It's eroding terribly. I have contacted the Corps of Engineers. People have come out. They say there's nothing they can do. It's eroding very bad. I keep getting told there's

nothing they can do about it. Okay. If y'all going to maintain this properties that y'all are talking about with all of these little recreational things, y'all don't even maintain our property that's terrible that y'all took from us, that we didn't even know anything about that y'all took from us, just come did. I went back there one day and y'all were back there digging.

UNKNOWN:

And chased us off.

MS. PIZANI:

And told us we had to get off our own property. Now, if y'all are going to be doing maintenance on these other properties like y'all doing on our properties, I feel sorry for the people that live around the other properties that you all want to take.

102

So that's all I have to say.

Thank you.

MS. RODI:

Thank you, Ms. Pizani, and we'll make a note to check on that again for you.

Next up, three: Mr. Tripp, looks like Phillip Livaudais; is that the close? And then Pete Taffaro.

MR. TRIPP:

My name is James Tripp. First of all, I work for the Environmental Defense Fund. I

am not a resident of St. Bernard Parish. I'm not a resident of the State of Louisiana. I'm a resident of the State of New York, and I'll tell you why that is relevant to this conversation.

First of all, I want to thank the Colonel. I think the Corps of Engineers, as a manager of resources in the Mississippi Basin, is light years ahead of where it was 10 or 20 years ago. The Corps couldn't begin to knowledge what MRGO was doing to this part of this state and this delta. And it has acknowledged what it did and it's now trying to repair that damage, and that's

what Congress has asked them to do.

This is part of an overall program to start a motion of the restoration of this magnificent Mississippi Delta ecosystem, the second largest delta in the world. And we are in a period of transition away from exclusive attention to flood protection, hurricane protection, navigation to including restoration. The question is how to do that.

I listened to the Parish President's plan which was even a more ambitious plan. I having to confess, having listened to many of the speakers, I'm beginning to wonder what you really want is nothing at all. It's unclear to me what you want to happen.

So let me tell you what I think are the important features of this plan. I think restoring the wetlands, including some of the cypress farms of the central wetlands, is absolutely vital, not only to law in terms of the sustainability of this parish, but also to New Orleans. And when you think about this plan, you have to think about beyond St. Bernard Parish.

104

As far as the Violet Canal is concerned, yes, it might be why I would urge the Corps to look again at alternative three, which is existing canal and see if you can figure out how to do that.

And in connection with the Violet Canal, I would urge that the Corps and the Parish consider how it can be used to convey sediment as well as water. We've got to move beyond thinking about freshwater diversions everywhere in the State to diversions that convey sediment. After all this whole diversion is a sediment store, so we should certainly think about how to use that and how to move sediment.

In terms of the source of sediment, yeah, I have to say, boy, I'm a bit weary of digging deep holes out in Lake Borgne, and there is a lot of sediment in the Mississippi River.

In terms of shoreline protection, which is an important feature of this plan, I would urge to the maximum extent possible looking at oyster reefs which are losing biological systems that can grow, rocks

being important, but rocks don't change.

Now, why is New York important to all of this? The price tag here is $2.9 billion. If you have a more ambitious plan, then it will be more than that. That's 60,000 to $100,000 per current resident in this system. So the question is, you're going to have to get the support of the congressional delegation from the State of Mississippi, if you're ever going to see this kind of money. That could come if the Congress supports dedicating 80 percent the civil penalties under the Clean Water Act the oil spill dollars, but you're going to have to get behind a plan and get behind the State and get behind the Gulf States, and my two Senators are going to have to get behind it if that's ever going to happen.

MS. RODI:

Thank you, sir.

I have Phillip Livaudais. Is that how you say it?

MR. LIVAUDAIS:

Yeah.

I'm Phil Livaudais, 4628 East

106

St. Bernard Highway. I'm here for -- I'm here -- I'm here to discuss the diversion. Basically, I think that we need the diversion built in Violet to go out into the marsh area. Right now, we have basically really good land and Meraux as far as the pastures, the hard lands, we don't need another canal through our parish. I believe they want 500 feet wide. Without much Corps input back in the 50s, they took 500 feet. If you all know anything about MRGO right now, I don't know how -- if y'all realize that's 2,000 feet wide right now so we've lost quite bit of land they haven't really discussed out they are going to bank stabilize our project. I think we need more input into what is happening just like what Dr. Gagliano and President Taffaro talked about. We need more input discussion after all of this comment period. Without it, our voices aren't heard because after this meeting, you don't know where our voices go.

And I was speaking to the one of our councilmen, Wayne Landry, asked me to read a letter, if we have a minute here. He's at

107

a meeting in Baton Rouge for the hospital. He says, "As an elected official in St.

Bernard Parish, I would like to state my position for the methodology proposed to help rejuvenate our coastal areas here in St. Bernard. I'm in favor of proper salinity levels being achieved in order to restore our lands. However, I am not in favor of doing it by a five-foot wide canal cutting through our parish. I also question specifications which require such a large flow of water once a year, which apparently is designed to produce proper salinity levels for the oyster beds in Mississippi. I don't believe that those levels in Mississippi require the same amount of flow that our marsh land requires, thus more sufficient data needs to be presented to the public for appropriate discussions to take place.

Further, it would seem that proper salinity levels for our marsh can be achieved by adjusting the flow from the spillway gates. This may produce a temporary algae problem, but nothing that

108

can't be overcome. This would also save millions of dollars to taxpayers' money while contributing significantly to your restoration effort.

In short, I want to be on the record saying that I am in favor of restoration effort, but want to use alternative methods

to achieve our goals and not produce such a negative impact that's cutting our parish in half. Thanks, Wayne Landry, Councilman at Large."

I would like to give you all this letter.

Thank you.

(Applause.)

MR. TUFARO:

Hello, my name is Pete TuFaro. I live at 518 Marina Road right off the side of Parish Road. Most of the people here can see my house as you come over the Parish Road bridge. It's the one with the copper roof.

I received one of the first permits to build a new home in St. Bernard at the present elevation. My house is eight and a

109

half foot on the first floor ground level. I'm concerned because there is no bank stabilization between the Forty Arpent Canal and the ship channel. My house is now located within the protection levee, yet I won't see any stabilization from this canal that's cut north-south through our parish. The water is going to be stabilized along the Forty Arpent to the river, but there will be nothing from the Forty Arpent to the MRGO right now. This water is going to

flow freely into that area, and it will affect the area where my house is. The entrance road to Marina Road will flood. The properties along Parish Road will flood. The ditch that runs north-south along Parish Road will flood. Every time the tide comes up past 2.4, it floods now. When we dump that much additional water into it, it's going to constantly stay flooded.

Additionally, there's a lot of businesses and infrastructure along Parish Road that will be affected by this. This is something that no one has addressed yet and I think it's a valid point that needs to be

49

110

looked at.

In addition, if we sit down and we look at the true problem, the problem is our area is not being restored with sediment. If we could restore it at a natural building bank of the river with a dredge, we could do this for literally pennies compared to what you're going to spend. I watched Glen Murphy fill a 15-acre pit in a week. He does this six or seven times a year. It's a building bank that has to be dredged. You're either going to pay someone to dredge it or you're going to allow him to do it and gain from it. It's great that he can do this and make money with it, and I think the Corps should take advantage of the building

bank along the river and pump sediment out to the marsh. Now, to do so, you may need relay point or a relay pump, but it could be pumped miles without any problem at all. And that is our true answer. It's our long-term answer, and it will solve the problem.

(Applause.)

MS. RODI:

111

Thank you.

I have about 20 cards left in case you're wondering. David Muth, Raymond -- maybe Couture and then -- oh, no -- Leer, maybe the last name Leer.

Go ahead.

MR. MUTH:

My name is David Muth. I'm a life-long resident of Southeast Louisiana.

About three weeks ago I took the job as the State Director for the National Wildlife Federation, and I did that because, like a lot of people in this room, I lost my house in Katrina and I am convinced that the way to prevent future tragedies and the way to sustain our life here is to undertake an aggressive program of coastal restoration so I -- I thank the Colonel and the staff at the Corps. I also thank President Taffaro for his very thorough and thoughtful

presentation. This is a difficult set of issues, but I am convinced by the science that since we live in a delta, we have to start letting it function like a delta again. We need to put freshwater back into

the system.

I'm also convinced by our own analysis that we can do it through the existing Violet Canal, that we don't need a new canal, and I hope that we will -- that the Corps will continue to analyze that question and find a way to do that.

So the final thing that I want to say about this -- I don't want to take up the entire three minutes -- is that I want to echo what Dr. Gagliano said, that this is a great opportunity to change the way the process goes forward and to look for creative ways to work out the issues that remain and to make this the best ecosystem restoration project that the Corps has ever undertaken in coastal Louisiana because what has happened here in St. Bernard deserves the best response that you all have ever come up with.

So thank you very much.

(Applause.)

MR. LOAR:

My name is Albert Loar. I'm a professional marine, been running boats for

113

30 years in the Mississippi River Gulf Outlet, MRGO.

You want sediment, Colonel, one mile north of Violet Canal you have a point right there with nothing but a sandbar. That is your sediment. Sure. You're going to have to pump it across the river because it's on the West Bank or you can go up where Mr. Murphy pumps his sand. That's your sediment, okay.

If you're truly talking about restoring what MRGO did to St. Bernard, then don't worry about Mississippi. Pump your freshwater from the Violet Canal that is already there, plus a sediment through the Violet Canal, do our coastal restoration. Also, rebuild our barrier islands, complete chain of the islands. Bird Island was there when I was a kid and has since been there for years. Rebuild all of these barrier islands where the natural flow can take place. Freshwater diversion has never and will never send sediment into any area. Davis Pond didn't work. Caernarvon didn't work. This is not going to work.

114

Look at Venice, West Bay area, okay. Look at Tiger Pass. Look at all of these

areas that naturally flow water through no levees at all. From the jump down, there's no levees. You have nothing but erosion down there, so if you've got natural flowing coming from the river and it's not doing it, this little bit that you're pumping through is not going to do it.

Also, on the East Bank from Pointe A La Hache down flows straight through, and you still have your coastal erosion. This little bit of freshwater is not going to do the job. You're going to have to pump sediment to build back the stuff that was lost to us. We know that MRGO would never be totally pumped in, that's a pipe dream that people thinks is going to happen. That will never happen.

Also, how much freshwater you said you need? The Bonnet Carre Spillway can give you as much water as you will ever need to pump, but the reason that won't happen is because the Lake Pontchartrain Basin Foundation

115

doesn't want it to happen. I mean, let's call a spade a spade. Okay. I mean, if you need water, freshwater pumped to Mississippi for this linear level, for the oysters you can get all of freshwater you want from Lake Pontchartrain, which is even closer to Mississippi than St. Bernard is. And you

can also get your freshwater to Lake Borgne, in that area, you know. I mean, this is not going to work. All it's going to do is hurt this parish, and if we do have to have freshwater to restore our wetlands that was stolen from us with MRGO, the perfect spot a Violet Canal which is already there, widen it. Just don't go with the side that y'all chose to make it look like, oh, we're going to impact a bunch of people. On the down road side, there's not that many people, you know.

So thank you very much, and y'all have a good day.

MS. RODI:

Thank you.

(Applause.)

MR. COUTURE:

I've heard a lot of things said tonight that I agree to and a lot of things that I don't agree to. I'm tired of St. Bernard being an experimental monkey for the Corps of Engineers. Every time they have a project they want to experiment with, they use St. Bernard. We are the Corps of Engineers' experimental monkey. That is the way I feel. Now, you want to stop salinity, go where it's at on the outside in the marsh. Build back all of that marsh. It

will create less salinity. You stop storm surge. You will help the fishermen and you will get plenty enough water to Violet Canal.

What's so hard about this? It's not hard. I got an eighth grade education. I can figure out if you stop salinity from coming in, you don't have to cut it down. It just doesn't get here. Violet Canal is plenty big enough. Now, we've got this ship channel drudge, we've got the intercoastal canal drudge, the Corps of Engineers put the levees in the ship channel, what more we got to -- how many more canals and bayous and

levees are we going to have to put up with from the Corps of Engineers? Look at it. I ain't seen a project that worked yet. The Caernarvon siphon was a disaster. It's actually a disaster. Yeah, I go fish catfish every day in the bayou, but that don't put nothing on the table, and I can't eat cypress trees.

MS. RODI:

Thank you. Your name is Raymond Couture? I just want to make sure that she had it for the record.

MR. COUTURE:

And I'm also on the St. Bernard Coastal Zone Advisory Committee.

MS. RODI:

17 We got it.
18 Next three: Blaise Pezold, Darryl
19 Malek-Wiley and Mr. Arceneaux.
20 He says you have to stay in the room.
21 We're locking the door.
22 MR. PEZOLD:
23 My name is Blaise Pezold. I'm a UNO
24 student in earth environmental science and I
25 live in New Orleans. I do a lot of work in

118

1 the Parish planting cypress trees in the
2 central wetlands, and I have a couple of
3 comments that I want to make on the plan.
4 First, the shoreline stabilization of
5 Lake Borgne will most likely cut off the
6 larva crab migration into the Chef Menteur
7 Pass and the rig league.
8 I would also like to say this: There is
9 not a part in the plan to deal with Chinese
10 tallow on the Mississippi River oil bank.
11 That is 80 percent to 90 percent Chinese
12 tallow in those areas.
13 And, lastly, if you're interested in
14 actually doing something with the barrier
15 islands, the cheapest alternative is
16 rebuilding the berms for Delta and
17 to reconfigure the Mississippi River to 30
18 percent from Breton Sound and 70 percent to
19 the west.
20 (Applause.)

MS. RODI:

Thanks.

MR. MALEK-WILEY:

Darryl Malek-Wiley, Sierra Club and I was listening to the Colonel talk about

119

here we are in the school. One of the rules that I remember they taught me, if you break it, you pay for it. And I think that what the Corps of Engineers is proposing here doesn't pay for it, and I think we need to figure out how we're going to get it paid for because it's going to take all of these projects and more. And what Mr. Tripp said from New York is right. Some way we're going to have to figure out how to get everyone else throughout the country to understand how important Louisiana coastal marsh and wetlands are to the rest of the country. And that is going to be a hard sale and we have to figure out how to do that some way.

The one thing -- you know, there's a number of things I'll be putting written comments, also, but I was reading in the document and it said in the document, this branch of the Corps did not look at anything that was -- that other Corps has projects going on with, like navigation stuff. I've been looking mainly at the Orleans side by Bienvenue area and there's an area up there

120

where we think would be a nice oak forest restoration area between the north side of the Bayou Bienvenue and the south side of the intercoastal waterway, that whole strip in there, we feel that needs to be restored, also. This Corps hasn't looked at it because the other Corps that wants to build these docks wants to put all of the contaminated sediment in that area. And I don't think that was a bad idea and I don't think putting Caernarvon sediment there is good for St. Bernard either.

So I think we need look at how we can build oak forests in that strip. Also Chinese tallow that's bringing up along MRGO, there needs to be some way to eradicate that kind of plant and put in more native plants. And I think the main thing is, though, we need to figure out how we're going to get moving forward on this process and not be here 20 years from now talking about how we're going to get moving forward on this process. And some way we've got to break it up and get moving on things now.

MR. ARCENEAUX:

121

First thing I want say is I hope I never live to see another freshwater system put in

St. Bernard Parish. If you do not use sediment, keep it. It's freshwater. Doesn't help anything.

Then I would like to say I've been chairman of the Coastal Zone Advisory Committee for eight years. I've been on the committee for 16 years. I went down and put a program together that you could use at West Pointe A La Hache. This is on West Pointe A La Hache. If you put it on the east side of the river, then we would have something that puts freshwater into Breton Sound and Chandeleur Sound. And if you put sediment with it -- without it, I'm against it, but with sediment, I would be glad to support it.

I thank you for your time. Good night.

(Applause.)

MS. RODI:

Thank you.

Okay. Sidney Torres, John Lopez and Pat Fitzpatrick.

MR. TORRES:

Thank you.

Sidney Torres, and I'm here this evening as a life-long resident of St. Bernard Parish and also as the attorney with the Moore Foundation that owns the property referred to as the Sinclair Tract.

Ms. Gilmore, Mr. Miller and Colonel

Fleming, I thought it important to be here tonight to basically echo what we've heard over and over by my friends in St. Bernard Parish, that the Moore Foundation that owns the property is opposed to the site that has been chosen at the Sinclair tract for reasons that we've heard over and over. The Sinclair tract is 3,200 linear feet on the Mississippi River. It goes all the way to the New Orleans line, Lake Borgne. It's about a thousand acres, approximately. There's approximately 700 acres between the river and the Forty Arpent Canal. The proposal calls for a footprint of a thousand feet. That's literally one-third of the Sinclair track going from the Mississippi River all the way passed the Forty Arpent Canal.

123

The particular tract, Colonel Fleming, that we're talking about, my good friend who is Mr. Cuo right here, Walter on the Violet canal summed it up and said get the price right or we'll take his boat and go elsewhere. When you take and propose to do a thousand-foot of cut in the heart of St. Bernard Parish, you have not only done something where money is not going to compensate, you're taking away from the citizens of St. Bernard the prime land. The

whole purpose here is to develop a system to restore land to protect something that you are destroying and you can't bring it back.

Now, I'm here tonight not really to debate the issue, but basically, I want to compliment all of you for the work that's been done and to tell you that in reading the thousand pages or whatever and Mr. Miller has done a good job -- we met a couple of months ago -- that the final step of this process is going to be to go Congress and have them appropriate that 2.9 million dollars.

You don't have it yet; correct?

124

COLONEL FLEMING:

No, sir.

MR. TORRES:

So I'm here tonight to tell you that the Sinclair tract is a nonstarter. Let's all get on the same page. Your parish president articulated very well what we should be discussing, but we should not be discussing putting it at Sinclair tract for this reason. No matter how far you go with this, the people of St. Bernard Parish, the owners of the property are going to vehemently oppose this. The citizens of St. Bernard are going to be calling every representative, every Senator, the President of the United States, and we are going to

prevail upon them and say, wait a minute we're down here trying to repair something. You know, we finally admit the MRGO caused problems. We're down here to repair something and we're just not going to go for it on this piece of property. It's going to destroyed the heart of our parish, and as a result of that is a nonstarter. We're going to tell them that the only way if it gets to

that point, we want to be on the same teams with you. We want to be debating and discussing the positive aspect of this program and how we can make it go forward. We don't want to be up there telling the Congressman and President that the only way we are going to accept this is because you are going to have to ram down our throat. And we're here tonight to tell you that because we think that's important. Why go off on the wrong track?

And let's going to the other location. In looking at that report, there's lots out here tonight -- that it's really important. Number one, the Violet canal I think in the report directly if I'm wrong. You can actually get the volume up to 2,000 units; is that correct?

MR. MILLER:

Yes.

MR. TORRES:

Yeah, 2,000.

And when you look at the fact that just closing the MRGO in the summer of 2009, I read the report and I have heard and you

126

acknowledged that it has already improved the salinity level. The report actually says that it has significantly improved. That's just in 2009.

So let me sum up real quick. I think my time is up; that when we get to the Violet Canal, let's have a meaningful discussion of how maybe we can reduce that footprint, how maybe there's less need so there are a lot of people here tonight and I learned a lot by listening to what they had to say, that we may not need that much diversion in order to accomplish the purpose that we have.

So we're here tonight to tell you that we don't want to see it go away. You know, 2.9 million is a lot of money to come down here and try to cure the problem. I think it was said that there was no final decision made yet. Please take that into consideration because we don't want to be your enemy. We want to try to work together.

Thank you, very much.

MS. RODI:

Thank you.

127

MR. LOPEZ:

I'm John Lopez. I'm the director of the Lake Pontchartrain Basin Foundation. I think many of you know our organization, we have a staff of about 10 people. We cover our basin. That's 10,000 square miles all the way up from Washington Parish to the mouth of the river. That is about 1,000 square miles per person. We have a lot to cover, but we have very dedicated staff and they're virtually all local people. We were here before, we were here after and we plan to stay. During Katrina basically everybody on our staff was impacted. We are here before. We are here after and we plan to stay.

We all have emotions, but we try our best to separate the emotions because we believe that you have to use the best science and engineering to make these decisions. Now I don't mean to say that science and engineering is perfect. We know it's not and that's why it's so important to hear the feedback we are hearing today. We need to keep learning and we need to keep

128

improving what we know, but in terms of coastal restoration, we know that the status

quo is not acceptable. We have to move forward. This vehicle, this instrument that the Corps has created could be a huge vehicle to try and move forward. It's not perfect, but we are going to continue to try and improve. The Corps said you can submit comments to them. Send them to us so, also. We want to send them the Corps, but we are an organization, so feel free to call us, talk to us. We want to hear what you have to say. We will continue to work to try and make this thing work.

On a couple of just technical details, we agree that the Violet Canal is the preferred alternative for a number of reasons. We think that that probably can work. So we would like to vigorously push the the Corps to try and find that solution. We're also concerned about source of sediment. We would like to see alternative sources of sediment. Some sediment probably can be taken out of the Lake Borgne and not be a problem, but the

129

bayou you're talking about could be problematic.

I don't want to go into all of the technical issues, but I just want to emphasize we'll continue to work with you and the Corps to try and make this plan work.

Thank you.

MR. FITZPATRICK:

My name is Pat Fitzpatrick. I'm a professor at Stennis Space Center. That is near Slidell and Waveland. I was born in Louisiana, fished St. Bernard much of my life. I know the area well, and first of all, just to let you know, y'all have already made some progress. There's bass in Lena's Lagoon again. I've been catching bass there, and it's full of grass. You've already lowered the salinity, so there's good progress already being made. And I support economic restoration and I support reclamation efforts, but I do not support the diversion. And the reason, the main reason is because I saw what happened after Katrina. It wiped out the marsh near

130

Caernarvon.

What we actually did at Stennis is we got some funding to study this and I'll give you some paper so you can read about this a little bit more, but what we found was -- it got wiped out because the new replaced -- the saltwater marsh or intermediate marsh or fresh marsh and has very shallow roots and what happened is before Katrina, you had 14 percent water coverage. After Katrina you had 53 percent water coverage. It's 290

percent erosion near the diversion. It stays like that, and then when you get away from the diversion, there's a little erosion for Katrina but not nearly at that kind of level.

And it's just not us. There's been another stuff from Boston University, UNO Arden and Vicksburg, by the way, they have also reached the same conclusion and they published this paper in the National Academy of Sciences peer review paper, and I'm going to give you that paper as well.

Incidentally, LSU is also doing studies on this with the same conclusions. And, of

course, the debate is why it's not working. But it's probably because this is not how nature works. When you have a river system that gets high, it naturally goes over banks. It very gradually disperses the freshwater system. It also has sediment in it which this does not.

So here's just some recommendations on my part. Before you think about building more diversions, you first need to understand what happened at Caernarvon. You need to understand the dynamics and its resiliency to hurricanes.

Second, at least from my point of view, you should look at alteratives for introducing the freshwater. The piping

system that the president suggested I think is a great idea to start.

Also, as far as MRGO I know you can't refill, but you could have at least restore at echo system. You could restore Bayou Casotte from point to point the way it used to be. And also, that would get rid of the dead zone that exists east of the dam that occurs every summer, and that would also

restore the system, so...

And, finally, just as a point of concern, even though we've lost Caernarvon, there's been no effort to restore it. So from my point of view, you ought to be trying to fix that and then understand what's happening before you try to do more diversions.

But I do applaud y'all. It's a very comprehensive plan. I think it's a good start and I thank you for your time.

Thank you.

(Applause.)

MS. RODI:

Next up, Polly Campbell, Dr. Paul Kemp, Nicky Alfonso.

MR. ALFONSO:

All right. My name is Nicky Alfonso. I'm a St. Bernard resident. I am a commercial fisherman since I got out of high

school in 1983.

It's a lot things here that's wrong that a lot of people is not realizing because I look around this room, and yeah, I see a couple of people I see out there on the

water. I see a lot of people I see on weekends. We losing land fast.

The whole deal here is we the first defense of New Orleans before the storm. When we gone, New Orleans is going to be the defense for Baton Rouge. Where is it going to stop?

The other thing I want to mention about it is the Caernarvon freshwater diversion, that's what we should have learned from. It's 20 years, but I never heard Greg say how good it was doing. I never heard Craig say how good it's doing because that affects some land in St. Bernard Parish, too. So how can we believe another diversion coming into our parish is going to work? I mean, this is like school. You didn't go there 20 years to learn nothing. True?

Well, I could tell y'all another thing, too. I got one more other thing about the commercial fishing part. I've seen the freshwater diversion create seafoods, not oysters. I seen it create a lot of white shrimp, not brown ones, but the biggest part is who is going to regulate it? Who's going

134

to say when it runs 7,000? Who is going to say when it runs 1,000? They had the boys for the Caernarvon Diversion, and they've have been screwing up a lot. I mean a lot. You would think they would come talk to us to see what would benefit, how the people would benefit and how the land would benefit because the people sitting on the board, they don't go on the water. They don't even know where the water is. You tell them to go to Pointe Fourchon and they ask you where is it at. I think that is going to play a big part if this diversion does go in. And I also think being that Caernavon been there for 20 years, and it really hasn't shown us nothing -- that guy that was just talking, if he would run for president, I would vote for him. He knows what he's talking about.

But if all of this is a study and a test, the test failed from the Caernarvon Diversion so why not put -- if you're going to put it -- not that I'm for it, but if you're going to put it -- to make it the way it flows with sand. What is the life span of a diversion, would you say? 50 years?

135

One hundred years? Two-hundred years? If it's 100 years or more, we don't have

nothing to lose by letting the sand flow through it because the only thing we can do is create something. Without it, we can't create nothing.

Thank you.

(Applause.)

MS. CAMPBELL:

Good evening, I'm Polly Campbell. I live at 4212 Florida Avenue in Meraux. I am the president of Lexington Place Civic Corporation, which is the largest subdivision adjacent to the Sinclair tract. We are a subdivision that is comprised of 849 properties. Since Katrina, we still have not reached 50 percent occupation in our neighborhood. We have a number of properties that are still empty, for sale, properties that no longer have structures on them and so we live with the everyday effects of Katrina.

And I say that to say to you all I appreciate all of the work that you have done on this study and, Greg, for your

willingness to be a part of our association meetings, to come to Kiwanis meetings, to engage us at a personal level.

But we live every day with the effects of Katrina that have not by any stretch gone away. They are every day present in our face. All I have to do is get up in the

morning and look out of my front door and the effects of Katrina is still there. I'm one of only six property owners, home owners who live on my street now. Pre-storm there would have been 40 neighbors. Now there are only six of us. So it's something that's in my face every single day so it's very difficult for us to see this kind of a plan and not react to it emotionally. And so I thank you for your patience in listening to so many of us this evening. Please know that there are many others who weren't here or who are very tentative at speaking behind a microphone, but know that's this is an emotional issue for us. There's no way that we can separate from that emotion because it is still very, very real and very apparent to us.

137

I think our number one concern is that in any plan -- and your plan is very detailed, very all encompassing. I think that Craig spoke tonight about adding us back into protection that is definitely worth consideration as well, but I think you have an overall plan. You have an ecosystem restoration plan which is what you called it.

The part of it that draws us all, obviously, to great passion is the idea of

cutting into the land that we have now, land that we already have holes in. We have neighbors gone, homes gone, properties gone. Just to picture that in a positive way is, for me, absolutely impossible. I can't look at it, regardless of the -- of the docks or the walkways that are built on the top of it in any way that it's portrayed nicely. I can't look at it without feeling anger or without feeling a great deal of passion because I believe St. Bernard Parish has lost a great deal of its land already. It is an incredibly complex issue. It's not something that any one pill is going to fix.

G-6

138

It's not something that any one Band-Aid is going to fix, but I think you have a parish full of people who are passionate about saving our land, preserving it and restoring it and if we can all be team members rather than being on the receiving end of something that is the ultimate benefit perhaps of another state or of another area. If we can be team members in creating a restoration plan, I think that it is to the benefit of all of us and I think that's what we want to say tonight is if your plan has our very best interest, and by our, I mean St. Bernard Parish residents at heart, we're going to support it and we'll go to Congress and lobby for all of the money that we need.

You don't have to worry about how much it costs to put it at Violet because we'll go ask them for the money. And as many people as you see here, I think we can double or triple the people and we'll go to Congress for you and get the money provided, if you can make that work.

And I have cookies for you because I don't go anywhere without bringing cookies,

so if that will sweeten the pot and get you to pick Violet, I will cook every day for you.

Thank you.

(Applause.)

MS. RODI:

I don't know how you can top that.

MR. KEMP:

I'm not going to try.

I'm Paul Kemp. I'm vice president of the National Audubon Society, and I'm an oceanographer by training and I did a lot of forensic work after Katrina on the MRGO with the team Louisiana crew.

And I want say that a lot of the things that President Taffaro said make a lot of sense, and a lot of the things that Woody Gagliano said and I think what we have here in this plan is really -- is really a lot of pages that -- in which words are written,

but we have to write new words in some of those places and that's what this process is about, getting comments. I have looked through the engineering indices and I think there's a lot of good features in there, but

they may be a lot of mistakes also in the -- in some of the calculations and so on and those things we can go through and fix, particularly if there's a group from this area working on it. And it's not -- it's not just done inside the Corps.

One thing we do know is that the Violet Canal is adequate with some deepening as adequate to convey the necessary flow and so there's really no hydraulic reason to consider another site there, particularly given the kind of opposition. And so we -- I guess what we want to do is try and organize that team that will help your designers actually come up with a plan that everyone can go to Congress and support. And I don't think we're that far away from it, but we have a lot of work yet to do because there's so little real data in there, but it's not going to take a long time to put that together.

Okay. Thank you very much.

(Applause.)

MS. RODI:

Thank you.

141

George Jackson, still here? Joe Oster.

MR. JACKSON:

My name is George Jackson and I live at 618 Florrisant. I've been a commercial fisherman for over 30 years.

UNKNOWN:

Can't hear you.

MR. JACKSON:

George Jackson. I'm a commercial fisherman. I've been here in the parish commercial fishing for over 30 years.

I don't think we need a diversion. I think we need to go back out and build barrier islands up. I've been having discussions with Senator Reed for a bunch of years now and he's been telling me that the Federal Government will not approve this, but to change the salinity level, you need the change the intake of the saltwater. And if you put barrier islands back, it will cause that, and then you will be able to build land. And I think the ship channel could be pumped in, filled in because the four-lane highway pumped in within a month or so all the way down with no problem.

142

Just pump there, fill the channel. You wouldn't have a problem with nothing. We

would stop the saltwater intrusion, you would the salinity level and you wouldn't have to put all this freshwater to kill our occupation and our jobs.

That's all I got to say. Thank you.

MS. RODI:

Joe Oster. Let's see. George --

UNKNOWN:

Give it a shot.

MS. RODI:

Well, I could give it to better shot if I could read it a little better.

MR. BARISICH:

Hello George Barisich. I'm third generation commercial fisherman in shrimp and oysters. Okay. That is what I mainly do; but here tonight, I'm serving as President of the United Commercial Fisherman Association.

I want to go on record and let y'all know that we were against it when Governor Foster tried to do it for Mr. Lott and then the again with this other foundation set it

to the side.

Unequivocally, the majority of the organization is against it, so we're just not speaking for myself. I don't want to beat what we hope to be a dead horse down because everybody else has done a fine job. I just want to go a little further. I had

what, I guess, would be the displeasure of serving on the Caernarvon advisory panel for six years. Nobody ever listened, not once. So if something like this happened, if y'all decide do use Violet and it works, I'm begging you don't let that happen again. Since Katrina, since BP, every time the government has listened to industry, it came out better. So if it does get to that point, I'm asking you to keep it there.

And the second thing, Craig told you about the funding problem. I'm always a fisherman that was hurt by Caernarvon. Never got a dime. They just came in and paid the people's deal. All right. So what's going to happen here? If you don't have enough funding to defend the project as it is, how are you going to pay me when you

144

displace me?

That's the three things you worry about. Thank you very much for coming.

MS. RODI:

I don't think Mr. Holse is here anymore.

Okay. We're going to wrap it up with Councilman Everhardt and then State Representative Henderson.

MR. EVERHARDT:

First, I want to thank all of y'all for

coming out. Fred Everhardt, Councilman, District E, St. Bernard Parish.

A showing like this, we can move mountains, come out and show y'all's support and y'all's interest in these project. When he sit down with the Corps, they listen, but when y'all show up like this, they have to pay attention. That's when we can change mountains with a Corps operation like this.

You know I'm against freshwater diversion. For what reason? The Corps of Engineers put in Caernarvon. The committee that was just talked about, I sat on that committee three years, three

145

years, and biologists that we hired to Plaquemines Parish and volunteer biologists, (Inaudible), we changed the operational procedure this year. You know why? I took your guys -- Nicky, am I lying? We took your guys out there. You know what they said? You're absolutely right. Over 100,000-plus acres was lost to poor operation procedures and management of the Caernarvon freshwater diversion. My land, Nicky's land, Wimpy's land. Y'all going to do this to Bernard over here on this side? Over my dead body. I told you I found myself to truth.

Greg, you're not going to dig that siphon in this parish. We're not -- the

key to coastal restoration, it's silt, it's mud, it's dredge. That's the way you build land. Diary island, stop the saltwater intrusion from the outside in.

Colonel, when you go to war, where do you fight a war at? You don't want to fight on your own ground, do you? You want to fight over there, whoever you fight. We got to fight out there. We fighting mother

nature. I tell y'all this all the time.

Where's John at? He must have ran out because he and I fight all the time. Build the barrier islands. From the barrier islands into the end of Biloxi marsh, your water levels -- what Mr. James sent to you -- you might have a 10 foot water level, a storm -- 12 foot. I'm giving it 12 foot. You're going from ground to 12 foot once you pass these barrier islands. A storm cannot regenerate and rejuvenate a tidal surge of 27 foot like Katrina brought in.

Do you agree, Colonel? On 10 foot of water, it cannot. A storm generates from the bottom up. Once you pass the barrier islands and you break that thumb you bust it down where it hurts, it will not regenerate and beat that wall like Greg Miller is putting up.

Freshwater is not the key. Silt,

dredging. Lake Lery, we just approved a project in Lake Lery. Where are y'all getting the silt for the shoreline restoration project? Borrow pit in Lake Lery; right? St. Bernard side,

147

Plaquemines side. Do that in every lake that we have out there, put a dredge on it. Take that three billion dollars, move that money. We going to Washington. We going to try and move that money. You know where I want to move it? I want to move it to each pond, Spanish Lake, Graham Lake, just like we doing on the Delacroix side, we do it on the same side. Christmas Camp Lake, same thing. We dig borrow pits, build it up, prop it with shoreline restoration project. Don't take a rocket scientist. I changed the Corps' operational procedure for the Caernarvon freshwater diversion. Nicky mentioned, 20 years. It ran at 8,000 CFS. They cannot run no more than 3,000 CFS this year because the land -- we had scientists prove -- y'all's people -- not only y'all, Wildlife and Fishery and other environmental entities that's involved in the diversion committee. We proved them wrong. I'm apologizing.

MS. RODI:

Wrap it up.

148

MR. EVERHARDT:

A hundred thousand-plus acres of land, of precious land was lost. I'm not going to let that happen on this side.

(Applause.)

MS. RODI:

Thank you.

MR. HENDERSON:

Reed Henderson, I'm the State Representative for our District 103, that's the eastern and western St. Bernard, also New Orleans East, so basically everything that is being affected.

My first question, Greg, is you're talking about the salinity level. Originally, when they proposed the -- well, not proposed -- when he was looking at the Bonnet Carre to bring water, freshwater through there to put it out in (inaudible), which is, if it goes east, it goes into the Mississippi. If it goes west, it goes into the Biloxi marsh. Why was it not put there to begin with when they was looking at buying it? That's a question. It was initially, when they looked at it, they were

149

looking at putting that diversion and just opening the Bonnet Carre, why wasn't it

done?

MR. MILLER:

(Inaudible.)

MR. HENDERSON:

You're looking at a risen salinity level of what, two parts per 1,000?

MR. MILLER:

One to three.

MR. HENDERSON:

One to three. Well, two was in the ballpark.

My question is, if it's not good for Lake Pontchartrain, why is it good for Lake Borgne? Because what you're going to try to do is -- initially, when I spoke to you when I first got in office with this, (Inaudible), acknowledge I've been talking to u about these. But when you're looking at the flow, it was initially supposed to be between 25 and 40,000 CFS; wasn't it, when y'all originally proposed it? In order to get the flow big enough, in order to get it into Mississippi, wasn't that the flow?

MR. MILLER:

(Inaudible).

MR. HENDERSON:

That's what y'all told me, yes. And that's what it was supposed to go down in the river ben area. Now, you're telling us 5,000 CFS. So in other words, you're

telling me that the 5,000 CFS is going to put that all the way to Mississippi? Because this whole project was supposed to be to get the -- revitalize the oysters beds in Mississippi. So what is -- you know, 25 to 40 because I remember what you said three to five times the Caernarvon flow, which was eight, but now you cut it down to five. Which one was wrong? If it took 25 to 40 to get it to Mississippi is five going to do the job?

Now, when you put it behind the Forty Arpent Canal and the Forty Arpent levee with when the Sinclair tract, then how is it going to get out into MRGO, into Lake Borgne? How is it going to flow out there? Through the Violet canal; right?

MR. MILLER:

We would have a structure.

MR. HENDERSON:

You don't have a gate or anywhere else.

MR. MILLER:

We would build it.

MR. HENDERSON:

So you're going to build another gate in addition to the bayou locks?

So you're going to -- I thought the whole project was supposed to be to get the silt -- not the silt -- because that's

where -- where's Mr. Tripp? He was sitting right there. He and I are both on the Governor's Advisory Board for Coastal Restoration and Protection.

It is pretty much universal that we need to start doing sediment diversions. Salinity diversions is not going to get where we need to go because it doesn't build land. It is not enough sediment in the water column in order to do the things that we need to do.

So, you know, we look at the Corps. I don't think anybody here hates the Corps. We hate what the Corps has done, and so you

look at the Parish's history, you'll understand. Like, for example, I was talking to Greg -- I mean, Garrett Graves, in the 1800s, Louisiana stated we didn't want levees. The Corps of Engineers said "We want levees against all of the advice of experts." That's one of the reasons Woody Gagliano is sitting back here. We need ridges. The only way we're going to protect ourselves is ridges. All right. The way it used to be. The only way you do that is get sediment. You have to pump that. The rest of the stuff is not going to work, in my opinion, because we don't need the freshwater.

If you go back to the 1800s, Louisiana

was on the record against levees because it was going to do exactly what we have now. All right. 1927, they modeled every year in St. Bernard flood years, then we got the MRGO. We flooded ourselves in Betsy, and then we got wiped out in Katrina.

So are we a little weary when we say the Corps of Engineers is here to help you? Yes, because y'all don't never sit down with

153

us. All of a sudden we wake up one day, we have another canal through the Parish. What are we going to do then? But the people here in St. Bernard are the people. Everybody is saying here right now is the fact that if you got to do it, we don't want it done. I want to be on record and everybody else here on the record, we do not want it done. Why should we be sacrificed again? We're tired of being the sacrificial lamb on the outset of New Orleans, also with Texas -- you're exactly right -- and now Mississippi without consultation from us saying what's the best way to do it. All right.

We're the suspect of it. Right now, we have to write to everybody, the Government and everybody else because this is not the first time this has been proposed. In the '50s, they proposed it once, and then we

were supposed to take the I asked you what
two weeks ago because I spoke with somebody
at the Corps a year ago and asked you about
this very project and whether you want to
put a bridge. They said, oh, we're not

154

putting no bridge. You said that's wrong?
But in the '50s, when it came in, the reason
that they killed it was because of the fact
that we were supposed to put in the bridges,
the train trestles, the overhead wire,
everything. So there was nothing supposed
to be that way in the '50s. We kind of
knocked it down, but we killed it. And in
the '80s, it came back.

We're looking at it again. And again,
the Corps says we're going to keep all the
property on each side of the channel, and
now we're doing it again. Kind of like one
of those zombie movies. You think you got
the killers, but it just keeps coming back
up. And right now, we just want to kill it;
but if we can't kill it, everybody here
said, what about Violet Canal? You got less
to disturb. You already got the flow. Then
you save the money (inaudible) because then
you've got the Violet Canal.

That's all I have to say. Just please
from now on allow us to sit down with the
Corps as a partner instead of as a guinea
pig, as been said, we're just being

155

violated.

MS. RODI:

Thank you, sir.

(Applause.)

MS. RODI:

Thank you, sir.

Okay. That's all the cards we have. I think we'll have some closing remarks really quickly from Greg or Colonel Fleming. No? President Taffaro?

All right. Wrap it up.

That's all. Thank you very much. Thanks for coming, everyone. We have another meeting February 3rd on St. Claude.

(Meeting concludes at 9:44 p.m.)

156

STATE OF LOUISIANA:

This verification is valid only for a transcript

accompanied by my original signature and original blue seal on this page;

I, Elicia H. Woodworth, Certified Court Reporter in and for the State of Louisiana, as the officer before whom this testimony was taken, do hereby certify that the witness, to whom oath was administered, after having been duly sworn by me upon authority of R.S. 37:2554 did testify as hereinbefore set forth in the foregoing pages;

That this testimony was reported by me in the stenotype reporting method, was prepared and transcribed by me or under my personal direction and supervision, and is a true and correct transcript to the best of my ability and understanding;

That I am not related to counsel or to the parties herein, nor am I otherwise interested in the outcome of this matter.

Baton Rouge, Louisiana, on this date _____.

_____

Elicia H. Woodworth, CCR

Certificate No. 27014

Appendix Y3

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: Jan. 25, 2011 | Meeting Name | Location: Waveland

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone
1	Mike Smith	915 Amar St	Waveland	MS	39576	Fireman39576@ATT	228-493-6643
2	Johanna Spicuzza	11088 Tahiti St.	Bay St Louis	MS	39520	johanna.spicuzza@bellsouth.net	228-467-9533
3	Lou & Pat Fuchs	5720 Anuai Way	D'Iberville	MS	39525	PAT.Fuchs.2379@gmail.com	
4	John Rosetti	998 Hwy 90	Bay St. Louis	MS	39520	JOHN@WELLERGROUP ASSOCIATES.com	228-860-1023
5	David A. Garcia	800 Rue De La Salle	Waveland	MS	39576		228-467-4134
6	George McClellan	539 Meadowood Ln.	Biloxi	MS	39532		
7	Dudley Vandenboorle	210 CHARLES CT	SLIDELL	LA	70458	deadlyDudley724@GMAIL.COM	
8	Land Tannery	301 Westview Dr	Missoula	MT	59803	mtducks@hotmail	406-370-5243
9	Chris Nook	9420 Music St	Russell	OH	44072	cnook@huntducks.com	216-470-1085
10	Jonathan Marino	3500 N. Causeway	Metairie	LA	70002		504 8376326
11	CAROL ACKERMAN	4304 E Campbell #1039	Phoenix	AZ	85018	carol@core4advisors.com	602 684 6800
12	STEVE SEYMOUR	19215 Hwy 603	KILN MS	39556	STEVE Seymour@ATT.NET		493-808
13	Katharine T. Chaman	110 De Montvron	BSL MS	39520	Ktolsa@hotmail.com		228 324 0105
14	Charles LaFleur	136 Edith Dr	BSL	39520	c.LAFleur@Mchsi.com		228-342-3699
15	Sandy Reese	406 Jay Davis Ave	Waveland	39576	MSEippi406@yahoo.com		228-352-0090
16	Kevin Ladner	6058 Firetower	Kiln	39556	Kevin.ladner@co.hancock.ms.us		228-467-4157
17	Merlin Necaise	315 Old Spanish Trail	Waveland	39576			
18	Heath Yeomans	1401 East 2nd Street	Pass Christian	MS 39571	Nhyeomans@sclicom		228 596 7700
19	David Kolf	406 Main St.	Bay St. Louis	MS 39520	dkolf@northshorerec		228 467-9608

595

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: Jan 25, 2011 | Meeting Name | Location: Waveland

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	News
1	Connie West	PO Box 683	Waveland	Ms	39576		228-697-2585	
2	Zachary Campo	1319 Y Scloskey Hwy	St. Bernard	LA	70085	zackcampo@aol.com	504-564-3116	
3	Dwayne Bremer	Sea Coast Echo News 124 Court St	Bay St Louis	MS	39576	dbremer@seacoastecho.com	228-216-8624	
4	Conceel Alfred	412 Palm Dr	Braithwaite	LA	70040			
5	Ed Cake	2510 Ridgewood Rd	Ocean Springs	MS	39564	ed.cake@yahoo.com	228-324-9292	
6	Jerry Beauger	36 Chantilly Terrace	Bay St. Louis	MS	39520	JBEAUGE21@yahoo.com	228 344-5839	
7	Ray Spicuzza	11088 Tahiti St	Bay	MS	39520		228-363-0181	V
8	Rocky Pullman	P.O. Box 16	Pearlington	MS	39572		228-533-7056	
9	Brian Gex	73670 Diamondhead Dr. North	Diamondhead	MS	39525	bgex@hcda.ms	228-467-9231	
10	Charles Stallings	Memo				CStallings@cemaims.usace.army.mil	601-405-2972	
11	Mike Brainard	1141 Bayview Ave	Biloxi, MS	39[illegible]1		mikebrainard@dmc.ms.gov	228 523-4057	
12	Stephen Bratter	425 N Beach Blvd.	Waveland	MS		bratt@spcoa.com	228-216-3797	
13	James Lagasse	709 Beaver Dr	Bay St. Louis			James.Lagasse@ARMY.MIL	228-216-0357	
14	Bill Wiley	1243 Woodside Dr	Hanahan	SC	29410	bill.cope+Advisory.com	843-345-1782	
15	Gayle + Bob Buckley	10 Pecan Grove	Meraux	LA	70075			
16	Dan Sager	608 Hogan	Waveland	MS	39576			
17	Myra Sager	608 Hogan	Waveland	MS	39576	msager3@bellsouth.net		
18	Paul Pitts Jr	615 St Joseph St	Waveland	MS	39576	paul@compengineering.com	228-355-0379	
19	Roger + Donna Estopinal	534 Meadow Lane	Waveland	MS	39576	aeroger@bellsouth.net	228-493-9857	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: Jan 25, 2011 | Meeting Name | Location: Waveland

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone
1	James Hemsley	145 Bay View Ct	Bay St. Louis	MS	39520	jimichaelhemsley@hotmail.com	228-467-0291
2	Byron Lynch & Mary Joy Lynch	420 Beach	Waveland	MS	39576		228-343-0353
3	Chris Lagarde	525 old spanish Trail	BSL	MS	39520		228 216 0978
4	Fred Butterfield	605 Nicholson Ave	Waveland	MS	39576	Fbutterfield@gcaa.org	
5	Bob Swanson	400 Sears Ave	Waveland	MS	39576		985-290-3099
6	John Zink	706 Hwy 90	Waveland	MS	39576	JZink@HCDC.MS	228 467-9231
7	Catherine Segura						
8	Linda Barnett						
9	Jasmine Paul Logan						
10	Louis Berry II.						
11	Shawn Brown	894 Robert Blvd Slidell	Slidell	LA	70458	sbrown@rotoloconsultants.com	(985) 643-2127
12	Normajean Sowe	PO Box 2102	BSL	39521			
13	Gene Hoffman	205 Ulmer Ave	BSL, MS	39520		gene.hoffman2100@gmail.com	228 323-3330
14	Al Jensen	502 Jeff Davis	Waveland	39576		seriousbread@gmail.com	228 547 5075
15	Patricia Fitzpatrick	180-B Lakeview	Slidell	LA	70458	drpfitz@yahoo.com	985-788-9486
16	Lee Seal	319 Carroll Ave	BSL	MS	39520	Lee_seal@Hotmail	
17	MARK KIDD	1101 Taranto St	Waveland	MS	39576	M.Kidd@wardk.AOL.com	363-2394
18							
19							

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: Jan 25, 2011 | Meeting Name | Location: Waveland

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	THOMAS PARKER	709 SIXTH ST.	WAVELAND	MS	39576	MISSISSIPPI FISHING @ gmail	3042508124	
2	STEVE HAND	423 LIZANA LN	WAVELAND	MS	3957[illegible]	sbhand@bellsouth.net	228-467-5960	
3	RHONDA GAMBLE	1020 DANIEL ST.	WAVELAND	MS	39576	RHONDAGAMBLE@bellsouth.net	228-342-0823	
4	GENE PERALTA	128 FOREST SQ. PASS CHR		MS	3957[illegible]			
5	JERRY BOOS	9037 W. JUDGE PEREZ DR		LA	70043			
6	BRUCE NAVESE	125 Jeff Davis	Long Beach	MS	39560	bnavese@jlevensenvironmental.com	2288630503	
7	OSCAR ECKHOFF	2301 Atkinson Rd. IC	Biloxi, Miss.	3953[illegible]			388-5719	✓
8	JOHN LOPEZ	387 Carr Dr	Slidell, La	70458		JohnLopez@POBOX1.COM	504 421-7348	
9	LISA EVELEIGH	320 Carroll Ave	BSL	MS	3952[illegible]	LJeveleigh@gmail.com	228.466.5096	
10	LISA COWARD	1005 DUNBAR AVE	BSL	MS	39520	lcoward@[illegible].MIL	2282160506	
11	BRIAN ROE	1235 WILLOW RIDGE	Waveland	MS	39576	bjroe2@netzero.net	228-466-0506	✓
12	Maria Brodine	1367 Magazine St	NOLA		70130	mtb2106@columbia.edu		
13								
14								
15								
16								
17								
18								
19								

Page Y3-4

MAILSALU	MAILFIRST	MAILLAST	Name 2	Address	City	State	Zip	Phone
Mr.	Robert	Campo		1319 Yscloskey	St. Bernard	LA	70085	504-239-5165
Dr.	Ed	Cake	Gulf Environmental Associates	25`0 Ridgewood Rd.	Ocean Springs	MS	39564	228-324-9292
Mr. & Mrs.	Louis	Barrett		2533 Bayou Rd.	St. Bernard	LA	70085	504-376-4829
Mr.	Paul	Lagarde		1200 Bayou Rd.	St. Bernard	LA	70085	504-439-7066
Mrs.	Catherine	Serpas	Eastern St. Bernard Association	2012 Bayou Rd.	St. Bernard	LA	70085	504-494-1363
Mr.	Pat	Fitzpatrick	Mississippi State University	18013 Lakeview Dr.	Slidell	LA	70458	985-788-9486
Mr.	Chris	Nook	Huntducks.com	9420 Music St.	Russell	OH	44072	216-470-1083
Mr.	Land	Tawney	National Wildlife Federation	301 Westview Dr.	Missoula	MT	59803	
Dr.	John	Lopez	Lake Pontchartrain Basin Foundation	387 Carr. Dr.	Slidell	LA	70458	504-421-7348
Mr.	Roderick	Pullman		PO Box 16	Pearlington	MS	39572	
Mr.	Dudley	Vandenborre		210 Charles Ct.	Slidell	LA	70458	985-847-1924
Mr.	Chris	Lagarde		PO Box 2253	Bay St. Louis	MS	39521	228-216-0978
Mr.	Stratford	Goins			Poplarville	MS	39470	601-467-3000

Mississippi River Gulf Outlet Ecosystem Restoration
[redacted]
NEPA Public Comment

(1)

Comment: Freshwater Diversion

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Robert Campo **Affiliation** _____
Street 1319 Yscloskey Hwy **Phone** _____
City, State, Zip St. Bernard LA. 70085
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
[redacted]
NEPA Public Comment

(2)

Comment: _____

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Dr. Ed Cake **Affiliation** Gulf Environmental Associates
Street 2510 Ridgewood Road **Phone** 228-324-9292
City, State, Zip Ocean Springs, MS 39564
E-mail ed.cake@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(3)

Mississippi River Gulf Outlet Ecosystem Restoration
[redacted]
NEPA Public Comment

Comment: MRGO Restoration

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Louis Barrett Jr. **Affiliation** N/A
Street 2533 Bayou Rd **Phone** 504-376-4829
City, State, Zip St. Bernard, LA. 70085
E-mail mrgnola2533@cox.net

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(4)

Mississippi River Gulf Outlet Ecosystem Restoration
[redacted]
NEPA Public Comment

Comment: Fresh Water Diversion

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Paul LaSarde **Affiliation**
Street 1200 Bayou Rd **Phone** 504 439-7066
City, State, Zip St. Bernard LA
E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(5)

Mississippi River Gulf Outlet Ecosystem Restoration
NEPA Public Comment

Comment: _____

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Catherine Draper **Affiliation** _____
Street 2012 Bayou Rd **Phone** 504-494-1263
City, State, Zip St Bernard La. 70085
E-mail DONLPAS@AOL.Com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(6)

Mississippi River Gulf Outlet Ecosystem Restoration
NEPA Public Comment

Comment: I will discuss alternatives to a freshwater diversion.

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Pat Fitzpatrick **Affiliation** Mississippi State University
Street 180B Lakeview Drive **Phone** 985-788-9486
City, State, Zip Slidell, LA 70458
E-mail drpfitz@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration
NEPA Public Comment

(7)

Comment: This Restoration project of Louisiana's coastal marshes is vital to the nation's waterfowl populations. Without the vital habitat provided by this river delta, fisherman throughout the Gulf of Mexico and waterfowl hunters throughout this country face a dim future

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Chris Nook **Affiliation** Huntducks.com & Global Manufacturing
Street 9420 Music ST **Phone** 216-470-1083
City, State, Zip Russell, OHIO, 44072
E-mail CNook@huntducks.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

---

(8)

Mississippi River Gulf Outlet Ecosystem Restoration
NEPA Public Comment

Comment: The Restoration of MRGO is vital to fish + wildlife habitats and our hunting & fishing heritage.

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name LAND TAWNEY **Affiliation** National Wildlife Federation
Street 301 Westview Dr **Phone**
City, State, Zip Missoula, MT 59803
E-mail mtducks@hotmail.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011

(9)

Mississippi River Gulf Outlet Ecosystem Restoration
[redacted]
NEPA Public Comment

Comment: _____

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name John Lopez **Affiliation** Lake Pontchartrain Basin Found

Street _____ **Phone** _____

City, State, Zip _____

E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(10)

Mississippi River Gulf Outlet Ecosystem Restoration
[redacted]
NEPA Public Comment

Comment:
(1) Proper Notification

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Rodrick Pullman **Affiliation** _____

Street P.O. Box 16 **Phone** 228-297-8868

City, State, Zip Pearlington MS. 39572

E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(11)

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: RIVER WATER, DEAD SPOTS IN LAKE

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name D.A. VANDENBORRE **Affiliation** _____

Street 210 CHARLES CT **Phone** 504-985-847-192

City, State, Zip SLIDELL LA

E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

---

(12)

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: IN regard to shoreline protection plans make sure that the COE enlarges the land to as close to original footprint -

- Taking sediment out of LAKE Borne seems to be a risky TASK -
- Impacting paluding oyster reefs seems to counterpro

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name CHRIS LAGARDE **Affiliation** citizen

Street P.O Box 2253 **Phone** 2282160978

City, State, Zip Bay St Louis, MS 39521

E-mail _____

www.mrgo.gov

The regulators in LA need to do a better job of wetland protec

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

DID NOT SPEAK.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: Affects on coastal mississippi (storm model & coordination of Mobile Dist.
what amounts of sediment not fresh water is being put into the marsh?

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Stratford Goins **Affiliation**

Street **Phone** 601-467-3000

City, State, Zip Poplarville MS 39470

E-mail stratfordgoins@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

DID NOT SPEAK.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: The Miss. delta is sinking for 3 reasons:
(1) geosyncline (2) the clay in the sediments shrinks (3) the enclosed vegetation also shrinks. Sea level is rising.
Therefore, St. Bernard Parish, Plaquemines Parish, and New Orleans will not exist in 50 years.

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Oscar Eckhoff **Affiliation** retired geologist

Street 2301 Atkinson Rd. Apt. 1C **Phone** (228) 388-5719

City, State, Zip Biloxi, Miss. 39531

E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

MISSISSIPPI RIVER-GULF OUTLET ECOSYSTEM RESTORATION PUBLIC MEETING TAKEN AT THE LEO SEAL COMMUNITY CENTER, 529 HIGHWAY 90, WAVELAND, MISSISSIPPI ON JANUARY 25, 2011 COMMENCING AT 6:30 P.M..

MR. POCHE:

All right. Good evening ladies and gentlemen and welcome to tonight's meeting. We have a couple administrative things to go through and then we'll get on with the presentation. My name is René Poche, and I'll be facilitating tonight's meeting. Colonel Ed Fleming, our district commander, sends his regrets. He was trying to get here, but got called to Washington DC for some meetings over the next couple days. But he wants you to know he's here in spirit. And he'll get a detailed briefing after the meeting. We're here tonight to talk about the MRGO Ecosystem Restoration. I understand there was some information out there that this meeting was concerning the Barrier Weir Project along Lake Pontchartrain. But that is not the purpose of this meeting.

It's to discuss the MRGO Ecosystem Restoration. And we'll be talking about that in just a little bit. We do have some distinguished visitors here

tonight. We have Mayor Garcia. Thank you for coming, sir. Judge Legas there in the back. Thank you, sir. And Supervisor Seymour. Thank you, sir. Okay. All right. Also one other administrative thing, we will have a comment period for you to participate in the comment period. We have comment cards in the back that you have to fill out. We also have a court reporter here with us tonight. So when you get up for the comment period, just keep that in mind that we have a reporter here and he's trying to capture everything that we have going on. Okay. As we said the purpose of tonight's meeting is the MRGO

4

Ecosystem Restoration. We want to get your input on the issues for this particular project. We want to hear your comments. We want to hear constructive comments. We do understand and acknowledge that people out here may have a strong opinion about the Corps. We'll accept that.

And we understand that people are passionate about this project. But in order for the Corps to make a really good informed decision on this project, we need your input. So if you could limit your comments to this project, it will be productive for everyone. Okay. Direct Environmental Impact Statement. And I'm going to turn it over to Tammy Gilmore at this time.

MS. GILMORE:

Hey, everyone. As René said, I'm Tammy Gilmore. I'm the environmental manager for this

5

project. It's good to see some familiar faces here from last meeting. I'll be the one taking your comments and addressing them in the final document. That's the verbal comments that we receive tonight and at other meetings and the written comments that y'all will or may provide to us during the public review. So as you know, we have prepared a Draft Environmental Impact Statement for your review. It's currently

out, which is a requirement of the National Environmental Policy Act. The document assesses impacts due to several alternatives. No final decisions have been made yet. That's why we're here to get some input from y'all to help us towards that. And this is just reinforcing what I just said. Input from the public is vital to helping us get to a final decision and a good

plan. Our public review has been extended to February 14, which gives a full sixty day review, I think. Oh, my contact information. This will also be up at the end of the presentation. And also I have cards if anyone is interested. I just want to thank you all for coming. And once again, it's very important for y'all to give us your input.

MR. POCHE:

Now, we're going to turn it over to Mr. Greg Miller from the Corps of Engineers. He's going to brief the details of this

project.

MR. MILLER:

Good evening, everybody. Thank you again for coming. As René mentioned, my name is Greg Miller. I work at the New Orleans District of the Corps of Engineers and I'm the chief of

7

the planning formulation office. I'd also like to recognize tonight a number of members from our environmental office, our engineering department, and our planning department. These were the folks that were around the side of the room helping to explain some of the details we have on the maps. They've done a great job over the last few years in putting this very large and complicated plan together in draft form. If you have questions about the specifics, I can give you the ten second answer. And they can give you the real details to things. So I do appreciate the work they've done. The purpose of this evening is to go over some of the details of

the draft restoration plan for the Mississippi River Gulf Outlet. And in putting this plan together, the Corps has responded

to direction given to us by the United States Congress. They did that through a law that was passed towards the end of 2007 called the Water Resources Development Act. That's how all of the Corps project authorizations, study authorizations, and construction authorizations are granted to us, by the United States Congress. And in this particular instance related to the Mississippi River Gulf Outlet, not only did the congress direct the Corps to come up with a plan to close the ship channel in southeast Louisiana, which we have accomplished that already. We finished that the summer before last. But they also asked us to develop a restoration plan for all the coastal wetlands affected by the ship channel. They also said to develop portions of the plan that would

9

help the soil of Lake Borgne Ecosystem. One of the goals that we have in trying to do that is to try to achieve sustainability of this important coastal area as much as we can and also to restore features that diminish or reduce damages from storm surges or hurricane storm surges by restoring natural features along the coast. Next line please. So when starting a study of this size, we've looked at quite a large area. In fact, this particular study covers over six thousand square miles of open water in the estuaries, lakes, sounds, bayous, marsh ponds, vegetated tidal wetlands, and developed communities ranging from upriver between New Orleans and Baton Rouge, across the north shore of St. Tammany -- St. Tammany Parish is another parish above Lake Maurepas -- all the

10

way to the other side of Bay St. Louis to Gulfport, south from

Gulfport on the gulf side of the Chandeleur Island System, down to the mouth of the Mississippi River outlet of the river called Baptiste Collete, and then up the east bank of the river tying back into the area near the Waterfall Swamp.

Next line. Now, the goal that we have in mind, in fact, I mentioned it, was to try to restore wetlands in parts of the ecosystem to a sustainable condition. What we're looking at is trying to get back to a healthy functioning system. And this is a graphic -- I'm not sure how well you can see it with the lighting that we have tonight. But essentially it depicts an interactive coast that we have. In this part of the gulf, we have a working coast where we have

commercial fishermen that use the coast to make a living, oil and gas production, we have coastal cities such as the ones that we have here along the coast of Mississippi with vibrant tourist

businesses. You're familiar with the large city in New Orleans. It's one of America's largest coastal cities. And then we have interspersed in that the tidal wetland habitats that are in and around our communities. And these are our cypress swamps, our river swamps, freshwater -- intertidal freshwater wetlands, intermediate marshes, brackish wetlands, and saltwater wetlands, all bounded by the Barrier Island Systems. And that's what we're trying to depict here is the interplay of that system with the people that use it and the fish and wildlife that inhabit these areas. Now, in the case of the Mississippi River

Gulf Outlet -- actually, could you back up? I want to point something out since we are here in Mississippi. Could you back up one? The Gulf Outlet is a ship channel that was authorized back in the 1950s by Congress. And the Corps of Engineers and the Port of New Orleans built -- with the support of the Port of New

Orleans built this ship channel. And it's a shortcut -- or was a shortcut from the Gulf of Mexico up to the Port of New Orleans. And it's the area that you see in the dashed line kind of on the lower right just extending up to New Orleans there. So just to orient you to where we are in terms of the focus area of the study and how it relates to where we are here in coastal Mississippi tonight. So in the 1950s prior to the construction of the shipping canal, you had

certain types of habitats that were similar to that picture I showed you of a functioning healthy system. And in the case of this map, this is a map that depicts what those habitats looked like along the coast over fifty years ago. And so the dark green areas that are close to the Mississippi -- this is a shot of Lake Borgne, which is kind of east of New Orleans and south of where we are this evening. The areas in dark green close to the

Mississippi River were forest and wetlands, kind of higher ground closer to the banks of the river. And then you'll see the colors, they change as you go to the right of the screen towards the blue, which is the lake itself. You'll see those colors change. And each color represents a different type of habitat. So this is what the area looked like

in terms of the mix of wetlands that were found before we came in and dug the shipping canal. Now, this is a shot of a habitat assessment taken fifty years after the first -- after the authorization of the channel. And you'll notice several things here. One is you'll notice that the canal itself is in place up from the lower right hand part of the screen up to the white box there that says 2006 habitat. The other is you see a lot of brown area, and those are developed areas. Those are places where levees have been built, neighborhoods have been

constructed, industrial areas, other things that weren't necessarily there fifty years ago. The other take away from this is that you see a transition of the habitat from having a mixture of forested, freshwater

marshes, intermediate marshes, and brackish marshes, to primarily all saline marsh and brackish marsh, as well as the blue areas inside of the levee system, which have converted to open water. Those were vegetated wetlands, either forested wetlands or other tidal wetlands that have now converted to open water. So with this change in the habitats that we find in this area, we see a decline in what's called biodiversity. And that's the mixture of different plants, wildlife, and fish that can utilize natural areas along the coast. And because these habitats have shifted to higher salinity habitats and we've lost the fresher areas of the system, you've seen a decline in the

types of species that depend more on those fresher habitats. And that's what we're trying to

16

depict here in this graphic. On the left-hand side of the screen you see a depiction of what's called the Bayou La Loutre Ridge. This is an area in St. Bernard Parish in southeast Louisiana where we had healthy oak trees, higher ground along the bayou, and that area now is severely degraded. And you see a lot of either stressed vegetation on that ridge, or even vegetation that is no longer living. And so as those areas decline, their benefit or use for animals in the system also deteriorates. So in conducting this particular study, what we had to do was help define what were the areas that were affected by the MRGO ship channel. And one of the best indicators that we have of that is how much did the salinity in the estuary change. And salinity is a measurement of how much salt

17

there is in the water. And it's measured in something called parts per thousand. And so these little blue boxes across this part of the study area show how much salinity increased after the ship channel was constructed. So when the ship cannel was built, we cut through the Bayou La Loutre Ridge, the one I just mentioned, and made a direct connection between the Gulf of Mexico and the interior parts of Lake Borgne, and even a connection through some other waterways to parts of Lake Pontchartrain. And so there's an increase in salinity. For example, at Bayou La Loutre salinity is documented to have increased four and a half parts per thousand. And you can trace that all across the estuary all the way up to the top part by Pass Manchac where we had about a

18

half a part per thousand increase in the amount of salt in the

water. So what the team has done, and that's what we're here to show you this evening, is put together a draft plan that has different projects that are able to restore some of the areas that were affected by the channel and to provide restoration of wetlands or other features that help reduce storm surges, natural features that help knock down a surge. And so you'll see a mixture, and they're different colors on this map. And they represent areas where we propose to do either marsh rebuilding with dredged material, the protection of shorelines with rock breakwaters, the introduction of freshwater from the Mississippi into the estuary, the rebuilding of a portion of the Bayou La Loutre Ridge area,

and the restoration of some oyster reef -- or the creation of some oyster reef habitat in the lower right-hand portion. And it's difficult to see from this particular map. And I'll get to

it later on when we talk about the estimated cost of this project. But this is a very large area. This is over fifty thousand acres of rebuilt wetlands that are being proposed as part of this plan. And we recognize at the Corps that we're probably not going to be able to do that in a single shot. Not only would we probably not receive that much money all at once to build it, but also it's a challenge to try to do that much work in any given year. And so these different colors represent a sequence of prioritized projects to build over about a ten year period of time. So those

colors, they represent different habitats -- I'm sorry. The different habitats that were affected by this ship channel, we have plans to rebuild a certain amount of acreage associated with how much we felt was affected by the ship channel. And these are the numbers you see, and they're quite large. Almost fourteen

thousand acres of freshwater and intermediate marsh, almost thirty-four thousand of brackish tidal wetlands, almost five hundred acres of salt marsh, over ten thousand acres of cypress rebuilding and reforestation, and about fifty acres or so of ridge habitat totaling over fifty-eight thousand acres of restored coastal habitat. And one thing that I'll mention about this is, this is just the habitat that is above the water, you know, the vegetated habitats that we see.

We'd also have a restoration of historic conditions within those water bodies in the area to more historic or natural salinity conditions. I think I spoke too soon. On the map before I mentioned that there were color sequences. This is actually the map with the years and when different phases of the project would be implemented over about a ten year period of time. What we've done in this particular case is we've tried to prioritize

the project so that one project builds to lead to the success of the next project. And I'll give you an example. An area in the middle of the screen, it's kind of green -- I'll walk to the screen and point it out for you -- this area is called Proctors Point. It's a wetland -- intertidal or tidal wetland marsh area that is brackish wetlands

and it sticks out into Lake Borgne. We have a proposal as part of this draft plan to rebuild wetlands on this peninsula or this point. It was highly affected by the passage of Hurricane Katrina and it's subject every year to erosion along the shorelines when we get cold front passages or other large wind or storm events. And so it wouldn't make any sense for us to spend a lot of money or effort to rebuild the marshes and then just watch them continue to erode away. And so we've coupled this project in sequence with a shoreline protection effort. We

put rocks out around the edges of the point, protect that area, and then build -- restore or rebuild wetlands behind it. And so that's the example of what we see across this plan where elements of it build upon or lead to the success

of other elements. Now, you know, over fifty thousand acres of rebuilt coastal wetlands is an enormous, enormous area. And it's going to take a lot of dredge material to be able to do that. And this plan calls for dredging material from portions of Lake Borgne in order to obtain that sediment to rebuild the elevations necessary for the vegetation to grow. And to try to picture in your mind, it's over one hundred fifty-seven million cubic yards of material that would be required for this. And to try to put that in perspective, that's about thirty-four Superdomes full of dredge material. So it's a tremendous amount of dirt that would be required for a plan of

this size. I mentioned there's a freshwater diversion component of this plan. We're trying to put a

link between the Mississippi River, which used to naturally overflow its banks, and the estuary around Lake Borgne, what we call the Biloxi Marshes, and to influence salinity in western Mississippi Sound. And there's been quite a bit of public comment, and most of it against the location of the diversion, and some of it even against the concept of using freshwater as a restoration tool. And we want to be clear about that tonight and hope that you can understand from the standpoint of what the team has put together how we reached this as a recommendation of the draft plan. And so we looked at about forty different locations along the east bank of the Mississippi River where we could try to connect the river back to the estuary. And we narrowed it down to four sites located in St.

Bernard Parish that are open land corridors. These are areas where there's minimal development or there's no industrial development or there's minimal other obstacles to try to be able to build a canal linking the river and the estuary. And so you'll see these four sites here. They're numbers one, two, three, four as you move down river. Site number one is locally in and around Chalmette. It's referred to as the Sinclair tract or the Pasture. And it's an open primarily agricultural area that is undeveloped between the river and the ship channel. The second site is an area that is referred to as the Pecan Grove. It's also the location, if you've been in this part of the state over there, where there's an alley way of -- I assume they're probably two or three hundred year old

26

live oak trees. It's a very beautiful stretch of highway. So it's the Pecan Grove or the Oak

Alley site. Alternative three is the existing Violet Canal, which is an old canal that runs almost from the river levee all the way out to a floodgate along the MRGO. And then last, the down river site is site number four. It's a primarily forested area between the river and the ship channel. Now, what we've done in evaluating these sites to make a recommendation of how to include, you know, where to include the diversion canal as part of the plan is we looked at what effect it would have in building the canal at any of these four sites. And that's what this table does is, it shows you a number of different factors along the left-hand side that we've considered in putting together

this element of the plan. For example, we've looked at how many homes or businesses might be located within any one of those four corridors. And if you look across the top, there are no existing structures in the first

site. There's one structure that falls in the second site. There's over a hundred in the third site and none in the down river site, the down river location. And you can look across each one of these, what we consider to be significant factors, and you can see how it would affect -- what it would do to be able to locate a channel in that site. Another example would be how many acres of wetlands would have to be removed in order to place the canal at that location. And again, you can read it across. It's two hundred twenty-seven acres at one site

all the way up to a little bit over eight hundred acres at another site. And then the last is facilities in the river. And I don't want to read this whole table to you. The first two sites have no facilities, no docks in the river that would have to be moved out of the way. And there's about seven at the alternative three location, and

there's a single facility at the fourth. There's a sealift command dock site there. And so you get an indication here of what we thought about when we were trying to decide where to recommend placing this particular feature. A lot of folks have asked us, you know, why do we need a project in Louisiana that has benefits only for Mississippi, and that's really not the case. This is a project that is, although located

29

physically in Louisiana, has benefits for the wetlands in southeast and eastern Louisiana and benefits for reducing salinity in portions of Mississippi Sound. And so we've run some computer models, and that's what these colors show, is how much reduction in salinity there would be in different parts of the project area with this particular project in place. And so around the yellowish areas and golden areas are the greatest amounts of reduction in salinity

over what they are today. And the areas in purple are the lowest amounts of salinity reduction.

So in this part of Mississippi, you'll see we have almost one part per thousand reduction in salinity in this part in Mississippi Sound, in western Mississippi Sound. In the

area closest to New Orleans, the golden area -- I don't know if you can read these numbers, but it's area 75 there -- we have almost two and a half parts per thousand reduction in salinity over what was there.

More numbers, but the takeaway from this particular table is that you see a reduction of about one to three parts per thousand across the area. And let me check my notes and make sure I get this part right. You know, it's not -- salinity is not -- and we've had some discussions with some of the scientists and fishermen in the area. It's not a constant thing across the

estuary. And so when you look at this table, what we're trying to show you is throughout the years salinity will fluctuate. It matters how much rainfall we get in the bay, for example, to

determine how much salt will be present there. That interchange with the tide is affected by that, the discharge from rivers. The Pearl River system has a large effect on how salty the water is in both Lake Borgne as well as Mississippi Sound. And so our modeling is picking up on that and then reflecting the reductions in salinity that we anticipate if we were to build a product to divert water from the river into this area. Now, this is a shot of some of the oyster reefs in Mississippi Sound that we think would benefit by reducing salinities in the Sound by about one part per thousand. And I wish I could tell you that I knew these areas because I've gotten a chance to fish on them, but I fish a little south of here

in the Biloxi Marsh. But these are the areas that are targeted

32

to benefit in Mississippi from those reductions. The areas in Louisiana that are anticipated to benefit are inside, what's called locally, the Biloxi Marsh. And the idea is to try to reduce the salinity in the Biloxi Marsh so that it's optimized for production of oysters and oyster reefs inside of those tidal marshes.

So I'll kind of go over what we anticipate to be the benefits of the freshwater diversion part of the project. It would establish conditions that would help us restore cypress forests and freshwater marshes. It would help reduce the amount of saltwater intrusion that we have into the estuaries. It would restore the historic patterns of fisheries. We would have fisheries similar to what we would have seen in the area prior

33

to the construction of the shipping canal. We'd improve the sustainability of wetlands through the introduction of freshwater and nutrients that are carried in it. It would lead to an improvement of habitat for wildlife. It would improve recreational fishing opportunities. And it would result in a reduction of salinity in one to three parts per thousand in Lake Borgne, and about one part per thousand in western Mississippi Sound. So kind of remember back to that biodiversity picture that I showed you a few minutes ago and remember on the left-hand side we had a picture of the degraded ridge at Bayou La Loutre where the oak trees were stressed. And this is to indicate what a restored system would look like, where you would have ridge

34

habitat that was healthy and vibrant offering habitat for birds that use those areas, and a

more natural transition of marsh creating from fresher areas closer to the Mississippi River to salty areas on the outside of the system. And another picture, this is actually a graphic that we developed looking up the MRGO. And it's intended to show you what some of the restoration features would look like. And so these photos along the bottom are taken at areas where we could see similar projects put in place. For example, the freshwater diversion at Violet on your left side would be a very similar structure to what we have at Caernarvon, Louisiana where we have a project that enables us to divert river water into the Breton Sound Estuary. Inside in the central wetlands we would

have cypress forests that's restored. So that's your second picture there. Some of the areas between Hopedale and Yscloskey we would see restoration of brackish wetlands. And so this third picture is a Spartina patens or

brackish marsh plant that we would see restored.

And the last picture on the right is a woody habitat or woody vegetation along the Bayou La Loutre Ridge that is targeted for restoration. And finally that blue picture kind of a little bit to the right off-center there, that's an example of shore protection, like I mentioned, around Proctor's Point where you would have rock placement and then dredge material placed behind those rocks to restore wetlands. So the, what we call, the tentatively selected plan, and Tammy mentioned that and

hopefully some others at the beginning of the meeting talked to you about it, this is not a decision that has been made yet. That's the purpose of us being here tonight. It's tentatively selected by the team at the Corps with the following kind of components. It's sixty-three miles of shoreline protection along Lake Borgne and portions of

Lake Pontchartrain. It's seven and a half miles of oyster reef restoration in Bay Eloi. It's over fifty-eight thousand acres of intertidal wetland restoration. It has three recreational features. We didn't show you the locations of them tonight. But these are areas where residents could go on boardwalks out into the restored wetlands or one site at Shell Beach where there's some improved fishing areas along the MRGO. And

the freshwater diversion, it has an operational plan of a thousand cubic feet per second most of the year with what we call a pulse event, or a larger flow, up to seven thousand cubic feet per second in the months of April or May.

And this is what I mentioned at the beginning about money. It carries an estimated price tag for construction of 2.9 billion dollars, and that's construction only. That doesn't include the funds that would be needed in

order to design all of these to full detail, to acquire the real estate that would be necessary to build the projects, or the price that the State of Louisiana and the State of Mississippi would pay to help maintain the features. And I mention those two states because obviously we're here tonight in Mississippi. The

freshwater diversion component of this is something that would be shared between the federal government, the state of Louisiana, and the state of Mississippi. So there's a cautionary element that we have to be aware of. Now, I've talked a lot. I've gone over quite a bit of things. If you want more information and you weren't able to get it this evening, we have a website. It's MRGO.gov. If you type the four letters M-R-G-O into Google, it's usually the first thing that shows up. It has a GIS mapping program on it so you can take your cursor and put it over any one of these

features, and it will pop up and show you what the details of that proposed plan are. It also has in the right-hand side here, you can download a copy of the report. I'll warn you if you have a slow

computer or small computer, you might not want to do it. It's a very large document. But we've tried to make the same information that our team has to put this plan together available to the folks that are interested to it. So I think I'm done, and I'll turn it back over to René.

MR. POCHE:

Thank you. Before we get into the comment period, we do have a few more distinguished visitors here that we want to recognize from the Hancock County Board of Supervisors. Rocky Pullman is here. Mr. Pullman? Thank you, sir. Lisa Cowen. David Yarbrough. Okay. And Tony Wayne Ladner. Okay.

All right. Now, as we mentioned before, we're here to gather your input, your comments.

If you have particular questions, we'll be around after the meeting

to discuss those with you. So I ask that anything -- any comments you make tonight are comments and not questions. We're here just to gather information from you. And to be efficient in doing that, we have a few ground rules that we want to go over with you. Each speaker is going to have three minutes to speak. And in the front here we have a little light box. And you'll see it's green, yellow, and red. Green you're still good; yellow you're running out of time; and red you're done. So if you could just follow that, please. You can't yield any unused portion of your time to another speaker. And you can't speak until every one has had reasonable opportunity to speak, and then you can come around for seconds if you wish. All comments and/or questions, written or verbal,

will become part of this official record for the MRGO Ecosystem Restoration report. And also in order for you to speak, you've got to fill out a comment card. And Cheryn in the front up here will have the microphone and also has the comment cards and a pen. So when I call your name, if you would come up to the front here and state your comment for the record.

Okay. Our first person is Robert Campo.

MR. CAMPO:

My name is Robert Campo. I got to do this first at the meeting down in Chalmette (inaudible). Guys, what I'm here to show you tonight is how freshwater diversions do not work. And this map is a map -- this yellow line indicates the line of Hurricane Katrina. And the Caernarvon segment is

somewhere right around right in here by (inaudible). And this is a hundred thousand plus acres that has disappeared since

Hurricane Katrina due to this wonderful diversion that they put in place in 1984. Delacroix Island, which is right here, was one of the -- this area back here was one of the largest brown shrimp producers in the state of Louisiana besides Grand Island. They have single-handedly -- the Corps have single-handedly yanked the rug out from underneath these people's feet. These people, all they can catch back here is catfish. This marsh is ruined. So then they turn around and said, well, we know it's going to hurt the brown shrimp, but it's going to bring the oyster industry back into Black Bay. Well, that's a big no-no too because I'm an oyster fisherman

and I have two oyster boats, and you can't make a sack out here. This is not going to work. This is not going to work here, and it's not going to work here because this is proven because this has already happened. And my cousin owns a marina in Delacroix

Island, and Mr. Miller was here by my place in Shell Beach one day. And he says what's this guy doing -- what are you doing putting water in this tank. I said, well, due to the wonderful diversion that you put over at Delacroix Island and you single-handedly destroyed these people, he has to come over here to get water to bring back to keep his live bait alive.

So having said that, this man has got to travel from Delacroix all the way down to Shell Beach, come catch his bait, much less haul the water back to be able to

keep it alive to sell it to his sport fishermen that come out to his place.

Now, today, I see in the front there -- I'm going to show you this in a second. Plaquemines Parish, we talk about this freshwater, how it's going to do so good. And Greg, I'm all into your rocking projects. I think Proctors Point needs to be fixed. I live here, people. I'm

from this area right here. And I fish this whole marsh. I've been born and raise here. I'm forty-two years old, and I've been out here since I was old enough to be on a boat. The river runs right smack through the middle of Plaquemines Parish. If river water builds so much land -- this is Southwest Pass actually where the ships come through. If the river did so much good, when it comes past

45

Venice, Louisiana, past Pilottown right here on this corner, it overruns the banks. So if it did so good, we'd have mountains out here. We don't have any mountains. If we don't fix this first, the Chandeleur Islands (inaudible), all of this 2.9 initial cost -- billion initial cost of money is going to cost us a lot. This is the best bang for the buck is to fix this first. So if we don't take care of this, all of this is for nothing. And it's in today's paper right here that they're going to tighten up

the budget for Southwest Pass for dredging. Well, what they did for the last thirty years was take a hopper ship and dredge this material into the ship and then went and dumped it off the Continental Shelf. People, if you take a dredge boat and you put it over the bay, we can rebuild

land. It's not rocket science. It's just fact. And thank you tonight for giving me the opportunity to speak to you guys. I appreciate it.

MR. POCHE:

Thank you, sir. Dr. Ed Cake.

DR. CAKE:

My name is Dr. Ed Cake. I'm a certified oyster biologist operating in the state of Louisiana and Mississippi. My comments basically will be about oysters, but I have some other comments. We all know what doctors do. One of the things that doctors are supposed to do is Primum non nocere, which means do no harm. And I believe this project will do considerable

harm. The project, when it began early on as the MRGO, did the harm. And now by congressional mandate, they're required to fix the harm. And I don't think

that, that can be done regardless of the congressional mandate. You cannot put enough sediment into the water to go out there and create new land. So they're going to dredge and make new land. The issue there is where they're planning to dredge that water from -- or that material from will be in Lake Borgne. Lake Borgne today has numerous oyster reefs and oyster leases and the parish of St. Bernard has a vibrant oyster industry. And if they're allowed to freshen that area and to dig up that bottom, the oyster leases and reefs will be harmed. And again, I say the first thing is do no harm. You will be destroying the St. Bernard Parish oyster industry that has evolved since your original harm; that is, when you put in the MRGO, it allowed the

salty waters to come in. And so

we now have oyster leases, thousands and thousands of acres and natural oyster reefs throughout those areas. If you destroy those with this project, someone will have to pay those oyster fishermen to re-create their oyster leases into oyster farms elsewhere. So this 2.9 billion dollars does not include the harm that has to be fixed when the oyster fishermen bring these lawsuits. And they will bring lawsuits, and I'll be there to help them. The entire Mississippi Birdfoot Delta is sinking today. It's sinking because the entire area is a geosyncline, and it is sinking by essential gravity. It's also compacting. We're no longer putting sediments there because the Corps has leveed the Mississippi River. We're also taking oil and gas that bleed

water out of the area so that the whole -- and we have on top of that sea level rise, which most of you will recognize. I have oyster farmer clients who are producing oysters on bottom areas that are now eight to ten feet deep that twenty years ago had houses on them. So all you have to do is watch and look, and you will see that. So the issue there is that we need to recognize that this whole area is going down further and further and further. And the things that we are going to pay 2.9 million dollars to do -- billion dollars -- will probably not last more than a few years beyond our lives. The last thing I'll talk about is the oysters that they plan to create in this project. They said so many miles, and that's equivalent to 1.5 acres of new oyster reefs as opposed to thousands and

thousands of oyster reefs that will be destroyed. This needs not to be done.

MR. POCHE:

Our next speaker is Louis Barrett.

MR. BARRETT:

My name is Louis Barrett. I'm a resident of St. Bernard Parish. And I've spoken a little about some of this before. I went to the meeting -- I did go to the meeting at St. Bernard. I'm not an expert on any of this. I've looked -- I've read a lot of the data. I even ordered their report, which is bigger than the healthcare bill. And I've read a lot of the news reports and done a little bit of studying on the internet and listened to a lot of folks. And so my comments are kind of going to be just speaking to some certain areas but first and foremost, this project,

according to all the news reports, was initiated by the politicians. And of course, in the case of the water diversion, pretty unscrupulous politics. We've talked about -- I've heard great talk about the section in the Border Act that directed this

restoration of the MRGO, which is probably a good part of it. But the other part of that section 3083 mandates a freshwater diversion at or nearby. And this was done by the politicians. It wasn't done by scientists stating what the best thing to do was, but just politicians, I think by catering to special interest groups. You know, this should be done on good science, not on political mandates. But that's why I say, we're destructing a lot of land that shouldn't be done. And this project seems to be -- a great part of this thing

is going to be the construction cost that's going to be to put a diversion in, which may or may not work. But I think -- I think overall they need to back up and take a look at this whole project differently and in whole way. This thing needs to be looked at wholistically so that you encompass everything instead of this one piecemeal. And this diversion is strictly -- I forgot

that -- strictly for them and in the law -- and in the language of the law. It was put in to control the salinity on the Mississippi coast. It wasn't put in to restore the Biloxi Marsh. I've heard lots of things on that.

But, you know, it's one thing -- and another thing this plan should have is an exit strategy. If you put -- dig this channel, if you're going to spend a billion dollars or so on it to

53

do, it's going to be hard to exit that plan. If this freshwater diversion doesn't work, you don't have a way out. There's numerous ways. And the plan doesn't say anything about what Mississippi's part of this is. And I'm not knocking on Mississippi. But it doesn't say anything. Pearl River should supply a lot of freshwater to the Mississippi coast. My time is up? But there's been many dams put on the Mississippi River to block the Mississippi River from coming in. So that's part of it. But

there's several other things.

Okay.

MR. POCHE:

Our next speaker is Paul Lagarde.

MR. LAGARDE:

Before you start my time, I've got one question I want to ask you. How deep is this thing

going to be? Does anybody know?
(Several inaudible responses.)

MR. LAGARDE:

And it's a thousand foot of land they're taking for the channel. Right? Does anybody know.
(Several inaudible responses.)

MR. LAGARDE:

One more thing.

MR. POCHE:

Can you get to your comments.

MR. LAGARDE:

Yeah. But can you put that map up that you had that brings the whole area that's going to be affected in.

MR. POCHE:

Okay. If you could get into your comments, that would be

great.

MR. LAGARDE:

All right. I want to show you something. That diversion at Caernarvon runs right through

here. I've got four hundred acres of land right here. What they did is they have the water over the ground for year round for five or six years. What they did was -- and that was a brackish marsh area. Cordgrass grass and (inaudible) grass in there. And what they did was they killed the root system. Okay. Stick your feet in a bucket of water and leave them there for a week. They'll fall off of you. What they did, they put the water over the prairie and held it there, like I'm saying, for years. Very seldom did the water ever completely drain off the prairie. So they killed the root system. And when they killed the root system, the storm came along and rolled everything up. It's gone. It's like Mr. Campo was trying to tell

y'all. Now they're getting ready

to do the same thing in Lake Borgne. You've got a lot of -- you've got a lot of brackish marsh over there. And your diversion is going to be going through a narrow field on an angle like this. I think this is a smoke screen myself. I might be wrong. I might be proven wrong. But I believe in a couple years what you're going to see is a ship channel through there. And what that's going to do -- what that's going to do is connect Lake Borgne to the Mississippi River. And you've got about thirty-five miles over here to Gulfport to make a nice little -- dig your channel right through here to Gulfport.

And they're rocking -- they're rocking both sides of these banks right here to break that wave action when they get out of the Mississippi Sound into

Lake Borgne. All this up here is

hard ground. They're not going to bust y'all up over here. They're going to tear us up real good when they're coming in. That's going to save them two hundred miles from New Orleans to Gulfport. You won't have to go to Southwest Pass and then go back all the way to Gulfport. They can come into the gulf, go to Gulfport, and right in to New Orleans, and go right back to Gulfport and go on out.

So I think -- I think we're being hoodwinked myself. And I think this is a lot of money. And our children's children are going to be paying for stuff right now. We need to start cutting back. We don't need to be putting our good money into projects that's not going to do us any good. And I suggest we get a petition together. And I think

it's got to go through the house of representatives to get this money. We ought to start a petition in the house of representatives to take and kill

this thing right now.

MR. POCHE:

Catherine Serpas?

MS. SERPAS:

My name is Catherine Serpas, and I'm from St. Bernard Parish and I live in Toca. And Greg said they start this project when they close the MRGO. Well, let me tell y'all something. When I say close the MRGO, I mean fill it in. And that's what needs to be done to it. And I've been to many Corps meetings, and every Corps meeting that I go to until the day I die I'm going to say the MRGO needs to be filled in. And then our problems will be solved. They won't be until that happens, and it will happen in

somebody's life. Well, first of all, I lived through Hurricane Betsy, Hurricane Katrina, and this ship channel has killed us. The ship channel has separated our families because of Hurricane Katrina and us being flooded. It has destroyed our homes. It has killed some of our family

members. And I'm tired of being sacrificed. I don't want St. Bernard to be sacrificed again. And I am against the diversion in the Meraux Pasture. If water has to be pushed -- because all they want to do is push water. They don't want to build land with the diversion. If all they want to do is push water, let them push it through the Violet Canal that's there already. We do not need to dig up our land and put in what I see as another ship channel, something else that's going to put water into our

parish and destroy us. I don't know what Mississippi needs. I don't live here. I live in St. Bernard. And I know what it is to be flooded, and I know what it is to lose my loved ones. And I don't think -- it matters not to me how much it costs to rebuild this. I think we deserve every and any amount because of what the Corps has done to us with the ship channel. And y'all better really take a clear look at

what's being done because, who knows, this might flood you. Thank you.

MR. POCHE:

Next is Pat Fitzpatrick.

MR. FITZPATRICK:

My name is Pat Fitzpatrick. I'm a professor at Stennis Space Center, also part of what is known as the Northern Gulf Institute. I'll talk about that in a minute. And also I fish St.

Bernard weekly. The Campo's know me a little bit. I brought my wife out here for some show and tell. I decided she's better looking than me. A few days ago I actually talked in Chalmette. I'm not going to rehash those comments. Basically our university is showing the diversions are harmful, that basically it creates wetland loss because the wetlands are not resilient to hurricanes. And I won't go over that again today. What I'd like to do today is talk about what could be done, alternatives to using a

freshwater diversion. And what I did is, we listened to the comments a few days ago. I've actually gone to the website and looked at the documents. There's a lot of stuff to read and went through it. And I also talked to some of the fishing guides and

marina operators. And so -- and the thing is, basically we all want the same thing in some ways. The Corps wants diversity and a focus on salinity. In our community we want to improve the estuaries. We all agree on this. And actually they did the first step because they finally listened to us and they closed the MRGO.

And, in fact, what they did is just by putting that rock thing in, they reduced the salinity. The salinity was something like fifteen to seventeen parts per thousand. And in Lena Lagoon now it's dropped to nine parts per thousand. I'm actually catching bass in there during the fall.

It's full of grass. It's already working. Now, historically Shell Beach was 3.5 and Hopedale Lagoon was about 7. And now that's

significant because Hopedale Lagoon is only about a mile or two away. So what was different? Well, all you've got to do is go to MRGO.gov and look at this old report. This is a report from Dr. Elsia, and actually he taught me at A&M. And let's go to the next page. I'll hold this up. This is what Shell Beach used to look like before the MRGO, and I know most of you can't see this. You see, Hopedale Lagoon had a current system. But back here it's mostly lagoon, very sluggish water. And most of the freshwater was just from rainwater. So what they really need to do is really work hard -- and I know they can't do everything. But they really should restore the lagoon system. And if you do that, just right then and there you'd get the salinity back down to the way it

64

used to be. There's no freshwater from there. There's only a little canal right here, and this canal is basically a dead end. They didn't get any of this freshwater here. It came from internal. It was an internal system.

Next page, now the other thing is if you look carefully -- let's hold it like this -- this is what it looked like east of the lagoon. It was a nice marsh system. Basically there were two conduits. You had Bayou Pisana hit Bayou Pointe-en-Pointe. Right now it's cutoff from erosion here. But it may be difficult to fill in the MRGO -- and I'm going to end after this -- but if you at least restore these two areas, you get rid of the dead zone in that area. And also if you rebuild the marsh out here, you reduce the salinity

65

that moves in. And the last page,

and if you do that, this is where the salinity used to look like because you had wetlands out here and it reduced it in there. And finally one thing the Corps has not talked about is saltwater barriers such as they use in Texas. If they really want to control the salinity, you could do that instead and harm the system a whole lot less. So with that I'll conclude. Thank you.

MR. POCHE:

Next is Chris Nook.

MR. NOOK:

Hi, my name is Chris Nook. I'm going to thank the Army Corps for the opportunity for all of us to get together tonight and share our comments. I think it's productive. I'm a duck hunter. I'm also the CEO of huntducks.com. It's the largest waterfowl guide and directory.

66

We reach over three hundred sixty thousand duck hunters a year. I'm also the director of the pro staff for Global Manufacturing. Our hardcore decoy product line

provides some of the top quality waterfowl products to duck hunters and sportsmen around the country. I come here tonight from Ohio to talk about the importance of Louisiana marshes to waterfowl populations throughout our nation. Historically the coastal marshes in your region provided crucial wintering habitat for waterfowl that are produced in our Nation's Prairie Pothole Region and the Great Lakes. The waterfowl that winter here every year come from and then return to every corner of our nation. Sadly Ducks Unlimited has said that about three million fewer ducks spend their winters along the gulf coast because of habitat

67

lost. A big part of the habitat lost has taken place right here in the area that this plan aims to restore. Tens of thousands, some say even hundreds of thousands of acres of freshwater swamp and brackish marsh have been damaged or completely destroyed by the MRGO. The

Mississippi River built this delta. It built all of these marshes we are here to talk about tonight. Both freshwater and saltwater. And it's the reason why Louisiana has such a productive commercial and recreational fishery, and why our nation's waterfowl come here. In fact, fewer ducks come here now -- the fact that fewer ducks come now show us the ecosystem is declining, and it continues to decline more and more species of fish and wildlife -- or as it continues to decline, more and

more species of fish and wildlife will be impacted as well. A diversion of freshwater and the delivery of sediment into this area is the only way to restore this critical national waterfowl habitat. That being said, this diversion can be operated to provide benefit for all species, fresh and saltwater, and not just ducks. And that is true of this entire delta. We urge the Corps of Engineers to work with

communities, the state, and within its own bureaucracies to move this project forward. I've been told that there are some concerns in the St. Bernard Parish about digging a new channel for the diversion because one exists already that can do the job. Please consider using the channel already in place. We also urge the Corps to start looking at the river for its

importance to the ecosystem and not just flood control and navigation. We urge the Corps to make the best use of the sediment dredged from the Mississippi River for navigational -- for navigation to build wetlands on both the east and west sides of the river. Without the vital habitat provided by this river delta, fishermen throughout the Gulf of Mexico and waterfowl hunters throughout this country face a dim future. Thank you very much.

MR. POCHE:

Land Tawney.

MR. TAWNEY:

My name is Land Tawney. I'm the senior manager for Sportsmen Leadership in the National Wildlife Federation. And again, I thank you guys for providing this opportunity for us to talk today and comment on this plan.

70

The National Wildlife Federation is the largest conservation organization in the country. It's a million members. But I also come here as a duck hunter. I'm from Montana. And our ducks from up in Montana come down here and spend the winter, so it's vitally important. I have a good time up there, and I want to continue to do that. What happens in Louisiana directly impacts the opportunities up north. The MRGO is one of the most environmentally destructive projects ever built in this country, damaging over a thousand square miles of coastal habitat suitable for ducks, geese, salt and freshwater fish. Included in the plan to create hurricane

protection for the people of New Orleans is to restore fifty-five thousand acres of crucial fish and waterfowl habitat. We much

capitalize on this restoration opportunity though. Specifically the Corps should use materials and support oyster and shoreline protection. Oyster reefs provide important habitats for a host of fish like red fish and speckled trout, while protecting the fragile shorelines and improving water quality. Any marsh and swamp restoration of MRGO should include the plan for native vegetation to improve forests for waterfowl and habitats for fresh and saltwater fish. The majority of the sediment to be used -- excuse my frustration -- is planned for dredging the bottom of Lake Borgne, a very productive and popular sports fishing destination. Any dredging activity in the lake should be conducted with careful attention to water quality and impacts established to this habitat. The

Mississippi River should also be used as a sediment source for marsh restoration for biodiversity, hopefully reconnecting the river with the wetlands, the lifeblood of the marsh.

Finally, I'm happy to see recreational opportunities incorporated in the draft plan, but urge the Corps to maximize and act on these opportunities. The marsh is directly linked to the culture of Louisiana and the hunting and fishing opportunities that go with it. And it's also vital to the state economy. We must perpetuate this sportsman's paradise for our children's future.

Thank you again for this opportunity to speak today. I'd also like to enter into the record a letter signed by over three hundred organizations and

businesses from across the country calling for Louisiana

gulf coast restoration. Since the 1930s more than twenty-three hundred square miles of Louisiana's vital marshes have disappeared. The wetlands are a national treasure and the nation's sportsmen and women are watching. To that end, the restoration of the MRGO is a step in the right direction to ensure the hunting and fishing future for our children. Thank you.

MR. POCHE:

We are down to our second to last comment card. It's John Lopez.

MR. LOPEZ:

I'm John Lopez. I'm with the Lake Pontchartrain Basin Foundation. The Lake Pontchartrain Basin Foundation, we're a group based out of New Orleans. Our areas concern

74

mainly the Lake Pontchartrain Basin, which is everything east of the river. However, we share an estuary with Mississippi. We work with Mississippi (Inaudible) and other programs, some of which

are not even here. So we share a common coastline here and we need to -- that's why the Corps is here because this project affects both of the states. The water and the fish don't know where the state boundaries are. This project crosses it. There's no way you can build a project that stops at the state line because of the water and the natural system. I want to mainly make some comments kind of directed toward the folks in Mississippi or that didn't attend the meeting in Chalmette. If anyone is not familiar, go to our website. We have a lot more information about our assessments of this kind of

project. But mainly what I want to talk about is the Biloxi Marsh. The Biloxi Marsh is, in my opinion, kind of the big piece of this project. It's got various restorational (inaudible), but in particular it's got vital diversion. The Corps -- what I want to make about the Biloxi Marsh is the

Corps has studied the surge, very comprehensive studies of all kinds of hurricanes hitting Louisiana and Mississippi. And what they found is that the Biloxi Marsh is identified as what they call a critical landscape feature. It's critical to stopping or slowing down a surge. And they were looking at mainly Louisiana. But if you're on the Mississippi coast, you know that protects the Mississippi coast also. The main objective, in my opinion, the

76

biggest objective of this project is about maintaining that Biloxi Marsh. There's no way you can build a diversion big enough to get a settlement over there as people have pointed out. They're correct about that. The best thing you can do, in my opinion, is build a diversion to optimize the oyster production on the Biloxi Marsh. Get those barrier reefs going again, maintain that area. When they did a part of it at Biloxi Marsh and Lagoon, the

storm surge on the east side of New Orleans went up ten or fifteen percent. I don't know what the numbers would be, but I guarantee you they would go up. The only other comment I want to make is in regard to the use of the river. Someone talked about subsidence. You can't keep a subsidence overall just by mechanically pumping sediment.

We don't have the sediment, we don't have the energy, we don't have the money to pump it. We need to use the river. The river is the best way, in my opinion, to move forward. The status quo is not acceptable in Louisiana and for the Biloxi Marsh. And the Biloxi Marsh is, I think, what is important to the Mississippi coast. So once again, if you want to go to our website and get more information, go to saveourlake.org. My name is John Lopez. Call me or e-mail me if you'd like. Thank you.

MR. POCHE:

Next up, Roderick Pullman.

MR. PULLMAN:

Yes, my name is Rocky Pullman. I'm actually an elected official in Hancock County and board supervisor. You know, I'd like to thank the Corps for coming here. Very few times have

I been in a place where the Corps was welcome. They seem to offend people. And I guess they've offended some people tonight. But anyway with that, I'd like to say, one, the notification to the general public in Mississippi, I don't think that was adequate. I think that was just about a slap in the face really. A lot of people learned about this in the past two days. It was advertised in the New Orleans paper on December 17. I mean, people here don't get the New Orleans paper. They get the Sea Coast, Echo, and some people get the Sun Herald. But with that being said, I don't think the plan goes far enough. Everything's in Louisiana. Y'all can think it's for Mississippi, but basically look at the

shoreline protection. There's not one single rock or stone going to be put in Mississippi,

79

and that's a shame. Eight billion dollars has been spent so far to protect New Orleans. Eight billion. Most of the dirt is coming from Hancock County out of the buffer zone, and that's a shame. I mean, when do we get some protection? And I mean, I know this is not your forum for questions that you want me to hit you with. But I'm just telling you as a person who lives on the state line who is a licensed tug captain, who does run across Little Lake. Little Lake, not one inch of it is encompassed in your protection plan with the exception of Hog Island. That's the only thing y'all will protect, Louisiana. Somewheres along the line Mississippi has got to get something done to protect itself. I never have opposed protecting the people of Louisiana. And that's the God's

80

truth. But I think we deserve the same treatment. Somewheres along the line there needs to be some type of barrier erected to help us. I know this is not the forum, but I have learned if you don't speak your peace with the Corps, you just waste your time. Somewheres along the line somebody has got to hear us. And I applaud y'all for standing here and taking heat. And you know, I've got a lot of good friends that are people that are employed with the Corps, or I think they still are. They haven't called me lately. But, you know, I want to thank all of you for coming. I know we've got different views on this project. I'm not a scientist. I'm just saying give us some help. We need help in Hancock County. We need it really in all the coastal counties in Mississippi, and we

81

haven't gotten it yet. It's a shame that that much money has

been spent in Louisiana. And today we've been told it was 436 million dollars to re-nourish the Barrier Islands. But to my knowledge, not one grain of sand has been put on them since Katrina, five and a half years later. That's a shame. Thank you.

MR. POCHE:

D. A. Vandenborre. I don't want to mess up that name too bad.

MR. VANDENBORRE:

I'm Captain Dudley Vandenborre. I'm actually from Slidell, St. Tammany Parish, and I've been involved in the meeting in St. Bernard. And I wasn't going to talk here, but there was a couple of points that weren't made. The first point made was, you know, it's constantly put up

that it's freshwater. Well, how many people in here are going to drink that Mississippi River water? Everything known to man comes down that river. What causes the dead spots out in the

gulf? The Mississippi River water. So what, you're going to take that and you're going to put it into Lake Borgne. You're going to have dead spots come through. My son crabs. Every time they open the spillway up and it rushes through Lake Pontchartrain, he finds numerous, numerous other traps. They might have fifty or sixty and every crab in there is dead because they can't get out of the way of these dead spots. You know, we're talking about those oyster reefs that are going to be out there. Well, what you're going to have is those dead spots are going to move over top of those

oyster reefs. So a man maybe goes out that way and it takes two years for an oyster reef. He may get away one year, but the following year he's going to have all dead oysters on his reef. I mean, if that's what you really want -- once you take that genie out of the bottle, it's going to happen. You're also going to --

you know, fish are going to move. You're going to turn areas in St. Bernard into freshwater areas that are now saltwater areas. To me, it's a bad plan the way it is right now. I think, you know, things could be worse. There's a lot of good parts to the project. The Barrier Islands is where it needs to happen at. This is large sums to push freshwater into an area that is not going to build any land. It's not the answer. You know, Mississippi, Louisiana, we should get together on this

project and try to get it moved to the Barrier Islands because that's where it all happened. Our salinity levels are already coming down with the closing of it. As a matter of fact, the hot water canal, I've been fishing there fifty years and never caught a bass before.

So that's basically all I have to say. You can't get what you want if that freshwater comes through that way. You'll find out it's not going to be, you

know, what everybody thinks it's going to be. Thank y'all.

MR. POCHE:

Chris Lagarde.

MR. LAGARDE:

Thank you for coming. Chris Lagarde. I used to work for Congressman Taylor, but now I'm a private citizen, so I can kind of say what I want now. A couple things, I think it's pretty --

it's simple but it's difficult. We need to figure out a way to get this sediment out of the Mississippi River. Somehow we've got to get the sediment to rebuild those marshes.

In terms of the canal for the diversion, it seems to me that if we already have a canal, we might as well use that one. I don't know why you would go dig another pasture or dig another forest or wetlands to dig another canal. There may be a reason engineering-wise, but it just seems to me that, especially in light of the budget crisis that this nation is facing. To ensure

our protection I would hope that you would -- I would assume that the Corps is going to expand to the original footprint or at least get to where we were. If you're going to put rocks down, I'm hoping you're going out to

reclaim some of the wetlands that we lost. Let me see my notes. Oh, the lady from St. Bernard, look, I was born in New Orleans. Okay? Believe me, MRGO did not get built in a vacuum. I can assure you that somewhere way back when there were lots of local officials pushing MRGO to get built. Congress doesn't do anything unless the local people are pushing for it. Taking sediment out of Lake Borgne seem to be a risky business. I don't know. I'm hoping y'all are looking at that. It's certainly impacting producing oyster reefs. That seems to be counterproductive. I don't know how many oyster reefs are out there, but if you're going to do harm to them, then I think we're

probably going backwards.

Let's see, the only other thing I've got to say is I came

home Highway 90 from New Orleans Sunday morning and, you know, that little stretch of 90 between Lake Catherine and -- what is it -- Lake Maurepas, you regulators -- I don't know if there's any here. But you guys need to send your regulators out there because we're filling lots of wetlands along that stretch of Highway 90 that were previously not impacted. And here we are spending millions trying to rebuild wetlands, and we have folks that are filling wetlands as we speak along Highway 90. So I'll leave it at that.

MR. POCHE:

Thank you, sir. That was our final comment card for the evening. I'm going to turn it back over to Greg Miller for some closing comments.

MR. MILLER:

I want to thank everybody

again for taking time out of your evening and coming to participate with us. I think the comments are well founded. It's certainly something that our team is going to have to scratch our heads and look at.

I want you to understand that that's why we're here tonight is to take your input. All of the things that have been mentioned tonight or anything that's been provided in writing will be a part of the record. And there will be a response to every single one of them. So it's not like we just put them in a drawer somewhere and ignore them. That's important to me personally. And it's the way we're going to do business at the Corps. And the other is to re-mention that that website, MRGO.gov. Again, you can get the report there. You can see the

maps. I forgot to mention that there is a feature on there that has a hot button where you can

e-mail us comments directly. So if you don't want to write a letter or call Tammy or come to the next meeting, then you can get us comments that way. The other is the comment period itself, Tammy mentioned it, it ends on February 14. So take advantage of that. If there's something that you see here that you don't like or if there's something that you'd like to see changed or the pieces of this that you really support, take advantage of that opportunity and provide those comments to us before the 14th. And then last we have a meeting on February 3 over in New Orleans. And that will be the last public meet month that we have. But I don't want you to think that the Corps is just

going to disappear when that happens. Folks will be here for a few more minutes tonight if you have some questions about it. You can call Tammy at the number she gave you, or you can reach me in New Orleans. I'll be in the

back. I've got some cards I'll hand out if you want to call me. We're very, very interested in having you understand all of the details of this. It's a very big plan and it's complicated. We don't expect everybody to grasp it tonight. I'm learning things -- just like Rob Campo pointed out, I learn things about this area all the time. And that's a real important thing to us. And thanks again for coming. Hopefully we'll see y'all again soon at another project meeting. Thanks again.

(The meeting ended at 7:55 p.m.)

REPORTER'S CERTIFICATE

STATE OF ALABAMA,

MOBILE COUNTY,

I, Paul Morse, Certified Court Reporter and Commissioner for the State of Alabama at Large, do hereby certify that the above and foregoing proceedings was taken down by me by stenographic means, and that the content herein was produced in transcript form by computer aid under my supervision, and that the foregoing represents, to the best of my ability, a true and

correct transcript of the proceedings occurring on said date and at said time.

I further certify that I am neither of kin nor of counsel to the parties to the action nor in any manner interested in the result of said case.

/s/ Paul Morse

Paul Morse, CCR

MCCR #1826 Expires 3/19/13

Appendix Y4

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: Feb. 8, 2011 | Meeting Name | Location: Light City

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Matt Weakley	4176 Canal St New Orleans, LA 70119	New Orleans	LA	70119	mweakley@bkiusa.com	504.301.6542	
2	Messiah Paul Ward	724 Oaklawn	Metairie	LA	70005		504 234 9936	
3	Rafael Campo	1319 BJSC - ON FILE						
4	ZACK CAMPO	1319 YSCLOSKEY HWY	ST. BERNARD	LA	70085	zackcampo@aol.com	504-564 3116	
5	Erin Bopp	70 Carondelet Cir	Covington	LA	70433	erinbopp@bopplaw.com	504-388-6242	
6	Michelle Gremillion	3013 Gallu Drive	Chalmette	LA	70043	mmgremil@uno.edu	504-377-1406	
7	Kelly Williams	105 Lori Ct	Luling	LA	70070	kwilliams.kelly@gmail.com		
8	John Clunk	4037 Jamestown Ave.	Baton Rouge	LA	70808	jcs@jcsmech.com	225-238-7609	
9	CALVIN Alexander	603 Caffin	N.O	LA	70117		(504) 945-5991	X
10	CHANCELLOR COLE	5921 MARAIS ST N.O, LA 70117	N.O	LA	70117	CCLARK COLE@aol.com	504-247-4458	X
11	GREG CRAIN	108 BRANCH DR.	Slidell	LA	70461		985-641-0191	X
12	Ariane Wiltse	314 Delery St.	NOLA		70117	arianewiltse@gmail.com		
13	Amanda Moore	716 Adams St.	NOLA		70118	Moorea@mnf.org	225 729 1941	
14	Keith Scott	#1 SE/NE CT.	NOLA		70114	Keith.Scott@DHS	(504) 762-2969	
15	DAVID MUTH	716 ADAMS ST.	NOLA		70118	muthd@mnf.org	504-872-5993	
16	STEPHANIE TAYLOR	2715 CONFEDERATE AVE	VICKSBURG	MS	39180	steffnt@gmail.com		
17	TIM DIFATTA	825 TERRY DR	ARABI	LA	70032	TDIFATTA@SHAW.com	DRAFT.COM	
18	SCOTT [illegible]	4465 Music St	NOLA		70122	Scottevstise@gmail	504 484-9599	
19	H-L-ERWIN SR	2526 St Maurice Ave	New Orleans		70117		504-453-7307	

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: Feb. 8, 2011 | Meeting Name | Location: Light City

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	ROBERT BRATHELOT	255 MARINA RD	CHALMETTE	LA	70043	RBMARINE@HOTMAIL.COM	504 450-5400	
2	Joshua Lewis	3309 Banks St	New Orleans	LA	70119			
3	Mike Hunnicutt	FEMA						
4	Howard Callahan	—	on file			—		
5	Angela Lawson	OCD DRU						
6	Natalie Snider	CRCL	—					
7	Elwin Frank	P.O Box 202	Orange Springs	MS	39566			
8	PATRICK EDWARDS	721 A MANDEVILLE	NOLA			edwardspm13@gmail		
9	Dinah Maygarden	834 Fern	NOLA	70118		dinahforsyth@gmail.com	504 669 1893	
10	Aron Viles	338 Berrone St. Ste. 200	NOLA	70118		aron@healthygulf.org	504 325-1524	
11	REV. JOHNNY HUGHES	2213 MONTICELLO ST NO			70117		504 302-1642	
12	Thom Pepper	1800 Deslonde	NO, LA		70117			
13	WENDY KING	2120 AUDUBON ST	NOLA		70118	wking@tulane.edu	504-865-7914	
14	Richard Campanella	725 Conpress	NO			rcampane@tulane.edu		
15	Julie HERNANDEZ	832 St Ann	NO		70116	hernandjulie@gmail.com		
16	Kathy Mussa	4818 Royal St	NO		70117	kcgmusse@yahoo.com	504-939-9028	
17	CHARLES OSBORNE	1629 ST CHARLES AVE	NO		70130	CJIMBORN1@AOL.COM	504-568-0490	
18								
19								

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: Feb. 8, 2011 | Meeting Name: MRGO | Location: Light City

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Elizabeth L. Smith	1215 Desiard St	N.O.	LA	70117			
2	Lvinia Reddick	2144 Delery	N.O.	LA	70117			
3	Celestine Lockley	1344 Tennessee	N.O.	LA	70117			
4	Harold Williams	105 Lone Cr	Luling	LA	70070			
5	Catherine Serpas							
6	Jeannot Paul Lagarde III		St Bern	LA				
7	Linda Barrett	2533 Bayou Rd.	St. Bernard	La				
8	David Barrett	2533 Bayou Rd.	St. Bernard	La.				
9	Chap Munger	4515 Coliseum St.	New Orleans	LA	70115			
10	John Jaisco	5200 Alphonse	Metairie	LA	70006			
11	Byron G. Martin	8000 Hayne Blvd	N.O.	LA	70126			
12	Bruno Bauer	3240 Evangeline	St. Bernard	LA.				
13	Frank Campo Jr.	1301 Aycock Dr	St Bernard	La				
14	Tim Gilthorpe	18440 Leawden St.	Metairie	LA	70001			
15	Shirley Laska		N.O.	LA				
16	Maria Bodine	13607 Mozart	NOLA		70130			
17	Peter Smith	NO LA						
18	Pete Sanchez	1519 Charbonnet	N.O.		70117			
19	Kirk Citron	404 Upstream St.	River Ridge	LA	70123			

Page 1 of 3

690

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date: Feb. 8, 2011 | Meeting Name | Location:

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newspa
1	Jon Mattiace	3500 N Causeway	metairie	CA	70002		837-6326	
2	Peter Tufaro	518 Marina Rd	Chalmette	LA	70043	PTUFARO@bellsouth.net	504 66-2688	
3	Chris Macaluso	337 S. Acadian Thruway B.R.		LA	70806	chris@lawildlifefed.org		
4	Jakob Rosenzweig	2913 Maurepas Street	New Orleans	LA	70119	jakobrosenzweig@yahoo.com		
5	Ed Boltaner	#3 Allwig Key	St Bernard		70085			
6	BRET CARRERAS	4900 MANDEVILLE ST	N.O.	LA	70122	gbc4900@aol.com		
7	Smitty	1307 CAFFIN AVE	NO	LA	70117		504-942-1324	
8	Maura Wood		BR	LA		woodm@mwf.org		
9	Mary Rigby	1435 N. Roman St.	NO	LA	70116	nolagrrl@gmail.com		
10	Joseph Pearly	2349 Nunez	N	LA	7009			
11	Adam S Irwin Sr.	2441 Tupelo st	N.O.	La	70117	AdamSIrwin@yahoo.com	(504) 382-3686	
12	BEN GORDON	P.O. BOX 71443	N.O. LA.		70172	ON FILE	(504) 522-3952	
13	David Eber	3012 Laurel St.	NO	LA	70115	david.eber.nola@gmail.com	307-5498	
14	BARRY KOHL	1522 Lowerline St	NO LA		70118	bkohl40@cs.com	504-861-8965	
15	BILL KAPPEL	2045 Lakeshore Dr Ste 443	NOLA		70122	BKAPPEL@CONSTANGROUP.COM	504 225-892-3241	
16	Jorge Lopez	311 Magazine St	NOLA		70130	Nolaws70@yahoo.com	504 919 8337	
17	Tracy Nelson	5012 Dauphine St	NOLA		70117	tnelson@sustainthewire.org	—	
18								
19								

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

Date:	Meeting Name	Location:

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newspa
1	Jace Sirgo	96 West Claiborne St	Chalmette	LA	70043		(504) 722-5972	
2	WARD Mack McClendon	526 Caffin Ave		LA	70117		504-402-4284	
3	Jonathan Henderson	1238 Magazine St.	NOla		70130	Jonathan@healthygulf.org		
4	Stephanie Zumo	~~1201 Ida Avenue~~ ON FILE				ON FILE	ON FILE	
5	Dennis Diaz	4800 Birch	Violet	LA	70092		504 231-3434	
6	Patricia Lunal	718 St Maurice Ave NO		LA	70117			
7	Sri Gaom	1004 Louis-						
8	John Lopez							
9	Charles Allen	City of NOLA						
10	BARRY BERNADAS	1208 E. GENE	CHAL	LA	70043			
11	Pat Fitzpatrick	1808 Lakeview Dr	Slidell	LA	70458			
12	John Koepfel	4402 ARTS	NO	LA	70122		605-7266	
13	Mary Patay "Story	4709 N. Lampart Ave LA		70117		MStory@cox.net	504-912-3334	
14	Glenwood Austin	2900 Poydras	Ave	70122				
15	Donna Duegue'	1300 Perdido St Ste 2W03	NO	70112		donduegue@nola	6581050	
16	Sarah Mack	1310 St Andrew #1	NOLA	70130		Sarahmack@heralles	504-339-4547	
17	Hugh McNeely	14367 Chef Menteur Hwy "E"		70129		hemcneely-attx@yahoo.com		
18								
19								

US Army Corps of Engineers
New Orleans District

ATTENDANCE RECORD

H

Date: Feb. 8, 2011 | Meeting Name: MRGO | Location: Light City

PLEASE PRINT CLEARLY

	First Last Name	Address	City	State	Zip	Email	Phone	Newsp
1	Ruston Graybill	121 Coneydr	Arabi	LA	7003		504-756-9234	
2	Matt Rota	338 Berne St Ste 200	NOLA		70112	matthe-healthygulf.org	504-525-1528 x206	
3	Bren Haase	on file					(225)342-1575	
4	Linda Delaney	304 Parish	Arabi		70032			
5	Dennis King	2037 Cambrome St.			7018		914-522-1932	
6	Ricky Gonzales	2540 Wilson ST	Videt		70092		504 452-9086	
7	Wardenetta Banks	5130 Chartres St	NOLA		70117		(504) 934-9012	
8	Ali Sickle	409 Andry St.	NOLA			asickle@gulfrestoration.org	504-525-2121	
9	Andrew Baker					~~drbaker~~ wetland.biologist@gmail		
10	CAROL GONZALES	1708 KELLY RD	ST BERNARD	LA	70085			
11	LAW RENEE NICOSIA	2604 SO LAKE Blvd	VIOLET	LA	70092		504-650 6879	
12	TONY LASKA	1010 Common, St 2500	NO	LA	7012	tony.laska@cgsyp.com 504.579.5633	504-328-5067	
13	WALT NAVARRA	310 MARINA RD.	CHALMETTE	LA	70043	walt@CalloucorpCom	504-570-4844	
14	TK Tieu	1300 Perdido 2W40	NO	LA	70112	htieu@nola.gov	658-1065	
15								
16								
17								
18								
19								

Page Y46

Feb 8, 2011 Public Meeting Speakers

MAILSALU	MAILFIRST	MAILLAST	Name 2	Address	City	State	Zip	Phone
Mr.	Tim	Gilthorpe						
Mr.	Pete	Tufaro		518 Marina Rd	Chalmette	LA	70043	2688
Mr.	Josh	Lewis		3309 Banks St.	New Orleans	LA	70119	
Mr.	Chris	Macaluso	Federation	Thruway	Baton Rouge	LA	70806	6707
Ms.	Amanda	Moore	Federation	716 Adams St.	New Orleans	LA	70118	1944
Mr.	Jim	DiFatta			Arabi	LA		
Mr.	Matt	Rotta	Network	200	New Orleans	LA	70112	1528
Mr.	Darryl	Ward	Garden of Eden	724 Oaklawn Dr.	Metaire	LA	70005	9936
Ms.	Catherine	Serpas		2010 Bayou Rd.	St. Bernard	LA	70085	1363
Mr.	Paul	Legarde, III		1200 Bayou Rd.	St. Bernard	LA	70085	
Mr.	Louis	Barrett	Government	2533 Bayou Rd	St. Bernard	LA	70085	4829
Mr.	John	Driscoll		5800 Alphonse Crt	Metaire	LA	70006	
Mr.	Frank	Campo, Jr.	Campo's Marina	1301 Yscloskey Hwy	Shell Beach	LA	70085	6377
Mr.	Robert	Campo		1319 Yscloskey Hwy	Shell Beach	LA	70085	5165
Mr.	John	Koeferl	Neighborhood Asso.					
Dr.	Pat	Fitzpatrick	Stennis Space Center		Slidell	LA		
Mr.	Charles	Imbornone	Government	1629 St. Charles Ave.	New Orleans	LA	70130	0480
Ms.	Maura	Wood	Federation	6160 Perkins Rd.	Baton Rouge	LA	70808	2804
Mr.	Ben	Gordon		PO Box 71443	New Orleans	LA	70172	3951
Mr.	Barry	Bernadas		1208 E. Genie St.	Chalmette	LA	70043	7738
Mr.	Jorge	Lopez		3111 Magazine St.	New Orleans	LA	70115	8337
Mr.	Jimmy	Delery		6530 Louis XIV St.	New Orleans	LA	70124	7436

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: Deeping the Lake Bottom, Checkerboard Dredging

disturbing the Bottom Particle — will Change Lake Borgne Fisheries

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Tim Gilthorpe **Affiliation** Fisher Man

Street _____ **Phone** _____

City, State, Zip _____

E-mail Tim 55@ BellSouth.net - Natural depth Alligator Pt/Proctor Pt.

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

- Checkerboard dredging this area has never been that deep

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: I am Concerned about The elevation of the water along with the water Coming from The River into the area between the 40 Arpent canal & the MRGO levee

(1) Amt of water comins in @ 40 arpent canal Spring time — boats @ Bienvenue are closed — How monitor? Keep consistent — so it doesn't flood Paris Road —

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Pete Tufaro **Affiliation** _____

Street 518 Marina Rd **Phone** 504-666-2688

City, State, Zip Chalmette La

E-mail PTufaro@bellsouth.net

www.mrgo.gov

- Evac. route could be hampered

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(2) Pump a levee along the

- Suggestion: Dump w/ Pipe / Build up + dredge

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: -thanks for going above + Beyond
ENDORSE -MRGO Must Go -Reed's
Locate diversion IN Violet Canal
Concern: Chemical talo on Spoil Banks w/ address + Remediate
- Plan has great potential - include -Coastal Scientists
-

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Josh Lewis **Affiliation** Orleans Parish
Street 3309 Banks St. **Phone**
City, State, Zip NOLA 70119
E-mail jlewis9@tulane.edu

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

We're losing it b/c we're isolating these lands

Comment: Support of Diversion - Comments on the Project
- Built in existing Violet Canal to work w/ folks
- Only Reason - Idea the putting - Can work
+ Caernarvon/DD diversions did make mistakes

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Chris Macaluso **Affiliation** Louisiana Wildlife Federation
Street 337 S. Acadian Thruway **Phone** 225-344-6707
City, State, Zip Baton Rouge, LA. 70806
E-mail Chris@lawildlifefed.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

NEPA Public Comment

Comment: MRGO Must Go Coalition Reps. - 17 Environ orgs
2004
Barataria Basin experts/community/
→ Existing Violet canal / Bilovi Marsh - oyster Reefs
↳ PDI/scientist say this will work /

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Amanda Moore **Affiliation** NWF
Street 706 Adams St. **Phone** 225 229 1949
City, State, Zip _____
E-mail moorea@nwf.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

NEPA Public Comment

Comment: Thank you Corps - HSDRRS & Restoration Program -
→ New canal thru St. Bernard Not desired - Supports parish
→ Why all FW? At what cost?
$300M-500M → Sediment

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Jim DeFATTA **Affiliation** ARABI, Resident
Street _____ **Phone** _____
City, State, Zip _____
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted] **NEPA Public Comment**

Comment: (1) freshwater from Pearl River hasn't been pursued yet - the Corps has almost approved dams in MS -

- oyster Bed Restoration - Corps can deny 404 permits

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Matt Rota **Affiliation** Gulf Restoration Network

Street 338 Baronne St. Ste 200 **Phone** 504-525-1528 x206

City, State, Zip NOLA 70112

E-mail matt@healthygulf.org

www.mrgo.gov

(2) don't sacrifice Lake Borgne (3) Violet Diversion as much sediment as possible

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted] **NEPA Public Comment**

Comment: there wonderful thing that has been done to improve our state, is important in our future of our natural resources will be our tools of advancement. advancement.

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name David Paul Ward **Affiliation** Friends of Edgard

Street 724 Oklahoma Dr. **Phone** 504 234-9936

City, State, Zip Metairie La

E-mail dward@mrgo.corp

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

NEPA Public Comment [redacted] (a) More Mtgs to discuss comment

Comment:

(1) Biggest Mistake MRGO

(2) Fill it - don't just close

(3) MS ppl. don't Really know or care about what's going on

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Catherine Serpas **Affiliation** Bayou Road

Street 2012 Bayou Rd. **Phone** 504-494-1363

City, State, Zip St. Bernard LA 70085

E-mail

www.mrgo.gov

(4) against digging up Meraux for diversion

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

(5) use Violet Canal - Study to see if it Needs to Be as Big as we say it does

Mississippi River Gulf Outlet Ecosystem Restoration

NEPA Public Comment [redacted] pointed @ Map -

Comment:

Diversion location Sediment

Shipchannel

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Paul Lagarde III **Affiliation** 1200 Bayou Road, St. Bernard

Street **Phone**

City, State, Zip St Bernard LA 70085

E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: Statement - St. Bernard Chapter Alliance

While viable + urgent -

Public participation is inadequate

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Louis Berrett **Affiliation** Alliance For Good Govt.

Street 2533 Bayou Rd. **Phone** 504-376-4829

City, State, Zip St. Bernard, LA. 70085

E-mail mzgrol.2533@cox.net

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment Sediment

Comment:

disappointed this is a freshw diversion

only addresses SW intrusion - another - You need sediment

Everything says from the River loose - subsidence

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name John Miscoll **Affiliation** Metairie

Street 5800 Alphonse Dr **Phone**

City, State, Zip Metairie, LA 70006

E-mail

www.mrgo.gov

When is the Corps - land loss Rates - old/small thumbs

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: 69 yrs. old - 10 yrs. old "Black Campo" → trees were dead - SW from hurricanes killed them -

*pump sand -

* doesn't want diversion - close off the islands @ Mereaux

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Frank Campo Jr **Affiliation** Campo's Marina

Street 1301 Aycock Hwy **Phone** 504 2394377

City, State, Zip Shell Beach 70085

E-mail [redacted]

→ put out of business

www.mrgo.gov

* fisheries - *diversion will hurt camp

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: Oyster Fisherman - FW

Need islands on the outside -

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Robert Campo **Affiliation** Shell Beach

Street 1319 Yscloskey Hwy **Phone** (504) 239-5165

City, State, Zip St. Bernard LA 70085

E-mail [redacted]

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: Support this effort - all laws/plans stated
- Need for Freshwater to satisfy MS -
- Burden falls on St. B - driving things backwards
Violet diversion is too grandiose - use Violet Canal

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name John Koefert **Affiliation** CAWIC / Holy Cross
Street _____ **Phone** _____
City, State, Zip _____
E-mail _____

Citizens Against Widening the Industrial Canal

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

River resources / hasn't been done yet

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: Show + tell - a lot in there - don't get it from Lake Borgne -
- don't support diversion -
- AHs - Break up into two parts
1) Rockdam
2)

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Pat Fitzpatrick **Affiliation** Stennis Space Center/Professor
Street Slidell **Phone** _____
City, State, Zip _____
E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: To Speak Against Project As Proposed

- Hope that we actually use what the public says
- Oppose diversion as submitted - If you have to
- Closed But Not Filled in - Violet canal is Bon
- We Need Barrier Islands / Silt / Landfill (1st)

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Charles Imborn **Affiliation** Alliance For Good Government
Street 1629 St Charles Ave **Phone** 504-568-0430
City, State, Zip NO LA 70130
E-mail CJimborn1@aol.com Organized labor

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: - Support MRGO Must Go Rece's
- SR. out reach coordinator
- Coastal LA's concerns ob. diversions - loss of coastal zone w/out action - No economy, etc...
- As the Period ends - plz. consider it a living document
- to preserve livelihoods / protect communities
- Flagship project - Not another Commission

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Maura Wood **Affiliation** National Wildlife Federation
Street 6160 Perkins Rd **Phone** 225-205-2804
City, State, Zip Baton Rouge, LA 70809
E-mail woodm@nwf.org

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: BEN GORDON

COMMENT MADE BASED ON LISTENING

(3) CAWIC - fear ab. dredging the canal - Bring up toxins - concerns about Lake Borgne dredging - toxins / pollutant

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name BEN GORDON **Affiliation** Nat'l Pres

Street P.O. BOX 71443 **Phone** 504 522-3951

City, State, Zip N.O. LA 70172

E-mail _____

www.mrgo.gov

ALF

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: (1) COULDN'T YOU DO THE SAME THING BY PIPING WATER FROM RIVER.

(2) IF YOU DECIDE TO USE CANAL SYSTEM ARE LOCKS GOING TO BE INSTALLED? thru ship channel

(3) Will they

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name BARRY BERNADAS **Affiliation** Chalmette

Street 1208 E. GENIE **Phone** 504-236-7738

City, State, Zip CHAL. LA 70043

E-mail _____

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

2.12.7 - Impacts of BP Horizon oil spill - all efforts will be taken to contain - Not
↳ in the Report

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: In addition to the proposed Freshwater Diversion @ MRGO, is the corps planning on continuing some of the River Diversion that were implemented during BP's oil spill to flood marshes to drive oil out of the marshes. This would in theory rebuild wetlands. 2nd, oyster beds / oil spill impacts - where they at.

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Jorge Lopez **Affiliation** citizen, US - Orleans Parish

Street 3111 Magazine St. **Phone** 504-919-8337

City, State, Zip NO LA - 70115

E-mail Jlodown70@yahoo.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

Mississippi River Gulf Outlet Ecosystem Restoration

[redacted]

NEPA Public Comment

Comment: SUSTAINABILITY - Livadais Family -
The PUBLIC Needs More time - Ask the Corps to give us
time to work out details -

☒ **If you would like to speak in addition to your written comment, please check this box.**

Name Jimmy DeLesDernier **Affiliation** Individual

Street 6530 Louis XIV St **Phone** 504-606 7436

City, State, Zip New Orleans LA 70124

E-mail

www.mrgo.gov

(1) Preserve Plus project But Include Sustainability

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011 (can't Build + Not have $$ to maintain)

(2) In fairness to Fisherman we Need it / But also consider

Did not speak

Mississippi River Gulf Outlet Ecosystem Restoration

NEPA Public Comment

Comment: We Are opposed To The Project w/o Proper Analysis Performance & Demonstrate That Erosion That will occur Between The 40 Arpent & 30 Arpent when The Condition Exist For A S/W wind, Pilot Town & Main River.

☑ **If you would like to speak in addition to your written comment, please check this box.**

Name Eric A. Bopp ~~Eric Bopp~~ **Affiliation**

Street P.O. Box 2297 **Phone** 504-388-6242

City, State, Zip Monroeville, La 70470

E-mail eabopp@boppLawFirm.com

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

X Did not speak

Mississippi River Gulf Outlet Ecosystem Restoration

NEPA Public Comment

Comment: Please Do Not Do this Deversion!

☐ **If you would like to speak in addition to your written comment, please check this box.**

Name Dennis Diaz **Affiliation**

Street 4800 Birch **Phone** (504) 231-3439

City, State, Zip Violet LA. 70092.

E-mail

www.mrgo.gov

Comments may also be submitted via e-mail to Tammy.H.Gilmore@usace.army.mil. Written comments must be postmarked by Feb. 14, 2011.

0001

MEETING MINUTES FOR THE U.S. ARMY CORPS OF ENGINEERS NEW ORLEANS DISTRICT
MISSISSIPPI RIVER GULF OUTLET RESTORATION PLAN
PUBLIC MEETING
HELD AT
LIGHT CITY CHURCH
6117 ST. CLAUDE AVENUE
NEW ORLEANS, LOUISIANA 70117
ON THE 8TH DAY OF FEBRUARY, 2011
COMMENCING AT 6:37 P.M.

0002

MS. RODI:
Good evening. We're going to get started. Okay. Thanks for coming, everyone.
We're here to talk about the Mississippi River Gulf Outlet Ecosystem Restoration Plan and Project, so we're here just to make sure no one's confused or anything like that. We are here to talk about the MRGO Ecosystem Project, and we're going to get your comments. Hopefully, you got your questions answered in the main portion event or at the end, but during the comment period, we're here to take your comments about where you would like to see the diversion, the side

and anything like that.
I think that's it. I'm going to turn it over to Tammy Gilmore, our Environmental Manager, to talk about the NEPA, which is the National Environmental Policy Act process.
MS. GILMORE:
Hi. I'm Tammy Gilmore. I am the person who will be addressing your comments in the final report. I thank you all for coming

0003

tonight. It's very important for us to hear your input.
As you're all aware, we have put out the Draft Environmental Impact Statement for y'all to review and submit your comments and suggestions. This is a requirement of the National Environmental Policy Act, and it is very important that we hear your voices.
So the draft report that we have out right now assesses impacts, gives you several alternatives. We have not made a final decision yet. Your input will help us get at that decision.
Okay. You can go to the next slide.
So once I have received all of your comments and the comment period ends, they will all become part of the official record. I will organize them and present them to the team for consideration, and that is what will help us get to your final decision. And, like I said, they will be addressed in the final document.
The comment period has been extended to February 14th, and here is my contact information. You can e-mail me, call me,

0004

send me something through the mail, and then, of course, give your comments tonight. Any one of those ways will make it to the official record and will be addressed in the final report.
I appreciate the comments that I've

received so far, and I look forward to receiving some more from you folks.

MR. MILLER:

Good evening and thank you, everybody, for coming. This is the third of our public comments meetings on the Mississippi River Gulf Outlet Ecosystem Restoration Plan. We've had meetings in January in Chalmette, Louisiana and over along the coast of Mississippi.

Tammy did mention that we have a comment period that has been extended 15 days and they will close on February 14th, and I will tell you that we received several requests for extending that comment period an additional 30 days and we're evaluating that right now. We hope to make a decision on that shortly. If we do make that decision to extend it, we'll publish notice in the

0005

news -- I'm sorry. We'll publish notices on our website. We'll probably send out some e-mails to allow folks in our stakeholder list and we'll put out press releases so that everybody's aware if they may need some additional time. I expect that either tomorrow or before the end of the week.

I want to get started by first telling you a little bit about the goals that we have in mind for putting together a Draft Restoration Plan, and that's based on the authority that Congress passed in the Water Resources Development Act of 2007 that was passed in November of 2007. And it did a couple of things: One was it authorized the closure of the MRGO navigation channel with the construction of a rock wall that we finished during the summer of 2009 across the channel near Hopedale, Louisiana.

The second piece of the legislation related to MRGO was for the development of the Ecosystem Restoration Plan to restore all of areas affected by the ship channel

and to restore natural features of our coastal ecosystem plan to reduce or prevent

0006

damages from storm surges. And one of the factors that we've added to the development of the plan is to try to achieve the ecosystem's sustainability to the greatest degree possible. So the first thing that we did as a planning team was define the area that we were going to evaluate. And the study area for the MRGO Restoration Plan extends along the east bank of the Mississippi River, roughly from the mouth of the river up above the Maurepas swamp area between New Orleans and Baton Rouge and across the north shore to Gulfport, Mississippi and then south along the Gulf front face of the Chandeleur Islands back down to the mouth of the river. That particular area covers over 6,000 square miles and includes open waters such as Chandeleur Sound, Lake Borgne, Lake Pontchartrain, tidal wetlands, wetland areas that are fresh, brackish, intermediate and saline marshes, as well as some forested swamp areas all around this part of southeastern Louisiana.

What we've done is establish a vision

0007

for what a water restored coast would be. A lot of us here tonight make a living or we live in coastal communities, and so what we tried to do is show a graphic of what a healthy restored ecosystem would entail, and it would have a diversity of habitats ranging from freshwater marshes all the way out to barrier islands and would have the ability for people to recreate and make a living in these areas in a sustainable manner.

So in evaluating the areas affected by the MRGO ship channel, what we've done is we looked back at habitat maps that were

documented prior to the construction of the ship channels, and so that's what you see here is a 1956 habitat classification map of the areas of St. Bernard Parish and portions of eastern Orleans Parish. And the thing to note about this is, one, that we don't see the presence of the MRGO canal, and, two, that you see a range of habitats that grade from the higher ground close to the Mississippi River, which are these dark green areas, which are forested wetlands to

0008

more saline wetlands or brackish wetlands close to the shore of Lake Borgne.

Next slide.

So if you look ahead, this is a 2006 habitat classification map and you'll see obviously the presence of the MRGO channel that was dredged in the 50s or 60s.

You see the brown areas are developed areas that are within levee systems and then you also see a real change in the types of habitat that are found in this part of the coast and it's a shift to much higher to salinity ecosystems and a complete disappearance of intermediate and freshwater wetland habitats.

And then, also, you see some blue areas that are open water that are in the previous '56 map. Those were covered with forested wetland.

So what happened with the construction of the channel was the increase in salinity across the Lake Borgne area and parts of the upper Pontchartrain Basin and a decline in the diversity sound within the ecosystem, and so we see a lesser variety of wildlife

0009

in the area, a shift towards higher salinity fisheries in the area and then also coupled with the loss of key habitats.

In this -- in this graph, we're depicting the Bayou La Loutre area where

you're familiar with that we have a very degraded ridge system in that part of this area of the coast.

One of the things that we've documented over the years with -- as an effect of the ship channel, and it's one of the best ways for us to show where areas have changed, is the change in salinity across the estuary. And so you'll see at Bayou La Loutre you'll have a documented change of over four and a half parts per thousand of salinity in the water, and you see that ranging up through the Pontchartrain Basin, about a little over two parts per thousand at Chef Pass, about a part per thousand on the Northshore, and .4 parts per thousand at Pass Manchac.

So salinity is important in the system because the amount of salt that's found in the water helps determine what types of plants can live there and the types of fish

0010

and other animals that live in those areas of the estuary.

So in putting together a draft restoration plan for all of the habitats affected by the ship channel, we identified about 300 different potential projects that could be put in place, and that's what you see along here is some of the different proposals that have been made. These come from different plans that have been produced in the past such as the Coast 2050 Plan, the State Master Plan, the Breaux Act, the Restoration Act and even in some local government plans that have been produced in the past.

So those ideas have been proposed to try and address the acre amount or the acre amounts that were impacted by the ship channel, and so there are various projects that are combined together to give us a restoration plan that restores over 58,000 acres of wetlands and those include almost

14,000 acres of fresh and intermediate marsh that was historically found in the area, almost 34,000 acres of restoration of

0011

brackish marshes, nearly 500 acres of salt marsh restoration, over 10,000 acres of cypress restoration and reforestation, cypress swamp restoration and about 48 acres of coastal ridge habitat restoration.

We've put together a construction timeframe of about 10 years to build all of the different projects that are identified in the Draft Restoration Plan, and, so, for example, we have some oyster reef restoration down by Bay Eloi. It's about seven and a half miles of reef creation there. We've got restoration in the Biloxi Marsh. This would be used in dredge material from Lake Borgne to rebuild eroded wetlands here. We have the diversion of freshwater in the vicinity of Violet. We have cypress forest restoration in the central wetlands, and we have shore protection along shorelines of Lake Borgne and portions of Lake Pontchartrain. I'll note on here, that there's some areas that you don't see in the proposed shore protection along Lake Borgne, and that's not because they're not features of the plan.

0012

It's because those areas are slated for protection under other programs such as the Coastal Impact Assistance Program funded by the State of Louisiana.

Now, you know, I mentioned over 58,000 acres of habitat restoration, and one of the key methods of achieving that habitat restoration is through the use of dredges and taking sediment and depositing it into open water areas to recreate the elevations that we need to support tidal wetlands. So we've identified about 157 million cubic yards of dredge material that would be

required to build this plan. Now, that's a very difficult number to picture, so we've estimated that at about 34 Superdomes full of dredge material.

There are also some features in the plan that add recreational opportunities in various locations across the project area. One example of that is at Shell Beach. We've proposed a recreation feature that would involve building some paved parking, a dock and boardwalk area around the Katrina Memorial that is at that site. And this

0013

would give folks an opportunity to have a chance to fish from the bank in a safe situation, you know, and a well-maintained situation.

There's a similar feature here in the lower 9th Ward at the foot of Caffin Avenue. This is where the location of the overlook platform is here in the neighborhood, and the proposal there is to build, again, some elevated boardwalks that would give folks an opportunity get out into the restored area and to have places for picnics, to have parking that's provided. Right now, if you go to the area, you have to park along Florida Avenue or pull up onto the -- you know, over the curb. So this would be a way to give folks a chance to get into the restored area and enjoy it for recreational activity.

And then, finally -- and I'm going to go into a little bit more detail about the freshwater diversion; but as part of the freshwater diversion project that is proposed, we have a series of trails and interpretive areas that are recreational

0014

features in St. Bernard Parish near Meraux. And so this would be a chance for folks to be able to walk or exercise along the sides of the proposed diversion channel.

There are a lot of folks very interested in this particular aspect of the plan. I will remind you that this isn't just a freshwater diversion project. It is a comprehensive ecosystem plan. We have all of the elements I've mentioned so far, but this particular component of it has probably been the biggest single piece of public interest or public opposition to the portion of the plan, and I want to walk you through what we've evaluated and how we reached the piece of the plan that has been tentatively proposed here.

So in looking at areas where we could divert water from the Mississippi River to help restore salinity in Lake Borgne, the Biloxi Marsh and portions of Mississippi Sound, we actually evaluated over 40 locations along the East Bank from the vicinity of the Bonnet Carré Diversion, even down below Poydras and the Caernarvon area,

0015

and what we came up with was there were four sites that are relatively open land corridors where we wouldn't have to relocate entire neighborhoods or industries, so these were, if you will, easier locations to propose to build a project of this size. And so what we're left with is alternative one, which is a pasture land site near Meraux. Alternative two, and I'm going to try to get this right, it's near the Dockville Farm. I tend to always want to call this the Pecan Grove area, but that's not exactly accurate. This is near the Dockville Farm and it's the area along St. Bernard Highway. We have a beautiful alleyway of old live oak trees. And then alternative three is at the existing Violet Canal. And then alternative four is below the Violet Canal before you get to the River Bend area.

So as a planning team, what we've done,

when we narrowed it down to these four sites, we also looked into little bit more detail about each of the sites and compared them to each other in terms of what effect

0016

would they have on infrastructure, wetlands, neighborhoods, businesses, cultural sites, a whole number of factors, and you can see them listed here. And I'll give you an example: For site one, there are no buildings within that corridor. In site two, there's one building. Within the corridor at site three, which is the existing Violet Canal, there's 121 structures, and then at site four, the lower river site, there are no existing buildings. So you can look at the same type of evaluation across each alternative sites and various considerations that were taken into account when we were putting together the proposed plan, and what you'll find in general is that site one, the least amount of impacts in terms of existing structures, distance between the river and the MRGO, wetlands that would have to be dug up in order to build the new canals and other factors here. So the idea here is to be able to show you what was considered and how we reached the recommendation that we have in the job plan.

0017

So this is the alternative one, and so as I mentioned, you'll see that there are no structures within this corridor.

Go to the next one.

This the Dockville location where there is one structure that falls within this corridor.

The next one, please.

This is the existing Violet Canal, which is alternative three. So you'll see there's some facilities right here on the river. This is the Lake Borgne Levee District

facility and then various businesses that -- some of them are reopened. Most of them aren't, but they are located along the canal as well as the High Rise Bridge that's over the canal.

And then, finally, the lower river site where there is an in-river dock location for some sealift vessels that use that area, but then no structures within the right-of-way here, but the impacts you would have to a forested area.

So the benefits that are anticipated as part of the freshwater diversion components

0018

are helping to achieve the conditions that are necessary for the restoration of cypress marsh and fresh marsh, the reduction of saltwater intrusion into the study area, the restoration of historic fisheries in Lake Borgne and Biloxi Marshes, improving the sustainability of wetland habitat across the area and improving opportunities for restoration. And then the key part, which is the actual goal of the project of itself, is to reduce salinity by about one to three parts per year all year long and to reduce salinity in Mississippi Sound by one part per thousand in May.

Next slide.

So this is a draft that we put together -- remember back to about my third or fourth slide where we showed a decline in biodiversity or a diversity of habitat and animals in the project area. So under a restored -- implementation of a restoration plan, you would have restored habitat along Bayou La Loutre. You would have an increase in the number and variety of different fish and wildlife that use the area and then you

0019

would have the restoration of a healthy marsh system across portions of the area.

So the next slide is a view looking up

the MRGO ship channel, the old MRGO ship channel, towards Lake Pontchartrain, and across the bottom here, we've got example photos of what different project features would look like. So this is the location of the freshwater diversion near Meraux, and this is a picture of the existing diversion of Caernarvon. So it would be a very similar structure along the river and canal that would be built here if the plan is implemented.

Within the Central Wetlands, which is an area close to where we are this evening, we would have restored cypress habitat. In other areas we would have the restoration of brackish marsh. This is in the area between Shell Beach and Hopedale. We would also have the restoration of habitat along portions of the Bayou La Loutre Ridge and then the protection of shorelines along Lake Borgne. So this is an example of a rock break water protecting the wetland

0020

shoreline.

Next slide.

I'm going to recount again the features of the plan in total. The draft plan, it's 63 miles of shore protection through rock, the construction of rock break waters along portions of Lake Pontchartrain and Lake Borgne. It's about seven and a half miles of oyster reef restoration or creation in Bay Eloi, over 58,000 acres of wetland restoration across the project area. It's three recreational features in the lower 9th Ward near the diversion, and the Taffaro Diversion Proposal, it's actually at Meraux. And then the recreation feature at Shell Beach along the MRGO. It has the proposed component of the freshwater diversion, which would operate at 1,000 cubic feet per second most of the year, and then during the months of April and May, we

would have a 7,000 cubic foot per second pulsing of that diversion. The entire plan carries an estimated construction cost of 2.9 billion dollars. I'll point out that that price tag is only for the construction

features. It does not include the dollars that would be necessary to design all of the features, acquire the real estate that would be necessary from private ownership and it also doesn't include the dollars that would be necessary over the life of the project for operation and maintenance costs.

Now, we have covered a lot of ground. I do really appreciate everybody coming out again tonight. If you're interested in more detail of that, we have a lot of members of the planning and technical team that have joined us this evening. They can answer a lot of questions. If you want to do some of your own research about the plan, it's available on the internet. You go to MRGO.gov, and on the lower right side you can download it. I do warn you, it's a sizable document, so you want to give yourself some time to download it to your home computer. It also has an interactive map where if you take your cursor and put it over any one of these futures, a little box will pop up and it will describe to you what's proposed in that particular

location. And I think we also have a hot button that you can send us e-mail comments and, of course, you can also send your comments to the address that Tammy gave you at the beginning of the meeting this evening.

And with that, we'll move towards the public comment part of meeting. Thank you.

MS. RODI:

All right. So now it's your turn. Get ready. We're here to take your comments on

any part of the plan, like Greg mentioned, again from the shore protection to the oyster reefs to the diversion. So please keep your comments broad and respectful.

I'm going to start with the comments cards that you turned in.

And do I have any more additional cards?

Cheryn in the back, has the white shirt on, she'll walk around, and we'll take those for a while.

With that, I'm going to start with Tim Gilford. If you don't mind, come to the middle, state your name and where you're from. We have a court reporter here. She

0023

is here to take all your comments and make sure we get them all correctly.

MR. GILFORD:

Hi. My name is Tim Gilford. I'm a commercial fisherman in the Chef Pass area.

Could y'all bring up the map of Lake Borgne, please? The largest one you have. Okay.

The two points that y'all are talking about working around is Alligator Point to the north and Proctor Point to the south. All of that area to the western side of the Lake, which is the smaller encompassed area by the Chalmette area, Bayou Bienvenue and Violet area, they're talking about doing massive dredging in that area over the next 10 years. They're talking about lowering the depth as much as 20 to 22 feet. Right now, the natural depth of that whole area is no more than possibly eight feet in high tide. The area between Alligator Point and Proctor Point is a natural current area, which drops around 10 feet. South of that, Proctor Point gets very shallow. The area along between the Rigolets and Alligator

0024

Point where they're talking about bringing in equipment to build this rock area is an

extremely shallow area, which is going to take a fair amount of dredging just to get large equipment in there. And they are also talking about checker boarding the dredging, actually not dredging a channel or one area. They're talking about this checker boarding. They're calling it a dredging, which is going to give you areas of eight foot of depth, 22 feet of depth, in a very unorganized fashion, and this is over however long a period of time, number one, it's going to take them to do the construction.

Number two, how long it would ever take the silt to the come to a current, development would be, I have no idea. This area has never been that deep, you know, as far as my recollection is concerned, and there's no body of water inland that is 20, 22 feet range in the size of channels. Even Lake Pontchartrain's main depth is approximately 12 feet. So dislodging all of this bottom for fill is going to totally

0025

change the situation as far as Lake Borgne's fishing is concerned, besides the fact you're tearing up the over one-third of the lake for an extended period of time for dredging activity. Some people have lived below Lake Pontchartrain for 35 years.

That's all I have to say. Thank you.

MS. RODI:

Thank you.

Pete TuFaro, concerned with the elevation of the water along with the water coming from the river.

MR. TUFARO:

Yes. My name is Pete TuFaro. I live at 518 Marina Road, right off of Parish Road, in Chalmette, Louisiana.

My concerns are multiple. The first concern that I have is the amount of water that's going to be placed into the area

between the Forty Arpent Canal and the back side of the new MRGO levee.

Could you pull up a slide that would show that? Yes. Well --

MS. MUELLER:

Is that okay?

MR. TUFARO:

That would show it.

The area that's marked green is the swamp area that you are looking to pump this water into or allow it to flow to. As I understand it, the areas that are in black from the river to the back Forty Arpent Canal are protected by a levee, a berm height of five foot. Once it reaches the Forty Arpent Canal, the water is to nourish that swamp area and flow out -- actually, it would be southeast. My concerns are during the spring, the tides -- the wind pushes the tides in and they close the locks at Bienvenue and at Violet Canal quite frequently. With this water coming in, you're looking to increase the volume of water in that area which will raise that water. How are you going to monitor and keep it consistent so that it doesn't raise the elevation flooding around my home and flooding Parish Road? This is also the time when hurricanes are right at their infancy, but if we catch an early hurricane, we have an influx of water coming from the river, we have the locks closed, our evacuation route, which is Parish Road, could be hampered as well.

So these are concerns that I have. I realize that we need to come up with some solution to correct the problems that MRGO created, but I would just like for you to keep that in consideration.

Some suggestions would be to pump it with a pipe outside of the wall. This would

put the earth and fill and water into Lake Borgne so that it would build up, then you could dredge it and build up and dredge and you could maintain the same level of water depth in Lake Borgne. Now, I don't know if that's the answer or not, but I do know that that is one solution.

Another solution would be to build a levee along side of this structure so that you could incapsulate the water and just let the amount flow in that the area could sustain. That's another option.

And the third thing that I'm concerned with is it took a great amount of time for the Corps to come up with the study to build

0028

the Great Wall of Chalmette at the height that it's at. This wall was built based upon eight-foot water depth in Lake Borgne. If we dredge Lake Borgne and make it deeper, you're going to have a different tidal action. You're going to have a greater volume of water to be pushed against that wall. It may not sustain that flow. So if that dredging is going to take place, make sure that enough sediment comes back to maintain that water level in there where we don't get flooded with excessive water due to the depth.

And that's about all I have to say.

MS. RODI:

Thank you.

Okay. I think this says -- is it E- -- Okay -- B-O- okay. "We are opposed to the" -- you know what, I can't read this one. We'll come back to it.

Josh Lewis.

MR. LEWIS:

I'm Josh Lewis from Orleans Parish.

First of all, I want to thank Greg and the Corps in general for going beyond the

0029

requirements of NAPA in terms of public

engagement in this planning process.
You know, seeing Greg at a lot of these meetings being very patient has been really great, and I know a lot of the non-profit community in New Orleans really appreciates that.
I just want to endorse the recommendations from what's painted in the MRGO Must Go Coalition document that the science team developed, including the recommendation of locating the freshwater diversion in the Violet Canal. If designed and managed well, the diversion can be very beneficial if the Corps can build the canal and diversion in St. Bernard Parish, obviously needs to be largely on the Parish's terms.
One concern that I have with the plan is that Chinese tallow on the spoil banks is not addressed. On the northern banks of Bayou Bienvenue and this shore plan by MRGO has been colonized by Chinese tallow very extensively, and you're going to be doing swamp restoration right up against that

0030

interface. Once you start getting exposed soil, birds, winds are going to disburse those seeds onto the soil and I think you're going to have a problem with Chinese tallow colonizing those areas before you can plant cypress. So I would like see them come up with a plan that addresses that and can remediate those problems up front.
I think the plan has great potential, and I hope the Corps makes an effort to include the best of coastal scientists as they develop a more detailed proposal and not rely so much on private consultants to conduct their research. There are dozens of excellent research universities, knowledgeable local residents and respected engineers that have been engaged in this process and want to see the product designed

well and carefully implemented.
Meaningful collaboration like that is difficult. It requires determination, experimentation and expertise. You've got a long process ahead, but please don't go back, pledge to be open and inclusive when the going gets tough.

Thanks.
MS. RODI:
Okay. I think the one I had before is Erin Goada. Nope. Not right. All right.
Chris Macaluso. I can read that one. And then after him will be Amanda Moore.
MR. MACALUSO:
I'm Chris Macaluso from the Louisiana Wildlife Federation, and I live in Baton Rouge. Pleasure to be before you guys again. Another excellent presentation by Greg Miller and the rest of your crew.
I want to bring up a couple of points. We would like to see the Violet Diversion built in the existing Violet Canal in an effort to work with the folks of St. Bernard Parish as much as possible to get this project built.
We would also like to urge the use of oyster beds as much as possible as a shore line protection, not only on the inside of Lake Borgne, but also on the outside of Biloxi Marsh as well and, to the greatest extent practical, the use of sediment from the Mississippi River to use as fill

material for some of the these dredge projects.
I would also like the point out that -- I know it's been emphasized that the most controversial part of this plan is the Violet Diversion. I don't think that's any secret, but I would also like to reemphasize something that I've said to this panel already. The only reason why we're standing

here arguing about any of these wetlands is because of the Mississippi River, and the idea that putting the river back into those wetlands is a bad thing, I don't think, pardon the pun, holds a lot of water.

I fished Delacroix a couple of weeks ago. I fished in the Biloxi Marsh, and I saw things in Delacroix that I don't see in the Biloxi Marsh like ducks and other migratory water fowl. We caught redfish, speckled trout and freshwater species like blue catfish, and the redfish and the speckled trout didn't seem to mind at all that the blue catfish and the ducks were there. So the idea that putting freshwater back into these areas is somehow a detriment

0033

to the ecosystem is bad, I don't think it carries a lot of merit.

I will say that there have been mistakes made with the operation of the Caernarvon Diversion. There have been mistakes made with the operation of the Davis Pond Diversion to a certain extent. We need to learn from these mistakes to make sure that we don't make the same ones when we operate this diversion in Violet; but we do believe that this ecosystem can be sustainable for a diverse array of animals, the same kind of animals that it once supported. The same kind of animals that it once supported with places like Bayou Bienvenue, Bayou Dupre, Bayou Terra Buff, Oak River and several other bodies of water in this ecosystem carried water every single year from the Mississippi River. We're not losing this estuary because of the MRGO. It helped it wash away. We're losing this estuary because we've isolated these wetlands from the Delta at the Mississippi River Belt and we need to bring that river back into these estuaries if we want to have any chance of

0034

being able to sustain them in the future.
Thank you.
MS. RODI:
Thank you.
MS. MOORE:
Hi. I'm Amanda Moore. I'm with the National Wildlife Federation, and I coordinate the MRGO Must Go Coalition, which is a group of 17 environmental and community organizations that came together in 2006 with the sole purpose to see the MRGO close and see the wetlands that are impacted by it restored. Our coalition, I've passed out these handouts to a lot of folks tonight, and, you know, we work with a lot of people in this room. And I think that something really important that our coalition brings into this restoration planning process is that we balance to have access to some of the best experts on this Basin, and we also as -- insofar as coastal scientists.
We also bring community leaders to the table and policy experts on the hill and here in this state level as well and we

0035

bring all of that together to try come up with the best recommendations so that we can get the best plan that represents the best science and community concerns.
And so these recommendations, there are seven that we have listed out, and, you know, we're all working on this very hard for many years because, as we all know, that's why we're all here. This plan -- this channel did enormous damage. Not just environmental damage, but it also did communities -- I mean, it devastated communities beyond imagination and it also had devastating economic impact. So it's going to take a lot to get this done, and that's why we're all working together to try to get the restoration that needs to be

done.
A few of the recommendations that we're advocating for, one, of course, is to have the diversion located in existing canals. We worked with the community. We've heard them loud and clear. This is what the parish wants. We've worked with the best scientists. The scientists say it's a

0036

viable alternative that can be done. So this is where it should be. So this is one of our major recommendations.
There's also the Biloxi Marsh, which Mr. Macaluso just said, we can't leave the outer ridges of Biloxi Marsh. We can't not restore historic oyster reefs that's out there because that is a critical landscape feature that's going to bring significant storm surge protection to St. Bernard and New Orleans and leaving that out would be a grave oversight in this planning process.
We also have reasons to believe looking at the best experts on river sediment that we can use sediment out of that stretch of the Mississippi River instead of having to dig so many burrow pits in Lake Borgne. So we really urge the Corps to take these comments into account and to work them into the final plan and make sure that the best science and the community voice is heard.
Thank you.
MS. RODI:
Thank you.
Okay. Jim TuFaro and then Matt Rotta.

0037

MR. TUFARO:
Hi. My name is Jim TuFaro. I'm a resident of Arabi, Louisiana. I would like to thank you all for giving us this opportunity provide some comments. Hopefully, they are going to be heard and utilized in this program here.
I would like to first start out by

thanking the Corps of Engineers. You all have gone up to Congress and secured a lot of money to provide us some very sorely needed hurricane protection or risk reduction.

MS. RODI:

Good job!

MR. TUFARO:

But I don't recall what HSDDRS and all of the rest of that stuff is. You all appear to be doing a really superb job of erecting these levees in some places 28 feet, some places 30 feet. New sector gates, all, you know, designed to provide the people with some sorely needed protection, and that's all good. And the restoration program here evidently succeeded

0038

in convincing Congress that what was destroyed should be restored and we absolutely need and appreciate that as well. And it seems to me, if you review this entire program, most of all of these nourishment and restoration programs that you have here, I don't think anybody would contest or disagree or say that we don't want those; but I do think, as you heard before in the previous two public meetings, that a new canal being cut through St. Bernard Parish is not desired and it separates the parish and it creates a lot of freshwater in an area that the people here in St. Bernard Parish are all too familiar with a freshwater diversion. We've had one for more than 20-some-odd years at Caernarvon. And if this freshwater diversion would do to the Biloxi Marsh what the Caernarvon syphon has done, you won't have a Biloxi Marsh. You might have this area in purple, this marsh nourishment, you might have that, but that would be about it.

But, you know, this takes us back to why do we need all of this freshwater and at

0039

what costs are we getting all of this freshwater because it seems to me that out of the 2.9 billion -- and I'll just ask this question: What portion and how much cost would that diversion be of that 2.9 billion? If somebody could just give us a ballpark.

MS. RODI:

Do you have an estimate?

MR. MILLER:

Between 300 and 500 million.

MR. TUFARO:

Between 300 and 500 million, and it occurs to me that you've got the Industrial Canal and you've got a way to be able to introduce freshwater -- I don't know -- as much as you possibly could ever want. You've got the Bonnet Carré Spillway. You could introduce as much freshwater as you could possibly want. I know that people living in St. Tammany on the Northshore probably gave you all a lot more trouble than St. Bernard could possibly give you. So maybe that's why it's not being considered. But it seems to me that that's actually almost free. That's not going to

0040

cost 500 million to get freshwater in here.

But I think the people in St. Bernard Parish want the restoration. We appreciate the restoration, but I don't think in 1958, if we're going to return things back to the way that they were, that we had an MRGO Canal in 1957 and pre. I think we've asked the Corps in the restoration to fill the doggone thing back in. I think we've asked -- we've never asked the Corps to bring us water. We already have plenty of that. We've asked the Corps over and over to bring us sediment and continue to bring us sediment and don't ever stop bringing us sediment. I don't care if you have to barge it in or suck it in from pipes out of the

Mississippi River because that's what we're talking about when people make a -- like the man in Baton Rouge was saying, Louisiana Wildlife Federation, he said we just want the river to do what it used to do, but a syphon is not going to what the river used to do. We just want sediment.

So if you want to return things back to the way they were, bring us plenty more of

0041

that, and I think you could get your freshwater pretty much for free.

Thank you.

MS. RODI:

Very good. Thank you.

And we do have a timer up here. Three minutes a piece. I do have a good amount of cards, so if I have to put you off, I'm sorry in advance.

MR. ROTTA:

Hi. My name is Matt Rotta. I'm with Gulf Restoration Network based out of here in New Orleans. I think I'm going to be pretty quick.

One thing that has been brought up that I would like to be at least looked at during this process is we're talking about this freshwater coming from the Violet Diversion, but one thing that we aren't talking about, one of the sources of freshwater is the Pearl River. And there have been several times where people in Mississippi have been trying to cut off that freshwater supply by building dams, artificial lakes, things like that, and that is within the Corps's

0042

jurisdiction and the Corps has almost approved a couple of those dams. So if you are indeed looking at an ecosystem restoration project here, and why look at that wholistically, we also have to -- I know we were held hostage for a while by Mississippi to get that Violet Diversion or

else we would have had to open up the Bonnet Carré, but we also need to be looking at the freshwaters coming down from the Pearl River and making sure that our development plan that's going on there where they're damming their rivers so they can have recreational lakes and they're denying the freshwater to get down into our oyster beds and then complaining when there isn't enough freshwater in those oyster beds. So I think that's a really important thing to also be looking at, making sure that the freshwater flows and the Pearl River are maintained. And the Corps has power to do that by denying 404 permits and other requests to dam the Pearl River and it's attributaries. So I think that's something really important to get into this plan.

0043

Another couple of other things. A couple gentlemen before me talked much more eloquently that than I ever can about the idea we don't want to be sacrificing Lake Borgne of dredging sediment from there, too much sediment and putting it, just completely changing the ecosystem out there. We don't want to try to fix one problem and just make another environmental problem so that needs to be looked at very closely.

And then also with the Violet Diversion idea, I just want to reemphasize to make sure that there is as much sediment delivery as possible with that to get at not only the freshwater issues but getting as much sediment into these areas as possible. So I think it's -- I think the Corps has done a very good job of putting some stuff out there with working a lot of our partners to get some ideas at the beginning so I just hope that they continue to take the considerations from the citizens as well as the experts in the NGOS and the scientific community and continue to push the best

project forward.

Thanks.

MS. RODI:

Thanks.

Darryl Ward and then Catherine Serpas.

MR. WARD:

I'm Darryl Ward with the Garden of Eden from Metairie. I worked on this five to six years, and I would like to say that to the local and federal sponsors and the U.S. Army engineers, Louisiana Department of Natural Resources, Office of Coastal Protection and Restoration, Environmental Protection Agency, that this is a big step forward for Louisiana and we got to put some thoughts into the implementation of what we're studying and all of our words are being recorded. I'm kind of into seeds and plants of food in the recovery of this. I mean, to build something without this establishment of growth, we say swamp, but the swamp can be turn into fuel. It can be turned into food. I want to be part of planting seeds, produce food of people, ocean life of jobs and education of our natural resources. This is possible with the construction of

the diversion of Mississippi River water to reduce salinity and provide sediment nutrients for marshes. We must capitalize on these improvements of the plant chutes that sprout food. We have created 7.55 miles of oyster reefs, so we can create burrows to grow catfish, shrimp, crawfish and other ocean varieties to be leaders in our seafood capital to capitalize our types of jobs and education for our children in Delgado, UNO and Southern. I've asked them to help me study everything that's being said tonight and everything that's been said at the last three meetings. The students to be part of a new frontier, our

government has created a natural step forward for the 9th Ward to be a beacon and a light. Three public restoration sites with community groups like Light City can be the beacon for all to be. I would like to see a memorial for Dr. Martin Luther King here in the 9th Ward be a beacon of light and the Light City rises. Our beacon is light in the city. This allows the natural resources of people, ocean species, air

current, geothermal gravity, water ocean pressure to the tithes of our energy to fill our cup of our new future. We have a new future right now and we must all try to be part with our children with us and saying, "Boom, you've been reborn in the name of the Messiah, Paul has spoken."

Thank you very much.

MS. RODI:

Thank you.

Ms. Serpas.

MS. SERPAS:

My name is Catherine Serpas. I live on Bayou Road in Toca in St. Barnard Parish.

Well, the first thing I would like to say is that the biggest mistake the Corps made was digging the MRGO.

The second thing is in my mind the solution to all of this is to let's fill it, not just close it. Let's fill it up.

The third thing is that I went to the meeting in Mississippi and I don't think the people in Mississippi really know what's going on. I don't think they really cared about what's going on. I think

one -- a political person spoke, and all he was worried about was that Louisiana, Louisiana, Louisiana, that's all that Mississippi hears about. They never got one rock, Mississippi. So they really don't know what's going on and what this is

supposed to be about for them and what I realize is the only reason we had a meeting in Mississippi was because Mississippi has to put money up.

I am definitely against digging up the Meraux Field for a diversion. I don't even know if we need this diversion, but if we do need it, I would absolutely rather see it done in the Violet Canal. And I think we need to look at the fact of does it have to be as big as what we're saying it has to be.

I think it does have to be studied more to see exactly what direction we need to go in, and I want to thank you for the opportunity that you have given me and all of the rest of the people at all of these meetings to speak and to give our opinion and I really am hoping that after you all go over everything that was said that you will

0048

give us an opportunity to have a few more meetings to discuss the things that you all have come up with and that you keep everything that's been said by the people and consider it all to come up with a final decision.

Thank you.

MS. RODI:

Paul Legarde and then Louis Barrett.

MR. LEGARDE:

My name is Paul Legarde. I live at 1200 Bayou Road in St. Bernard, Louisiana.

Could you bring that map back up that shows the whole area that's going to be studied. Could you -- go ahead.

All right. And could I use your little light? Thank you, ma'am.

We had a syphon right here at Caernarvon. It runs back to Lake Lery. They put that in quite a few years ago. I own four trapping lots right above Lake Lery right here, and when they first talked about putting it in, I thought this was going to

be God sent, believe me, because we had a lot of fresh- -- saltwater that came up in

there and it killed out -- it killed out our duck grass in that area. We had a real brackish marsh here. As you go out, you get more saline to your marsh area out here, but I thought that was going to be God sent. They put the syphon in and they would not listen to the landowners. They kept the water over the prairie, at least six inches over all of this prairie, just kept it running, and they kept it running for years. And I want to tell you folks something. If you go home and you fill up the bathtub and stick your feet in. Keep them in there for about a week. What happens to your feet? They'll rot off of you. Well, they killed the root system. In a prairie, you've got a root system of about 18 to 20 inches thick. It's nothing but roots that holds your grass that has been there for hundreds of years. One set of grass grows, dies out and the roots go down and they tie into this.

Another thing: They cut out burning, okay. We're not supposed to burn in St. Bernard Parish no more. People are afraid to burn the marsh. You've got to burn the

marsh when you can burn it. We couldn't burn it for years because there was too much water. It wouldn't dry out. Even in the wintertime, they kept it open. Your grass grows up and it lays over and it lays over and it gets to be a mattress, and what it does, your new grass can't come up. You've got to burn it and we used to burn it once a year. Come fall we burn the grass before trapping season. So they cut that out. And what happened? Your whole root system was dead. You got the hurricane came through and it rolled everything up. You go back there right now from Lake Lery which is that

little lake right there, three-quarters of the way up to the river is all rolled up and throwed up on the land to the front. You've got about this much water (indicating), about 24 inches of water from Lake Lery to almost to the big marsh up into there, and all of this is ate out. All of this, same thing, all back up in ratio into the island. So freshwater without silt isn't worth two bits. And I don't know how you're going to get the silt in there. The way they

designed that freshwater system was just freshwater. It was no silt coming in at all. And that ran into a place that's called a carvasse, and I figured when they put that thing in, the carvasse would be filled up in four or five months. That's been now 20 years and it ain't filled up yet. So you don't have anything going in.

I'm going to tell you something else: You've got the dying Delta. Our Delta is dying. The river wants to turn and go down the Atchafalaya River. When I was a kid, in that river they had whirlpools from here to that table round. Some of the older fellows remember that. You get caught there with a skiff, it would spin you around. You don't have that anymore. They have dammed your river off. Your current is gone. So, consequently, your river is silting up. From New Orleans down, it's silting up. It's costing maybe six million dollars a year to dredging and they're wanting to cut the dredging out, okay.

This is what I've got in my mind. I'm going to have some people that laugh at me

and tell me I'm crazy, but if I'm crazy, I'm crazy. I'm going to give you my idea. I don't believe this is a freshwater diversion system at all. I believe that's a ship channel. If they're going to quit dredging

this river all the way to the bottom, 97 miles, that's going to silt up. If you got a ship channel cutting right across here into Lake Borgne, you can -- and they're sewing all of this up on both sides with rocks, you can take that dredging (inaudible) straight to Gulfport. Got about 45 miles from New Orleans to Gulfport. From Gulfport to southwest pass, you got about 115 miles and then another 97 miles back up to New Orleans. So what you're doing is you're cutting off about 160 miles just taking a boat from -- a ship from Gulfport to New Orleans. Okay. And you go a little bit further and you can run right over into Mobile. So you're cutting off a heck of lot of shipping.

MR. LEGARDE:

Y'all want to shut me up, huh?

MS. RODI:

0053

She said we need to cut you off.

MR. LEGARDE:

I believe it's a ship channel folks. Once they acquire that piece of property, they're going to do what they want with it.

MS. RODI:

And, again, I apologize, three minutes. Mr. Lewis.

MR. BARRETT:

I'll try to read quickly.

My name is Lewis Barrett. I live on Bayou Road in East St. Bernard Parish. I'm going to just try to read this statement in this three minutes you're allocating now.

This statement reflects the opinion and position of the St. Bernard Chapter of Alliance For Good Government on this Mississippi River Gulf Outlet Ecosystem Restoration Plan. We are going to say while recognizing the restoration for the region is vital and urgent, there are serious

concerns of the impact on the community by this plan that's currently stated. This proposal that's presented does not present a

wholistic plan of the entire region for restoration. It does not offer proof of a complete and supportable plan of restoring the areas affected by the MRGO navigation channel, nor does it contain plans to restore natural features of the ecosystem that were reduced to prevent damage from the storm surge. Rather, a major component of the plan proposes a project for the diversion of freshwater at or near Violet, Louisiana for the purposes of reducing salinity in the western Mississippi sound and Townsend oyster production in promoting the sustainability of coastal wetlands. Cutting this proposed diversion, a large 500-foot wide completely across the prime area of St. Bernard Parish would be a unconscionable act of the Corps of Engineers against the objections of the people of St. Bernard.

Furthermore, not rebuilding the Chandelier Island which historically has been the primary natural feature that protected this area from storm surge is a serious omission of the importance of the

first line of defense for storm surge. Instead, this project should be supported by sound current scientific studies and proven physical models instead of being driven by questionable political agreements based on outdated studies which is listed the Mississippi and Louisiana estuarine areas, freshwater water diversion to Lake Pontchartrain basin and Mississippi sound and dated in 1984.

The public participation for this project is inevitable and the information has not reached the majority of the people

in the community. The number of public meetings at St. Bernard has been inadequate, given that St. Bernard is largest area affected. The Corps of Engineers and local government are encouraged to reach out to the people in the community to inform them of the impact of these projects. We do encourage the Corps of Engineers to listen to the residents of St. Bernard and to other stakeholders and their objections to this plan and find alternate methods of restoring the ecosystem while preserving the land and

0056

life that is precious to the people of St. Bernard.

Thank you.

MS. RODI:

You want to give us that for the record?

MR. BENNETT:

Sure. I'll give it to you.

MS. RODI:

Next is John Driscoll and then Frank Campo, Jr.

MR. DRISCOLL:

John Driscoll from Metairie, Louisiana. I've learned here tonight and I'm disappointed to find out that this is yet another freshwater diversion project. Kind of four basic reasons for coastal land loss: One is subsidence, storm surges, sea level rise and saltwater intrusion. This only really addresses the fourth one, saltwater intrusion. To me, this seems like another expensive project that's doomed from the start through faulty thinking and design. Everything you read from the coalition to restore coastal Louisiana, the Lake Pontchartrain Basin Foundation, American

0057

Wetlands Environmental Defense Fund, Ducks Unlimited, Governor's Coastal Advisory Commission and the list goes on and on, says turn the river loose to try and recreate the

natural processes land building that were in place before the Corps started building levees and navigation canals 80 years ago.

I live in Metairie and anybody that lives in Metairie knows that your yard sinks over time through subsidence. You know, every five years or so you got to go get sand and fill your yard in. What you're proposing with a freshwater diversion similar to the Caernarvon diversion is if I run enough water on my yard long enough, the yard will rise, and that won't happen without sediment. I guess what you're proposing when I -- finally, when is the Corps going to get the message? We are losing land at a higher rate than any place on this planet, and yet, we still have old thinking, small thinking. This is a big problem. We need big thinking and creative thinking.

So, it's been a common theme tonight, we

0058

need sediment. We need to restore the natural processes of the river back into the ecosystem. Water alone is not going to get you there.

MS. RODI:

Thank you.

MR. CAMPO, JR.:

My name is Frank Campo, Jr. Between me and my two sons, we own Campo's Marina at Shell Beach. I moved to Shell Beach and I was born and raised on the edge of Lake Borgne. I'm 69 years old and I've seen the ship channel come. I lived through it. I lived with it, and now we are living basically without it with the dam.

When I was 10 years old, my dad, who was Blackie Campo known by most everybody in this room, used to take me hunting in the back at Proctor Point. And we used to go way up into the marsh land close to the trees that you see along the highway, now

four lanes. And when I was 10 years old, trees were dead. I asked my daddy, I said, "Why are the trees dead?" He says, "The 1915 hurricane, the 1927 hurricane and the

1947 hurricane, that's what killed them, the saltwater." He said, "Then all of the debris that went up against the trees, when they burned the marsh, it -- you burn the bark off the tree and you kill it. That's why the trees are dead."

The bring these trees back, freshwater is not going to do it. Now, if you want to do something, you pump sand in there and you plant them and you might do something with that.

As far as this freshwater diversion coming through Meadow Field, when I was a kid, Lake Borgne was paradise. We didn't have any freshwater. We didn't have any diversions. We had natural stuff, which we would have again if you close the islands off out there and let everything turn back like it was.

Now, I don't know who came up with this idea of cutting St. Bernard in half, but I will personally chain myself to a tree, along with Fred, to keep it from happening. This is crazy. You will take -- you will destroy the lower end of St. Bernard Parish

which put up most of the money for the doggone parish to start with with the fishing industries. Now, how anybody could do something like that is beyond me. We have -- well, until the oil spill. I don't know what is going to happen after that. We might not have anything left. I don't know. It's going to take it the better part of this year to figure out what's going on with that. But we have the best fisheries in the country. People come from all over the world to fish here. And if you put that

diversion, they could tell you what they want. He might have caught trout and redfish back in Delacroix Island. I'm not against that. I know it happens. In Bayou Sue, true when I was a kid, we used to catch trout, redfish and green trout and red drum all in the same spot. But we didn't have a diversion. We didn't have all of this freshwater. If you cut that diversion, every camp down there is going to be worth nothing. We are personally going to be out of business. We've been in business -- my family has been in the business for over 100

0061

years. We've lived through all of hurricanes. We came back. We came back because we knew there was going to be a project out there, and there was going to be people who were going to get it. But if you change all of this up and you kill the product, you kill the reason for being there.

And all of these people that's got their camps down there depends on us for baits, ice, fuel or whatever and we are not going to be there, so that that's going to -- you know, they won't have a reason to be there, either. You just ask them about it.

MS. RODI:

All right.

MR. BENNETT:

Ask them what effects would be if I closed it up.

MS. RODI:

Thank you.

Robert Campo and then John Koeferl, K-O-E-F-E-R-L.

MR. CAMPO:

My name is Robert Campo. That was my

0062

dad that was just talking here.

I'm an oyster fisherman and also a marina owner and operator in Shell Beach at

Campo's Marina, and, you know, I'm not an attorney, but I feel like an attorney defending my parish because I don't want to see something, you know, to come through and destroy what we have already. You know, we -- I'm 42 years. I've lived and I made a living in that MRGO because it was there, but I think I could have did without it. You know, and happened to sacrifice Meraux Field to -- or the Violet Canal to make another freshwater diversion when we already have one in place.

People, we do not need a freshwater diversion. This is not the answer. You know, I heard Mr. Macaluso say he went behind Delacroix Island and he caught redfish and trout and blue cats. He didn't catch no catfish in the Biloxi Marsh and he didn't see no ducks in the Biloxi Marsh. Well, let me tell you something: Try to go drag a trowel in Lake Lery and I bet you ain't going to see how many brown shrimp you

0063

catch because of that damn freshwater diversion they put in Caernarvon. You don't catch that many because they're not there. You can't make a living back there anymore.

Go ask the people at Delacroix Island what happened to all of the oysters that was back there. They're not there anymore. That's just what's going to happen to Lake Borgne where I make a damn living. And I want to see the oyster industry ruined due to a freaking freshwater diversion.

We don't need this stuff, people. We do not need a freshwater diversion. I could go along with Greg's ideas with rocking projects. That's all good. That's all well and fine, coastal restoration we sure do need. We need our islands built back up on the island side. If freshwater was the answer, people, down at the mouth of this river you'd see mountains. You don't see

nothing but land disappearing in leaps and bounds. It's going to be -- Venice is going to be the next line of defense. That's going to be your next barrier island, Venice, because that's where the river is

0064

going to wind up being real, real soon. Freshwater does not build land, people. The proof's in the pudding right there from Main Pass out. There ain't no place in the world eroding faster down there than at the mouth of the river.

Look, I live there at Shell Beach and I was born and raised there and I want to continue to see people prosper and come there and catch fish and have fun and do things for lifetimes, generations, and if we put this in here, people, we don't. Stick a fork in it. It's over with.

Thank you.

MR. KOEFERL:

I'm John Koeferl with the Holy Cross Neighborhood Association and Citizens Against Widening the Industrial Canal. Good to be here.

I feel that this plan is the only game in town, you know, what we've been working on. You guys have the money or the time to do it. We need the coast fixed, and when I read the document -- and I want to tell you, I support this effort. I have a different

0065

appreciation of where we are. I think we are maybe halfway through the draft plan and a whole lot more imagination and common sense and talking to folks has to happen, okay?

What I see has been done is all of the laws have been stated, what they are. All of the plans in Louisiana and everything have been followed. I see that what has affected the diversion plan done in St. Bernard and Violet is the need for a

tremendous amount of freshwater to satisfy Mississippi, right, in the U.S. Senate, and since the Bonnet Carré Spillway is not going to provide any of that water because of a decision of, I guess, our legislator, I'm not sure. Then since we need so much water at least hypothetically or, you know, legally, all of this burden suddenly falls on St. Bernard and we have to have this huge thing, and it seems to me that it's kind of driving things a little backwards. I think everything, all of our structures, including the Pearl River, needs to bring freshwater, its share of freshwater into this area. How

0066

much we need? I don't know, but it seems to me that the Violet diversion plan is really a sticking point for me. I think it's much too grandiose, you know, and it should be something using existing areas, maybe the Violet Canal. It should be assisted with whatever energy, efficient energy that can be used like some people talk about natural gas. I'm talking about river turbines. Let's have river turbines move things through the Violet Canal or other kinds of things. You know, let's do that.

I think a whole lot can be done and what bothers me is that it hasn't been done yet, you know. The little girls down at Martin Luther King School were taking buckets of sand up into the Bienvenue area have done more than the entire U.S. Corps of engineers, you know. We need to get moving.

I think that there's a growing consensus that river diversion -- I mean, river sand, river silt, river sediment needs to be what fills our coast. We shouldn't be taking it from Lake Borgne. We don't even want to talk about the Industrial Canal, okay. So I

0067

think that we need to get moving on this, okay, and not send this plan as it is to

Washington just because you can, but let's really work out something, you know, that it works and get it moving.

Thank you.

MS. RODI:

Thank you.

Pat Fitzpatrick and then Charles Imbornone, something like that.

MR. FITZPATRICK:

I brought a show and tell.

All right. Thank you. This is my third time here. I was asked to talk a little bit more about what I talked about in Mississippi so -- and first I want to -- my name is Pat Fitzpatrick. I'm a professor at Stennis Space Center. And I fished St. Bernard much of my life, almost weekly so I know the area fairly well.

If you actually look at their plan, there's much to admire. It's about 10 Ph.D. dissertations long, but there's a lot of good stuff in there about marsh restorations and restorations. I do encourage you to get

0068

from the river, not Lake Borgne. I'm a little leery of that. And I do support the basic idea, which is to bring the salinity levels down, but as I talked about previously, I do not support the diversion idea and won't go into those details because I've already done that before.

What I would like to do is talk about maybe an alternative way to reduce the salinity. Actually, the key factors are to restore some of the features that were destroyed by when you dug MRGO. Now, on this little chart here, the red is where MRGO is, wider than it used to be, of course, when it was first dug. Now, one thing a lot of people forget about, this purple area, that's where the spoiled banks are where they dug the MRGO, and they effectively cut off the ecosystem. And

that's one of the problems that has never been really looked into much, in my opinion.

After talking to the Campos and some other people and just from my general knowledge of oceanography, some of the features I would suggest as an alternative

0069

is you can break it up in two parts. You got that rock dam which was put in and that's already lowered the salinity a lot. That's been a big success story, but we want to lower a little more probably to bring it back to where it used to be. And as I pointed out previously, I'm actually catching bass in the back lagoon this far, not many, but there's a few back there because the water has really already started to become less saline.

Now, what I would propose is this is an old map of what it used to look like. I would propose -- it used to have a stagnant fuel system back here. Most of the freshwater is actually from rain so I would -- in the plan they do call to restore some of this area, my recommendation would be to restore even more, cut it off some more, put some urban levees in there, sediment pipe, really hammer this area hard beginning with Lena Lagoon and the area back to Shell Beach the way it used to be.

Now, another component that's often forgotten is that Bayou La Loutre used to be

0070

a lot narrower. If you narrow it, you reduce the salinity coming in, and since you want to restore it anyway, put some components in there to reduce the influence of La Loutre.

Now, if saltwater is still a problem, the Corps of Engineers has a lot of experience with this, you can put saltwater barriers at the mouth at Bayou (inaudible). And this is just a prototype. You can do

this in other areas further west if you wish.

Now, east of the dam, to me, I know it's unrealistic probably to fill it in, but you could probably hammer the key features. And what they've done is they've cut off the main north-south bayous right here, okay -- I'm almost done -- and what I would recommend is just to bring them some what we would call, leaky, earthy damn, rocks, weirs, cut into this system, maybe get some of this spoiled bank that's not being used for anything and just restore the flow to reduce saltwater from going in, restore marsh and also you reduce the dead zone,

0071

eliminate a dead zone that occurs there every summer.

And I have some maps if anybody wants them.

Thank you.

MR. IMBORNONE:

Hi, I'm Charles Imbornone. First, I would like to thank the Corps for allowing up us to give our input to this project. I just hope that it is considered in deciding what you will do.

I'm chairman of the Board of Directors for the Alliance of a Good Government. The Alliance was organized in 1967. It's a non-partisan watchdog political group with chapters in Orleans, St. Bernard, Jefferson, St. Tammany Parishes. And Plaquemines, St. John, St. Charles, Tangipahoa and East Baton Rouge Parishes all have applied to us for charters.

Now, we in St. Bernard, as well as the other parishes, oppose the diversion project as submitted. I understand that the Corps of Engineers has good intentions in proposing the project. However, we do not

0072

need another body of water cutting our

parish in two.

This project is reminiscent of the MRGO project in the 1960s. Parish residents were told that the project would be for the area as a whole. What was supposed to be a 500-foot wide channel turned into a channel over 1500 feet wide. In addition, it destroyed our marshes and took away our land. For many years, we tried to get the Corps and our government to close the MRGO. Our fear was that some storm could come up the MRGO, bring with it total destruction of St. Bernard and the eastern parts of Orleans. Our worst fears were realized. MRGO may be closed, but it's still not filled in. It still causes a problem. We don't need another MRGO through our parish. There are already diversions existing that would put freshwater into the lakes and waters of the Mississippi Delta. There are the spillways north of Lake Pontchartrain, the Industrial Canal into Lake Pontchartrain, the Caernarvon diversion and the Pearl River.

0073

The Violet Canal -- now, we don't want the diversion project going through St. Bernard Parish. If we have to do it, though, the Violet Canal would be the best location for the project.

People, we need barrier islands. That's what we need as people before me said, we need silt. We need landfill. When you build a house, you start with the foundation. You don't construct the roof before you build the foundation. So it puts storm protection. Rebuild the barrier islands. That would serve to protect Orleans, Jefferson, St. Tammany and St. Bernard Parish. As well as Mississippi, we need the barrier islands before we need a freshwater diversion. So if you must go forward with the diversion project, take the

money you would save by using the Violet Canal instead of cutting through the Meraux land and put that money into rebuilding our barrier islands. As I said, we understand that the Corps of Engineers has good intentions. It did when the MRGO was built and they had those same good

0074

intentions in proposing this project, but as we have seen with the MRGO and Katrina has proven, that the road to hell was paved with good intentions.

So, please, don't put the City of New Orleans and the Parish of St. Bernard in harm's way. Rebuild your barrier islands first.

Thank you.

MS. RODI:

Next, Maura Wood and then Ben Gordon.

MS. WOOD:

Hi. I'm Maura Wood with the National Wildlife Federation. I worked with Amanda Moore with the MRGO coalition who has already stated some recommendations that we support.

What I wanted to say was I -- my position is Senior Outreach Coordinator and in that position I have spoken with a lot of people in coastal Louisiana about diversions and their concerns about those diversions, their concerns about their livelihood and how they're livelihoods their communities, the economy will be affected by diversions.

0075

But one thing that I also hear from all of those people is the loss that they have seen over the years that they have been so intimately involved with the coastal zone. They have seen what was once land and water turn to water and land, and they know that without action, there will be no economy. There will be no livelihoods.

So we are at the public comment period

of this process, and as you all -- as this period comes to an end and you go back sort of into a black box to take the draft plan and continue to shape it, I encourage you to continue to consider it a very living document and then you take all of the pieces of wisdom that you've heard from people here tonight and that you shape an organic consistent, efficient restoration plan for this area that will preserve the livelihood of the people that will protect communities because this is a very flagship project. This is something that we need to have be right. We need to learn from all of the mistakes that we have made. We need to not do another Caernarvon. We need to learn

0076

from that and make this the best thing for St. Bernard, the City of New Orleans and coastal Louisiana.

Thanks.

UNKNOWN:

I second the motion.

MR. GORDON:

My name is Ben Gordon. I'm from Pax Christi, the National Catholic Peace Organization. And I also work with advocates for Louisiana Public Health, but I support all of the work that's being done for coastal restoration. I have some reservations. I'm listing them to anyone who will listen tonight. I have several concerns; two of them I won't bring up because they've already been addressed.

The third concern was, as John Koeferl mentioned, he works with a Citizens Against Widening of the Industrial Canal, and one of the reasons that he didn't bring up tonight but was mentioned earlier, was that they were going to dredge the canal and there was a fear a lot of heavy metals and toxins that have been in the sediment for many years

0077

because of pollutants. That could also happen with Lake Borgne so I had reservations about when they're there dredging, you remember the dredging that occurred in Lake Pontchartrain, the shell dredging, and that was stopped. I can't remember the name of that company offhand. But, anyway, whenever I hear about dredging, it may be a necessary evil. I don't know. I don't know enough about it yet, but I just wanted to bring up whenever you do something like this, there's always consequences you have to look up and one of them is pollutants that have been in the sediments for years, particularly heavy metals and other things like that, that cause more problems than it's worth.

Thanks.

MS. RODI:

Okay. Barry Bernadas and then looks like Jorge Lopez.

MR. BERNADAS:

Hi. My name is Barry Bernadas. I'm a resident of Chalmette.

Mr. TuFaro actually touched on one of my

0078

suggestions. If you want to move sediment, you should pipe it, not run it through a canal.

And the second thing was Mr. DiFatta touched on and that was the use of the Industrial Canal to divert water and that way it could go through the ship channel and back through the MRGO. So that's two things that I was going to suggest.

My third thing is if you do have to build a channel, whether it's through Violet or through the Meraux land, will they be building a lock structure at the end of it in case there's a hurricane, another hurricane like Katrina, they could shut these locks and close that channel off. That is my question.

Thank you.
MS. RODI:
Thanks.
MR. LOPEZ:
Good evening. My name is Jorge Lopez. I'm a resident of Orleans Parish.
I'm concerned -- well, some time ago, a few months ago, actually, we saw when the

0079

oil was still going into the Gulf, saw some Louisiana scientists that had gone to Alaska, turned over some rocks and found oil because it was (inaudible). This was 20 years later they're finding oil. It's been six months, less than that, and I'm looking at 2.12.7, oil spill uncertainties, and the first thing it says is "The impact of Deep Water Horizon on coastal Louisiana are uncertain at this time."
Later on, it says, "If at any time petroleum, crude or oil is discovered on project land, all efforts will be taken to seek clean-up at the possible parties pursuant to Oil (inaudible). So does that mean if the Corps finds tar balls, they say "Oh, that's it. Let's go home. Call BP." This is a concern, because nobody has been talking about it. It seems like it's not in style anymore, but the oil millings and barrels are still out there. They broke down. Nobody -- it's all passé and nobody is even talking about it. But 20 years later there's still oil over there in Alaska. We are still in the first calendar

0080

year of this. There's not enough written in here to address that. Everywhere I look it's uncertain, uncertain, uncertain.
Thank you.
MS. RODI:
Thank you
Jimmy Delery, and then I'm going to try again, maybe it is Eric Boc from Arabi.

MR. DELERY:

Good evening. My name is Jim Delery. I'm part of an old family in St. Bernard, the Libida family, and we have substantial pieces of land in the St. Bernard and Violet area.

Now, I'm here today because I would like to thank the Corps. I would like to thank Greg Miller for presenting the project, but I believe the public needs more time, okay.

Now, I understand what's going on in Washington right now. This nation is in a financial crisis. I would like to ask that the Corps realize -- I will contact my two U.S. Senators -- please give us the time to work out more of these details. We need a little bit more time. I think most of us

0081

here in south Louisiana lost six months because of the BP oil spill. We need to focus on this, so what I would like to ask is let's preserve this project. We need to build our future, but the plan should include sustainability because we don't want something we can't afford to keep, okay. We don't want another Caernarvon. We don't want Davis pond where they built and we don't have the money the manage it, okay. Even the Violet Canal has only been cleaned out once since of Hurricane Katrina and that was because of hurricane debris. So we need to do something that is sustainable, but the most important thing is to balance this project with coastal restoration in sustaining what we have now. We cannot lose any more. But I also feel in fairness to the fishermen, nobody traps anymore that much, but fairness to the fishermen, the oyster guys, the shrimp guys and the rod and reel guys, we have got to look at this project. But in fairness to the people that live in St. Bernard and Orleans Parish, we need to consider this as part of our storm

0082

protection system as well. So we can't do one and not think about the other.

So anyway, thank you, and we'll work on our Congressmen.

MS. RODI:

Okay. I don't have any more cards.

Greg, do you want to make closing comments?

MR. MILLER:

I just want to thank everybody, once again, for coming out this evening and for those that have made effort to be here, Mr. Campo, Ms. Serpas have taken a lot of time out of your personal lives. We appreciate that. That is what this process is about. This is a draft plan. No decisions have been made. We've gotten -- I'm going to guess here, but we've probably had 300 or 400, maybe 500 people show up at the meetings. We've probably gotten over 10,000 comments on it.

I mentioned at the beginning that we've gotten some requests to extend the comment period by 30 days. We are looking at that. I hope to have that as a decision for you

0083

this week, but right now, in case that doesn't happen, I want to get your thoughts together and have them turned in to us. Right now the deadline is Valentine's Day. If we extend it, it will be around mid March so that's important.

A couple of folks noted they that want to continue to have the opportunity to meet and talk about this. And I'll tell you, on a personal level, that's a very big part of what the Corps of Engineers is about. We are in this as a collaborative effort. That is why we've had as many meetings about this as we have. I've been to over 200 neighborhoods, local government, civic organization meetings about it, and I'll

continue to do that until we come up with what is a vital plan. It's very important to us as a planning team and organization that you understand what Congress asked us to do, the proposals that have been made, why they were made, what they will do, how much they will cost, all of those things and then to provide us with your thoughts as you've done this evening. That's a very,

0084

very key part of it. It will not end at the end of this meeting or at the end of this month.

So, thanks again. Please drive safely on your way home, and we'll you at the next event that we have. Thank you.

(Meeting concludes at 8:21 p.m.)

0085

STATE OF LOUISIANA:

This verification is valid only for a transcript accompanied by my original signature and original blue seal on this page;

I, Elicia H. Woodworth, Certified Court Reporter in and for the State of Louisiana, as the officer before whom this testimony was taken, do hereby certify that

the witness, to whom oath was administered, after having been duly sworn by me upon authority of R.S. 37:2554 did testify as hereinbefore set forth in the foregoing pages;

That this testimony was reported by me in the stenotype reporting method, was prepared and transcribed by me or under my personal direction and supervision, and is a true and correct transcript to the best of my ability and understanding;

That I am not related to counsel or to the parties herein, nor am I otherwise interested in the outcome of this matter.

Baton Rouge, Louisiana, on this date _____.

_____

Elicia H. Woodworth, CCR
Certificate No. 27014

Appendix Y5

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

ER 10/1079
9043.1

February 14, 2011

Ms. Tammy Gilmore
US Army Corps of Engineers
Regional Planning and Environmental Division South
New Orleans Environmental Branch CERPDS-PDN-RS
P.O. Box 60267
New Orleans, Louisiana 70160-0267

Re: Comments and Recommendations on the Draft Environmental Impact Statement (DEIS) for the Mississippi River Gulf Outlet Ecosystem Restoration Study

Dear Ms. Gilmore:

The U.S Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Mississippi River-Gulf Outlet (MRGO) Ecosystem Restoration Plan. The MRGO Ecosystem Restoration Plan (Plan) is being developed as a supplement to the June 2008 MRGO Deep-Draft De-Authorization Report and is intended to fully meet the requirements of Section 7013 of the Water Resources Development Act (WRDA) of 2007. This feasibility study is anticipated to result in a Chief of Engineers' Report containing a recommended MRGO Ecosystem Restoration Plan, which has been conditionally authorized for construction by WRDA 2007. The Plan will address systematic ecosystem restoration and protection of the Lake Borgne ecosystem and areas affected by the former MRGO navigation channel, and will include consideration of measures to reduce or prevent damage from storm surge. The following comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The Tentatively Selected Plan (TSP) would restore approximately 10,431 acres of cypress swamp, 13,890 acres of fresh and intermediate marsh, 33,696 acres of brackish marsh, 466 acres of saline marsh, and 48 acres of ridge habitat. Features in the East Orleans Landbridge and South Lake Borgne subunits include marsh creation and nourishment and shoreline protection. The Terre Aux Boeuf subunits include marsh creation and nourishment. The Central Wetland features include a freshwater diversion at Violet, cypress swamp and marsh restoration and nourishment. Features in the Biloxi Marshes consist of restoring part of the existing subsided

ridge on the south bank of Bayou La Loutre, marsh creation and nourishment, and shoreline protection.

General Comments

The Feasibility Study (FS) report and DEIS provide an adequate description of fish and wildlife resources in the project area and project impacts on those resources. Marshes in the project area provide important habitat for several Federal trust species including wading birds, neotropical migrants, and resident and migratory waterfowl. The Department agrees that the MRGO Ecosystem Restoration Plan would help restore the Lake Borgne ecosystem and the areas affected by the MRGO navigation channel and will help habitat diversity by restoring and sustaining marsh, swamp, bottomland hardwood, and ridge habitats. Specific comments are provided in the following section.

Specific Comments on the Feasibility Study Report

Page S-24, S-25, and 4-7, Tables S-5, S-6 and 4-1 – The item labels in these tables are not reflective of common terminology used for the project. For instance there is not a barrier island component to the plan and the item "17 Beach Rep" would seem to indicate a beach component. In Louisiana, beach is predominately found on barrier islands or barrier headlands. The Department understanding is that the "17 Beach Rep" label is meant to represent marsh creation or nourishment. The Department recommends re-labeling the items to be more reflective of the project components.

Page 2-16, Section 2.2.4.2 Habitat Types – This section describes the habitat types of the project area. Ridge habitat is a component of the plan but is not mentioned in this section. The Department recommends including a description on ridge habitat.

Page 2-162, 2-163, and 2-164, Figures 2-35, 2-36, and 2-37 – These figures show the plan components for Alternative Plan B, C, and D, respectively. Each plan has a ridge restoration component that isn't represented on the figure. The Department recommends adding the ridge feature to the figures.

Chapters 2 Plan Formulation and Chapter 3 Tentative Recommendations – The report briefly discusses existing conditions and future without project conditions but does not include a discussion of future with project impacts. The Department recognizes that Table 2-28 lists impacts to significant resources for each alternative plan. However, the Department feels it would also be appropriate to include a summary of the future with project impacts in the text of the document.

Specific Comments on the Draft EIS

Page 2-29, Section 2.3.2.7 Barrier Island Restoration – This section describes the barrier island restoration feature that was proposed and states it was eliminated from implementation under this authority because of the "insufficient nexus to MRGO affects." However, recent studies (Lavoie, D, ed., 2009; Thomson et al., 2009) indicate there were long-term impacts to Breton

Island, a National Wildlife Refuge (NWR) of National importance, as a result of the MRGO channel. The Department believes restoration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the Tentatively Selected Plan for the MRGO Ecosystem Restoration Project.

Page 2-85, 2-86, and 2-87, Figures 2-85, 2-86, and 2-87 – These figures show the plan components for Alternative Plan B, C, and D, respectively. Each plan has a ridge restoration component that isn't represented on the figure. The Department recommends adding the ridge feature to the figures.

Page 2-101, Section 2.9.1.5 Shoreline Protection – This section describes the specific components of the shoreline protection features. The Department recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed with a 25 ft bottom width set to the pre-project water bottom elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points. Fish dips are not discussed and the Department recommends including this component in the description.

Page 2-128, Section 2.12.7, Oil Spill Uncertainties – This section describes the impacts of the Deepwater Horizon oil spill on coastal Louisiana as of August 2010. Since then more information has become available. The Department recommends updating this section to reflect more recent knowledge of the oil spill impacts to the project area.

Page 3-69, Section 3.14.3 Plant Community Types – This section describes the plant community types of the project area. Ridge habitat is a component of the plan but is not mentioned in this section. The Department recommends including a description of ridge plant communities.

Page 3-79, Section 3.15.1, Wildlife Resources – This section describes the historic and existing conditions of wildlife resources in the project area. The end of the third paragraph makes reference to a USFWS, 1997 document however; the reference is not listed in the literature cited section. The Department recommends including the reference in the literature cited section.

Page 3-79, Section 3.15.1, Wildlife Resources – The last paragraph on the page discusses brackish wetlands and the species associated with them. Some of these species are not typically found in brackish areas or use brackish marsh because they are on the periphery of their range. Also fresh and intermediate wetlands are not discussed. Many of the species discussed use fresh, intermediate and some brackish habitats. The Department recommends revising the discussion to include all relevant wetlands for these species.

Page 3-80, Section 3.15.1, Wildlife Resources – The first paragraph describes wildlife resource use in open water habitats. Some species, such as rails, do not predominantly use open water habitat. The Department suggests re-checking the species indicated to be associated with open water habitats.

Page 3-80, Section 3.15.1, Wildlife Resources – The third paragraph describes wildlife resource use on the Chandeleur barrier island chain. Some species, such as reddish egrets, great blue

herons, great egrets and peregrine falcon, do not use barrier island habitats. The Department suggests re-checking the species mentioned as being associated with barrier island habitats.

At the end of this paragraph there is reference to a USFWS, 2008 document however, the reference listed in the literature cited section is for black bear critical habitat. The Department suggests revising the literature cited.

Page 3-80, Section 3.15.1, Wildlife Resources – The fourth and fifth paragraphs supposedly describe the recent wildlife trends in the project area since 1985. The trends data is from 1985-1999, which do not reflect the past ten years or more. The Department suggests removing the word "recent" from this description.

Furthermore, the middle of the fourth paragraph and the first line of the fifth paragraph conflict with each other. One states that species numbers have been steady since 1985 and the other states that numbers have declined for many of the same species. The Department suggests revising this description to be more consistent.

Page 3-101, Section 3.19.1, Threatened and Endangered Species, Historic and Existing Conditions, West Indian Manatee and Gulf Sturgeon – This section describes the historic and existing conditions of the West Indian manatee and Gulf Sturgeon in the project area. The top of the page for manatee and the middle of the Gulf Sturgeon paragraph uses the reference USFWS, 2006 however, the reference is not listed in the literature cited section. The Department recommends including the reference in the literature cited section.

Page 3-102, Section 3.19.1, Threatened and Endangered Species, Historic and Existing Conditions, Pallid Sturgeon – This section describes the historic and existing conditions of the Pallid Sturgeon in the project area. The paragraph at the top of the page uses the reference USFWS, 2009 which references a piping plover website. It appears that USFWS, 2009b may be the more appropriate reference. The Department recommends checking and revising the reference.

Page 4-95, Section 4.20.1, Threatened and Endangered Species, Alternative A – No Action Plan – This section describes indirect impacts of Alternative A – No Action Plan on Threatened and Endangered Species in the project area. The last paragraph in this section discusses the Chandeleur and Breton Islands but references appendix J, which is the appendix for Navigation and Potential for Shoaling. The Department suggests updating the reference.

Page 4-97, Section 4.20.2, Threatened and Endangered Species, Alternative B – MRGO Restoration Plan, Direct Impacts – This section describes indirect impacts of Alternative B – MRGO Restoration Plan on the threatened Gulf sturgeon in the project area. The last sentence of the second to last paragraph states "Access from borrow sites to marsh restoration sites would not involve any dredging in critical habitat." Since all of Lake Borgne is designated critical habitat, the sentence should be revised to state "...would not involve dredging any primary constituent elements within critical habitat."

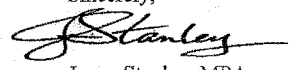
Page 4-101, Section 4.20.2, Threatened and Endangered Species, Alternative B – MRGO Restoration Plan, Indirect Impacts – This section describes indirect impacts of Alternative B – MRGO Restoration Plan on the pallid sturgeon in the project area. The end of the page states there is potential for entrainment of small sized sturgeon in the diversion but the extent of impacts to the sturgeon population from entrainment in the diversion structure is currently not quantifiable. It also states that the Corps concludes that there is a risk of entrainment and therefore the proposed MRGO ecosystem restoration project "May Affect" the species. The Department recommends including a statement indicating the Corps will analyze the project effects to determine whether or not to pursue formal or informal consultation. Should the project adversely affect the pallid sturgeon, formal consultation under the Endangered Species Act of 1973 (as amended) will be necessary.

Page 6-4, Section 6.7, USFWS Positions and Recommendations – This section lists the Department positions and recommendations for the proposed MRGO Restoration Plan. Typically when the Department provides our recommendations, wording and format remains as it was originally provided. Though the only changes that were made appear to be ones for consistency with the rest of the DEIS (using "USFWS" rather than "Service," adding "Department of Commerce – National Marine Fisheries Service (NMFS)" rather than "NMFS" alone, etc.), the Department would like this section to reflect our original document.

Page 6-5, Section 6.7, USFWS Positions and Recommendations – This section list the Department's positions and recommendations for the proposed MRGO Restoration Plan. The Department's first recommendation states that we believe the barrier island alternative warrants inclusion in the TSP. The Corps response is that given uncertainties of conditions at this time due to the Deepwater Horizon oil spill and recovery efforts, the Corps would seek additional authority for further study before recommending a viable restoration plan. This is in conflict with the reason for eliminating the barrier island component from the TSP provided in Section 2.3.2.7, which states it was eliminated because of the "insufficient nexus to MRGO affects." The Department would like to further encourage including a barrier island component in the TSP. We feel the design and evaluation was sufficient and this is the appropriate authorization, as the MRGO was shown to have had long-term impacts to Breton Island (Lavoie, D, ed., 2009; Thomson et al., 2009). In addition, preliminary results show that there were minimal impacts to Breton Island as a result of the oil spill (J. Harris, USFWS Southeast Louisiana Refuges, Personal Comm. Jan 24, 2011).

The Department supports the measures proposed for the MRGO Ecosystem Restoration Plan and encourages the inclusion of a barrier island alternative in the TSP to restore impacts to Breton Island. We appreciate the opportunity to provide comments this comments. If you have any questions regarding our comments, please contact Catherine Breaux at (504) 862-2689. I can be reached on (404) 331-4524 or via email at joyce_stanley@ios.doi.gov.

Sincerely,



Joyce Stanley, MPA
Regional Environmental Protection Assistant

for

Gregory Hogue
Regional Environmental Officer

cc: Jerry Ziewitz
Brenda Johnson
Dave Vela
Steve Spencer

Literature Cited

Lavoie, D., ed., 2009, Sand resources, regional geology, and coastal processes of the Chandeleur Islands coastal system—an evaluation f the Breton National Wildlife Refuge: U.S. Geological Survey Scientific Investigations Report 2009—5252, 180 p.

Thomson, G., Miner, M., Wycklendt, A., and Rees, M., 2009. MRGO Ecosystem Restoration Feasibility Study – Chandeleur and Breton Islands. Boca Raton, Florida: Coastal Planning & Engineering, Inc. 100p. (Report prepared for USACE under contract to URS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

318-473-7751
318-473-7626

January 28, 2011

Joan Exnicios
Chief, New Orleans Environmental Branch
Department of Army
P.O. Box 60267
New Orleans, Louisiana 70160-0267

RE: DEIS for MRGO

Joan Exnicios:

NRCS has reviewed the Draft Environmental Impact Statement for the Mississippi River Gulf Outlet Ecosystem Restoration Plan (DEIS MRGO Ecosystem).

NRCS concurs with the Tentatively Selected Plan (TSP) including the following restoration features: shoreline protection, artificial oyster reef, marsh nourishment, marsh restoration, marsh creation, cypress swamp restoration, ridge restoration, freshwater diversion and maintenance as needed to repair and maintain foreshore protection along the MRGO.

NRCS agrees that phased implementation over a 10 year period is necessary due to the extensive scale of the plan.

Please send all future correspondence to me at the address shown above.

Respectfully,

Kevin D. Norton
State Conservationist

ACTING FOR

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
(727) 824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

FEB 1 1 2011

Colonel Edward Fleming
District Engineer
New Orleans District, U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Col. Fleming:

NOAA's National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement (DEIS) for the Mississippi River-Gulf Outlet Ecosystem Restoration Study dated December 9, 2010. NMFS conducted its review in accordance with a "findings" with the Army Corps of Engineers, New Orleans District (NOD) pursuant to the regulations (50 CFR 600.920(f)(3)) that implement the essential fish habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). In accordance with these "findings," the consultation requirements pertaining to impacts of civil works projects on EFH are met through NMFS' review and comments on National Environmental Policy Act documents. As such, the transmittal of this DEIS constitutes initiation of the EFH consultation. Based on our review, NMFS finds the EFH sections of the DEIS satisfy the requirements of an EFH Assessment as defined at 50 CFR 600.920(e). In addition, NMFS is providing comments on this project under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).

The tentatively selected plan, Alternative C, includes the creation of 48 acres of ridge habitat in the Biloxi Marsh area, preservation of 10,431 acres of cypress swamp in the Central Wetlands, and protection of 45,471 acres of various marsh types in the Lower Pontchartrain sub-basin. The tentatively selected plan also includes a diversion of fresh water and nutrients from the Mississippi River through the Central Wetlands into Lake Borgne. That diversion would pulse 7,000 cubic feet per second in April and May, and 1,000 cubic feet per second the remainder of the year. The project also includes approximately 70 miles of shoreline protection, primarily in the Mississippi River-Gulf Outlet and Lake Borgne, using rock or artificial oyster reefs.

Much of the material for wetland restoration would be obtained by dredging more than 19,500 acres of Lake Borgne water bottoms to generate sufficient fill for the marsh creation effort. The existing water bottoms of Lake Borgne, which are six to eight feet in depth, may be dredged to as deep as 18 to 20 feet. In addition, the construction of the diversion canal would result in the

destruction of 245 acres of intermediate marsh, and the construction of the ridge would result in the conversion of 48 acres from marsh to upland habitat. The shoreline protection features would result in the additional excavation of more than 2,000 acres of flotation and access channels. Dredging activities would persist for at least ten years in the Lake Borgne ecosystem. Hydrologic changes caused by the Violet Diversion component would block tidal inflow into the Central Wetlands and reduce salinities to zero parts per thousand. In addition, the proposed swamp restoration would require the construction of 1,149 acres of retention dike, but there are no plans to degrade the dike upon project completion.

The enclosed comments (Enclosure 1) provide additional clarification or information needs concerning impacts to EFH and other resources. NMFS concurs with the Corps of Engineers' determination that project-related benefits should more than offset adverse impacts to EFH. However, to attain this net benefit, measures identified in the DEIS intended to avoid, minimize, and offset adverse effects must be implemented. These measures include, but are not limited to, use of best management practices during project construction and operation, and implementation of proposed monitoring and adaptive management actions as needed to measure project-related impacts and to provide a framework for decision-making.

Based on our review of the DEIS, NMFS provides the following

EFH Conservation Recommendations

1. To avoid and minimize impacts to EFH and associated marine fisheries resources, specific details and documents for each restoration feature of the Tentatively Selected Plan (TSP) shall be provided to NMFS for evaluation, discussion, review and comment during the preliminary engineering and design (PED) stage.

2. The borrow pits in Lake Borgne initially shall be limited to no deeper than 15 feet below the water surface (i.e., total water depth) unless monitoring and adaptive management, or modeling of the hydrology of the borrow pits, clearly indicate deeper pits would have little impact on water quality.

3. The Monitoring and Adaptive Management Plan (MAMP) shall be revised to include monitoring of benthic communities and dissolved oxygen (DO) levels within borrow areas in Lake Borgne. Water quality monitoring shall be conducted at least during April through October for a minimum of three years post-dredging to verify the relative success of the borrow pit design in avoiding impacts to water quality. Specific conductance, temperature, DO, and pH shall be sampled from the bottom to the surface in five-foot profiles. Samples shall be collected at least one time during April, September, and October. Samples shall be collected twice, about two weeks apart, during May, June, July, and August. Benthos should be sampled annually pre- and post-construction to evaluate changes in community structure. This information shall be used to adaptively manage borrow site design to minimize adverse impacts, if any.

4. The retention dikes constructed for marsh creation and nourishment areas shall be gapped and degraded within three years of use in a manner acceptable to NMFS.

5. Shoreline protection features in the TSP shall include 25-foot wide gaps down to pre-project depth elevations for fisheries ingress and egress every 1,000 linear feet, unless otherwise refined in coordination with NMFS during PED. Scour aprons may be incorporated so as not to decrease the pre-project water depth, or offset sections of rock in front of or behind foreshore rock dikes may be included to minimize erosion in the vicinity of gaps.

Consistent with Section 305(b)(4)(B) of the Magnuson-Stevens Act and the implementing regulation at 50 CFR 600.920(k), the NOD is required to provide a written response to these EFH conservation recommendations within 30 days of receipt. The NOD must include a description of measures to be required to avoid, mitigate or offset the adverse impacts of the proposed activity. If the NOD's response is inconsistent with these EFH conservation recommendations, the NOD must provide a substantive discussion justifying the reasons for not implementing those recommendations. If it is not possible to provide a substantive response within 30 days, the NOD should provide an interim response to NMFS, to be followed by the detailed response. The detailed response should be provided in a manner to ensure that it is received by NMFS at least ten days prior to the signing of the Record of Decision for the action.

Thank you for considering these comments. If you wish to discuss the project further, please contact Kimberly Clements at (225) 389-0508, extension 204.

Sincerely,

Miles M. Croom

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

Enclosures

cc (with Enclosure):
FWS, Lafayette, Walther
EPA, Dallas, Ettinger
LA DNR, Consistency, Ducote
LDWF, Finley
F/SER4, Dale
F/SER46, Swafford
F/SER, Keyes
NOAA PPI, Reid
Files

Enclosure 1

NOAA's National Marine Fisheries Service (NMFS) provides these comments on the Draft Environmental Impact Statement (DEIS) for the Mississippi River-Gulf Outlet (MRGO) Ecosystem Restoration Study in elaboration of the comments contained in the body of our letter.

General comments

NMFS supports ecosystem restoration including efforts to restore impacts that resulted from the construction of the MRGO Navigation Channel. NMFS recognizes that the formulation of alternatives was developed with the intent to maximize ecosystem benefits while minimizing environmental impacts. However, specific details for many project components are not included in the DEIS. NMFS stresses the need for the NOD to consult with NMFS on specific plans regarding the construction of all restoration features in the tentatively selected plan (TSP) that may impact estuarine and marine fisheries and associated EFH. Specific details and documents for each restoration feature footprint, including ridge, diversion canal, shoreline protection, dredging and disposal area location, initial and final target dredged material elevations, containment plans, and flotation and access channel routing should be provided during the preliminary engineering and design (PED) phase of construction to allow for NMFS review and comment. Adequate review periods should be allowed prior to issuance of solicitations for bids to accommodate any changes recommended by NMFS to avoid and minimize impacts to EFH and associated marine fishery resources.

NMFS recognizes that the proposed marsh creation and nourishment features in the TSP intend to restore 45,471 acres of marsh and protect 333,329 linear feet of shoreline in the study area. Restoration of that magnitude would also result in the construction of at least 6,515 acres of retention dikes across marsh and shallow water bottoms that are temporary structures which may eventually degrade to wetland elevations. However, the Wetland Value Assessment for the marsh model evaluated the passage of aquatic organisms to have access to these restored marshes within three years of project construction. NMFS recommends that all retention dikes be degraded or gapped, as described in our EFH Conservation Recommendations, within three years of construction to allow for tidal connectivity of the restored areas to the adjacent system. NMFS suggests this recommendation should be included in all sections that pertain to retention dike construction in the Final Environmental Impact Statement (FEIS). NMFS has provided reference in the specific comments below.

With the implementation of the TSP, active dredging in the Lake Borgne ecosystem would persist for at least ten years. NMFS is concerned that the prolonged disturbance in the lake has the potential to impact to EFH and associated marine fisheries resources within this portion of the project area, potentially to a greater extent than the ten years specified in the DEIS. Although the DEIS states there is a potential for direct impacts associated with the dredging activity over this period of time for some resources, NMFS recommends the NOD include a more thorough analysis of direct and indirect impacts in the "aquatic and fishery resources", "commercial fisheries", "water bottoms and benthic resources", "oyster resources", "EFH", and "recreational resources" sections of the FEIS.

Freshwater diversions are an important technique for habitat restoration, especially at the ecosystem level. The proposed location for the freshwater diversion would include the construction of a sediment trap, the use of the existing MRGO channel, and the delivery of sediment and water into the Lake Borgne ecosystem. All of the sources identified above would be potential sinks for the sediment introduced from the diversion. Further, the extent of shoreline protection in Lake Borgne, including the Biloxi marsh, would limit the introduction of fresh water, nutrients, and sediment into the targeted marsh areas. Therefore, it is reasonably foreseeable that these physical features would limit the benefits to marsh from a diversion, despite the intent to maximize those benefits and/or attempts to modify the salinity regime to promote fisheries production in the study area. Given the sediment trap in the outfall channel and impediments to sediment and freshwater introduction to project area marshes, NMFS is concerned that project-level benefits to creating or sustaining wetland habitats are likely overestimated. This concern should be addressed in the FEIS.

The MRGO Ecosystem Restoration Study area and alternatives analyzed are of a scale and scope that would result in ecosystem level impacts. As such, it is paramount that the rigor or level of the analysis and data used to inform the plan selection should be commensurate with the magnitude of the impacts. As such, NMFS appreciates the investment in both the statistical analysis of fisheries-independent data and the Comprehensive Aquatics Systems Model (CASM MRGO), both of which enabled more informed decision-making. In consideration of this and other information, NMFS is concerned with the local displacement of marine fisheries species, including benthic species, and the EFH associated with the Lake Borgne ecosystem. Although the CASM MRGO model has indicated that there will be no significant impacts to net productivity in the project area as a whole, results of the model have indicated localized displacement of white shrimp, brown shrimp, red drum, oysters and spotted sea trout. This displacement has potential commercial and recreational resource economic implications. While it is difficult to quantify the socioeconomic impacts associated with these potential displacements, NMFS stresses the need to identify, to the maximum extent practicable, these localized impacts on aquatic and fishery resources, commercial fisheries, EFH, and recreational resources in the FEIS.

Additionally, the description of environmental risks from low dissolved oxygen (DO) in the DEIS is inadequate, and the potential impact should be further analyzed and discussed in the FEIS. Development and pervasiveness of hypoxia associated with open water borrow pits is case- and estuary-specific. Lacking project specific analyses, literature is available to make broad inferences to assist in further characterizing the potential effects on water quality and develop measures to avoid or minimize those impacts. Our preliminary evaluation of literature indicates that of seven studies reviewed by NMFS, three indicated an occurrence of hypoxia in depths greater than 13 to 16 feet and an additional study indicating it occurred at or below 20 feet deep (Shurtz and St Pé 1984; Palm Beach County Department of Environmental Resources Management 1994; Cooper and Morse 1996; Flocks and Franze 2001). The reported hypoxia typically occurred during the warmest months of the year, specifically the late summer and early fall months. NMFS HCD staff in Baton Rouge is available to discuss these findings in detail, if needed.

The TSP proposes to borrow 157.2 million cubic yards of material that would require the

excavation of 19,537 acres of waters bottoms, mostly from Lake Borgne. If borrow pit design remains at 10 to 12 feet below existing bottom elevations, there is a potential for portions of Lake Borgne to reach anoxic and hypoxic conditions. Hypoxic conditions could be exacerbated by the creation of a fresh water layer on top of Lake Borgne from the Violet diversion component.

Furthermore, it should be noted that the University of New Orleans box model and therefore the CASM MRGO model did not include the potential impacts to EFH and associated marine fisheries resources as a result of the proposed borrow areas in its evaluation. Therefore, the DEIS did not discuss these potential long term impacts to water quality or the various fisheries that inhabit Lake Borgne. Due to the spatial extent of borrow needed for the TSP, this could be a significant impact. NMFS stresses the need to identify, to the maximum extent practicable, these potential impacts in the environmental consequences section of the FEIS for the following resources: "aquatic and fishery resources", "commercial fisheries", "oyster resources", "water bottoms and benthic resources", "EFH", and "recreational resources". The document should fully discuss the potential for hypoxia in the borrow pits and evaluate alternatives to mitigate such conditions, if their occurrence appears likely. NMFS recommends the maximum borrow pit depth be restricted to 15 feet below the water surface and be adaptively managed over the ten years worth of dredging required to implement the marsh creation in the TSP. Site-specific monitoring within the Lake Borgne ecosystem should be included in the final Monitoring and Adaptive Management Plan (MAMP), and that information should be used to revise borrow pit designs and depths, if warranted.

NMFS is concerned that the localized impacts associated with the restoration of the Central Wetlands Ecosystem have not been adequately discussed in the DEIS. The DEIS states there are no impediments to fishery access to the Central Wetlands. However, it also states in the environmental consequences discussion of the recreational resources section (Page 4-123) that node 75 (Central Wetlands) will observe reverse tidal flow impeding passage of blue crab into the area. Both maintenance and pulse flows may result in continuous or long term outgoing water movement through the existing water control structures at Bayou Bienvenue and Bayou Dupre. Such water flows would impede immigration of most young marine fishery species, not just blue crab, into the Central Wetlands. Smith (2008) reports swimming speeds of small teleost fishes may have burst speeds of 1.6 to 4.9 feet per second (fps) over very short periods, their normal maximum swimming speed would be much less. The maximum sustained swimming speed for blue crab megalopae is 0.4 fps with the burst speed of 0.7 fps (Luckenbach and Orth 1992). The maximum swimming speed for oyster larvae is approximately 0.01 fps (North et al. 2008). Because the migration of postlarval and juvenile forms of most estuarine-dependent marine fisheries species would not be possible due to flow velocities, the Central Wetlands frequently would be eliminated as nursery habitat for many species. Impacts to the access of most estuarine-dependent marine fisheries species into the Central Wetlands should be discussed and analyzed in the appropriate sections of the FEIS.

Furthermore, according to the DEIS, the 1,149 acres of retention dikes constructed for swamp restoration will not be degraded post construction and the salinity model predicts a complete freshening of the Central Wetlands unit. These hydrologic and water quality changes have the potential to convert EFH to an area no longer supportive of marine fisheries6 species. This

impact should be discussed and analyzed in the "aquatic and fishery resources", "commercial fisheries", "EFH", and "recreational resources" sections of the FEIS. NMFS recommends the TSP include plans to breach containment dikes, following sediment compaction and tree planting, to assist in tree survival and the health of the swamp vegetative community.

NMFS recognizes that the NOD quantifies environmental impacts and benefits with the implementation of all alternatives in multiple chapters of the DEIS. However, the acreages associated with both impacts and benefits are not consistent with the description of the TSP. NMFS recommends correct acreages for the impacted and benefited habitats be consistent in the FEIS. The habitats acreages should include impacts during construction of the freshwater diversion canal, ridge restoration, shoreline protection flotation and access channels, as well as for retention dikes for marsh creation and nourishment. Specific references identifying these inconsistencies are located in the specific comments below.

NMFS supports the recommendations specified in the U.S. Fish and Wildlife Service's Coordination Act Report for the MRGO Ecosystem Restoration Feasibility Study. NMFS recognizes the NOD response concurs with all the recommendations in the report. However, NMFS believes there are additional potential marine fisheries and EFH impacts with the proposed freshwater diversion and potential marine fisheries and EFH impacts with the spatial and temporal extent of borrow sites in Lake Borgne. In this regard, NMFS stresses the importance of compliance with recommendations number 3, 4, 6, 7, 16, and 17 in the Fish and Wildlife Coordination Act Report to the NOD. Those recommendations are provided in section 6.8 of the DEIS as well as in Enclosure 2 of this letter.

Specific comments pertaining to multiple sections of the DEIS

Potential Water Quality Impacts to Fisheries

Chapter 4.14-18, 24 AQUATIC AND FISHERY RESOURCES, COMMERICAL FISHERIES, OYSTER RESOURCES, WATER BOTTOMS AND BENTHIC RESOURCES, ESSENTIAL FISH HABITAT, and RECREATIONAL RESOURCES
Pages 4-64 through 4-91 and Pages 4-122 through 4-126
Sections titled "Direct Impacts" and "Indirect Impacts"

NMFS recommends the FEIS include the following information under the direct impacts and indirect impacts analyses for each of the resource sections identified above for all action alternatives:

Low DO levels could be a potential impact during construction activities in Lake Borgne and continue to persist after construction. In addition, there is a concern that the diversion could exacerbate low DO conditions in Lake Borgne due to the high level of nutrients causing algal blooms. The potential for this impact should be monitored to a greater extent than is indicated in the DEIS or Supporting Documentation and addressed with adaptive management, if needed. These impacts should be identified in the FEIS as direct and/or indirect impacts to these resources.

The diversion should be operated to avoid and minimize adverse impacts to aquatic and fishery resources in the project area to the maximum extent practicable. Revisions to the CASM MRGO report that were not included in the DEIS should be updated in each of these sections for inclusion of the FEIS. Localized impacts should be identified by node in the direct impacts of each of these resources, even if there is a regional gain in net productivity for the project area as a whole.

Potential Hydrologic Impacts to Fisheries

Chapter 4.14-15, 24 AQUATIC AND FISHERY RESOURCES, COMMERICAL FISHERIES, and RECREATIONAL RESOURCES,
Pages 4-64 through 4-71, and pages 4-122 through 4-126
Sections titled "Direct Impacts"

NMFS recommends the FEIS include the following information under the direct impacts for each of the resource sections identified above for Alternatives B, C, and D:

The restoration of the Central Wetlands area involves an alteration of the existing hydrologic conditions that may result in: a) reverse tidal flow at the water control structures at Bayou Bienvenue and Bayou Dupre; and b) the construction of 1,149 acres of retention dikes for swamp creation and nourishment. These impacts likely would result in the loss or reduction in marine fishery productivity in the Central Wetlands area, and the potential conversion of EFH to an area no longer supportive of federally managed marine fishery species.

Gapping and Degrading Retention Dikes

Chapter 2.9 IDENTIFICATION OF THE TENTATIVELY SELECTED PLAN
2.9.1 1 Marsh Restoration
Page 2-98

Chapter 4.12 COASTAL RESTORATION RESOURCES
4.12.2 Alternative B – MRGO Restoration Plan 2
Page 4-54

Chapter 4.12 COASTAL RESTORATION RESOURCES
4.12.3 Alternative C-MRGO Restoration Plan 7
Page 4-56

The DEIS indicates that earthen dikes and closures would be breached or degraded if necessary; however, no time frame for such actions is provided. The above sections of the FEIS should indicate that these features would be breached or degraded within three years of construction, if necessary.

Inconsistency among Environmental Impacts with TSP

Chapter 4.3 HYDROLOGY AND HYDRAULICS

4.3.2 Alternative B – MRGO Restoration Plan 2
Page 4-13
Section titled "Indirect Impacts"

Chapter 4.5 NAVIGABLE WATERWAYS
4.5.2 Alternative B – MRGO Restoration Plan 2
Page 4-30
Section titled "Direct Impacts"

The extent of impact of the retention dike to be constructed under the TSP is not consistent among all sections in the document (ranging from 6,515, 8,871, and 10,020 acres). NMFS recommends the NOD verify the correct acreages are provided in the appropriate sections of the FEIS.

Specific Comments Pertaining to Individual Sections of the DEIS

EXECUTIVE SUMMARY

Table S-1: Evaluation of Potential Impacts to Significant Resource by Alternatives

Page ES-8 WATER QUALITY

This section of the table suggests that project implementation has the potential to increase DO levels in the area. Considering concerns regarding DO levels in the borrow areas described above, NMFS recommends this section be revised to indicate that DO levels in borrow areas could be reduced, especially during warmer months, and that adaptive management efforts would be undertaken to limit the geographic extent of such impacts.

Page ES-9 COASTAL VEGETATION RESOURCES

NMFS recognizes that Alternatives B, C and D would reduce the rate of loss of coastal vegetation in the project area. However, given the extent of the project area (3.86 million acres), the system as a whole will continue to encounter coastal vegetative losses that should be quantified in the description of the action alternatives in this table. Lacking such information, readers may believe that project implementation would result in a net gain over the wetland acreage present today, and that additional restoration efforts may not be warranted.

Page ES-10 AQUATIC AND FISHERY RESOURCES, COMMERCIAL FISHERIES

While NMFS agrees that project implementation may not result in adverse impacts to marine fishery resources over the entire 3.86 million acre project area, CASM MRGO model results suggest there would be localized impacts to some species in some areas. This table should be revised to indicate the potential for localized reductions in marine fishery species in areas closest to the Violet diversion, as well as the potential for increased production in areas further from the diversion.

Page ES-11 ESSENTIAL FISH HABITAT

While NMFS agrees that project implementation would create and protect vegetated habitats that are very productive categories of EFH, it should be recognized in this section that it is likely that the creation of the cypress swamp in the Central Wetlands, combined with reverse tidal flows through the Bayou Dupree and Bayou Bienvenue floodgates, could convert EFH in the Central Wetlands to an area that is no longer supportive of federally managed marine fishery species.

Chapter 1 INTRODUCTION
1.3 STUDY AREA
Pages 1-6

NMFS recommends the FEIS include a map, with each node clearly labeled, to illustrate the revised study area as described in this section, including the spatial limits of analysis and results. The map should include the designated numbers labeled for each node to observe more closely as they are referenced during future sections of the FEIS.

2.9 IDENTIFICATION OF THE TENTATIVELY SELECTED PLAN
2.9.1.3 *Swamp Restoration*
Page 2-99, paragraph 5

This section of the DEIS indicates that dikes would be constructed to an elevation of +6.5 ft. Dikes at this elevation would impede drainage from the swamp area, potentially leading to wetland degradation. NMFS recommends the TSP include plans to breach containment dikes, following sediment compaction and tree planting, to assist in tree survival and the health of the swamp vegetative community.

2.9.1.5 *Shoreline Protection*

Page 2-101, paragraph 1.

NMFS recommends the following be included in this paragraph: "The shoreline protection will include 25-foot wide fish ingress and egress gaps, which will be open to pre-project construction bottom elevations, every 1,000 linear feet." The fish gap designs can be further refined through coordination with NMFS during the PED phase of the project.

2.11 ENVIRONMENTAL COMMITMENTS
Page 2-119

The third paragraph in this section quantifies environmental impacts and benefits with the implementation of the TSP. However the acreages associated with both impacts and benefits are not consistent with the description of the TSP throughout the entire DEIS. For example, the DIES in this sections states that there will be 277 acres of intermediate marsh, 363 acres of shallow open water and five acres of bottomland hardwoods impacted with the construction of the diversion canal. In previous sections of the document, it states 245 acres of impact to wetlands. It also states that there will be 32 acres of ridge restoration, where in previous

sections it states 48 of acres ridge restoration. In addition, not all impacts and benefits associated with implementation of the TSP were identified in this section. As previously recommended in the general comments of our letter, NMFS recommends the NOD verify correct acreages are provided and identify all adverse and beneficial impacts to habitats for consistency in the FEIS.

Chapter 4 ENVIRONMENTAL CONSEQUENCES
4.2 ENVIRONMENTAL CONSEQUENCES SUMMARY TABLE

Table 4-1, pages 4-3 through 4-9.

This is the same table as presented in the executive summary (Table S-1). NMFS recommends the same revisions to Table 4-1 as recommended above for Table S-1.

4.4 WATER QUALITY
4.4.2 Alternative B – MRGO Restoration Plan 2

Direct Impacts
Borrow Sites

Page 4-19, paragraph 1.

This paragraph should be revised to indicate that DO impacts could occur throughout the ten years of dredging activity and could continue long term post construction. As previously referenced in Sections 3.7.2.2 and 3.7.2.5, there are low DO areas in the southeastern portion of Lake Pontchartrain due to water depths of borrow pits being greater than 15 feet below the water surface (i.e., total water depth) and salinity stratification.

If borrow pit design remains at 10 to 12 feet below existing bottom elevations, the potential for Lake Borgne to reach anoxic and hypoxic conditions could result. Due to the spatial and temporal extent of borrow needed for the TSP, this could potentially be a significant adverse impact that should be monitored or scientifically researched to a greater extent than is indicated in the DEIS or Supporting Documentation. To avoid the potential for this impact, the depth of cut could be revised with adaptive management to a depth where hypoxia does not occur. This is of particular concern with the anticipation of a freshwater layer from the Violet Diversion in the shallow water depths of Lake Borgne that may cause salinity stratification. This section of the FEIS should commit to allowing borrow pits to be no deeper than 15 feet below the water surface. The dredging program should be adaptively managed to minimize adverse impacts on DO levels and water quality in the borrow pits should be monitored during the ten year construction period to allow for design changes if needed.

Violet Freshwater Diversion Channel

Page 4-21

The high level of nutrients in water diverted from the Mississippi River could lead to algal blooms in Lake Borgne which could contribute to low DO conditions. In addition, the fresh

water from the diversion could help stratify water levels in Lake Borgne, also contributing to low DO conditions. The FEIS should discuss this potential impact.

Placement and Construction Sites

Page 4-24, paragraph 4

The duration of construction impacts due to dredging in Lake Borgne will persist over a period of ten years. NMFS recommends that the last sentence of this paragraph in this section be revised to indicate the ten year duration of construction.

Appendix T: Monitoring and Adaptive Management Plan (MAMP)

Page 9

The MAMP identifies four questions that, when answered appropriately, suggest proposed actions being taken which could benefit from adaptive management. As it pertains to the questions shown on Page 9: 1) the dredging of borrow pits is not well understood in their long term impacts on benthos and water quality; 2) the most effective design of the pits is not easily identifiable; and 3) the measures of how those options would perform are not well understood. Since management actions can be revised by changing the depth of the borrow pits or the configuration, and because the dredging of borrow pits is expected to proceed in a piecemeal fashion over a period of approximately ten years, NMFS believes that borrow pit dredging qualifies for adaptive management. As such, NMFS recommends the MAMP be revised to include a plan for monitoring benthic community structure and water quality until a depth and design that limits adverse impacts can be identified and used for future borrow pit dredging efforts.

Objective 1

Page 12, Monitoring Design

This section indicates that a nutrient sampling plan would be developed, if needed, in coordination with the Louisiana Department of Environmental Quality. Given the potential for high freshwater flow rates to cause eutrophication in Lake Borgne, NMFS believes a nutrient sampling plan is necessary. Because high nutrient levels could result in phytoplankton blooms, which could eventually impair DO, NMFS believes Objective 1 of the MAMP should be revised to include monitoring of nutrient levels, phytoplankton populations and DO in Lake Borgne. Such monitoring should be undertaken at least during the spring, summer, and fall months for a sufficiently long period of time to determine the potential for adverse impacts and identify measures to limit such impacts.

Objective 2.

Page 13. Monitoring Design

Given sediment loads in the Mississippi River, it is not clear whether diverting river water through the Central Wetlands and into Lake Borgne would provide sufficient sediment to create and maintain swamp and marsh elevations in those areas. NMFS recommends the monitoring design be revised to include the establishment of sediment erosion tables or some other measure of accretion, at a number of sites in the Central Wetlands and marsh habitats on the southwestern perimeter of Lake Borgne. Those accretion stations should be established for several years prior to construction and sampled at least annually until pre-construction and post-construction patterns of accretion have been established.

In addition, there is some concern over the impacts of high nutrient levels in Mississippi River waters impacting shear strength of marsh soils, potentially leaving them more vulnerable to storm generated erosion. NMFS recommends this objective be revised to include pre- and post-construction monitoring of marsh soil shear strength at a number of sites in the Central Wetlands.

Section 1502.9(c)(1.)(ii) of the Regulations for Implementing Provisions of the National Environmental Policy Act specifies that agencies shall prepare supplements to either draft or final environmental impact statements if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. In the paragraph 3 of "Direct Impacts" on page 4-74 in the DEIS, the NOD states that: "access channels, shoreline protection, borrow sites and wetland creation/nourishment sites would be designed to avoid oyster leases and nearby Louisiana Oyster Seed Grounds." NMFS recommends that should any of these design features change resulting in impacts to identified oyster resources, the NOD should prepare a supplemental National Environmental Policy Act document. The commitment to perform environmental monitoring and undertake adaptive management as needed to protect and restore EFH and federally managed fishery resources is essential to the determination that adverse impacts to EFH will be sufficiently averted and offset. As such, any future action that would curtail environmental monitoring and adaptive management of the project would also necessitate preparation of supplemental National Environmental Policy Act documentation.

Literature Cited

Cooper, D.C. and J.W. Morse. 1996. The chemistry of Offatts Bayou, Texas: a seasonally highly sulfidic basin. Estuaries 19(3):595-611.

Flocks, J. and C. Franze. 2001. Dredge pit characterization, *in* S. Penland, A. Beall and J Waters, (eds.), Environmental Atlas of the Lake Pontchartrain Basin. Lake Pontchartrain Basin Foundation, New Orleans, LA, p. 153.

Luckenbach, M.W. and R.J. Orth. 1992. Swimming velocities and behavior of blue crab (Callinectes sapidus Rathbun) megalopae in still and flowing water. Estuaries 15(2):186-192.

M.H. Shurtz and K.M. St. Pé. 1984. Report on interim findings: water quality investigation of environmental conditions in Lake Pontchartrain. Louisiana Department of Environmental Quality Water Pollution Control Division. 85 pp.

North, E.W., Z. Schlag, R.R. Hood, M. Li, L. Zhong, T. Gross, V.S. Kennedy. 2008. Vertical swimming behavior influences in a coupled particle-tracking and hydrodynamic model of Chesapeake Bay. Marine Ecology Progress Series 359:99-115.

Palm Beach County Department of Environmental Resources Management. 1994. The dredged site survey, benthic macro invertebrate samples. pp 246-260.

Smith, D.L. 2008. Reconnaissance study of fish passage impacts resulting from structures in the MRGO, IHNC and GIWW – Letter report. ERDC/EL TR-08-X, May 2008. 25 pp.

Enclosure 2

U.S. Fish and Wildlife Service's Fish and Wildlife Conservation Recommendations for the Mississippi River-Gulf Outlet Ecosystem Restoration project.

1. The Service recommends, with support from NMFS and LDWF, the selection of a barrier island component of the MRGO Ecosystem Restoration Plan be a part of the TSP. The Service feels the design and evaluation of the barrier island alternatives was sufficient to warrant selection, though further engineering would be required prior to construction. Breton Island is a National Wildlife Refuge (NWR), managed by the Service and is of National importance. Until recently (Lavoie, D, ed., 2009; Thomson et al., 2009) the Service was unaware of the long-term impacts to this important refuge as a result of the MRGO channel. However, the Service believes restoration of the areal loss of Breton Island due to the construction and maintenance of the MRGO channel should be appropriately addressed in the TSP .

2. The Corps should contact the Service regarding a compatibility determination, Wilderness Act provisions and special use permits that may be necessary to conduct activities on Breton Island NWR. The Corps should establish and continue coordination with the Service until construction of any project feature is complete and prior to any subsequent maintenance. Points of contacts for the Service are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Breton Island NWR.

3. The Service recommends the operational plans for the Violet Diversion be evaluated to include more flexibility of flow (flows between 1000cfs and 7000cfs) to achieve optimal habitat conditions favorable to nearby intermediate marsh and to bald cypress germination, growth, and reproduction by controlling depth and duration of inundation and salinity levels. As the operational plan for the Violet Diversion is further developed, future hydrological and fisheries (i.e., CASM) modeling, and updated habitat assessments (i.e., Wetland Value Assessments) should be conducted.

4. The Service recommends, with support from LDWF, the diversion operational plan be developed in a way to avoid or minimize adverse impacts to marine fisheries and Essential Fish Habitat (EFH) while maximizing freshwater and nutrient input to the extent practicable to meet habitat objectives.

5. The Service recommends the diversion be adaptively managed to enhance surrounding wetlands, that habitat switching (as a result of re-introduced river water) is allowed to occur in a manner that is not detrimental or destructive to the ecological processes, and that the diversion allows for draw down periods sufficient for cypress regeneration and cypress growth.

6. The Service recommends, with support from LDWF, a comprehensive examination of the river and all existing and proposed diversions to coordinate their operation and ensure that their operation will maximize their restoration capabilities. The ongoing Mississippi

River Hydrodynamic and Delta Management Study should be utilized to address this issue. The Service and other natural resource agencies should be involved in this study.

7. The Service recommends, with support from LDWF, establishment of a committee similar to the Caernarvon Interagency Advisory Committee or Davis Pond Advisory Committee to review the operation and the monitoring and adaptive management results of the Violet diversion and when necessary, provide recommendations regarding any future operational and maintenance changes. The Service and other natural resource agencies should be on this committee.

8. The Service recommends that all shoreline protection features include one fish dip every 1,000 feet (ft) constructed to a 25 ft bottom width to the pre-project elevation. On a case by case basis the 1,000 ft distance can be adjusted, in consultation with National Marie Fisheries Service (NMFS), to incorporate existing exchange points.

9. The Monitoring and Adaptive Management Plan, as it is further developed, should be provided to the Service, NMFS, and Louisiana Department of Wildlife and Fisheries (LDWF) for continued review, comment, and input.

10. If a proposed project feature is changed significantly or is not implemented within one year of the Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with the Service and NMFS to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

11. Avoid adverse impacts to nesting bald eagles, gulls, terns, and/or black skimmers, wading birds, and brown pelicans through the careful design of project features and timing of construction. A qualified biologist should inspect the proposed work area for the presence of undocumented nesting colonies and bald eagles during the nesting season (i.e., September 15 through March 31 for brown pelican, September 1 through February 15 for wading bird nesting colonies, September 16 through April 1 for colonies containing nesting gulls, terns, and/or black skimmers, and October through mid-May for bald eagles).
    - To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).
    - For colonies containing nesting brown pelicans, all activity occurring within 2,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 15 through March 31). Nesting periods vary considerably among Louisiana's brown pelican colonies, however, so it is possible that this activity window could be altered based upon the dynamics of the individual colony.
    - For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, exact dates may vary within this

window depending on species present).

- If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.

12. Land clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

13. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service and other State and Federal natural resource agencies, and shall be provided an opportunity to review and submit recommendations on all work addressed in those reports.

14. A report documenting the status of implementation, maintenance, and adaptive management measures should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, U.S. Environmental Protection Agency (EPA), Louisiana Department of Natural Resources (LDNR), Office of Coastal Protection and Restoration (OCPR), and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

15. The Service recommends minimizing impacts to marsh from marsh buggy activities. One way is to limit repetitive use of the same marsh buggy route to prevent ruts and lasting damage while at the same time reducing the amount of marsh buggy tracts as much as possible. Another option is to build temporary boardwalks over marsh where feasible and then backfilling the boardwalk area if needed. In areas with large marsh creation features that have minimal access routes, such as the inner Terre Aux Boeufs marsh features, the Service recommends that work begin at the farthest location and proceed to the outer edges of the site to minimize the amount of damage.

16. The large quantity of borrow material proposed to be taken from Lake Borgne for the TSP may have an adverse effect to fisheries, EFH, and the threatened Gulf sturgeon by: 1) alteration in water bottom substrate habitat: 2) direct removal of benthos from a large area which may (at least temporarily) reduces food availability for fishery organisms; 3) other sessile resources, such as oysters could be affected; and 4) by continually moving the dredge, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service recommends, with support from LDWF, careful consideration be given to the affects of taking all borrow from Lake Borgne and consideration should be give to obtaining borrow from other "outside" sources, such as the Mississippi River, and adjacent bays, and offshore areas.

17. The proposed borrow areas in Lake Borgne do include private leases as well as public oyster seed grounds. LDWF manages the public seed grounds and should be consulted before final borrow locations are determined. LDWF also recommends that all borrow sites be less than 10 feet below the existing sediment surface and 1000 feet from the shoreline.

18. The aquatic modeling, Comprehensive Aquatic Systems Model (CASM) used to help evaluate the impacts of the freshwater diversion on representative fish species as well as the potential impacts from low dissolved oxygen levels on fisheries resources in Lake Borgne was developed and had produced initial results. The Service, LDWF, and NMFS support the CASM modeling effort and agree the trends may provide reasonable results. However, because the model results represent the first draft and have since been provided corrected assumptions and interactions to better represent Louisiana waters, a final model run is necessary to obtain more accurate results relative to Louisiana. The assumptions were corrected in consultation with NMFS and LDWF. Because of funding constraints the CASM modeling efforts were halted. The Service recommends completion of the CASM model to achieve more accurate results that will be used to fully address impacts to aquatic resources.

19. In addition the Service recommends the CASM model should be updated to incorporate conditions from the oil spill in the adaptive management plan. This model should also use the corrected assumptions.

20. Due to the significant acreage of marsh that will be accessed for swamp and marsh creation/nourishment, the Service request the Corps quantify the estimated flotation access and construction access impacts to shallow open water habitat.

Bobby Jindal
Governor

State of Louisiana

Robert J. Barham
Secretary

Department of Wildlife and Fisheries
Office of Fisheries

March 9, 2011

Attn: Joan M. Exnicios
Planning, Programs, and Project Management Division
Environmental Planning and Compliance Branch
United States Army Corps of Engineers
P. O. Box 60267
New Orleans, LA 70160-0267

RE: *Application Number: Draft EIS, Mississippi River Gulf Outlet*
Applicant: U.S. Army Corps of Engineers-New Orleans Division
Notice Date: December 17, 2010

Dear Ms. Exnicios:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF) has reviewed the above referenced Public Notice. Based upon this review, The LDWF Office of Fisheries has the following comments:

Borrow Sites:
We understand the economic and logistical constraints on borrow sites due to the amount of marsh creation, Given the sediment starved status of the Lake Borgne system, the USACE should fully investigate all possible outside source alternatives that may become economically feasible with new advances in technology over the life of the project.

We understand the geographic and logistical constraints placed on borrow sites but would like to restrict borrow to not more than 15 feet below the existing mudline. We also request that dissolved oxygen monitoring be performed in these borrow pits due to the geographic extent and that fresh nutrient rich water will be entering the area via the diversion which could cause stratification and could result in hypoxia.

We would also like a buffer of at least 500ft to be placed around existing hard bottom and oyster leases to offset impacts and to allow oysters resources to supply oyster spat and provide ecological services for the rest of the system. Some of the borrow areas in borrow area 2 and 4 can be shifted into the open areas to provide that needed buffer.

We are concerned that extensive dredging and subsequent deepening of Lake Borgne that may increase wave height. We suggest shifting some of the borrow sites further from shore and into existing deeper water. Borrow areas 2 and area 4 can be shifted to deeper waters further from shore.

Most of the borrow sites are on the primary Public Oyster Seed Grounds which are managed by LDWF. All of these sites are subject to LDWF permit restrictions on any dredge work performed there. Please contact Christy McDonough at (225)765-2386 for additional information.

Oyster reefs:
Created oyster reefs proposed in this project are currently located on the Public Seed Grounds; LDWF supports creation of these structures in the Seed Grounds provided they are placed appropriately. Please coordinate with Patrick Banks-LDWF Oyster Program Manager(225)765-2370 for placement of reef material on the seed grounds.

Diversion:
Adaptive management of the diversion is discussed in the DEIS. However it does not state the location of the salinity meters used to determine if the salinity targets are reached. In addition, will flow be stopped or dropped to the maintenance flow once this salinity target it reached.

Shoreline protection features:
All shoreline protection features shall include fish dips to allow marsh access. Please consult with LWDF and resource agencies during the coastal use permit process.
LDWF prefers more natural shoreline protection including shell material. Large surface areas materials provide more habitat than vertical walls. Use of sheet piles should be restricted to those places where no other material will work.

CASM
LDWF Office of Fisheries is in support of ecosystem modeling as a tool to provide a more quantitative and science-based assessment of large public works projects. LDWF Fisheries staff spent much time and effort improving the CASM trophic model for this project and it's unfortunate that the finished CASM output was not included in the DEIS for public review. LDWF requests that the existing finished CASM product be released for public review and comment to fully inform the public on possible impacts from the MRGO Restoration including the impacts from the diversion. If the final product is released only in the Final EIS we request that the model be released for public review and comment separately.

The report identifies issues such as with Gulf sturgeon biomass being too large or biomass represented in the CASM model not being an accurate representation of the ecosystems biomass. These models are intended to be used to compare Future Without Project(FWOP) and Future With Project(FWP). Therefore, relative changes in biomass should be looked at rather than actual values of biomass. This also explains the apparent incorrect values of biomass in various nodes. The same constraint exists with prey species. The modeled prey bear all of the predation pressure so the prey biomass is not a realistic value, so only comparisons between FWOP and FWP are valid.

Deepwater Horizon Oil Spill
The oil spill section needs to updated. The section on oyster closures did not reflect the current closed water bottoms or the reason for closure.

Errors
As pointed out by our staff in an earlier document, the correct species name for Gulf stone crab is *Menippe adina*.

The Louisiana Department of Wildlife and Fisheries appreciates the opportunity to review and provide recommendations to you regarding this proposed activity. Please do not hesitate to contact Fishery Habitat Section biologist Robert Bourgeois at 225-765-0765 should you need further assistance.

Sincerely,

Randall B. Pausina
Assistant Secretary-Office of Fisheries

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

February 14, 2011

Colonel Edward R. Fleming
District Commander
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Fleming:

In accordance with the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, Environmental Protection Agency (EPA) Region 6 has reviewed the Corps of Engineers (Corps) December 2010 Draft Environmental Impact Statements (DEIS) for the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan. EPA offers the following comments and recommendations regarding this DEIS to help the Corps develop and implement the most effective restoration strategy for coastal areas adversely impacted by the MRGO.

EPA strongly supports restoration of areas adversely affected by the MRGO. EPA commend the Corps for its diligent work in assembling a restoration plan which matches in scope the magnitude of the challenges facing this part of the Louisiana coast. The plan focuses primarily on addressing the adverse environmental effects of MRGO (e.g., wetland loss) and, to some extent, the broader underlying causes of wetland loss in coastal Louisiana (e.g., disruption of deltaic processes). The plan addresses critical coastal areas such as the Biloxi Marsh complex, which provides important ecological functions. The plan also addresses potential restoration sites of high community importance, such as the Central Wetlands and Bayou Bienvenue Triangle. High priority aspects of this plan should be implemented as quickly as possible.

Given the scope, schedule, and cost of the proposed MRGO restoration effort, there will be ample opportunity to reevaluate aspects of this plan during a multi-year implementation process. The Corps should continue to closely examine the tradeoffs and potential environmental effects of the proposed large-scale mining of internal borrow sources for marsh creation, as well as the extensive use of rock shoreline protection. While EPA could support targeted near-term application of MRGO restoration activities in high priority locations, EPA is not convinced that full implementation of these two types of measures would be the most

effective and ecologically sound use of restoration funds. EPA would recommend the Corps consider substantially expanding its proposed adaptive management process to include rigorous review of these and other matters based on data gathered from implementation of initial phases of this work, as well as the most current restoration science. Such considerations should not necessarily delay completion of the subject EIS and implementation of high-priority components of the MRGO Ecosystem Restoration Plan.

EPA rates the subject DEIS as ***"EC-2"***, i.e., EPA has environmental concerns and requests additional information in the Final EIS (FEIS). Areas requiring additional consideration include adaptive management; review of internal sediment mining and rock shoreline erosion control; water quality monitoring; and avoidance of impacts to existing wetlands. Detailed comments are enclosed with this letter which more clearly identify our concerns and the informational needs requested for incorporation into the FEIS.

Finally, please note that schedule constraints have affected EPA's ability to fully engage in the interagency development and review of this proposed restoration project. EPA greatly respects the views of our state and Federal partner agencies with responsibilities and expertise pertaining to fish and wildlife impacts. EPA would encourage the Corps to fully address the recommendations of the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Louisiana Department of Wildlife and Fisheries on any additional information and analysis needed for resources within their purview.

If you have any questions about the 309 Review Process, please contact Michael Jansky, of my staff, at (214) 665-7451 or by e-mail at jansky.michael@epa.gov. If you wish to discuss technical aspects of our comments, please contact John Ettinger at (504) 862-1119 or by e-mail at ettinger.john@epa.gov.

Sincerely yours,

Rhonda M. Smith, Chief
Office of Planning and
Coordination

Enclosure

cc: USFWS, Lafayette, LA
NMFS, Baton Rouge, LA
OCPR, Baton Rouge, LA

DETAILED COMMENTS
ON THE
U.S. ARMY CORPS OF ENGINEERS
MISSISSIPPI RIVER GULF OUTLET ECOSYSTEM RESTORATION PLAN
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

Air Quality

Any demolition, construction, rehabilitation, repair, dredging, or filling activities have the potential to emit air pollutants and EPA recommends best management practices be implemented to minimize the impact of any air pollutants. Furthermore, construction and waste disposal activities should be conducted in accordance with applicable local, state and Federal statutes and regulations.

Large-Scale Internal Sediment Mining

EPA continues to question the proposal to extensively mine sediments within Lake Borgne for the purpose of marsh creation. EPA understands such "internal" sediment sources are substantially less expensive and involve fewer logistical challenges than taking material from the Mississippi River or other "external" sources. However, internal sediment mining does not address the underlying, systemic sediment deficit caused by disruption of deltaic processes. While EPA understands the benefits of strategic use of internal sediment sources, EPA questions whether it is appropriate when conducted at the scale proposed in this plan. From a policy perspective, there is an argument for focusing restoration funds on those measures which could help address the underlying causes of wetlands loss in coastal Louisiana.

Additionally, there remains uncertainty with respect to the potential adverse impacts of extensive dredging of interior open water areas. EPA appreciates the Corps' efforts to design the borrow pits in a way that might minimize potential reductions in dissolved oxygen. Nevertheless, the extent to which this strategy will in fact minimize such water quality concerns is untested at this scale. Given the size of the area that would be affected, the Corps is encouraged to include measures in this project to monitor the water quality effects of the proposed borrow areas. The information gathered from such monitoring should be used as part of an ongoing adaptive management program that assesses the environmental trade-offs of large-scale internal sediment mining as compared to the use of external sediments. A lower priority should be placed on restoration features that involve extensive dredging of internal sediments until the ecological impacts can be sufficiently analyzed.

Rock Shoreline Protection

EPA is also concerned that the extensive use of rock shoreline protection (approximately 63 miles) would represent a large-scale and unnatural landscape intervention which could have unintended adverse impacts. It appears the proposed rock shoreline protection measures would range in elevation from +3 to +8 feet. Even with periodic gaps, rock barriers of this height and extent could interfere with fish access, marine processes, and marsh hydrology. It is unclear what, if any, assessment has been made of such potential affects. For example, has the Corps evaluated whether the proposed shoreline erosion control features might reduce the input of re-suspended sediments to marsh areas via storms and frontal passages? Such sediment inputs can be vital for marsh sustainability. Extensive use of rocks might also result in future navigation hazards in areas where adjacent wetlands convert to open water.

As with the use of internal sediment mining for marsh creation, the Corps should include provisions in the adaptive management plan calling for ongoing and rigorous evaluation of the ecological effects of large-scale rock shoreline protection. The Corps should fully consider potential ecologically preferable alternatives to rock (e.g., sand or shell), and greater use of artificial oyster reefs. Alternative shoreline protection measures are discussed in the DEIS. However, other than the proposed artificial oyster reefs, it is unclear where, when, and under what conditions alternative shoreline protection measures would be employed instead of rock. EPA believes this can be done in the context of a robust adaptive management plan.

Robust Adaptive Management

The Corps should develop a more comprehensive and rigorous adaptive management process to better gauge the effects of proposed restoration measures beginning at the earliest phase of implementation. Such a process should include continuous reevaluation of the proposed restoration measures based on the most current science, and should allow for significant changes if and when science and restoration policy dictate. In particular, such an adaptive management scheme should include reevaluation of the extensive use of internal sediment mining and rock shoreline protection. It might also include, for example, reevaluating the wetland types currently proposed for restoration in specific areas if future hydrological and landscape conditions indicate that a different wetland type might be more feasible and suitable for the given location. Perhaps most importantly, the adaptive management plan should include a formal process for continuous engagement and input from external scientists and restoration policy experts.

Need for Supplemental NEPA Analysis

Even under an optimistic funding and schedule scenario, full implementation of the proposed ecosystem restoration plan would be phased over approximately 10-15 years or perhaps

many more. This situation poses substantial uncertainties from both fiscal and scientific perspectives. The implications of an unfunded and costly program to be implemented over a long timeframe should be dealt with head on from an environmental review standpoint. The scientific advancements and likelihood of significant changes in habitat condition that could occur over such a time period would indicate that aspects of the current NEPA review will need to be supplemented. A tiered process should be laid out in the FEIS whereby a commitment is made to subject significant restoration measures to additional NEPA and public review whenever the funding is secured, the engineering feasibility is addressed, and the scientific issues are reassessed.

The current document appropriately lists a number of scientific studies that are currently unavailable or in progress. These are studies or data that will be required prior to launching engineering feasibility studies. An example is the *LCA Mississippi River Hydrodynamic Study,* which will include a sediment budget and sediment sources inventory. As the document notes, "[l]imitations in analytical tools to assess ecosystem responses also exist, and were compounded by the short timeframe in which the MRGO ecosystem restoration study was formulated."

In addition, our understanding of the effects of the proposed restoration measures will likely change during the implementation period, as will the landscape itself. The DEIS also provides limited and generalized information for certain measures. For example, there is relatively limited site-specific detail on shoreline protection and marsh creation measures. The quantity of borrow material needed for marsh creation is based on assumptions as opposed to site-specific data and analysis. As noted in the DEIS, the engineering for such features is "considered preliminary and has not yet reached full feasibility level of design."

This is further justification for committing to a process of tiered NEPA studies for this restoration program. The DEIS states that "supplemental NEPA documentation may be necessary for unidentified impacts resulting from project changes." EPA believes that this is such a strong likelihood that a firm commitment to incorporate the additional environmental reviews and analyses of alternatives should be made at this time. In addition, a conceptual process of tiered studies should be proposed. The Corps is encouraged to continue to coordinate with us and our other partner agencies to determine when such additional NEPA analysis is warranted due to substantial changes in restoration measures and potential environmental effects.

Monitoring Water Quality Impacts of Violet Diversion

River reintroduction is an essential tool for restoring coastal Louisiana. Nevertheless, it is important to monitor the potential effects such reintroduction projects might have on receiving waters, and modify operation of the project if necessary to minimize any potential adverse impacts. As with the Corps proposal for the LCA Medium Diversion at White Ditch, the MRGO Ecosystem Restoration Plan should include a commitment to monitor nutrients, metals,

dissolved oxygen, agrochemicals, and other parameters prior to construction and for a period of at least ten years after construction of the Violet diversion.

Avoiding Impacts to Existing Wetlands

Marsh nourishment, cypress swamp restoration, and other proposed activities should not result in adverse impacts to existing wetlands. For example, the DEIS states that, "[d]redged material from the flotation channels would be side cast onto adjacent marsh..." In the absence of clarifying information, it would appear that the Corps is proposing to create spoil banks on existing marsh. These types of wetland impacts would be particularly unacceptable in the context of a restoration plan, and must be avoided to the maximum extent practicable.

The Corps also proposes to construct up to 10,000 acres of temporary retention dikes and earthen weirs. Such features are often a necessary component of marsh creation projects. However, if left in place too long, retention dikes can limit estuarine exchange, reduce marsh drainage, and potentially trap saltwater brought in by a storm surge. The Corps has proposed to degrade the retention dikes after three years (if the dikes have not already naturally degraded). Three years might be longer than necessary for successful marsh restoration. The Corps should re-evaluate this timeline to determine whether retention dikes could be degraded sooner, thereby minimizing the aforementioned potential adverse impacts.

EPA supports the concept of marsh nourishment (e.g., a thin layer application of sediment to extend the life of existing marsh). However, if too much sediment is placed on an existing marsh, existing vegetation is smothered, causing short-term adverse impacts and hindering or possibly precluding natural re-vegetation. It would appear the proposed marsh nourishment could involve additional fill of up to 1.5 feet. Appendix E contains the following statement in that regard: "For marsh nourishment it was assumed that existing marsh is between +0.5 foot and 1.0 feet and fill would be to +2 feet." To minimize potential adverse impacts, EPA generally recommends no more than six inches of sediment be placed on existing marsh. EPA recommends the Corps review its proposed marsh nourishment specifications and protocols to ensure that such measures do not result in excessive and damaging discharges onto existing wetlands.

Environmental Justice

The population of Violet, LA has a 46.5% minority rate (slightly below the 50% minority rate normally used to consider a community to be an "environmental justice" community), while Louisiana has a 38.6% minority population. The poverty rate of 21.7% (slightly over the 20% rate used to normally consider a community an "environmental justice" community), and has therefore received a more careful consideration. The only "adverse" impacts detailed in the EIS are that dust, noise, traffic, and traffic delays would increase during the construction period and

because traffic on two highways will have to be rerouted, temporarily changing them from four-lane highways to two-lane highways. Because the channel will be constructed in a large vacant field, no residences or businesses will have to be relocated, and the noise and dust impacts will be greatly decreased for anyone living or working in the general area.

The Executive Order 12898 mandates that low income or minority residents not be disproportionately and adversely impacted by our environmental policies and laws; however, the delays in traffic will be felt by all the travelers on those highways, and not just by the low-income residents of Violet. Information should be included about the procedures used or to be used regarding notification of the State-Recognized Tribes about this project. State and federally recognized tribes may have burial mounds, fishing/hunting rights and/or use areas in this region for cultural, subsistence or other traditional purposes.

From: Stiles, Sandra E MVN
To: Gilmore, Tammy H MVN
Subject: Fw: DEQ SOV 101220/2695 USACE - Misisippi River Gulf Outlet Ecosystem Restoration
Date: Tuesday, January 11, 2011 1:18:08 PM
Attachments: image001.png

Message sent via my BlackBerry Wireless Device

From: Beth Altazan-Dixon <Beth.Dixon@LA.GOV>
To: Stiles, Sandra E MVN
Sent: Tue Jan 11 09:43:14 2011
Subject: DEQ SOV 101220/2695 USACE - Misisippi River Gulf Outlet Ecosystem Restoration

January 11, 2011

Joan M. Exnicios, Chief

USACE Environ.Planning Branch

P.O. Box 60267

New Orleans, LA 70160-0267

sandra.e.stiles@usace.army.mil <mailto:sandra.e.stiles@usace.army.mil>

RE: 101220/2695

USACE - Misisippi River Gulf Outlet Ecosystem Restoration

Draft EIS and Feasibility Study

St. Bernard Parish

Dear Ms. Exnicios:

The Department of Environmental Quality (LDEQ), Business and Community Outreach Division has received your request for comments on the above referenced project.

After reviewing your request, the department has no objections based on the information provided in your submittal. However, for your information, the following general comments have been included. Please be advised that if you should encounter a problem during the implementation of this project, you

should immediately notify LDEQ's Single-Point-of-contact (SPOC) at (225) 219-3640.

· Please take any necessary steps to obtain and/or update all necessary approvals and environmental permits regarding this proposed project.

* If your project results in a discharge to waters of the state, submittal of a Louisiana Pollutant Discharge Elimination System (LPDES) application may be necessary.
* If the project results in a discharge of wastewater to an existing wastewater treatment system, that wastewater treatment system may need to modify its LPDES permit before accepting the additional wastewater.
* All precautions should be observed to control nonpoint source pollution from construction activities. LDEQ has stormwater general permits for construction areas equal to or greater than one acre. It is recommended that you contact the LDEQ Water Permits Division at (225) 219-3181 to determine if your proposed project requires a permit.

· If your project will include a sanitary wastewater treatment facility, a Sewage Sludge and Biosolids Use or Disposal Permit application or Notice of Intent must be submitted no later than June 1, 2011. Additional information may be obtained on the LDEQ website at http://www.deq.louisiana.gov/portal/tabid/2296/Default.aspx <http://www.deq.louisiana.gov/portal/tabid/2296/Default.aspx> or by contacting the LDEQ Water Permits Division at (225) 219- 3181.

* If any of the proposed work is located in wetlands or other areas subject to the jurisdiction of the U.S. Army Corps of Engineers, you should contact the Corps directly regarding permitting issues. If a Corps permit is required, part of the application process may involve a water quality certification from LDEQ.
* All precautions should be observed to protect the groundwater of the region.
* Please be advised that water softeners generate wastewaters that may require special limitations depending on local water quality considerations. Therefore if your water system improvements include water softeners, you are advised to contact the LDEQ Water Permits to determine if special water quality-based limitations will be necessary.
* Any renovation or remodeling must comply with LAC 33:III.Chapter 28, Lead-Based Paint Activities; LAC 33:III.Chapter 27, Asbestos-Containing Materials in Schools and State Buildings (includes all training and accreditation); and LAC 33:III.5151, Emission Standard for Asbestos for any renovations or demolitions.
* If any solid or hazardous wastes, or soils and/or groundwater contaminated with hazardous constituents are encountered during the project, notification to LDEQ's Single-Point-of-Contact (SPOC) at (225) 219-3640 is required. Additionally, precautions should be taken to protect workers from these hazardous constituents.

Currently, St. Bernard Parish is classified as attainment with the National Ambient Air Quality Standards and has no general conformity determination obligations.

Please send all future requests to my attention. If you have any questions, please feel free to contact me at (225) 219-3958 or by email at beth.dixon@la.gov <mailto:beth.dixon@la.gov> .

Sincerely,

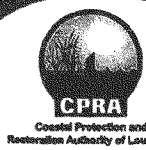
Beth Altazan-Dixon

Performance Management

LDEQ/Business and Community Outreach Division
Office of the Secretary

P.O. Box 4301 (602 N. 5th Street)
Baton Rouge, LA 70821-4301
Phone: 225-219-3958
Fx: 225-325-8148

Email: beth.dixon@la.gov



August 12, 2010

Colonel Edward Fleming
New Orleans District
US Army Corps of Engineers
PO Box 60267
New Orleans, LA 70160-0267

Dear Col. Fleming:

The State of Louisiana is pleased to offer its continuing support of the Mississippi River Gulf Outlet Ecosystem Restoration Project as authorized in the Water Resources Development Act of 2007. This program is a vital step in rehabilitating the natural system of coastal Louisiana that serves to protect the economic and energy security of both the state and nation, the safety of more than 2 million Louisiana residents, the ecological balance of the Gulf region, and the survival of a unique culture.

This letter, while not legally binding on the State in any way and not an obligation of future funds appropriated by the State Legislature, declares our full support for the Mississippi River Gulf Outlet Ecosystem Restoration Program. The State understands that the Corps interprets WRDA 2007 to require a 35% non-Federal cost share for construction elements. However, the State disagrees with this interpretation. Rather, the State assert the Congressional intent is for the Mississippi River Gulf Outlet Ecosystem Restoration Project to be undertaken at **full Federal expense**, pursuant to Sections 7012(b) and 7013 of the Water Development Resources Act of 2007 (Pub. L. 110-114) referencing Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Pub. L. 109-234). Therefore, the State respectfully submits that it has **no** financial obligations (including but not limited to cost share, land rights acquisitions, operations and maintenance obligations) as non-Federal sponsor with respect to the Mississippi River Gulf Outlet Ecosystem Restoration Project.

The State of Louisiana and the Coastal Protection and Restoration Authority whole-heartedly endorse this and other Corps' hurricane protection and ecosystem restoration efforts, and we look forward to working with Corps on the implementation of this important project.

Sincerely,

Garret Graves
Chair
Coastal Protection Restoration Authority

STATE OF MISSISSIPPI
Haley Barbour
Governor

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES
William W. Walker, Ph.D., Executive Director

September 20, 2010

Colonel Edward Fleming
New Orleans District
US Army Corps of Engineers
PO Box 60267
New Orleans, LA 70160-0267

Dear Col. Fleming:

The State of Mississippi is happy to offer its continued support of the Mississippi River Gulf Outlet Ecosystem Restoration Project – Violet Diversion as authorized in the Water Resources Development Act of 2007. The Violet Diversion is a program vital to rehabilitating the natural system of coastal Mississippi and Louisiana that serves to protect the economic and energy security of both states, the nation and provides a salinity regime essential for fishery habitat vital to both coastal Mississippi and Louisiana.

The Violet Diversion project has been developed as a component of a plan to restore the areas in Louisiana affected by the Mississippi River Gulf Outlet (MRGO) navigation channel and to improve salinity conditions in estuaries of southeast Louisiana and southwestern Mississippi. Selection of the Tentatively Selected Plan that identifies a 7,000 cubic feet per second capacity freshwater diversion from the Mississippi River at Violet, Louisiana, meets the objectives of the Congressional authority. The project includes monitoring and adaptive management features to help ensure projected benefits are achieved.

Section 3083 of the Water Resources Development Act of 2007 (Public Law 110-114) authorizes the Violet Freshwater Diversion. The project has an estimated total cost of approximately $400 million. In accordance with that Congressional authority, the Violet feature would be cost shared at a ratio of 75% federal and 25% non-federal. The Corps has proposed that the State of Louisiana provide 20%, and the State of Mississippi 5% of the total project costs. This allocation was recommended by the Office of Management and Budget in a letter dated August 10, 1989, for the Bonnet Carre' Freshwater Diversion project, the benefits of which will be achieved by the Violet Diversion. Further, the Governors of Mississippi and Louisiana voiced support for the allocation of costs in letters dated September 21, 1990 and July 13, 1992, respectively.

This letter, while not legally binding on the State in any way and not an obligation of future funds appropriated by the State Legislature, declares our full support for the Mississippi River Gulf Outlet Ecosystem Restoration Program – Violet Diversion. The State understands that the Corps interprets WRDA 2007 to require at 25% non-Federal cost share for construction elements. However, the State of Mississippi believes that the Corps of Engineers should pursue to the fullest extent possible, full federal funding for this project.

The State of Mississippi continues to endorse this ecosystem restoration effort, and we look forward to working with Corps on the implementation of this important project.

Sincerely,

William W. Walker, Ph.D
Executive Director
Mississippi Department of Marine Resources

Cc: Governor's Office



State of Louisiana

BOBBY JINDAL
GOVERNOR

March 5, 2011

Colonel Edward Fleming
District Commander
New Orleans District
US Army Corp of Engineers
PO Box 60267
New Orleans, LA 70160-0267

Dear Colonel Fleming:

The State of Louisiana respectfully submits the following recommendations on the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Draft Feasibility Report & Draft Environmental Impact Statement.

We are strongly supportive of your efforts to restore the area of Louisiana's coast that was affected by the MRGO, and appreciate your commitment to soliciting our feedback throughout the planning process. We look forward to working alongside your agency and our other federal partners toward the implementation of projects to restore the extensive damage caused by the MRGO, as well as the larger effort to protect and restore Louisiana's magnificent coast.

On the whole, we believe that the Draft Feasibility Report (DFR) represents a significant positive step toward mitigating for the neglected adverse effects of the MRGO and a substantial commitment toward the long-term restoration of the Louisiana and Mississippi Coasts. We are strongly supportive of these efforts. However, we have a number of areas of concern related to the DFR and respectfully urge you to consider the following as you develop the final Ecosystem Restoration Plan for the MRGO:

1. **Proposed Scope and Scale of the Draft Feasibility Report**

First and foremost, we are concerned that the scope and scale of the restoration project, as outlined in the DFR, does not adequately realize its congressionally-mandated objectives. In the Water Resources Development Act (WRDA) of 2007, Congress directed the Corps to prepare a plan to "physically modify the Mississippi River Gulf Outlet and restore the areas affected by the navigation channel," "to restore natural features of the ecosystem that will reduce or prevent damage from storm surge," and "to prevent the intrusion of saltwater into the waterway." WRDA 2007, Section 7013(a)(3)(B).

The restoration of 58,861 acres of coastal habitat, as called for in the Tentative Selected Plan (TSP) in the DFR, is an important step toward achieving the restoration of the areas of Louisiana and Mississippi Coasts that were negatively impacted by the MRGO. However, it is our view that the size of the area proposed for restoration is not commensurate with the full extent of ecological damage caused by the MRGO, does not adequately restore and provide for the sustainability of the ecosystem services provided prior to the channel's construction, and fails to appropriately address the resulting vulnerability to the communities buffered by the MRGO

area. Numerous independent estimates conclude that the extent of degradation was significantly greater than the Corps' estimate. For example, one estimate indicates that approximately 600,000 acres of habitat were lost or negatively impacted as a result of the MRGO. Accordingly, we urge the Corps to consider expanding the scale of the DFR to more accurately address the full extent of damage, service loss, and natural buffer degradation caused by the navigation canal.

Further, it is our view that the geographic scope of impacts caused by the MRGO far exceeded the scope of the geographic areas identified for restoration activities in the DFR. Although the entire Project Study Area spanned 3.86 million acres throughout the Louisiana and Mississippi coastal zones, the DFR proposes conducting actual restoration projects in a significantly smaller area, heavily concentrated around the shores of Lakes Ponchartrain and Borgne. To more accurately focus the restoration plan on the actual geographic area impacted by the MRGO, we urge the Corps to include restoration projects within a broader range of the Project Study Area and in restoration configurations that are sustainable in the final plan.

For example, we suggest including in the final plan provisions for a more extensive restoration of the Biloxi Marsh, including the protection of the Biloxi Marsh land bridges and the construction of oyster reef restoration projects. This area is of critical ecological importance to Mississippi's coast and provides an important storm surge barrier for both Louisiana and Mississippi. We recognize that the Violet Diversion (which is currently included in the DFR) will significantly contribute to the restoration of the Biloxi Marsh, but we feel that that project alone will not be sufficient to restore this area—a more active approach must be taken. Thus, in addition to the Violet Diversion, we strongly encourage you to include the aforementioned measures for the restoration of the Biloxi Marsh in the final plan.

2. Cost Share and Financial Considerations

As is stated in the DFR, our agencies are in significant disagreement regarding the cost share requirements for this project. The State of Louisiana has consistently maintained that the clear congressional intent is for all stages of the MRGO Ecosystem Restoration project to be conducted at full Federal expense, pursuant to Sections 7012(b) and 7013 of WRDA 2007. Although we fully support the full implementation of this project, we believe that the Corps' refusal to reconsider its position on the cost share elements of this plan seriously jeopardizes its future success. In light of the clear congressional intent to require full Federal funding for the construction of this project, we strongly urge the Corps to reconsider its position on this issue.

The history of the MRGO navigation canal underscores the fact that the federal government bears full responsibility for the implementation of the ecosystem restoration plan. The MRGO was constructed as a federal navigation channel, with the agreement that the federal government was 100% responsible for the maintenance of the channel, including dredging and bank stabilization. Consistent with its original obligations for the MRGO, the federal government must assume full responsibility for remediating the ecological damages caused by neglecting to fulfill these responsibilities. The Corps' current refusal to accept this responsibility is contrary to both public policy and the congressional intent of WRDA 2007.

Finally, we are concerned that, within the current federal budget climate, obtaining full congressional funding for this project will pose a significant challenge. Accordingly, we urge the Corps to consider alternative non-traditional funding sources for the implementation of this project. However, we note that when the MRGO was open to navigation, Congress authorized approximately $10-13 million annually in funding for the operations and maintenance (O&M) of the navigation channel. At a minimum, this amount should be allocated annually to the implementation of the MRGO Ecosystem Restoration plan. To this effect, we will urge Congress to continue its commitment to restoring the Gulf Coast by appropriating this funding, while also working with the Corps to identify alternative funding sources for the long-term restoration efforts.

3. Location of Violet Diversion

We are strongly supportive of the construction of a diversion in Violet to provide essential freshwater and nutrients to sustain and restore the ecological viability of critical coastal wetlands in Louisiana and Mississippi. However, we urge you to reconsider the recommendation in the TSP to locate the diversion in the Sinclaire Tract, rather than utilizing the Violet Canal.

We are concerned about the strong local opposition to the proposed alternative to As you are aware, numerous key stakeholders—including St. Bernard Parish and local environmental nonprofit organizations—are strongly supportive of utilizing the existing Violet Canal for the diversion, rather than the Sinclaire Tract. The use of the Sinclaire Tract would divide the county in two, as well as require additional costly land acquisition. Further, preliminary assessments have indicated that the Corps' original conclusion on the technical feasibility of using the Violet Canal may be inaccurate. As such, we urge you to thoroughly evaluate all possible options and available studies on this project before pursuing the recommendation in the TSP to locate the diversion in the Sinclaire Tract.

4. Utilize Mississippi River as Source of Sediment for Wetland Restoration

The current TSP recommends dredging over 150 million cubic yards of sediment to restore wetlands, with the vast majority of material being sourced from Lake Borgne. However, we believe the better approach would be to utilize the Mississippi River as a significant source of this dredge material, for several reasons. First, sourcing the dredge material from the Mississippi River would provide significant ecological benefits by dispersing much-needed sediment into coastal wetlands, rather than allowing it to be carried into the Gulf of Mexico or settle on the river bottom. Second, river-sourcing the material would eliminate any potential concerns related to increases in surge wave heights, negative impacts to existing shoreline protection along the lake rim, and damage to the bottom habitats of Lake Borgne. Accordingly, we recommend that the final plan include sourcing sediment from the Mississippi River in addition to Lake Borgne.

We disagree with the DFR's conclusion that economic considerations rule out sourcing dredge material from the Mississippi River as a viable alternative. The DFR ruled out the

Mississippi River as a sediment source for these projects due to the higher cost of transporting the material from the river, versus the more proximate Lake Borgne. However, the Corps should consider a greater array of costs and benefits in evaluating potential sediment sources. For example, the DFR fails to take into account the economic value of the ecosystem services provided by the net addition of riverine sediment into coastal wetlands. Additionally, it fails to consider the potential negative economic and ecological impacts that large-scale removal of material from the Lake Borgne ecosystem may cause. Further, the introduction of a river sediment source would re-establish the historic relationship between the river and the Biloxi marsh while ensuring a more sustainable restoration project providing greater ecosystem services over a longer period. We believe that if the full array of costs and benefits were taken into account in evaluating sediment source options, the use of the Mississippi River as a source would prove to be both economically and ecologically advantageous. We urge you to reconsider this option in developing the final plan.

5. Implementation Schedule

We recommend that the implementation schedule for the MRGO Ecosystem Restoration Plan be reevaluated. According to the DFR, project areas with lowest land loss rates would be constructed first, because this would allow the largest possible net acreage for the 50-year project life to be obtained. While we understand this rationale, our view is that areas of greatest need—e.g., those with the highest land loss rates—should be constructed first. Land loss is the most critical and urgent problem facing the Study Area and coastal Louisiana in general, with over 2300 square miles (an area the size of Delaware) lost since the 1930s. Unless we take immediate actions to preserve and restore those areas at the highest risk of being lost first, these areas will continue to degrade at ever-increasing rates. Further, the costs of rehabilitating these areas will continue to increase at an exponential rate. Thus we recommend that the Corps revise the TSP to address the most vulnerable areas first, which we feel is the most ecologically beneficial and economically efficient approach.

6. Other Recommendations

We have a variety of other primarily technical recommendations, which are briefly discussed below:

- **Integration of Restoration Measures With Flood Protection System:** We recommend the utilization of a system approach to integrating restoration with flood protection during Pre-Construction Engineering and Design (PED). When specific restoration measures are further evaluated during PED, flood protection benefits should be maximized whenever possible.

- **Comprehensive Aquatic Systems Model (CASM) Modeling:** A CASM modeling study was undertaken to determine the impacts of the MRGO Ecosystem Restoration Plan on fishery productivity. However, the DFR indicates that the modeling results presented in this study were preliminary; modifications to the CASM were not able to be done prior to release

of the DEIS for public comment. We recommend that potential changes to the CASM results be included in the Final EIS.

- **Caernarvon Freshwater Diversion:** The sections of the DFR that discuss Hydraulics and Hydrology (H & H) modeling state that input flows for the Caernarvon diversion were increased by roughly 25 percent, consistent with the projected increase in the capacity of the structure. However, because there have been no plans to increase the physical capacity of the diversion through the currently authorized LCA feasibility study, we recommend that this language be modified to note that no increase in the capacity of the structure is expected.

In conclusion, the State of Louisiana sincerely appreciates the opportunity to review and comment on the MRGO Ecosystem Restoration Plan Draft Feasibility Report and DEIS. We look forward to the opportunity to continue to work with the Corps on continued development and implementation of this project.

Sincerely,

Garret Graves, Chairman
Coastal Protection and Restoration Authority of Louisiana

Appendix Y6

St. Bernard Parish Government

8201 West Judge Perez Drive Chalmette, Louisiana 70043
Phone (504) 278-4200 Fax (504) 278-4330

Craig P. Taffaro, Jr.
Parish President

March 4, 2011

Colonel Edward Fleming
District Engineer
U. S. Army Corps of Engineers
New Orleans District
C/O Tammy Gilmore PDR-RS
Mississippi River Gulf Outlet Ecosystem Restoration
7400 Leake Avenue
New Orleans, LA 70118-3651

RE: Comments and Recommendations Regarding the U.S. Army Corps of Engineers Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan and Environmental Impact Statement December 2010 Draft.

Dear Colonel Fleming:

St. Bernard Parish is grateful for the level of effort and work that the U. S. Army Corps has undertaken in the development and evaluation of the MRGO Ecosystem Restoration Study. The changes caused by the MRGO compounded by the more recent devastation resulting from Hurricane Katrina in 2005 and the BP event in 2010, have resulted in catastrophic damage to the landscape of St. Bernard Parish. Recovery from Katrina was slow at first, but because of the resiliency and determination of our people, we are continuing to build a stronger and more prosperous community. However, the wounds to our landscape remain largely unhealed and these affect our safety, economy and social structure. Clearly, the MRGO Ecosystem Restoration is one of the most important programs on the horizon for healing some of our festering environmental wounds.

Essentially, the decision of coming back from the storm is behind us, but the opportunity for St. Bernard that lies before us must not be missed. Between the MRGO Ecosystem Restoration project and funding streams for coastal restoration that may be available at some time in the future, St. Bernard has been actively charting its own course through development of a long-term, comprehensive land use and wetland conservation plan.

Y6-1

While we fully understand that the MRGO Ecosystem Restoration Plan is a stand-alone attempt to address environmental damage caused by the shipping channel, and we are in full agreement and support of its intent and many of its features, when evaluated in light of the long-term vision of St. Bernard Parish for restoration of its coastal area, we think that some revisions to the draft restoration plan must be made. For that reason, we respectfully submit the enclosed report of comments and recommendations for your consideration. We urge that a small steering group and a scientific advisory panel be formed to coordinate and expedite timely and meaningful resolution of issues and refinement of the draft plan. We look forward to working with you toward that end.

Sincerely yours,

Craig Taffaro, Jr
Parish President

COMMENTS AND RECOMMENDATIONS REGARDING THE U.S. ARMY CORPS OF ENGINEERS MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT DECEMBER 2010 DRAFT

March 4, 2011

COMMENTS AND RECOMMENDATIONS REGARDING THE U.S. ARMY CORPS OF ENGINEERS MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT DECEMBER 2010 DRAFT

Prepared by
S. M. Gagliano, Ph.D.
K. M. Wicker, Ph.D.
M. H. Gagliano, B.S.
B. Kappel, M.S.
E Fike, B.S.

Prepared for
St. Bernard Parish Government
Craig P. Taffaro, Jr., President

March 4, 2011

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
INTRODUCTION 4
Purpose and Need for the Ecosystem Restoration Project 4
Purpose of this Response 5
St. Bernard Parish Long-Term Commitment to Coastal Restoration 5
The St. Bernard Parish Vision for Coastal Restoration 6
Components of the Vision Plan 6
THE LEVEE PROTECTED CORE 12
The Urban Corridor 15
St. Bernard Vision for the Urban Corridor 15
St. Bernard Comments on TSP for the Urban Corridor 15
Central Wetlands 16
Paris Road Gateway 16
The Violet Canal 17
Violet Canal Safe Harbor 17
St. Bernard Comments on TSP for Central Wetlands 18
THE LAKE BORGNE AREA 20
Lake Borgne 21
Lake Borgne Shore Zone 21
Recommended Restoration, Management and Use 21
St. Bernard Comments on TSP for the Lake Borgne Area 22
THE FISHING VILLAGES 25
Recommended Restoration, Management and Use 25
EASTERN ST. BERNARD ESTUARINE ECOSYSTEM 26
Biloxi Marsh Zone 26
St. Bernard Vision for the Biloxi Marsh Zone 26
St. Bernard Comments on TSP for the Biloxi Marsh Zone 28
Lake Lery - Delacroix Marshes 28
St. Bernard Comments on TSP for the Lake Lery - Delacroix Marshes 29
Oyster Zone 29
Destructive Processes Within the Oyster Zone 33
Island Accretion (How The Islands Build Up) 33
St. Bernard Comments on TSP for the Oyster Zone 36
Shoreline Barrier - East Biloxi Marshes 41
EASTERN ST. BERNARD ESTUARINE ECOSYSTEM RESTORATION PRIORITIES 44
St. Bernard Comments on TSP for the Eastern St. Bernard Estuarine Ecosystem 45

SUPPLEMENTAL MEASURES AND METHODOLOGIES FOR ECOSYSTEM RESTORATION IN ST. BERNARD PARISH 46

Violet Freshwater Diversion 46

Hard Structure Shoreline Stabilization and Barriers 48
Rocks 48
A-Jax Structures 49
Submersible Concrete Barge Surge Breakers and Breakwater Units 49
Oyster Reef Bioengineering 55
Loose Oyster Shells 55
Interlocking Concrete Rings 55
Interlocking, Triangular Welded Steel Reef Units 57

The NOAA-The Nature Conservancy Oyster Reef Program in the Oyster Zone 61
Cultch Spreading 61
Navigation Issues 63
Judicious Use of Tax Dollars 64
Recreational Features 64
Compatibility With Oil and Gas Activities 65
Landowner Issues 65
Moving Forward 66

REFERENCES 66

Appendix A. St. Bernard Parish Council Resolution SBPC #640-05-10, May 19, 2010. Endorsing the establishment of the East Biloxi Marshes Shoreline Barrier Zone in conjunction with the Parish President and the Coastal Advisory Committee.

Appendix B. Senate Concurrent Resolution No. 115, Regular Session of the Louisiana Legislature, 2010. To urge and request the Coastal Protection and Restoration Authority of Louisiana and the United States Army Corps of Engineers to incorporate the East Biloxi Shoreline Barrier Zone as a vital component in the state and federal master plans for coastal restoration and storm protection.

Appendix C. Southeastern Louisiana Flood Control Authority-East Resolution #10-21-10-04, October 21, 2010. To recreate oyster reefs to protect critical reaches of the Biloxi Marsh.

Appendix D. Louisiana Oyster Task Force, January 25, 2010. A letter of support to Governor Bobby Jindal for Restoration of Oyster Grounds and the Oyster Industry in St. Bernard Parish, Louisiana based on a unanimous motion of the task force.

LIST OF FIGURES

Figure 1. Area of study and subunits, MRGO Ecosystem Restoration Plan (USACOE, 2010b, Fig. 1-2, p. 1-5) 7

Figure 2. Features of Alternative C, the tentatively selected plan, MRGO Ecosystem Restoration Plan (USACOE 2010b, Fig. 2-20, p. 2-86) 8

Figure 3. Major components of St. Bernard Vision and Coastal Restoration Plan 13

Figure 4. The levee protected core of St. Bernard Parish, including the Central Wetlands subunit and features related to ecosystem restoration 14
Figure 5. Alternative Freshwater Diversion Routes 19
Figure 6. Alternative Location 3 19
Figure 7. Location of Borrow Sites in Lake Borgne for TSP (after USACOE, 2010b: 2-115, Figure 2-28) 23
Figure 8. Eastern St. Bernard Estuarine Ecosystem 27
Figure 9. Thin, fragile islands and reefs of the Oyster Zone (after Barras 2009) 30
Figure 10. Islands, oyster leases and public oyster grounds in the Oyster Zone 31
Figure 11. Eroding marshy shoreline of an island in the Oyster Zone 34
Figure 12. Oyster shell bank in St. Bernard Parish 34
Figure 13. Section across an Oyster Zone island at mean tide 35
Figure 14. Section across an Oyster Zone island at spring high tide and squall conditions 37
Figure 15. Section across an Oyster Zone island during passage of a tropical storm 38
Figure 16. Section across an Oyster Zone island showing proposed stabilization and restoration 40
Figure 17. High vertical profile oyster reef units along shoreline of Galveston Bay on sound side of Galveston Island 41
Figure 18. Plan view of proposed stabilization and restoration of an Oyster Zone island 42
Figure 19. Landward encroachment of the Breton Sound shoreline as the result of edge erosion and interior marsh breakup 43
Figure 20. Massive concrete A-jax type structures 50
Figure 21 Proposed submersible concrete barge surge breaker for Lake Borgne 51
Figure 22 Marine Concrete Products dry dock and plant on the Michoud Canal in New Orleans East 52
Figure 23 Submersible concrete barge under construction at Marine Concrete Products Plant 52
Figure 24. Submersible concrete barge under construction on dry dock 53
Figure 25. Internal construction of concrete barge 53
Figure 26. Drawings of concrete beak water unit, 80 ft x 24 ft x 12 ft with a 3 ft center breakwall, Marine Concrete Products 54
Figure27. Associated Branch Pilots quarter boat and operations barge, Southwest Pass, Mississippi River Delta, Louisiana 56
Figure 28. Molded concrete oyster rings 56

Figure 29. Oyster rings in the Vermilion project area showing oyster growth..... 57
Figure 30. ReefBlk$_{TM}$ units in a staging area..... 58
Figure 31. Newly placed reef units along the Gulf Intracoastal Waterway at the Mad Island Marsh Preserve, Matagorda, Texas..... 58
Figure 32. ReefBlk$_{TM}$ units in water showing conditions for oyster spat attachment and growth..... 59
Figure 33. Oyster unit exposed at low tide showing 10 months of growth..... 59
Figure 34. Comparison of conditions at Mad Island Marsh Preserve site at time of reef installation and one year after, both photographs at low tide..... 60
Figure 35. Sediment trapped behind oyster reef units at Mad Island Marsh Preserve restored eroded land and was replanted with marsh vegetation..... 60
Figure 36. Shallow draft reef deployment vessel and staging area at Grand Isle, Louisiana..... 62
Figure 37. Reef units deployed in Grand Isle, Louisiana..... 62
Figure 38. Traditional method of spreading cultch over bottom reefs and oyster leases..... 63

LIST OF TABLES

Table 1. Restoration features included in the final array of alternatives, MRGO ecosystem restoration plan (USACOE, 2010b, Table 2-28, p. 2-56 – 2-59)..... 9
Table 2. Borrow Sites and Amount of Dredged Material Needed for Wetland Restoration and Nourishment Measures (after USACOE 2010b, Pg. 2-56 – 2-59, 2-115)..... 24

COMMENTS AND RECOMMENDATIONS REGARDING THE U.S. ARMY CORPS OF ENGINEERS MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN AND ENVIRONMENTAL IMPACT STATEMENT DECEMBER 2010 DRAFT

Prepared by
S. M. Gagliano, Ph.D.
K. M. Wicker, Ph.D.
M. H. Gagliano, B.S.
B. Kappel, M.S.
E Fike, B.S.

Prepared for
St. Bernard Parish Government
Craig P. Taffero, Jr., President

EXECUTIVE SUMMARY

The Mississippi River Gulf Outlet (MRGO) was a deep-draft navigation channel excavated through the deltaic lowlands of Orleans, St. Bernard and Plaquemines Parishes by the U.S. Army Corps of Engineers (the Corps) in the 1960s and was operated and maintained until Hurricane Katrina in 2005. In 2006 Congress directed the Secretary of the Army to develop a plan for de-authorization of the MRGO navigation channel. In 2009 the channel was plugged by a rock dam south of its intersection with Bayou La Loutre. Construction, operation, maintenance and final closure of the MRGO during a half-century interval caused extensive environmental damage within the Pontchartrain Basin. Most of the direct and indirect damages were within St. Bernard Parish.

The United States Congress in Section 7013 of the Water Resources Development Act of 2007 (WRDA 2007), directed and authorized the Corps to develop a comprehensive plan to restore the Lake Borgne ecosystem and the areas adversely affected by the MRGO. The draft plan was made available for comment in December 2010 and has been reviewed by St. Bernard Parish officials, staff and consultants. Major recommendations for modification of the tentatively selected plan (TSP) resulting from this review are presented in the following section:

Priorities for Restoration
There must be a rational balance between funds spent within the Central Wetlands and the Eastern St. Bernard Estuarine Ecosystem.

Eastern St. Bernard Estuarine Ecosystem
Through the planning process of its federal and state approved Coastal Management Program, St. Bernard Parish has identified The Eastern St. Bernard Estuarine Ecosystem as an endangered ecosystem and a critical landscape feature with the highest priority for coastal restoration and protection. Major components of the desired program include

restoration and management for sustainability of the Biloxi Marshes and the Oyster Zone and development of a proposed East Biloxi Shoreline Barrier.

Use oyster reef technology to restore oyster reefs, banks and beaches as a primary framework building process for the Biloxi Marshes and Oyster Zone.

Initiate development of the proposed East Biloxi Shoreline Barrier using a combination of rocks, submersible concrete barge breakers, imported sand, and induced oyster reefs.

This ecosystem has local, state, regional and national values for renewable resources production and also functions as a storm surge reduction zone for inland communities in Louisiana and Mississippi.

The MRGO had direct and indirect impacts on the Eastern St. Bernard Ecosystem particularly along its lower reaches in the Bay Eloi and Lake Robin area seaward of the Bayou La Loutre ridge. Secondary impacts continue to occur. These impacts are given sparse acknowledgement in the plan documents, and little restoration is recommended. The assumption seems to be that the rock closure dike has remedied the problems.

The values at stake and the approach to restoration and management have been spelled out in resolutions of the St. Bernard Parish Council and the Louisiana Legislature. Certified copies sent to appropriate state and federal officials stated that "The Louisiana Office of Coastal Protection and Restoration and the U.S. Army Corps of Engineers are requested to incorporate The East Biloxi Shoreline Zone as a vital component in the state and federal master plans for coastal restoration and storm protection."

The importance of restoration and management of the Chandeleur Sound (SU 16) and the Chandeleur Islands is also recognized. St. Bernard Parish will work in conjunction with the U.S. Fish and Wildlife Service, who has responsibility for management of the Breton National Wildlife Refuge, in seeking funding for restoration and management of this vast area.

Central Wetlands

Some cypress swamp and marsh restoration should be done in the Central Wetlands, but not to the habitat area allocation and spatial extent proposed in the TSP. Because the area is within the Levee Protected area of the parish and in close proximity to the Urban Corridor, restoration and management must be compatible with private property rights and land use and transportation plans of the parish.

Violet Freshwater Diversion

There are unresolved issues regarding the Violet Freshwater Diversion, including infrastructure related size and discharge, need with regard to the Central Wetlands and Biloxi Marshes, and the location of the conveyance channel, as well as distribution and effects of outflow into receiving areas.

If the diversion is implemented, flow must be controlled and directed into appropriate receiving basins. Excessive salinity reduction in the Biloxi Marshes and oyster grounds

will be detrimental and must be avoided. Special precautions must be taken against possible direct introduction of invasive species into the Oyster Zone.

Violet Diversion Conveyance Channel
The Violet Canal should be used for the conveyance channel. Mitigation provisions should be made for establishment of a safe harbor for the fishing fleet along the Violet Canal, somewhere between the 40-Arpent Canal Levee and the MRGO back retention levee, because the Violet Canal currently provides this function.

The TLC identifies the Sinclair Tract as the preferred alignment for a large Violet Diversion conveyance channel. The highest and best use for this relatively high, flood protected and drained land within the Urban Corridor is future commercial and residential development, not a leveed diversion corridor.

Sources of Fill
Alternative sources of fill for cypress swamp and marsh restoration must be considered. Borrow areas in Lake Borgne would be detrimental to fishing grounds and public oyster areas and may increase height and energy of storm waves.

For restoration in the Central Wetlands, a Mississippi River meander bar site for sand between Mile 86 and 88 on the left descending bank in the vicinity of the Murphy Oil Refinery in Meraux should be evaluated.

A sand bar borrow site, where replenishable sand bars exist along the left descending bank of the Mississippi River in the vicinity of Bertrandville - Wills Point area in Plaquemines Parish, should be investigated as a source of fill for the Delacroix – Reggio – Yscloskey - Hopedale area marsh restoration. Although some distance from the restoration site, such a pit could be developed as a long-term permanent pumping plant to provide fill for wetland restoration and flood protection needs in both St. Bernard and Plaquemines Parishes.

Inland Navigation Needs
Provisions should be made for designation and maintenance of safe inland navigation routes seaward of the MRGO rock dike. A number of natural channels and canals are currently being used for navigation, but the channels and banks are not stabilized and are rapidly scouring and eroding since the rock dike was installed.

Shoreline Protection
Access channels for deploying rock or other hard structures used for shoreline channels should be backfilled after use. There should be more emphasis on creation of living shorelines.

Ridge Restoration
If the Bayou La Loutre Ridge is raised as part of multiple lines of defense, special attention must be paid to cultural resources.

Dredge Material Disposal Ridges along the MRGO offer special opportunities for cost-effective restoration of oak ridge habitats. Within the Central Wetlands area, portions of

these disposal sites could be planted with live oaks and associated species. This would provide further habitat diversity to the restoration plan and as wind protection for the Urban Corridor.

Outside of the Levee Protected Corridor, the enhanced ridges should be managed as oak ridges, maritime forests, providing habitat for trans-gulf migrating birds, indigenous birds and terrestrial animals.

Recreational Features
The Bienvenue Triangle Overlook and Shell Beach Recreational Features are both desirable. The Bienvenue Triangle Overlook should be designed in coordination with the proposed New Florida Avenue Bridge that extends from the GIWW to Paris Road (LA Hwy 47).

Cost Effectiveness
Tax dollars required to implement the MRGO Ecosystem Restoration plan are scarce and the uses of these dollars must be justified. These tax dollars must be allocated by priority and their expenditure must be consistent with the long-term vision and objectives of St. Bernard Parish.

Moving the Program Forward
It is critical that the MRGO Ecosystem Restoration program moves forward in a timely manner to implement components that will reduce ongoing environmental deterioration. Priority must be focused first on the outer estuarine areas and not within the areas protected by levees. The Corp's draft plan and EIS provide valuable data and a detailed framework for completing this challenging planning and decision-making process.

At this juncture in the planning and review process, the traditional procedure for response to comments on the draft plan should be supplemented with a constructive procedure for interaction between draft plan reviewers and Corps staff. To facilitate resolution of issues, a small Steering Group should be established that would include representation from the Corps, the state, St. Bernard, Orleans, and Plaquemines Parishes and Hancock County. An objective 'special master" should chair the Steering Group. There should be a Science Liaison Team with representation from the scientific community to provide technical support to the Steering Group.

INTRODUCTION

Purpose and Need for the Ecosystem Restoration Project

In recognition of the extensive amount of environmental damage caused by the construction, operation, maintenance and de-authorization of the MRGO deep draft navigation channel over a period of half a century, the United States Congress in Section 7013 of the Water Resources Development Act of 2007 (WRDA 2007) directed and authorized the U.S. Army Corps of Engineers (the Corps) to develop a comprehensive ecosystem restoration plan to restore the Lake Borgne ecosystem and the areas affected by the MRGO navigation channel. The Corps defines

the purpose and need of this project within the narrow scope of water resource problems and authorization of the work under WRDA (USACOE, 2010b).

In December 2011, the New Orleans District, Corps of Engineers released a package of draft reports and appendices for public review and comment and held public hearings to receive comments. The two principal volumes are:

- *Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan: Draft Feasibility Report* (USACOE 2010a) and
- *Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Study: Draft Environmental Impact Statement* (USACOE 2010b).

The area of consideration in the MRGO ecosystem restoration plan is shown in Figure 1. The plan area includes the entire Lake Pontchartrain Basin as well as the western end of The Mississippi Sound. Features included in the TSP are shown in Figure 2 and a brief description of each feature is presented in Table 1.

Purpose of this Response

The largest amount of adverse environmental impacts of the construction and operation of the MRGO over a period of a half-century occurred and remain in St. Bernard Parish. This Draft EIS review submittal contains comments and recommendations of the St. Bernard Parish Government. It is the intention of St. Bernard Parish to work with the Corps in refining the draft plan to produce the most favorable, sustainable, and cost-effective results possible with the funds available. The Corps' draft ecosystem restoration documents provide the framework for ongoing discussions directed toward that end.

St. Bernard Parish Long-Term Commitment to Coastal Restoration

Because of the nature of its coastal landscape and the long tradition of fishing, trapping and hunting, along with the impact from a series of modern environmental catastrophes, the citizens and elected officials of St. Bernard Parish are acutely aware of the importance of ecosystem restoration. For that reason, they have been at the forefront in the environmental movement in Louisiana. Particularly noteworthy have been their efforts in development of the state and local coastal management program, working for closure of the MRGO channel, as well as participation in the CWPPRA program, the Coast 2050 program, the MRGO Task Force and combating the British Petroleum (BP) oil event of 2010. Toward that end, a number of technical studies regarding the extent and causes of coastal deterioration and proposed restoration measures have been funded by, or conducted on behalf of the parish. Several reports and documents that are particularly relevant to this response and which will be referred to herein are:

- Wicker, K.M., G. J. Castille, III, D. J. Davis, S. M. Gagliano, D. W. Roberts, D. S. Sabins and R. A. Weinstein. 1982. *St. Bernard Parish: A Study in Wetland Management*, LA Dept. of Natural Resources, Baton Rouge, LA 132 pp.

- Coastal Environments, Inc. and St. Bernard Parish Government. 1982. *St. Bernard Parish Coastal Management Program Document.* LA Dept. of Natural Resources and NOAA. Baton Rouge, LA
- Gagliano, S. M., K. M. Wicker and B. L. Rivenbark. 2008. *Mississippi River Gulf Outlet (MRGO) Channel Restoration and Mitigation Plan, 2008.* LA Dept. of Natural Resources and US Environmental Protection Agency. Baton Rouge, LA
- The St. Bernard Parish Government. 2010. *Resolution to Establish the East Biloxi Marshes Shoreline Barrier.* Chalmette, LA
- Gagliano, S. M., M. Gagliano and B. Kappel. 2010. *Restoration of Oyster Grounds and the Oyster Industry in St. Bernard Parish, Louisiana.* 2010 (Power Point).

The St. Bernard Parish Vision for Coastal Restoration

St. Bernard Parish has participated in Louisiana's Coastal Management Program since its inception in 1982, and was one of the first parishes to have a program approved by the state and federal government. Because of significant changes to the landscape and hydrology resulting from Hurricanes Katrina and Rita and the closure of the MRGO deep-draft navigation channel with a rock dam, the parish government has undertaken a revision to its coastal management program document. While revisions to the plan were underway, President Barack Obama initiated a program for accelerating coastal restoration efforts in Louisiana and Mississippi and the BP oil well blowout occurred. These two events delayed completion of the coastal management document, and changed its purpose. It morphed from a document intended primarily as a guide for the local government coastal regulatory program (i.e., local coastal use permits and compliance standards) to a vision statement to guide environmental, economic and social restoration of the parish. It is becoming a statement of what local citizens would like to see after billions of tax dollars are spent to protect their parish from storm induced flooding and to restore its endangered coastal environments. Will the dollars be spent wisely? Will the restoration and flood protection be sustainable? How will the results of these programs contribute to the economy and social structure of the parish? This vision statement not only serves as a plan, but also provides the standard by which proposals made by state and federal partners will be measured. The statement will establish priorities and the standard for acceptance or rejection of proposed projects. The vision statement is a work in progress being developed through the Parish's authorized Coastal Management Program. Some elements of the plan have been formally endorsed by the Parish Council and the Parish President that are relevant to the proposed MRGO Ecosystem Restoration plan and are referred to herein.

Components of the Vision Plan

The major landscape components of St. Bernard's restoration and vision plan are shown in Figure 3. These components include:

- Levee Protected Core
  - Urban Corridor
  - MRGO Dredge Material Ridge
  - Central Wetlands

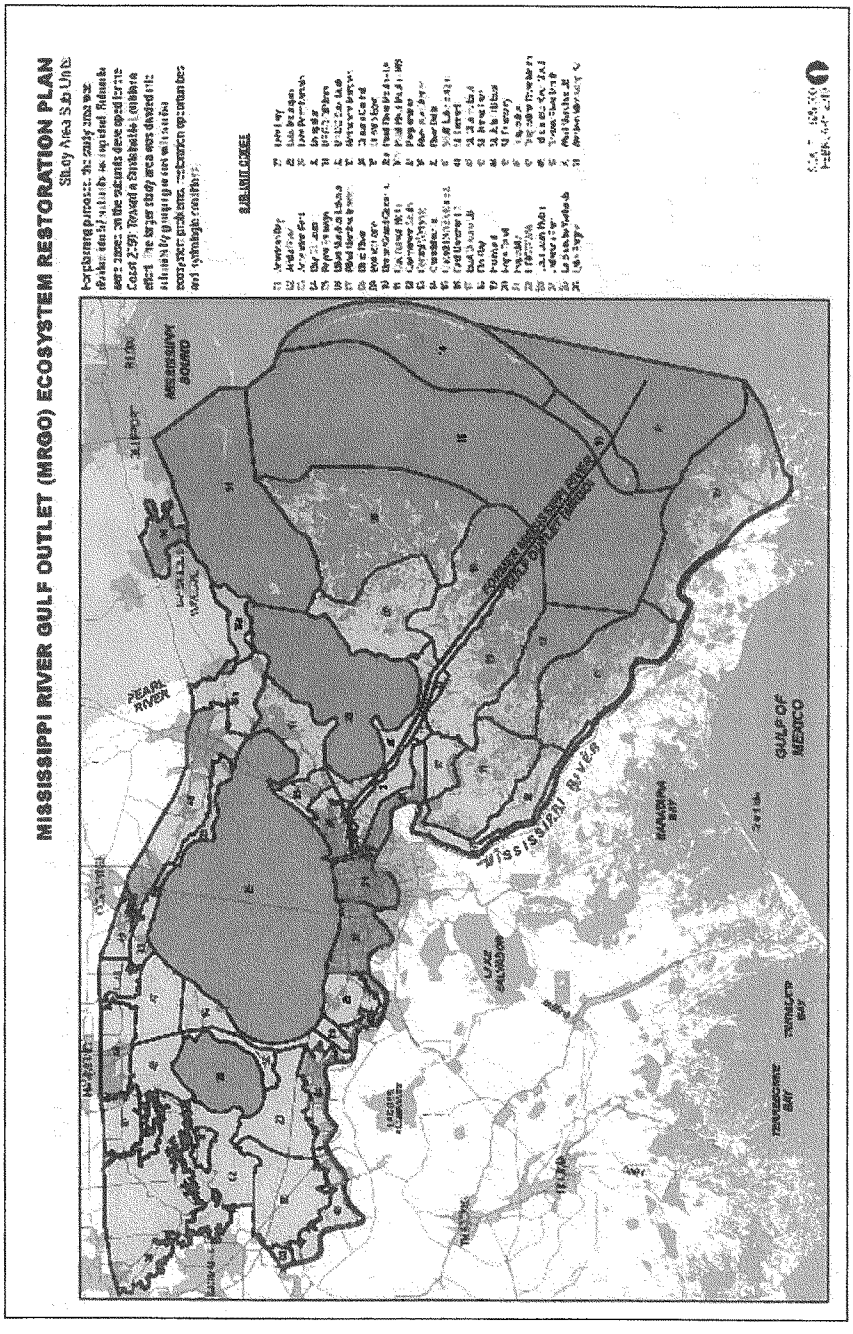


Figure 1. Area of study and subunits, MRGO Ecosystem Restoration Plan (USACOE, 2010b, Fig. 1-2, p. 1-5).

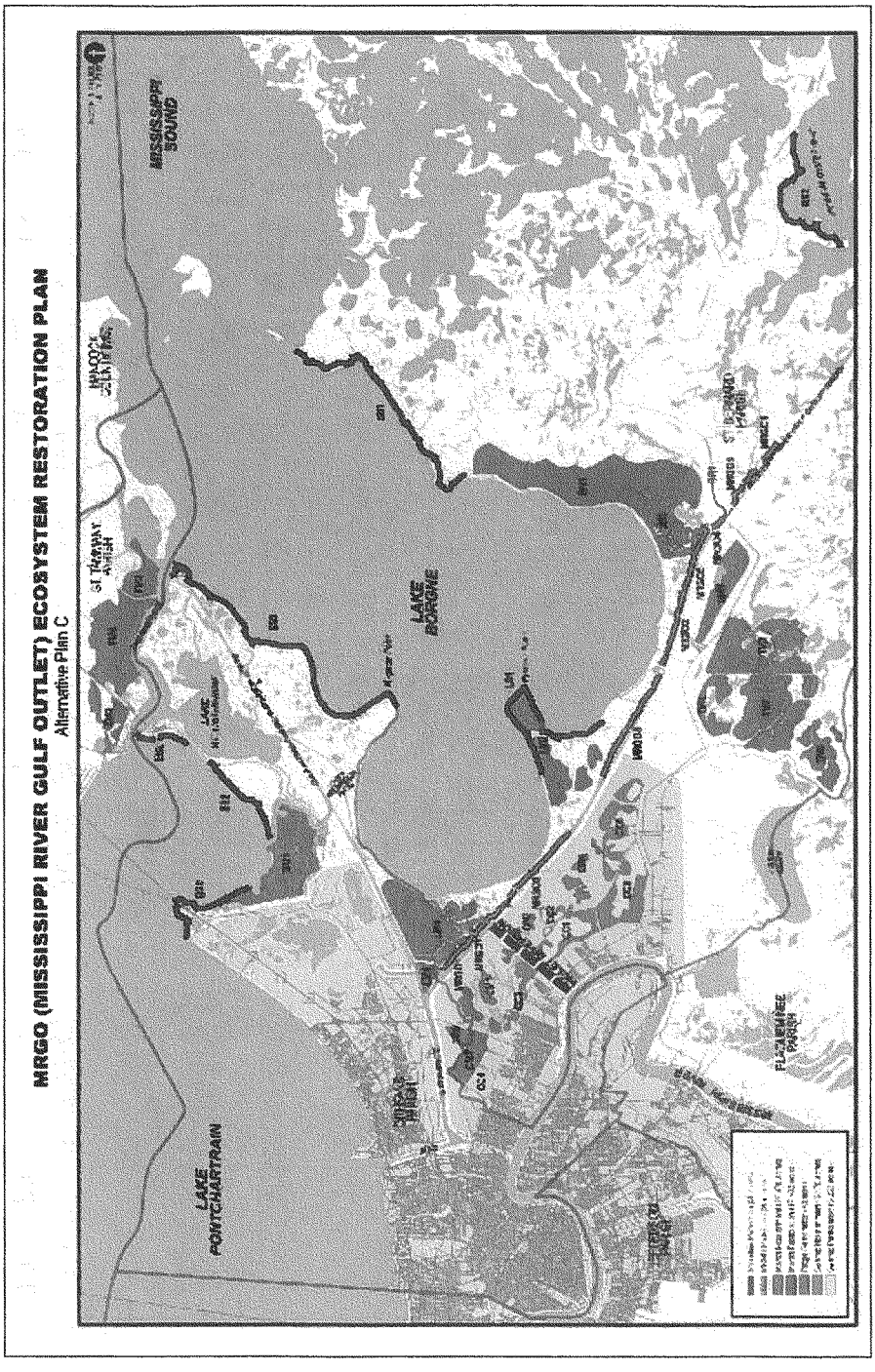


Figure 2. Features of Alternative C, the tentatively selected plan, MRGO Ecosystem Restoration Plan (USACOE 2010b, Fig. 2-20, p. 2-86).

Table 1. Restoration features included in the final array of alternatives, MRGO ecosystem restoration plan (USACOE, 2010b, Table 2-28, p. 2-56 – 2-59).

Area	Measure	Description	Alt. B	Alt. C	Alt. D
Biloxi Marsh	BM1	8,295 acres of brackish marsh nourishment along the south shore of Lake Borgne. 10.8 million cubic yards (mcy) of material would be obtained from Lake Borgne Borrow Area 2.		Y	Y
	BS1	Approximately 51,000 linear feet (9.7 miles) of shoreline protection along the southeast shore of Lake Borgne. This feature begins at the northern terminus of the Biloxi Marsh Shoreline Protection Project (PO-72) south of Point aux Marchettes and extends north to Malheureax Point.		Y	Y
	BS2	Approximately 39,600 linear feet (7.5 miles) of artificial oyster reef development on the Chandeleur Sound side of the Biloxi Marsh between Eloi Point and the mouth of Bayou La Loutre. Various construction methods would be considered, such as: loose oyster shells; interlocking, triangular welded steel structures; and interlocking concrete rings.		Y	Y
	BS3	67,623 linear feet (12.8 miles) of shoreline protection extending from the south shore of Treasure Bay, around Point Paulina and Point Lydia to the north side of the mouth of Bayou La Loutre.			Y
	BR1	Approximately 48 acres of ridge restoration on the south bank of Bayou La Loutre. 425,000 cubic yards of silty sand material to be obtained from the Mississippi River.	Y	Y	Y
MRGO	MRGO1	3,850 linear feet of new foreshore protection between MRGO Miles 56.6 and 57.4. This stone protection feature is embedded within the limits of MRGO7.	Y	Y	Y
	MRGO2	Repair and maintenance of approximately 15,070 linear feet (2.85 miles) of foreshore protection between Miles 44.4 and 39.9 of the MRGO.	Y	Y	Y
	MRGO3	Repair and maintenance of approximately 10,420 linear feet (1.97 miles) of existing foreshore protection between approximately Mile 56 to 51 of the MRGO.	Y	Y	Y
	MRGO4	Repair and maintenance of approximately 6,690 linear feet (1.27 miles) of existing retention dike MRGO Miles 36.6 to 37.1 and MRGO Miles 33.9 to 32.9.	Y	Y	Y
	MRGO5	188 acres of intermediate marsh would be restored behind 14,485 linear feet of vinyl sheet pile wall to establish the shoreline. 2.7 mcy of material would be obtained from Lake Borgne.	Y	Y	Y
	MRGO6	8,132 linear feet of new, non-continuous foreshore protection between MRGO Miles 36.0 and 34.2, immediately east of the existing stone closure of the MRGO. MRGO6 ties into an existing foreshore dike immediately downstream.	Y	Y	Y
	MRGO7	91 acres of intermediate marsh restoration adjacent to approximately 9,700 linear feet of bankline reclamation, consisting of 9,700 linear feet of vinyl sheet pile wall. 1.3 mcy of material would be obtained from Lake Borgne.	Y	Y	Y
	MRGO8	200 acres of intermediate marsh restoration adjacent to approximately 20,640 linear feet of bank reclamation constructed using vinyl sheet pile wall. 3.2 mcy of material would be obtained from Lake Borgne. Approximately 14,172 linear feet of new foreshore protection would also be included between approximate channel Miles 51.0 and 48.3		Y	Y
	SHELL BEACH REC	Recreational Feature – 343 linear feet of boardwalk into the MRGO, 805 linear feet of shoreline boardwalk to 5 picnic shelters (2 handicap accessible), interpretive signage, bathrooms, parking, solar lighting, and vegetative plantings		Y	

Table 1. Continued.

Area	Measure	Description	Alt. B	Alt. C	Alt. D
Central Wetlands	CC1	1,020 acres of cypress swamp restoration and 953 acres of cypress swamp nourishment in the area north of the existing Violet Canal along the 40 Arpent Levee. 8.5 mcy of borrow material to be obtained from Lake Borgne Borrow Area 5.	Y	Y	Y
	CC2	250 acres of cypress swamp restoration and 250 acres of swamp nourishment to the northeast of CC1. 2.4 mcy of borrow material to be obtained from Lake Borgne Borrow Area 5.	Y	Y	Y
	CC3	370 acres of cypress swamp restoration and 790 acres of swamp nourishment along the 40 Arpent Levee south of Paris Road. Approximately 5.3 mcy of material to be obtained from Lake Borgne Borrow Area 5.	Y	Y	Y
	CC4	1,465 acres of cypress swamp restoration in the open water areas adjacent to the 40 Arpent Levee north of Paris Road, including the Bienvenue Triangle area in Orleans Parish. 11.3 mcy of borrow material to be obtained from Lake Borgne Borrow Area 6.	Y	Y	Y
	CC5	1,120 acres of cypress swamp restoration and 1,645 acres of swamp nourishment south of the Violet Canal along the 40 Arpent Levee and the Chalmette Loop Levee. 9.6 mcy of borrow material to be obtained from Lake Borgne Borrow Area 4.	Y	Y	Y
	CC6	1,028 acres of cypress swamp restoration and 1,540 acres of swamp nourishment in the southwest corner of the Central Wetlands. 11.2 mcy of borrow material would be obtained Lake Borgne Borrow Area 4.	Y	Y	Y
	CM1	1,240 acres of fresh marsh nourishment south of Paris Road between cypress restoration feature CC3 and the Chalmette Loop Levee. Approximately 3.0 mcy of material would be dredged from Lake Borgne Borrow Area 5 for this feature.		Y	Y
	CM2	795 acres of fresh marsh restoration and 190 acres of marsh nourishment north of Paris Road. 3.8 mcy of material are required, 2.6 mcy of which can be obtained from the adjacent reach of the GIWW. The remaining material would be obtained from the Michoud Canal.		Y	Y
	CM3	300 acres of fresh marsh restoration and 215 acres of marsh nourishment in the area north of Bayou Dupre and south of MRGO. 1.9 mcy of borrow material would be obtained from Lake Borgne Borrow Area 5.		Y	Y
	CM4	98 acres of fresh marsh restoration and 129 acres of marsh nourishment south of Bayou Dupre. 900,000 cubic yards of dredged material would be obtained from Lake Borgne Borrow Area 4.		Y	Y
	CM5	245 acres of fresh marsh restoration and 70 acres of marsh nourishment in the area north of Bayou Bienvenue and Paris Road. 1.2 mcy of material would be obtained from Lake Borgne Borrow Area 4.		Y	Y
	VIOLET DIVERSION	7,000 cfs capacity freshwater diversion from the Mississippi River to the MRGO in the vicinity of Meraux.	Y	Y	Y
	VIOLET REC	Recreation Feature – 6,500 linear feet of guide levee multi-use path; 4,500 linear feet of path at the base of the levee; 15 picnic shelters (including 3 handicap accessible); interpretive signage; bathrooms; parking; solar lighting; and vegetative plantings along the Violet Freshwater Diversion		Y	
	BAYOU REC	Recreation Feature – 100 linear feet of platform, 995 linear feet of boardwalk into the swamp, 4 picnic shelters, interpretive signage, bathrooms, parking, solar lighting, and vegetative plantings in the Bienvenue Triangle.		Y	

Table 1. Continued.

Area	Measure	Description	Alt. B	Alt. C	Alt. D
East Orleans Landbridge	EM1	1,175 acres of fresh marsh restoration and nourishment of 2,830 acres of surrounding marsh in the area bounded by the Lake Pontchartrain shoreline, Chef Menteur Pass, and the levee. Approximately 8.1 mcy of material would be obtained from Lake Borgne Borrow Area 6.	Y	Y	Y
	EM2	1,095 acres of brackish marsh nourishment on Hog Island, located between the west and east mouth of the West Pearl River. Approximately 2.2 mcy of dredged material would be obtained from Lake Borgne Borrow Area 8.	Y	Y	Y
	EM3	861 acres of brackish marsh restoration and 180 acres of adjacent marsh nourishment in the area bounded by Highway 433, Little Lagoon, Salt Bayou and Highway 90. Approximately 3.45 mcy of dredged material would be obtained from Lake Borgne Borrow Area 8.		Y	Y
	EM4	2,625 acres of brackish marsh restoration and 1,455 acres of adjacent marsh nourishment in the area bounded by Salt Bayou to the north, the West Pearl River to the east, the Rigolets to the south and Highway 90 to the north. Approximately 10.6 mcy of material would be obtained from Lake Borgne Borrow Area 8.		Y	Y
	EM5	704 acres of brackish marsh restoration in the area on the south side of the Rigolets from Sawmill Pass to Counterfeit Pass. 2.3 mcy of dredged material would be obtained from Lake Borgne Borrow Area 8.			Y
	ES1	24,000 linear feet (4.6 miles) of shoreline protection from the south shore of Lake Pontchartrain to the terminus of the existing Bayou Chevee shoreline protection feature.		Y	Y
	ES2	30,750 linear feet of shoreline protection in Lake Pontchartrain between Chef Menteur Pass and The Rigolets.		Y	Y
	ES3	70,000 feet of foreshore protection along Lake Borgne between Alligator Point and The Rigolets.		Y	Y
	EV1	Three Submerged Aquatic Vegetation (SAV) protection structures 5,000 linear feet in length, consisting of five 750 feet low level rock weirs spaced 100 feet apart. This feature is located along the south shore of Lake Pontchartrain from near the former mouth of Turtle Bayou to the railroad bridge.			Y
South Lake Borgne	LS1	47,000 linear feet (8.9 miles) of shoreline protection beginning at the terminus of the Bayou Dupre supplemental shoreline project, extending around Proctor Point to the West of Shell Beach supplemental funding shoreline protection.	Y	Y	Y
	LM1	3,240 acres of intermediate marsh restoration from open water and nourishment of 777 adjacent acres in the Golden Triangle, south of the IHNC Surge Barrier. Approximately 12.8 mcy of borrow to be obtained from Lake Borgne Borrow Area 6.	Y	Y	Y
	LM2	422 acres of intermediate marsh restoration and 2,523 acres of marsh nourishment in the area between Proctor Point and the MRGO. Approximately 4.9 mcy of borrow material to be obtained from Lake Borgne Borrow Area 3.	Y	Y	Y
	LM3	911 acres of intermediate marsh restoration and 950 acres of marsh nourishment in South Lake Borgne north of Lena Lagoon in the area bounded by the lake, Bayou St. Malo, MRGO, and Doulluts Canal. Approximately 4.6 mcy of borrow to be obtained from Lake Borgne Borrow Area 2.		Y	Y
	LM4	289 acres of intermediate marsh restoration and nourishment of 95 adjacent acres of marsh in the portion of the Golden Triangle bordered by the GIWW, the IHNC Surge Barrier (under construction), and the MRGO. Approximately 1.35 mcy of borrow material would be obtained from Lake Borgne Area 6.		Y	Y
[illegible]	TM1	760 acres of brackish marsh restoration and 223 acres of marsh	Y	Y	Y

Table 1. Concluded.

Area	Measure	Description	Alt. B	Alt. C	Alt. D
		nourishment, requiring approximately 3.2 mcy of material to be obtained from Lake Borgne Borrow Site 2.			
	TM2	770 acres of brackish marsh restoration and 3,400 acres of marsh nourishment in the vicinity of Lake Ameda. Approximately 7.4 mcy of borrow material would be obtained from Lake Borgne Borrow Area 2.	Y	Y	Y
	TM7	2,255 acres of brackish marsh restoration and up to 3,338 acres of adjacent marsh nourishment on the east side of Bayou Terre aux Boeufs. 11.5 mcy of material would be obtained from Lake Lery if available, but it is currently assumed that material will be obtained from Lake Borgne Borrow Area 2.		Y	Y
	TM8	1,511 acres of brackish marsh restoration on the east side of Bayou Terre aux Boeufs in the vicinity of Delacroix. 5.5 mcy of material would be dredged from Lake Lery if possible, but it is currently assumed that material will be obtained from Lake Borgne Borrow Area 2.		Y	Y
Hopedale	HM1	757 acres of brackish marsh restoration and the nourishment of 973 acres of adjacent marsh, located in the Hopedale area bordered by MRGO to the northeast. 4.1 mcy of dredged material would be obtained from Lake Borgne Borrow Area 2.		Y	Y

- Lake Borgne Area
  - Lake Borgne
  - Lake Borgne Shore Zone
- Fishing Villages
  - Fishing Villages
  - Rural/MRGO Dredge Material Corridor (No Levees)
- Eastern St. Bernard Estuarine Ecosystem
  - Biloxi Marsh Zone
  - Lake Lery-Delacroix Marshes
  - Oyster Zone
  - Shoreline Barrier - East Biloxi Marshes
  - Chandeleur Islands and Sound

THE LEVEE PROTECTED CORE

The approximately 53,000-acre Levee Protected Core, virtually all of which is in St. Bernard Parish, is surrounded by 100-year hurricane protection levees. This core area includes the east bank of the Mississippi River, the upper reach of the relict Mississippi River-Bayou Terre aux Bouefs channel and the northern third of the Mississippi River Gulf Outlet (MRGO) dredge material disposal area (Figure 4). The unit is the oldest inhabited, most densely developed, most elevated and most flood protected area of St. Bernard Parish.

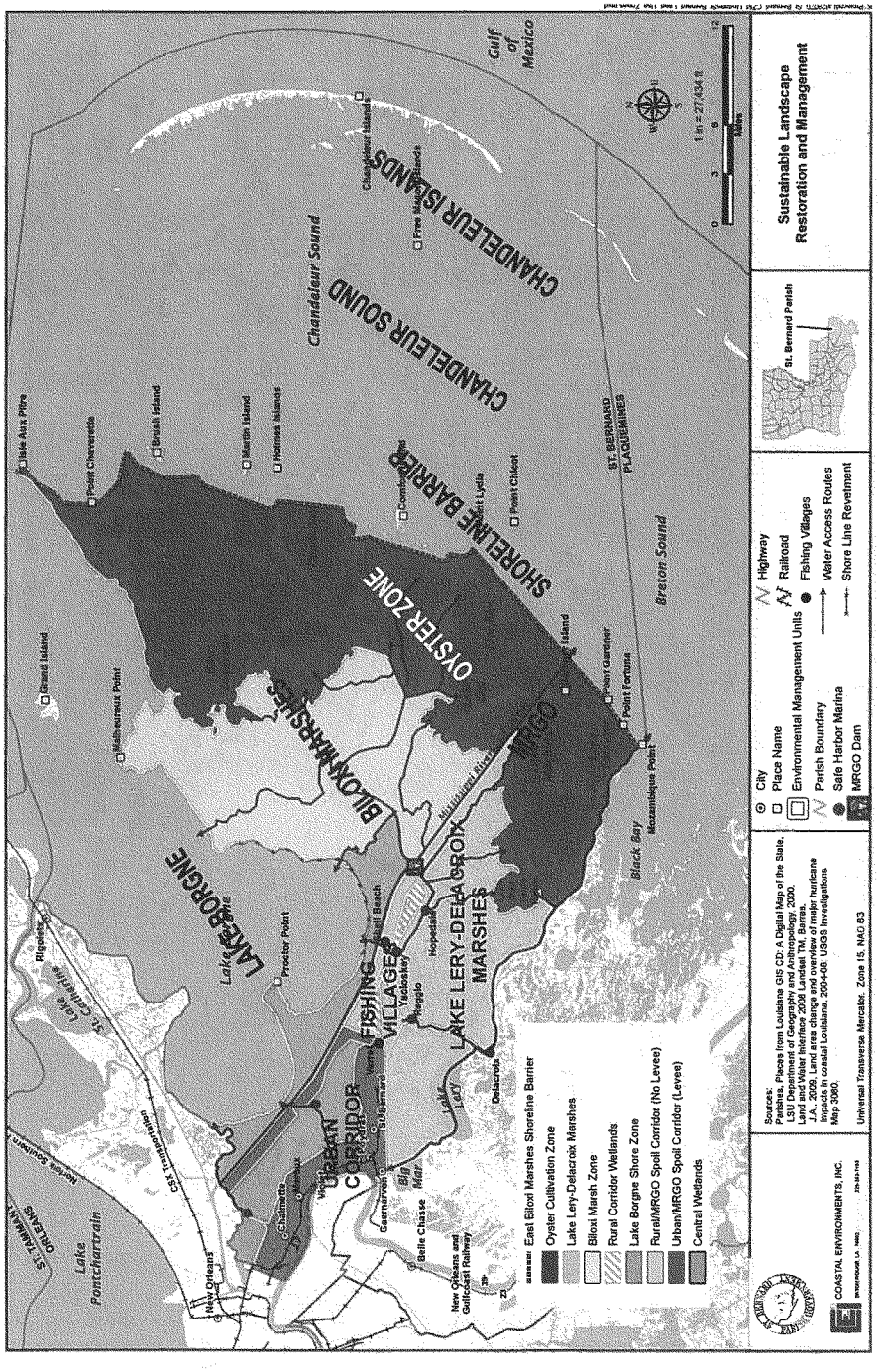


Figure 3. Major components of St. Bernard Vision and Coastal Restoration Plan.

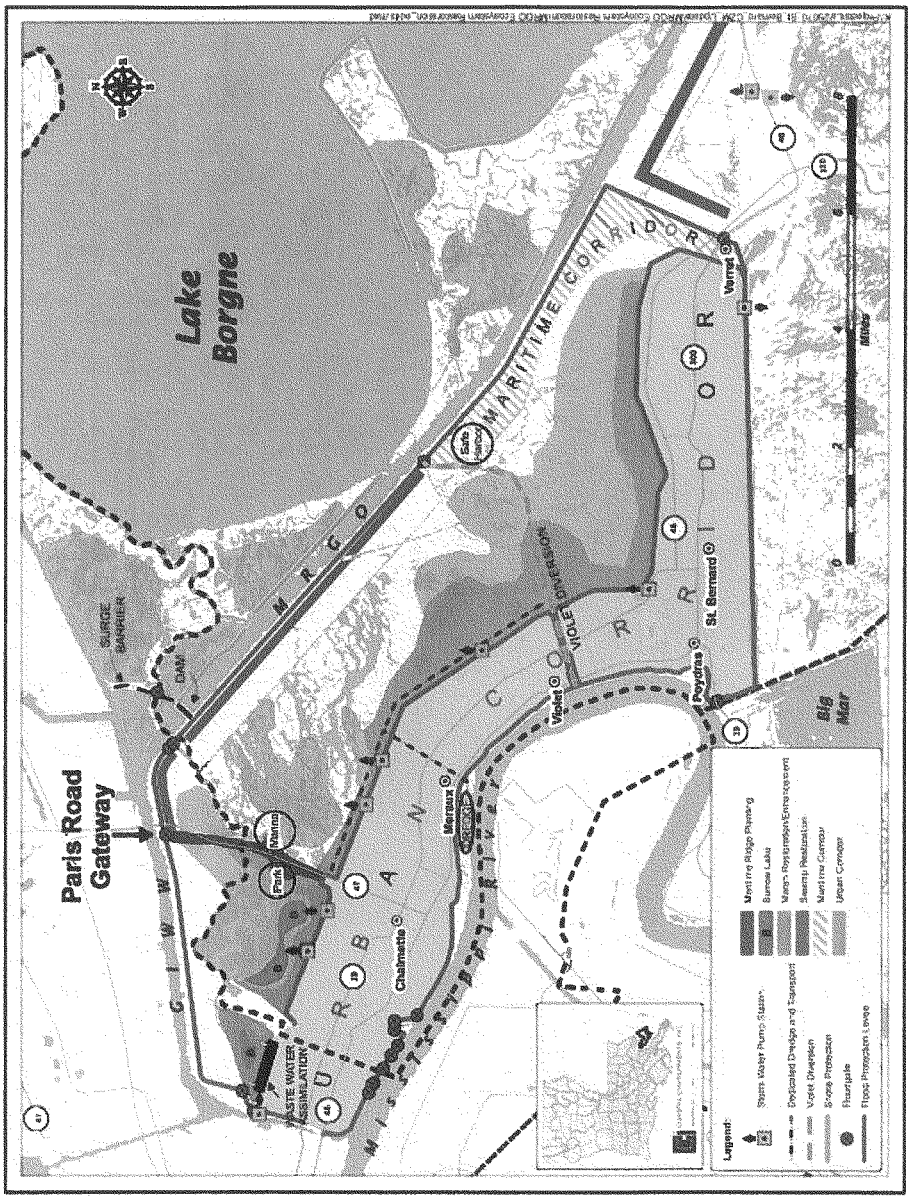


Figure 4. The levee protected core of St. Bernard Parish, including the Central Wetlands subunit and features related to ecosystem restoration.

The Urban Corridor

The existing approximately 21,000-ac Urban Corridor is the parish's flood protected development area located along the south and west perimeter of the larger Levee Protected Core. It is surrounded by levees to protect it from Mississippi River floods on the west and storm levees to protect it from hurricane and winter storm tides and surge from the north, east and south. A system of drainage canals and pumps provides drainage within the levee system.

Most of the population of the parish resides within this Urban Corridor. Communities within the corridor include Arabi, Chalmette, Meraux, Violet, Poydras, St. Bernard, Toca, Kennilworth and Verret. The corridor has a fully developed urban infrastructure including public water supply, electricity, gas, sewage and drainage services, railroads, state and local highways and street networks, schools, churches, hospitals, fire departments, police department, government services, etc. A full range of social and economic related services and shopping facilities is available. On the west side the Urban Corridor fronting the Mississippi River for 9.5 miles the parish boundary extends to the center of the channel. The Murphy Oil and Exxon oil refineries, American Sugar Refinery and port facilities are aligned along the Mississippi River. The area is linked to the City of New Orleans by the St. Bernard Highway (Hwy 46) and Judge Perez Drive (Hwy 39) as well as US Hwy 90 and I-10 via Paris Road (Hwy 47) and I-510. The corridor is linked to fishing villages to the south and east by Judge Perez Drive (Hwy 39), St. Bernard Highway (Hwy 46), Bayou Road, Hwy 300 and Hwy 624. The Urban Corridor is a small, viable American cityscape.

St. Bernard Vision for the Urban Corridor

- Orderly growth and development controlled by planning and zoning
- Healthy, sustainable mixed economic growth and development
- High quality of life linked to a rich cultural heritage and close proximity to the Greater New Orleans area as well as the coast and its natural bounty and beauty, and
- Education and job opportunities for the young and security for the senior population.

St. Bernard Comments on TSP for the Urban Corridor

The Violet Diversion control structure and conveyance channel would cut across the Urban Corridor and the Central Wetlands.

- St. Bernard Parish is opposed to Alternative Alignment # 1 through the Sinclair tract because this is not the highest and best use of the limited amount of undeveloped land within the levee protected area.
- If a diversion channel is approved, it should use the existing Violet Canal, Alternative #3.
- If the Violet Canal is used provisions must be made for a safe harbor for small boats because the Violet Canal presently serves this function.
- If sediment is mined from the Mississippi River for wetland restoration in the Central Wetlands, slurry delivery pipes may be routed across the Urban Corridor.

Central Wetlands

The Central Wetlands subunit lies between MRGO Spoil Bank subunit and associated flood protection levees and the Chalmette Loop flood protection levee at the back of the Forty Arpent Canal. Although within the Levee Protected Core of the parish, drainage of the Central Wetlands is confined to two outlets. They are interconnected to wetlands and water bodies outside of the levees by Bayou Bienvenue and Bayou Dupre are not under forced drainage. Runoff from the Urban Corridor is discharged from pumping stations into the Central Wetlands. Floodgates located on Bayou Bienvenue and Bayou Dupre at their junctures with the hurricane protection levee along the MRGO prevents tidal flooding during storm events.

Historically, the Central Wetlands were occupied by an extensive fresh-to intermediate marsh and cypress swamp. The rapid increase in salinity post construction of the MRGO channel resulted in deterioration of the freshwater marsh and swamp vegetation. By the 1990s, less than 90 ac of cypress trees remained and the former fresh-to-intermediate marsh had converted to brackish marsh, dead cypress trees and open water.

Paris Road Gateway

Paris Road (LA Hwy 47) traverses the western edge of the Central Wetlands and merges into Interstate 510 north of the MRGO, which in turn connects to Interstate 10. Thus, Paris Road is a gateway into St. Bernard Parish. There are commercial and recreational facilities activities along this road including a motel, restaurants, small shipyards, seafood wholesalers, water-front homes and a marina. The marina and other dockside facilities for commercial and recreational small boats in effect constitute a "safe harbor" in the Central Wetlands. The area can be protected from storm tides and surge by closing the Bayou Bienvenue flood gate.

The Nunez Community College, with a 2011 enrollment of more than 1664 students is located on Paris Road within the Urban Corridor but immediately adjacent to the Central Wetlands. The college lies in close proximity to waterway access into the coastal estuaries, Lake Borgne, the Mississippi Sound and the Gulf of Mexico. Because of the maritime heritage of many of its students and its location near the marine oriented businesses and activities, the college has great potential to develop degree programs in coastal restoration and maritime technology.

An important goal of St. Bernard Parish is to develop a comprehensive multiple-use plan to make the Paris Road Gateway the focal point for marketing coastal related assets of the St. Bernard – Orleans Parish region to tourists and the public at large. The multiple-use plan should include waterfront development, primary and secondary homes, restaurants, charter fishing boats, docking for commercial and recreational fishing boats, boat fuel and provisions, boating shops, arts and crafts shops, land and water based tours of historic, cultural, coastal restoration and disaster recovery and re-restructuring of the closed solid waste disposal site west of Paris Road an upland habitat and recreational area. This gateway should also include a small airport facility for floatplanes and helicopters.

The Paris Road Gateway should include a visitor center and museum complex. This complex should present the story of the history of the area and document the resilience of the people who

live here. The complex should present the story of the Islenos people of St. Bernard Parish, the African American heritage of the Lower Ninth Ward of New Orleans, and the culture and perseverance of the nearby Vietnamese Community. Other stories to be documented include those of the Native American peoples who inhabited the area for more than 3000 years, the foreign occupations of the area prior to American independence and Louisiana statehood, the British invasion through the coastal marshes during the War of 1812 and the subsequent Battle of New Orleans, and the Yugoslavian (Slavonivan) contributions to the development of oyster cultivation.

While the Paris Road Gateway has great future potential it requires planning and upgraded infrastructure. Land use has developed in the absence of a well-conceived plan and there are environmental problems related to hydrology and water quality. Wetland deterioration is a symptom of these problems. The proposed TSP, among the MRGO ecosystem restoration plans evaluated in the EIS, has many desirable features. It would in effect create a wetland park within the Central Wetlands that would, if fully achieved, create a grand backdrop for the plan envisioned above. The Paris Road Gateway should be the focal point for the proposed MRGO ecosystem restoration plan.

The MRGO ecosystem restoration within the Central Wetlands may not include funding for the waterfront planning and restoration outlined above, but it must be compatible with this multiple-use vision. The MRGO ecosystem restoration should create the hydrologic and edaphic conditions favorable for re-establishing a mosaic of landform-habitat types that includes bands of bottomland hardwoods along the restored banks of Bayou Bienvenue, the Violet Canal and the MRGO dredge material ridge, islands of cypress swamp fringed by fresh marsh and freshwater lagoons. Water quality conditions must be maintained that are not only conducive to the target vegetation communities, but also to the water oriented recreational uses envisioned. Figure 4 shows combined features of the St. Bernard vision plan and the MRGO ecosystem restoration.

The Violet Canal

The Violet Canal is a second gateway through and across the Central Wetlands. Located in the southeastern sector of this subunit, the Violet Canal (aka Lake Borgne Canal) is an historic water route which once linked the Mississippi River-St. Bernard Highway transportation corridor and Lake Borgne. The Violet Canal remains a link between the Urban Corridor and the lake. It is used by fishing boats and until recently was the location of a seafood processing plant. The canal has dockside fuel and provisions and serves as a safe harbor. At the head of the canal is a 48-inch diameter siphon pipe with a discharge capacity of 250 cubic feet per second (cfs) that delivers river water and suspended sediment over the flood protection levee, under the St. Bernard Highway and into the Violet Canal. The siphon was built to supply fresh water to the Central Wetlands.

Violet Canal Safe Harbor

As mitigation for impacts to development of the Violet Canal into the Alternative #3 freshwater diversion feature, a safe harbor and related facilities should be incorporated into the diversion design and located near the intersection of the Violet Canal - Bayou Dupre juncture with the

MRGO spoil bank or the 40-Arpent Canal - Chalmette Loop Levee. Material dredged for the safe harbor facilities could be used to restore marsh and diminish the amount of material dredged from Lake Borgne. Development and management of the safe harbor could be undertaken by the existing harbor authority in St. Bernard Parish and would provide a crucially needed place to harbor commercial and recreational boats during severe weather events as well as a hub for unloading and marketing seafood. When constructed and operated with public-private enterprises, as in the case of Port Fourchon, the operation would provide an economic boost to the parish and the region as well as being a component of the parish's hazard mitigation plan.

St. Bernard Comments on TSP for Central Wetlands

Items cited below refer to the USACOE (2010) Draft EIS document.

- All four alternatives for the Violet Diversion control structure and conveyance channel would cut across the Urban Corridor and the Central Wetlands (Figure 5).
- St. Bernard Parish is opposed to Alternative Alignment # 1 through the Sinclair tract because this is not the highest and best use of the limited amount of undeveloped land within the levee protected area.
- If a diversion channel is approved, it should use the existing Violet Canal, Alternative #3 (Figure 6).
- If the Violet Canal is used provisions must be made for a safe harbor for small boats because the Violet Canal presently serves this function.
- If sediment is mined from the Mississippi River for wetland restoration in the Central Wetlands, slurry delivery pipes could be routed across the Urban Corridor.
- Scale down acreage of cypress swamp restoration and use extra dredged material to restore more marsh habitat.
- Table 2-28 pg. 2-57 shows that within the Central Wetlands, 4,225 acres of swamp will be restored and 5,178 acres of swamp will be nourished, using a total of 48.3 mcy dredged from Lake Borgne. Within the Central Wetlands subunit southeast of Paris Road there were only 7459 ac of swamp habitat in 1956, 574 ac in 1978 and 93 ac in 1988. It does not appear that there are actually 5,178 ac of existing cypress swamp to be nourished in this area today. It would appear more responsible to create a narrow band of higher cypress swamp at the base of the 40-Arpent Canal - Chalmette Loop Levee and create a low-lying fresh-to-intermediate marsh between this newly created swamp and the landward side of the MRGO subunit. This action would reduce the amount of material dredged from Lake Borgne, or from a dedicated dredge material site on the Mississippi River, and would result in less impacts to benthic communities and hydrologic processes within the lake.
- Easements could be acquired on selected portions of the 15,700-ac MRGO subunit and planted with tree vegetation to restore an oak ridge - maritime forest ridge habitat with the lower-lying portions of the ridge planted with cypress. These actions would result in lower cost, higher sustainable fresh-to-intermediate wetlands and a linear oak-maritime forest/"pocket size "cypress swamp. These types of habitats would be less expensive and more sustainable under conditions of rising sea level and input of higher salinity waters

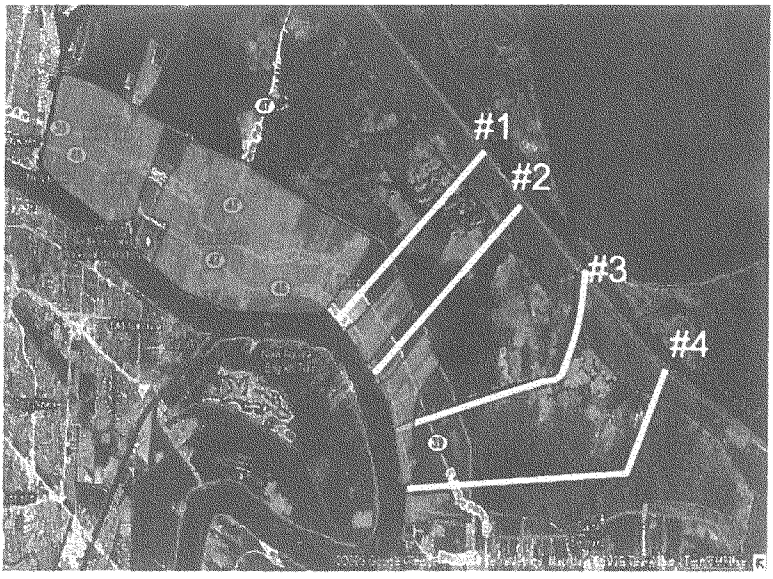


Figure 5. Alternative Freshwater Diversion Routes.



Figure 6. Alternative Location 3.

during extreme storm events and periods of drought when freshwater flow through the Central Wetlands would be reduced.

- Use dredged material from the Mississippi River, the Violet Canal, and lakes or lagoons excavated within the Central Wetlands to elevate the substrate sufficiently for replanting or natural re-establishment of marsh vegetation and cypress trees. The primary source should be Mississippi River sand bars.
- Re-establish a mineral soil base for the restored cypress swamp with dredge material. Use proven planting measures and herbivory control to restore marshes and cypress swamps.
- The water within the Central Wetlands must circulate and not be stagnant. Because of the location of these restoration projects within the immediate proximity to an urban population, they must not result in unhealthy swamps that will become a perpetual maintenance burden and vector threat for local government.
- Proposed environmental restoration measures involving freshwater and sediment diversion, discharge of forced drainage and waste water assimilation into flanking wetlands and establishment of staging areas for other types of restoration and monitoring activities occur on or pass through this unit. Such activities must be designed to minimize the impact to the unit's highest and best use as a land-based economic center of the parish.
- Finalization of the draft environmental restoration plan must be closely coordinated with the Parish's plans for land use, zoning and transportation.
- Pg. 2-99. Would the series of dikes used to retain dredged material for marsh and swamp restoration be configured to allow the borrow areas adjacent to the dikes to serve as conduits for freshwater circulation throughout the Central Wetlands from the discharge of treated waste water, flood water discharge pumps and the proposed Violet Freshwater Diversion Channel?
- Pg. 2-99. Construction of dikes to retain dredged material throughout the proposed 10,950 ac cypress swamp restoration area may be very expensive due to the difficulty of dredging through cypress stumps in the previously logged and dead cypress swamp area.
- Pg. 2-100. The General Operation Scheme proposed for reestablishment of a cypress swamp through restoration using dredge material disposal and planting and nourishment using dredge material disposal and natural recruitment, requires the ability to manipulate water levels, including draw-downs every 3 to 5 years. This scenario would appear to require construction of leveed subunits and operable water control structures, as well as man-power to manage the structures, to tightly control salinity and the movement, duration and elevation of water levels within the restored swamp

THE LAKE BORGNE AREA

The Lake Borgne Area includes the second largest open water fishing ground in the parish, its shoreline, fringing marshes and a large segment of the MRGO channel. This area can be distinguished for management and restoration into Lake Borgne proper and the Lake Borgne Shore Zone.

Lake Borgne

The configuration of Lake Borgne has remained relatively unchanged throughout historic times. Its two round southern lobes have remnants of a distinctive beach rim that formed two-thousand years ago. Historically grass beds along this rim provided habitat for crabs and other shellfish. As evidenced by shoreline accumulations, there are beds of *Rangia cuneata* clams in the lake. The lake is directly connected to the Mississippi Sound and thence to the Gulf of Mexico through large unobstructed tidal passes. The bottom of most of the lake is designated a public oyster ground by the Louisiana Department of Wildlife and Fisheries and some areas are identified as hard bottom habitat of Gulf sturgeon, an endangered species. All of Lake Borgne is designated as critical habitat for the Gulf sturgeon. There are also numerous private oyster leases in the lake outside of the public ground. Trawling for shrimp occurs throughout the lake and there is extensive crabbing and recreational fishing in the marshes and nearshore areas around its margin. In recent years, much of the southern shore has been lined with limestone boulders to retard shoreline erosion through a series of CWPPRA projects. The lake is used extensively by recreational and commercial fishermen from St. Bernard and Orleans Parishes and fishermen from coastal Mississippi.

Lake Borgne Shore Zone

The Lake Borgne Shore Zone is a ± 26,000-acre estuarine marsh located between the MRGO channel and Lake Borgne and extends from the GIWW westward to Bayou St. Malo. Land loss has been extreme in this unit from both shoreline and interior marsh loss. This area functions as a viable estuarine habitat and a protective apron against storm surge and waves between Lake Borgne and the storm levee along the west bank of the MRGO. The marshes have been badly degraded by erosion along the bankline of the MRGO channel.

Recommended Restoration, Management and Use

- Restore marsh habitat using material dredged from Lake Borgne and the GIWW.
- Install appropriate shoreline protection measures along the lake and MRGO channel (i.e., living shoreline emplacements, rock riprap, etc.). This shore area is generally too fresh for bioengineered oyster reef techniques.
- Minimize the dredging of access channels for placement of shoreline protection.
- Develop alternatives for sources of dredge material other than the bottom of Lake Borgne.
- Segment the abandoned MRGO channel into a series of lakes interconnected by smaller channels.
- Evaluate the construction of a submersible concrete barge surge breaker in Lake Borgne for the dual purpose of reducing height and intensity of storm surge against the 100-year hurricane levee/wall on the west side of the MRGO channel and enhancing fisheries habitat through the compartmentalization of Lake Borgne.
- The area is particularly rich in historic and prehistoric cultural resources that must be avoided and protected to the greatest extent possible and appropriate mitigation must be undertaken to prevent adverse impacts.
- Restore grass beds along Lake Borgne shoreline.

St. Bernard Comments on TSP for the Lake Borgne Area

As indicated in Figure 1 and Table 1, the plan calls for 8.9 miles of shoreline protection around Proctor Point (Measure LS1). Shoreline protection would consist of limestone rocks placed along the shoreline. Access channels would be dredged for the placement of the rocks. The plan also calls for 422 acres of intermediate marsh restoration and 2,553 acres of marsh nourishment in the area between Proctor Point and the MRGO (See Figure 1 and Table 1). To accomplish the latter, 4.9 million cubic yards (mcy) of material would be dredged from Lake Borgne. While Proctor Point is a critical landform, every effort must be taken to minimize damage to the lake bottom in implementing these projects.

The DEIS shows that Feature LM3 would restore 422 acres and nourish 2,523 acres of intermediate marsh in the Lena Lagoon area using 4.9 mcy of dredged material from a Lake Borgne Borrow area. This is a critical area for restoration, but the borrow areas will be detrimental to Lake Borgne. Can material be dredged from the MRGO channel? Can it be supplied via slurry pipeline from a Mississippi River sand mining operation at Wills Point? Can it be barged in as proposed in Feature BR1?

Measure BR1, a 48-acre ridge restoration on the south bank of Bayou La Loutre, is in an area with high potential for cultural resources. Dredge material (425,000 cubic yards of silty sand) will be barged in from a Mississippi River source. This feature, a component of the area's multiple lines of defense, and its sediment acquisition process is supported by the parish.

The most serious issue related to TSP is the extensive excavation of borrow pits in Lake Borgne as the primary source of fill for marsh and swamp restoration and enhancement measures. As shown in Figure 7 a very large area of lake bottom will be altered by dredging activity that is projected to continue over a 10-year period or longer. The DEIS states that natural filling of the borrow pits will occur over a period of several years (USACOE 2010b; 4-136) even though it is noted that "...there is little accretion and sediment movement in the lake..." (USACOE 2010b, 4-136).

A tabulation of the amount of dredge material needed for restoration measures and the source of this material reveals that virtually all of the material is planned to come Lake Borgne (Table 2) (USACOE 2010b: 2-56 – 2-59 & 2-115). Alternative C (TSP) is designed to restore or enhance 10,431 acres of swamp, 46,174 acres of marsh and 48 acres of ridge habitat. To achieve this restoration 1558.8 mcy will be dredged from borrow pits in Lake Borgne. Another 3.8 mcy of material will be dredged from the GIWW and the Michoud Canal for marsh restoration near these canals Orleans Parish. Only 0.425 mcy will be obtained from the Mississippi River and barged to Bayou La Loutre to construct the 48-acre ridge.

There is no question that there is a need for dredge material for wetland restoration and enhancement. However, the effectiveness of massive use for nourishment has not been convincingly demonstrated. The Corps considered a wide range of alternatives for fill material but rejected almost all on the basis of cost. The DEIS concluded that it is simply less expensive to pump material from Lake Borgne and to deliver it through slurry pipes to the major areas of restoration (Table 2).

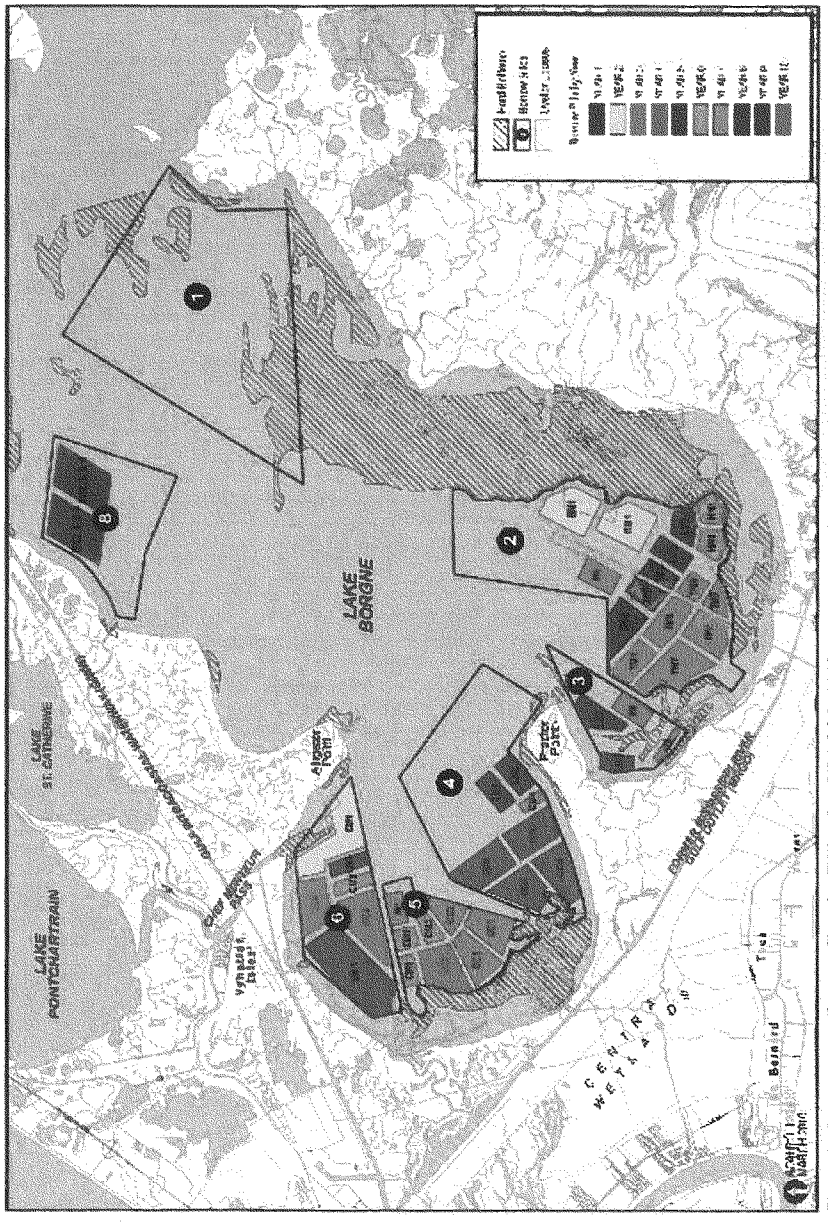


Figure 7. Lake Borgne Borrow Sites for TSP (after USACOE, 2010a, Figure 2-28, 2-115).

Table 2. Borrow Sites and Amount of Dredged Material Needed for Wetland Restoration and Nourishment Measures (after US ACOE 2010b, Pg. 2-56 – 2-59, 2-115).

Measure	Ridge	Swamp ac	Marsh Ac	LB 1* mcy	LB 2 mcy	LB 3 mcy	LB 4 mcy	LB 5 mcy	LB 6 mcy	LB 8 mcy	MS R	GIWW
North of MRGO												
BM1			8295		10.8							
LM1			4017						12.8			
LM2			2945			2.45	2.45					
LM3			1861		4.6							
LM4			384						1.35			
MRGO5			188		2.7							
MRGO7			91					1.3				
MRGO8			200			3.2						
Hopedale												
HM1			1730		4.1							
South of Bayou La Loutre												
TM1			983		3.2							
TM2			4170		7.4							
TM7			5593		11.5							
TM8			1511		5.5							
Central Wetlands												
CC5		2765					9.6					
CC6		2568					11.2					
CM2			985									3.8
CM4			227				0.9					
CM5			315						1.2			
CC1		1973						8.5				
CC2		500						2.4				
CC3		1160						5.3				
CM1			1240					3.0				
CM3			515					1.9				
CC4		1465							11.3			
Chef Menteur												
EM1			4005						8.1			
The Rigolets												
EM2			1095							2.2		
EM3			1041							3.45		
EM4			4080							10.6		
EM5			704							2.3		
Bayou La Loutre												
BR1	48										0.425	
TOTAL	**48**	**10431**	**46174**		**49.8**	**5.65**	**24.15**	**22.4**	**34.75**	**18.55**	**0.425**	**3.8**
* No Dredging Shown in DEIS												
Total Dredging from Lake Borgne: 1558.8 mcy; from MS River: 0.425 mcy; from GIWW: 3.8 mcy												

It is ironic that, as indicated in the DEIS (USACOE 2010b: 2-54), on average 150 million tons of sediment is passing by St. Bernard Parish each year only to be discharged into the deep gulf. We must conclude that given the need and cost of this restoration project, and the engineering and scientific expertise available, a system for obtaining the needed fill from the Mississippi River must be developed.

THE FISHING VILLAGES

The Fishing Villages Area consists of the individual fishing villages and the Rural/MRGO Dredge Material Corridor. This area stretching along the central reach of the Bayou La Loutre distributary channel-natural levee complex and the central portion of the MRGO dredge material disposal area.

The ±13,700-acre Unleveed Rural Corridor extends south and east along the natural levee ridges of the relict Mississippi River distributary channels of Bayou Terre aux Bouefs and Bayou La Loutre and the elevated MRGO dredge material retention area. This lower-elevated landscape is subject to flooding from storm surge and building construction must meet rigorous new standards for base floor elevations and resistance to hurricane force winds. A narrow expanse of marsh lies between the natural levees and the MRGO dredge material retention area. The Fishing Villages Area has, historically, been the least densely populated area of the parish with income derived largely from seafood extraction and limited agriculture. The unit contains six fishing villages, five of which have existed since historic times: Reggio, Delacroix, Yscloskey, Shell Beach, Hopedale and Ft. Beauregard. The community of Violet, although it lies within the levee protected Urban Corridor, is functionally linked with the fishing villages.

The configuration of settlements, boat launching and docking facilities, seafood off-loading areas, intricate network of tidal channels and close proximity to prime natural resource harvesting areas and inshore oil and gas fields support the continued use of this area for water oriented – water dependant activities. Infrastructure is not as well developed here as within the Urban Corridor, but there is electricity, roads and bridges, public water supply, police, fire and other emergency protection. Parish-wide economic development and coastal protection activities, guided by input from local inhabitants and property owners, would enhance services available for the area's inhabitants as well as provide additional revenue streams for the parish. New development must adhere to storm-hardened technology and meet environmental quality standards. All new construction must be built to FEMA flood elevations.

This area is well suited as a strategic staging area for rapid and sustained response to emergency situations, such as boating accidents, petroleum well blowouts and oil and hazardous materials spills. The fishing villages are a critical economic, cultural and social link between the Urban Corridor and the Eastern St. Bernard Estuarine Ecosystem of the parish.

Recommended Restoration, Management and Use

- Assessment of existing and future development needs through stakeholder input.
- Identification of funding sources and development of plans to take advantage of potential funding opportunities associated with offshore oil and gas activities.

- Economic development programs.
- Restoration and enhancement of interior marshes through sediment input and freshwater discharge.
- Development of a maritime forest on the MRGO dredge material disposal area.
- MRGO mitigation measures.
- Development of hurricane recovery and oil spill cleanup protocols
- Development of commercial/recreational marina - safe harbor complex.

EASTERN ST. BERNARD ESTUARINE ECOSYSTEM

The configuration and extent of the Eastern St. Bernard Estuarine Ecosystem is shown in Figure 8. Components of the ecosystem include Biloxi Marsh Zone, Lake Lery - Delacroix Marshes and lower reaches of the MRGO channel, Oyster Zone, Shoreline Barrier-East Biloxi Marshes and Chandeleur Sound and Chandeleur Islands (See Figure 3). The small bays and tidal channels of the Oyster Zone merge into the Chandeleur Sound through a maze of islands and reefs along a perimeter defined by a series of islands and headlands. The shoreline barrier depicted in Figure 6.1 illustrates the perimeter along which protection measures should be placed to provide added protection to interior wetlands and estuarine areas.

The Eastern St. Bernard Estuarine Ecosystem complex is exceptionally productive in fish and wildlife resources and natural services, including storm surge protection for inland urban communities. The Biloxi Marshes and the islands and reefs within the Oyster Zone, collectively, serve as a storm barrier for inland urban areas including Chalmette, Eastern New Orleans and Slidell in Louisiana and Bay St. Louis and Pass Christian in Mississippi. Storm surge models developed by the Corps of Engineers after the passage of Hurricane Katrina indicate that if the Biloxi Marshes had not been present, the surge which impacted the hurricane levees in St. Bernard and Eastern Orleans Parish would have been 15 to 20 percent higher (Greg Miller, per. com., Nov. 2010).

Biloxi Marsh Zone

The Biloxi Marsh Zone consists of a primarily brackish marsh core zone that extends from near the shore of Lake Borgne on the west to the Oyster Zone on the east. The brackish marsh merges with a saline marsh perimeter linked by interconnected tidal channels and shallow water bodies. The area is bordered on the north and west by Lake Borgne, on the south by the Bayou St. Malo and the MRGO channel extending eastward of the recently constructed closure dam, and on the east by a more broken marsh and bay complex that merges into the Oyster Zone on the east.

Almost all of Biloxi Marsh Zone is owned by the Biloxi Marsh Lands Corporation and an affiliated company Lake Eugenie Land & Development, Inc. The owners lease approximately 40,000 acres to the state for the Biloxi Wildlife Management Area.

St. Bernard Vision for the Biloxi Marsh Zone

- Real time monitoring and management of fresh water introduced to the area from the proposed freshwater diversion of Mississippi River

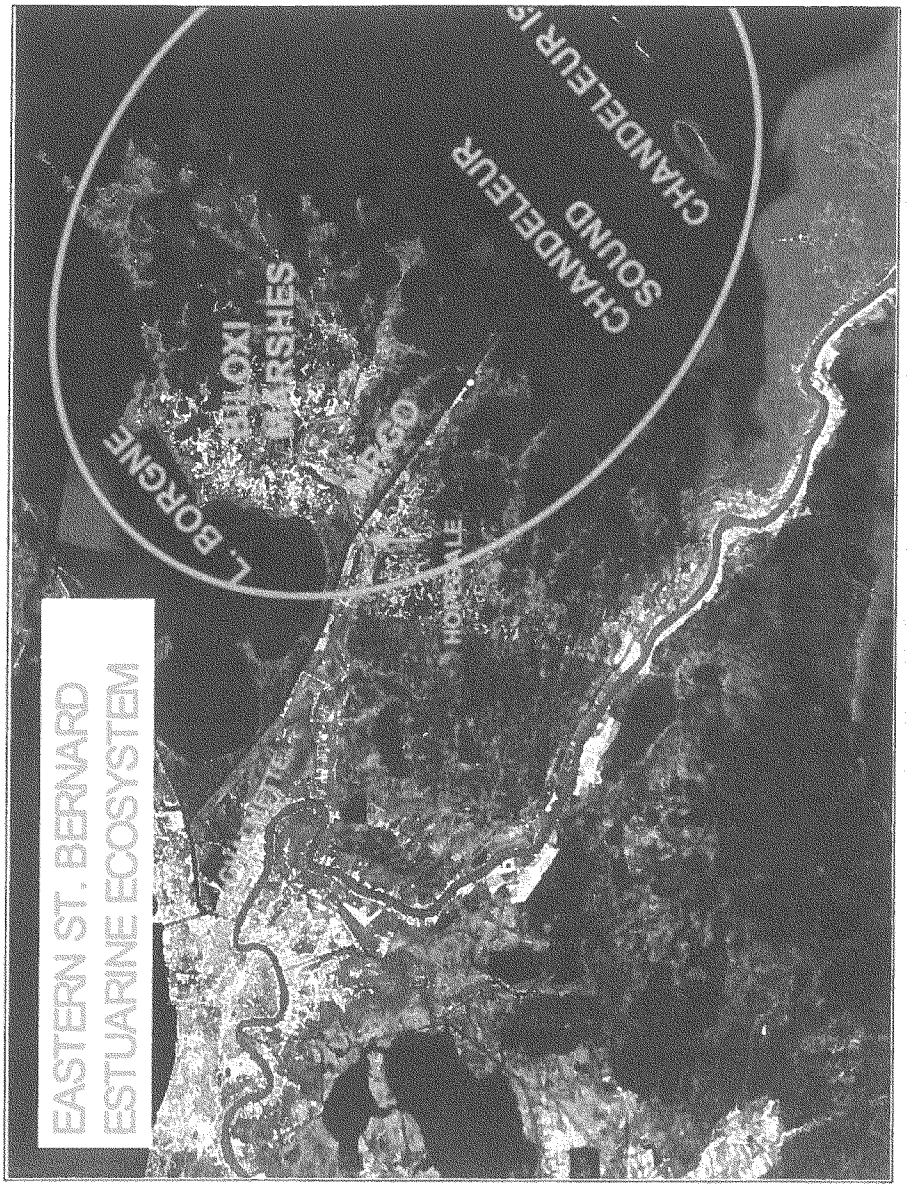


Figure 8. Eastern St. Bernard Estuarine Ecosystem

- Stabilization of shorelines
- Selective restoration of eroded marsh areas using transported dredged material
- Use of bioengineered oyster reefs for shoreline stabilization and estuarine sculpturing
- Support of implementation of management plans developed by the area landowner and managers of the Biloxi Wildlife Management Area that are designed to retard erosion and enhance and diversify wildlife and fisheries habitat.
- Customized management measures related to site characteristics and habitat maintenance and sustainability goals such as installation and management of small water control structures, vegetation planting in eatout and storm damaged areas, terracing, and maintenance of plugs on pipeline canals plugs to prevent scouring of substrate.
- Block unused drilling rig access canals to reduce tidal exchange and bank erosion.

St. Bernard Comments on TSP for the Biloxi Marsh Zone

- Feature BS1 calls for 9.7 miles of shoreline protection along the eastern shore of Lake Borgne extending from south of Point aux Marchttes to Malheureax Point. If rocks are placed along this shoreline, construction channels should be backfilled. Living shoreline alternatives, such as bioengineered oyster reefs, should be evaluated.
- The BM1 measure would nourish 8,295 acres of marsh along the western perimeter of the Biloxi Marshes, but would require 10.8 mcy of dredge material from a Lake Borgne borrow area. How will damage to lake bottom habitats be mitigated?
- Even though the Biloxi Marsh Zone experienced a large amount of direct and indirect detrimental impact from the MRGO deep draft channel the only restoration features shown along the MRGO below the closure dam are maintenance and repair of 1.2 miles of existing retention dike and 8,132 ft of new foreshore protection (MRGO4 and MRGO6) (USACOE 2010b; 2-86). The parish concludes that this is a high priority area for environmental restoration that has not been addressed in the DEIS.
- A program of systematic hydrologic and water quality measurements was initiated along the MRGO channel by the U.S. Geological Survey six months prior to placement of the rock dam across the MRGO channel on the east side of the Bayou La Loutre ridge. This program has continued since construction of the dam. Resulting data indicate a dead zone of low oxygen in the segment of the channel southeast of the closure dam after closure. St. Bernard requests that the Corps restore water quality within the MRGO south of the dam using all appropriate measures.

Lake Lery - Delacroix Marshes

The approximately 71,000-acre Lake Lery - Delacroix Marshes Unit, lying south of the Leveed Protected Core (Urban Corridor) and Unleveed Rural Corridor (Fishing Villages) is segmented into two areas by the north-south trending Bayou Terre aux Boeufs channel - levee complex extending from Verret to Delacroix (See Figure 3). Virtually all of the area is brackish marsh with only the eastern fringe being in saline marsh that merges into the more open water environment of the Oyster Zone. The area did not receive Mississippi River overflow during historic times but is currently influenced by fresh water, nutrients and sediment diverted via the

Caernarvon Freshwater Diversion structure. The area sustained extensive marsh loss from Hurricane Katrina in 2005. The marshes have high habitat value and provide some storm surge protection to the fishing villages of Delacroix, Reggio and Yscloskey.

The northeastern edge of the Lake Lery – Delacroix Marshes includes the 11.5-mile long MRGO spoil bank ridge. The MRGO channel north of the spoil bank extends southeast for 13.5 miles from the MRGO closure dam to the seaward side of Gardner Island. A very large part of the direct impact of the MRGO channel within the Lake Lery – Delacroix Marshes is due to excavation and deposition of dredged material within a leveed retention area located on top of marsh and shallow water bottom habitats.

St. Bernard Comments on TSP for the Lake Lery - Delacroix Marshes

- St. Bernard Parish supports TSP's 12,257-acre marsh restoration and nourishment measure (TM1, TM2, TM7 and TM8) but prefers to have the 27.3 mcy of fill material come from a Mississippi River sand mining operation at Wills Point rather than from the southeastern lobe of Lake Borgne.
- St. Bernard proposes that a permanent hydraulic mining operation be established to utilize sand from naturally replenishable bars along the left descending bank of the Mississippi River near Wills Point in Plaquemines Parish. The sand would be utilized jointly by Plaquemines and St. Bernard Parishes for ecosystem restoration and flood protection projects. A slurry pipeline and booster pump system would be constructed to deliver dredged material to selected areas to restore and sustain wetlands.
- The parish supports current adaptive management measures being considered for the Caernarvon Diversion to deliver more fresh water and sediment through the area north of Lake Lery using small channels and blockage of existing canals to restore the marsh. A slurry pipeline and booster pump system placed in the middle Caernarvon Diversion outfall area would facilitate sediment delivery to key land-building sites.
- Incorporate MRGO Ecosystem Restoration features into the ongoing adaptive management measures for the Caernarvon Diversion to deliver more freshwater and sediment through the area north of Lake Lery using small channels, training dikes and blockage of existing canals to maximize restoration of the marshes.
- Plug pipeline canals to reduce bankline erosion and saltwater intrusion.
- Construct revetments along eroding banklines using most suitable structural materials
- Establishment a maritime forest along the higher segments of the MRGO dredge material retention areas.
- Use dredge material from all channel/canal maintenance operations for wetland creation and enhancement.

Oyster Zone

The Oyster Zone consists of narrow marsh islands and reefs within and around large shallow bays. The islands are susceptible to edge erosion and breaching by tidal channels (Figures 9 and 10). The branching pattern of these islands is related to their origin as natural levee ridges

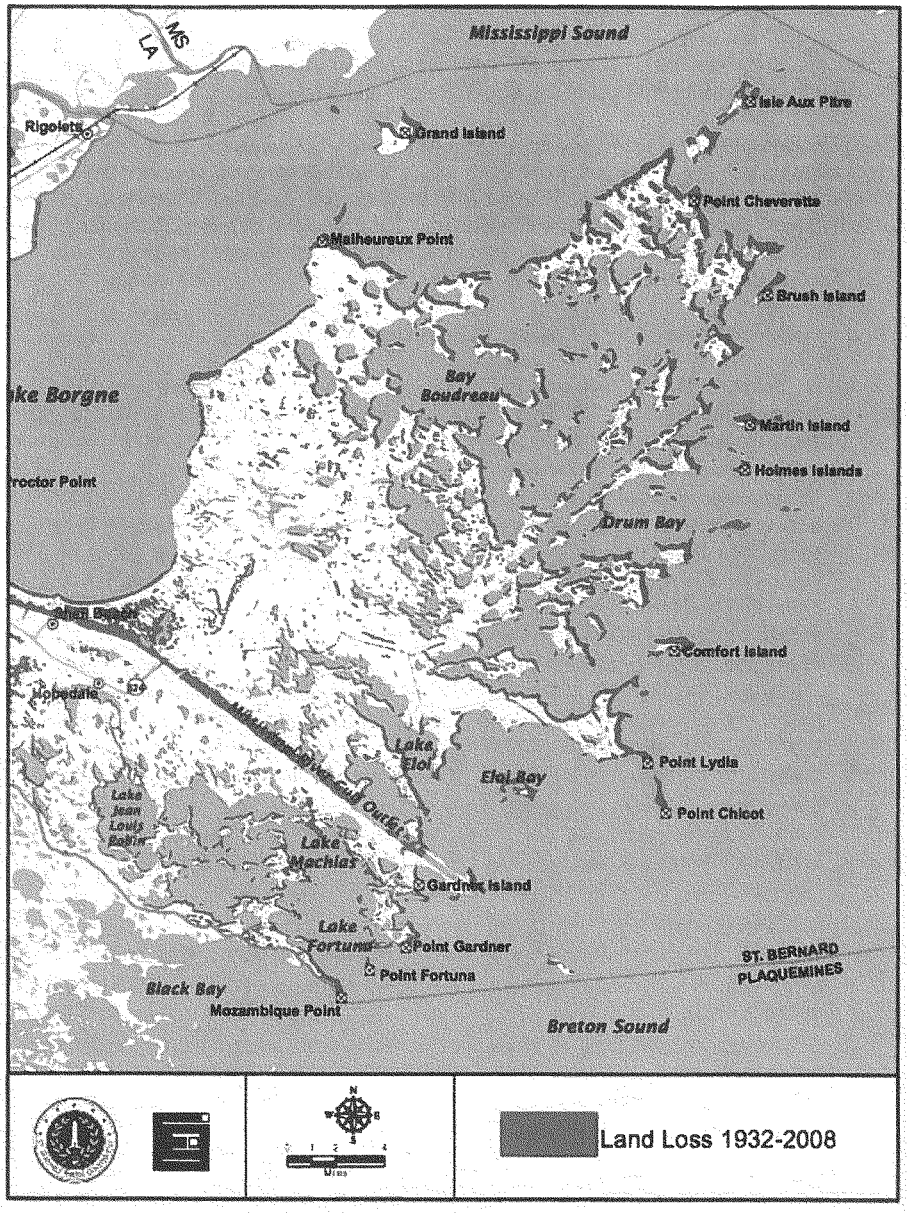


Figure 9. Thin, fragile islands and reefs of the Oyster Zone (after Barras 2009).

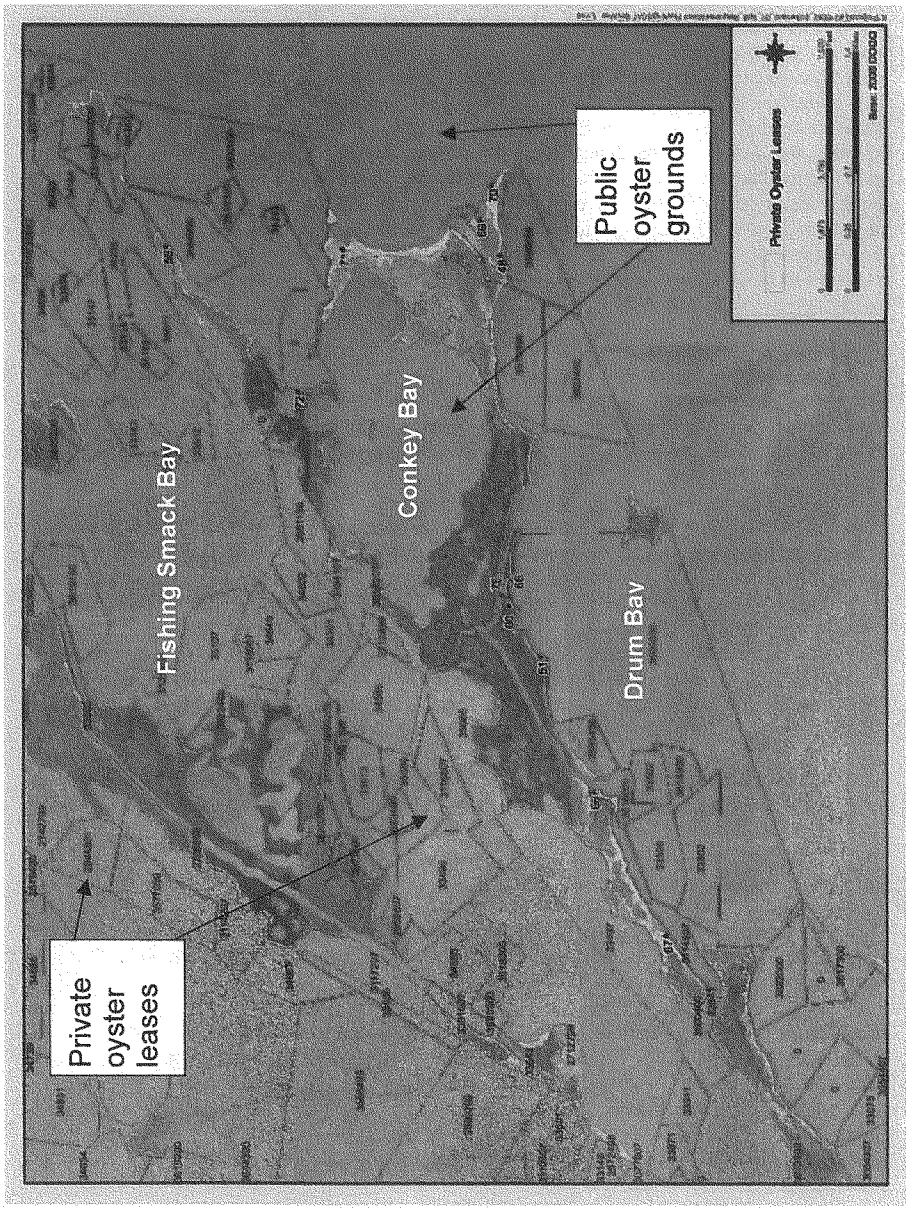


Figure 10. Islands, oyster leases and public oyster grounds in the Oyster Zone.

that formed along distributaries of the Mississippi River when they were active one to two thousand years ago. The natural levees are composed of sand, silt and clay-sized particles of mineral sediment transported into the area during a delta building episode called the St. Bernard. This delta lobe landmass, of which the Oyster Zone islands are remnants, originally extended eastward beyond the present location of the Chandeleur Islands. The old natural levees have subsided and during the abandoned stage of the delta lobe have been capped by saline marshes and in many places by oyster reefs. Extensive marshes which once occupied most areas between the distributary natural levees have largely eroded away, as the sediment upon which the marsh vegetation grew was highly organic and more susceptible to erosion than the mineral sediment of the old natural levees. Vegetation communities on the remaining marshes have made the transition to brackish and saline conditions and are more resistant to storm processes than fresh marshes on fragile organic soils.

In addition to favorable substrate around the numerous islands and tidal channels, the Oyster Zone has a salinity regime that was historically conducive to the growth of extensive natural oyster reefs and currently supports a highly economic commercial oyster industry. The area also has an abundant supply of plankton, good water quality and tidal currents deliver the food supply to the filter feeding oysters. These factors combine to further enhance conditions for exceedingly productive oyster growth.

Within the Oyster Zone most of the shallow waters around the islands and small water bodies are leased from the state by oyster fishermen for oyster cultivation. In contrast, the bottoms of the open waters of Chandeleur Sound and centers of the large bays directly connected to the sound are managed by the state as public grounds where oysters may be harvested and seed oysters dredged for transplant to the privately leased beds for grow out and harvest.

The Oyster Zone is a truly endangered ecosystem. In a recent op-ed article in *The New York Times*, two prominent biologists described the ecological value of oyster reefs in the northern Gulf of Mexico. The authors (Jacobsen and Beck 2010) stated that

> There are few other places on earth still like this. Worldwide, 85 percent of oyster reefs have been lost. They are the single most imperiled marine habitat. The oyster reefs of the gulf are not merely the best in the nation; they are the best in the world, a global treasure. Yet some 50 percent to 90 percent of the gulf's oyster reefs have been lost, and that was before BP's oil spill.

There is a worldwide and nationwide movement among the conservation community to restore oyster reefs. The Oyster Zone in eastern St. Bernard Parish is among the best of the best. It has been impacted by the MRGO and it is endangered.

The Nature Conservancy, Louisiana Chapter, with funding provided by the American Recovery and Reinvestment Act through the National Oceanic and Atmospheric Administration, has promoted restoration of oyster reefs as a means of shoreline protection and enhancement of biodiversity. Within St. Bernard Parish a permit has been obtained to construct 4.54 miles of bioengineered oyster reefs in the Oyster Zone of St. Bernard Parish, of which 2.15 miles have been fully funded. This installation, while slowed by the BP oil spill incident, is expected to be completed in 2011.

Destructive Processes Within the Oyster Zone

Processes that are causing deterioration in the Oyster Zone include subsidence and chronic edge erosion as well as interior marsh erosion from storm tides, waves and surge. Unlike many areas along the Louisiana coast this area is relatively stable. Total relative sea level rise in much of this area is less than 1.0 ft. per century, most of which is attributed to eustatic sea level rise.

Critical ingredients for a sustainable restoration and management program include maintenance of the skeletal framework of old alluvial ridges and reefs that hold the more fragile marshes together and reduction in the destructive effects of expansion of the tidal prism. The key to controlling edge erosion is to armor the shore with barriers and granular beach material. This can be achieved through a vigorous program of oyster reef restoration.

The shorelines of the islands are generally low, muddy and marshy (Figure 11). The marsh grass is essential for holding the islands together and for capturing sediment brought in by tides and surge. A healthy root mat is somewhat resistant to wave erosion. Typically, there is an erosion scarp at the edge of the marsh grass. When the marsh grass dies back along the water's edge leaving an un-vegetated muddy marsh floor, erosion during both winter and tropical storms is greatly accelerated. Year-in-year-out winter storms cause the north side of the islands to erode. Erosion on the south side is most severe during hurricanes. When edge erosion results in breaches across the islands, the breaches quickly evolve into deeply scoured tidal passes. Segmentation is the death knell of these islands.

Island Accretion (How The Islands Build Up)

Recent field investigations in the area indicate that the islands and reefs of the Oyster Zone are sustainable against the forces of subsidence and edge erosion. Some clays drift into the area from the Mississippi River and Pearl River and from the Chef Menteur Pass and the Rigolets. Eroded sediment is also redistributed over the marshes by storms and tides. These sediments are captured by the healthy brackish and salt marsh vegetation, and in turn contribute to robust root mat growth.

In many places, oyster shells wash up on the islands and form ridges that reduce edge erosion and build up the islands elevation (Figure 12). Field reconnaissances during the response phase to the BP oil event revealed the extent of the shell build up and the processes by which shells are transported and deposited and shell ridges develop.

Figure 13 shows a typical section across one of the islands in the Oyster Zone. The section depicts a mean tide condition. The body of the island is low and flat; the marsh floor about one foot above water level. The island has a firm base consisting of silt and sand deposits of an old Mississippi River distributary. This base is capped by several feet of marsh deposits topped by a living root mat. The predominant vegetation is *Spartina alterniflora,* with a uniform canopy about 2 feet above the marsh floor. There are occasional patches of mangroves. Set back from the shore 25 to 100 feet or more are prominent elongated banks of oyster shell three to four feet high and usually capped by salt cedars and other small bushes. Wrack lines consisting of rafted wood and grass are common and are typically set back 25 to 50 feet from the shore. The area

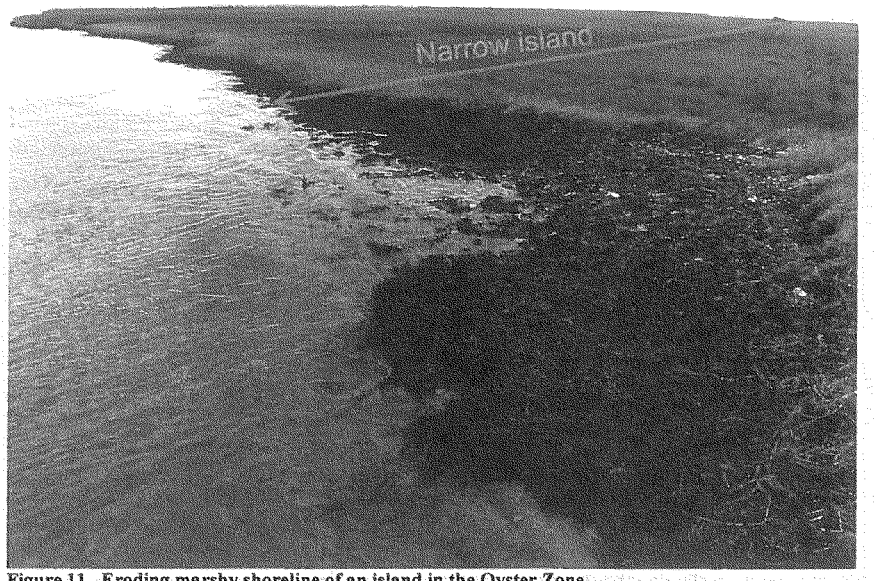


Figure 11. Eroding marshy shoreline of an island in the Oyster Zone.



Figure 12. Oyster shell bank in St. Bernard Parish.

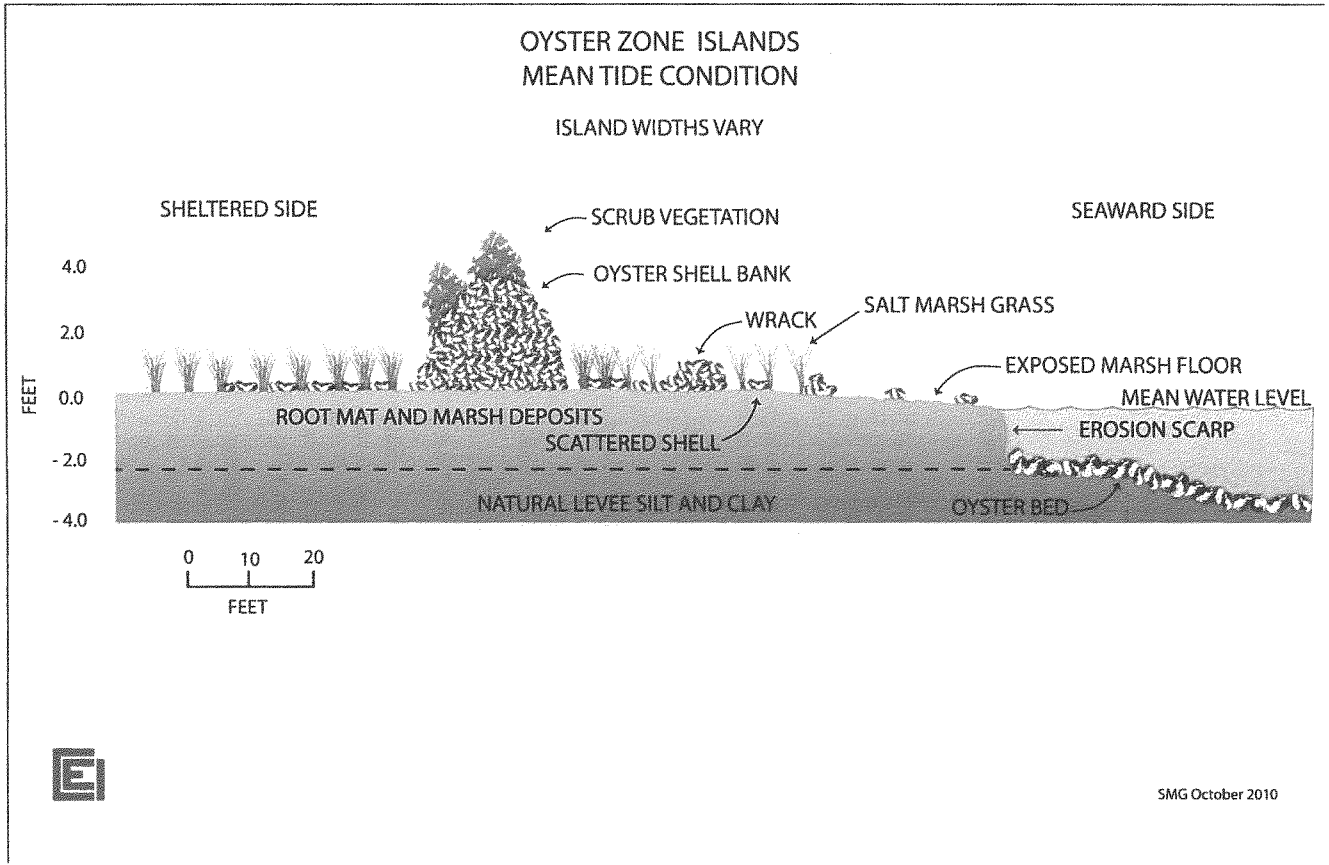


Figure 13. Section across an Oyster Zone island at mean tide.

between the wrack line and the shore may be occupied by marsh vegetation or may be denuded muddy marsh floor. The edge of the island is marked by a subaqueous two-to-four foot vertical scarp. Often there is a notch at the base of the scarp where soft organic deposits under the root mat have been undermined. Small concentrations of live oysters and shell may be found on the marsh floor at the top of the scarp. Oyster growth often occurs at the base of the scarp and extends for variable distances into the adjacent water body.

Figure 14 depicts the same section shown in Figure 13, except that the water is elevated above the marsh floor and most of the grass canopy. This condition exists during high spring tides and during squalls. Under such conditions, water flows freely through and over the low canopy saline marsh grass and some oyster shell and live oysters may be thrown to the top of the erosion scarp and onto the marsh floor. However, it should be noted that the higher shell banks are not overflowed during such conditions.

Figure 15 depicts conditions across the section during a high energy tropical storm. The water level is elevated above the entire island, including the oyster shell bank. Storm generated waves ride in on top of the tide elevated water surface. As the waves travel from open water across the erosion scarp and the marsh edge they pick up live oysters and shells and deposit them as banks on the body of the island. In plan view the banks show sinuous and parabolic-dune patterns resulting from shaping by breaking waves and surge. When the oyster shell bank is overtopped some shell is thrown onto the body of the island contributing to aggradation or build up.

St. Bernard Comments on TSP for the Oyster Zone

St. Bernard Parish supports TSP measures (BS2) to reduce shoreline erosion in the Eloi Bay Area of the Oyster Zone through development of artificial oyster reefs. However, the parish encourages more aggressive measures to protect larger expanses of shoreline and interior marsh habitat. Measures should be taken to reinforce the basic skeletal framework of the Oyster Zone, such as the Bayou La Loutre land bridge between Point Lydia and Point Eloi and the segmented tidal barrier between Point Eloi and the south bank of Canal Pecal. Shoreline erosion should be reduced around Lake Eloi and Lake Athanasio. The enlargement of tidal channels at the upper reaches of Lake Eloi and Lake Athanasio should be controlled.

The parish would like to see shoreline stabilization measures implemented around Gardner Island, the last area of marsh along the eastern bank of the MRGO channel. Erosion along the northeast bank of the MRGO in the broken marsh area above Lake Athanasio should be controlled through appropriate living shoreline techniques, including combined rock/bulkhead/sheet piling-dredged fill-vegetation planting and bioengineered oyster reefs.

Within the Corps designated Louis Robin Subunit (23) of the Oyster Zone, St. Bernard Parish wants the shorelines of island groups to be stabilized around Fiddler Point, St. Helena Bay, Pass Fernandez and Point Gardner. Additional areas requiring shoreline stabilization are the Mozambique Point – Bayou Palo Headland and the landbridge on the east side of Lake Calibasse. Shoreline stabilization is needed to control the tidal passes at Bayou Palo, Numa Pass, Cat Pass and three unnamed passes on west side of Lake Machias. The parish desires to have selective shoreline stabilization implemented on Lake Calibasse, Lake of Two (Second)

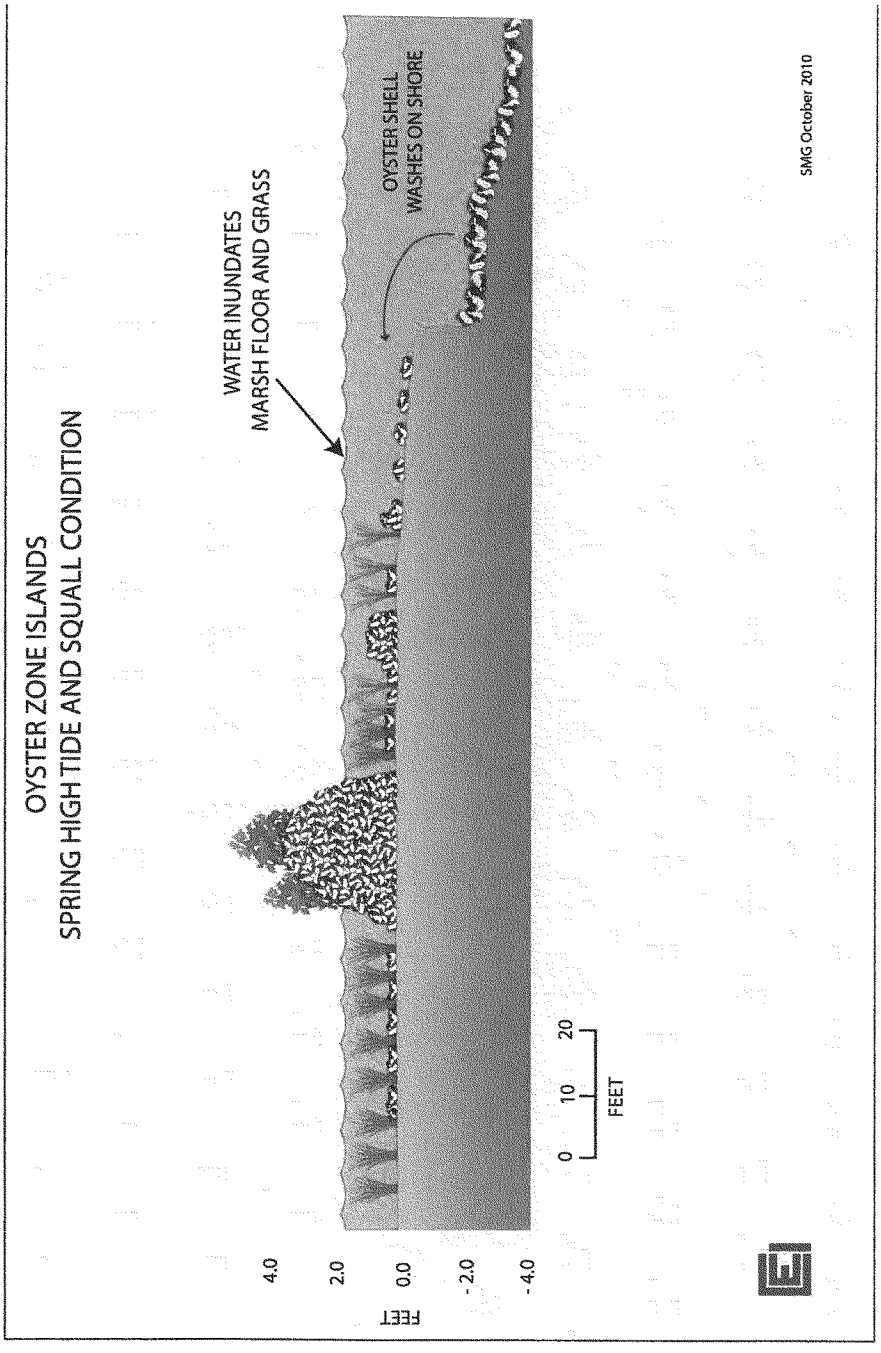


Figure 14. Section across an Oyster Zone island at spring high tide and squall conditions.

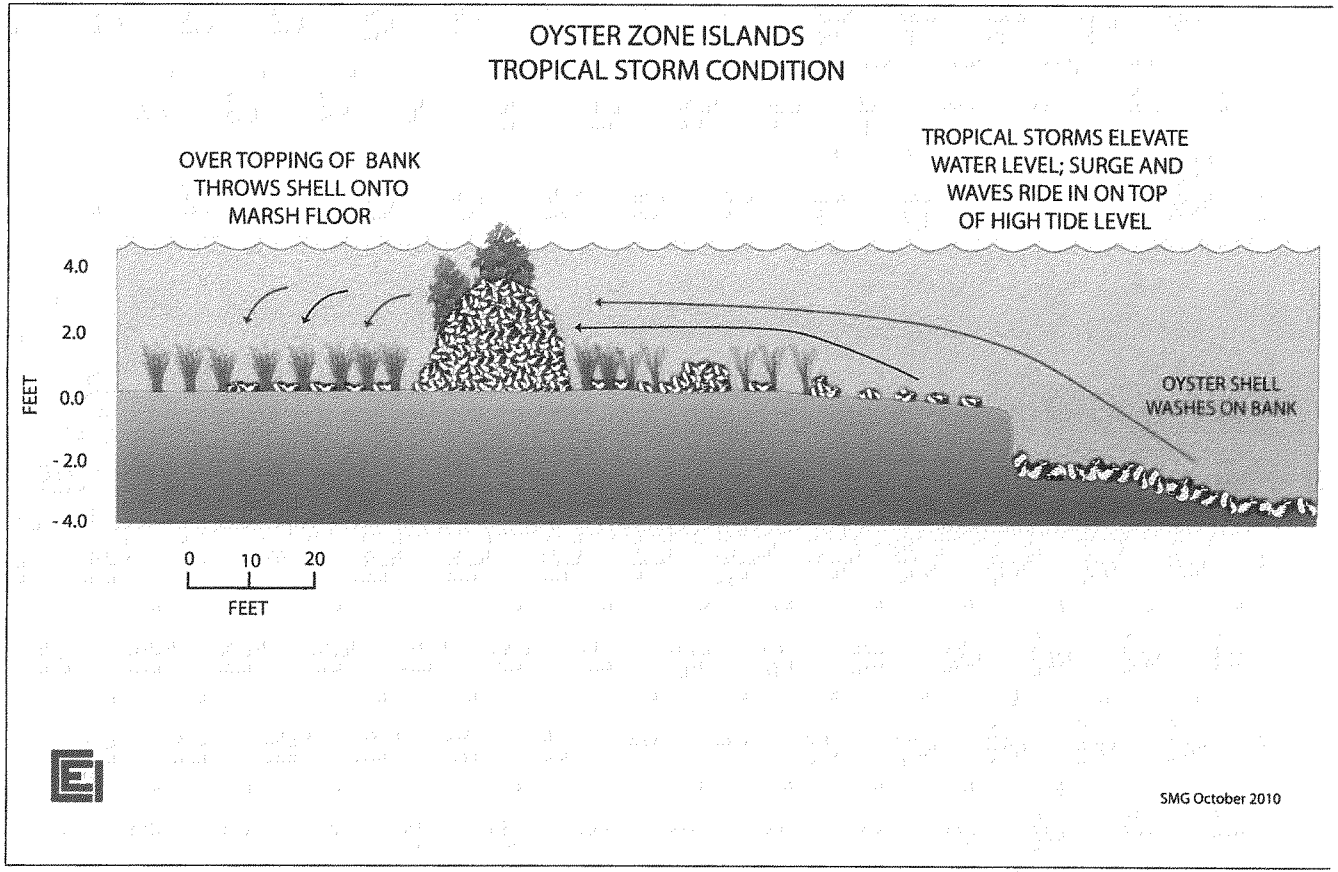


Figure 15. Section across an Oyster Zone island during passage of a tropical storm.

Trees, Lake Coquille and Lake Robin. A detailed discussion of the mechanisms to stabilize shorelines and prevent marsh loss using a variety of techniques presented below.

Figures 13 – 15 were constructed from field observations and an analysis of oyster shell banks visible on aerial photographs. These schematic diagrams depict processes that build up these islands in the face of subsidence. If the islands are diminishing largely as a result of edge erosion, and oyster shell washed up onto the shore and the body of the island reduces erosion and builds up the islands, it follows that an increase in the production of oyster shell would decrease the erosion and deterioration of the islands. Figure 16 illustrates a proposed restoration plan whereby crushed concrete oyster cultch would be spread on denuded marsh floor areas along the edges of the island, along the scarp and in the adjacent near shore areas. Accelerated oyster growth would armor the denuded marsh floor making it less vulnerable to erosion. In addition, the cultch supply would create more oyster growth and greater quantity of shell available to be washed up along the marsh edge to form beaches and to be thrown up onto the body of the island to form oyster shell banks and over-wash debris during high energy tropical storms. A second stage of the restoration plan would be to install induced high-vertical-profile oyster reefs parallel to and a short distance from the shore (Figure 17). These bioengineered reef features would break wave energy and form a protective reef barrier and lagoon. Thus, the eroding shoreline would be transformed into a living shoreline with diversified habitat types, erosion protection and result in an increase in oyster growth and shell supply.

Figure 18 shows typical deployment of reef units along an eroding shore for the purpose of creating a barrier and lagoon configuration. The reef units are aligned in a saw-tooth pattern in segments that are parallel and about 75 feet away from the eroding shore. Gaps are left between the segments to allow tidal movement. This configuration results in the creation off oval-shaped tidal lagoons. Each 110-foot segment of reef units creates a quarter-acre lagoon. Tombolos composed of oyster shell and captured sediment would form behind each reef segment. Live oysters and shells of dead oysters would become detached from the reef units. Some of this shell supply would accumulate within the lagoons and on the tidal flats and eroding shore where live oyster larvae would attach as spat and initiate cluster growth of new oysters. Some shells broken from the reef units and the new growth clusters would wash onto the eroding shore to form beaches and oyster shell banks. Oyster growth could be further accelerated by spreading crushed concrete cultch within the lagoons. Thus, the induced oyster reef shoreline treatment becomes a veritable biological machine for manufacturing huge quantities of calcium carbonate limestone rock in the form of oyster shells. In addition to the erosion control benefits, these reef forms support high levels of biodiversity for both aquatic and terrestrial organisms.

This newly developed understanding of the role of oysters as reef building organisms led to the parish's request for implementation of an emergency plan for the introduction of oyster cultch to the tidal flat and near-shore areas of the Oyster Zone to increase the supply of shell and further reduce erosion. Cultch spreading on exposed mudflats damaged by oil from the BP incident was initially proposed to prevent excessive hurricane and winter storm erosion and island breaching. The plan works as well for long-term reduction of edge erosion within the Oyster Zone and other estuarine areas with conditions conducive to oyster growth.

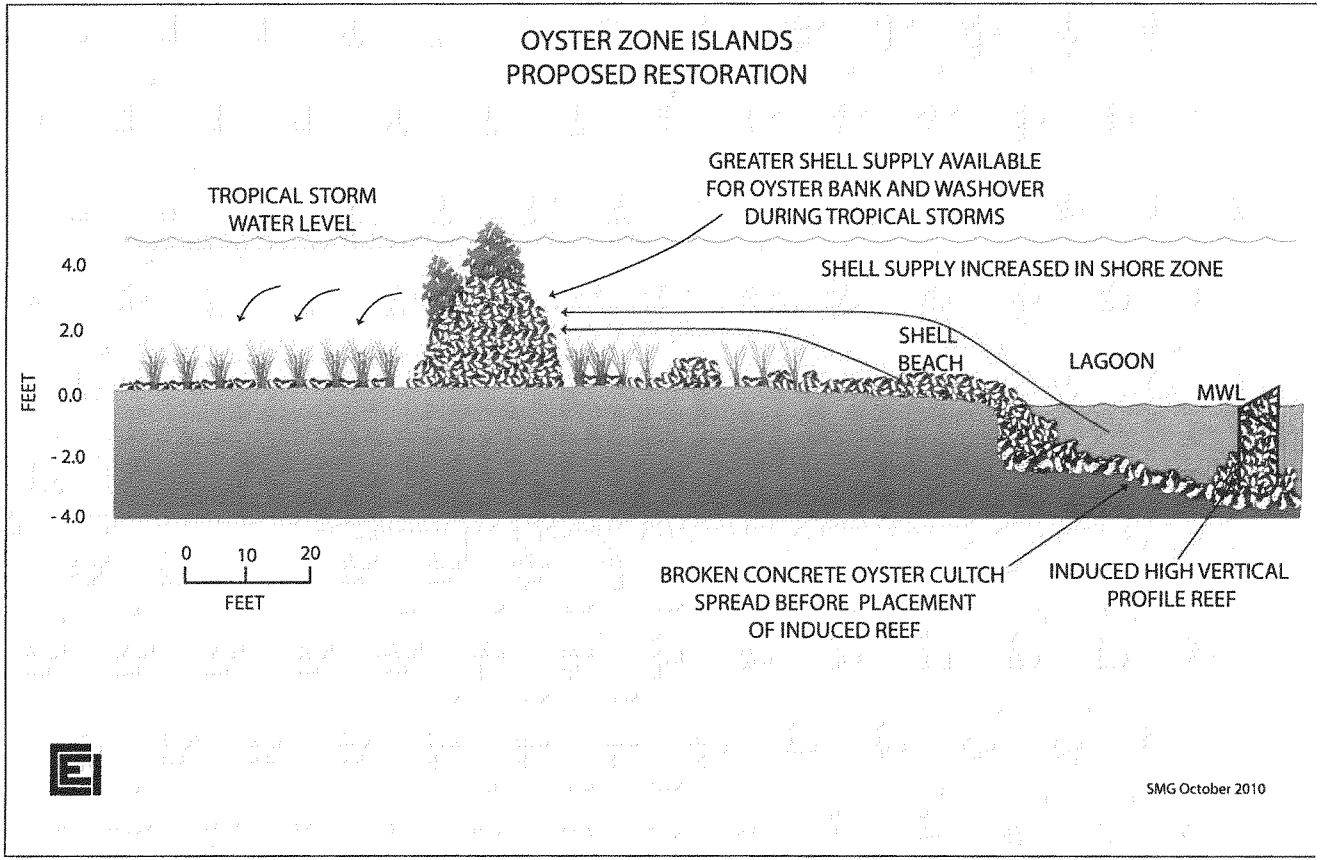


Figure 16. Section across an Oyster Zone island showing proposed stabilization and restoration.

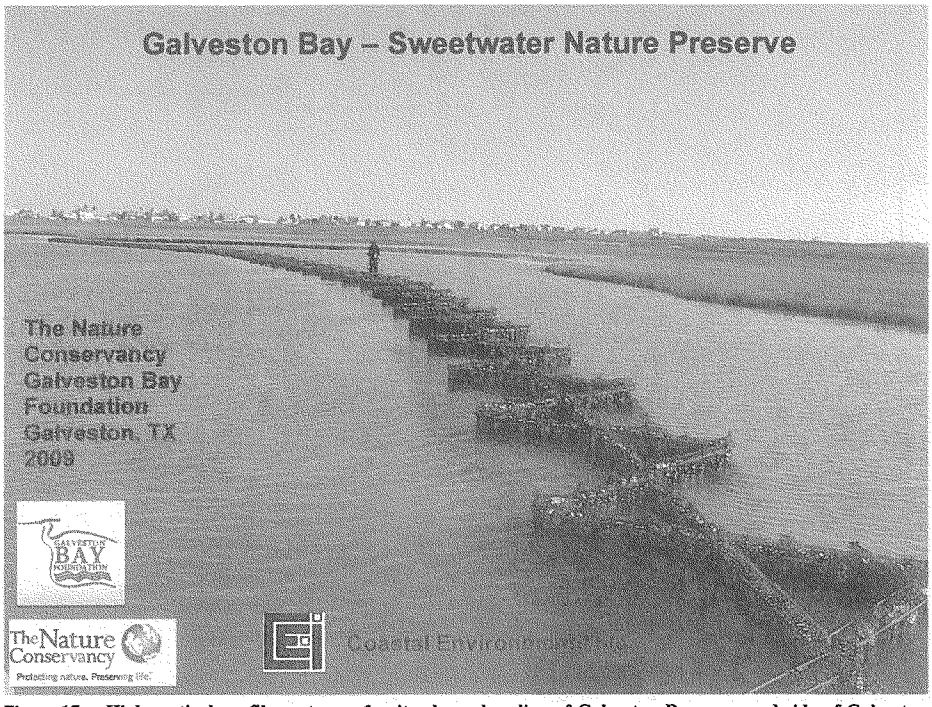


Figure 17. High vertical profile oyster reef units along shoreline of Galveston Bay on sound side of Galveston Island.

Figure 19 illustrates other applications of induced oyster reefs for controlling headward expansion of open bay conditions in hydrologic sub-units of the larger Eastern St. Bernard Estuarine Ecosystem. Induced oyster reefs can be used to stabilize small tidal passes and control expansion of tidal prisms resulting from interior marsh breakup. As shown in Figure 19 uncontrolled edge erosion and interior marsh breakup results in the landward advance of the bay shoreline in increments of 4 to 5 miles. Oyster fishermen have placed a voluntary moratorium against harvesting their beds in these newly eroded areas and are replenishing them by spreading crushed concrete cultch.

Shoreline Barrier - East Biloxi Marshes

The eastern perimeter of the Oyster Zone from Isle aux Pitre on the Mississippi Sound to Mozambique Point on Breton Sound and encompassing Bay Boudreau, Drum Bay, Morgan Harbor, Eloi Bay, Lake La Fortuna and interconnected smaller lakes and fringing wetlands is an elongated dynamic edge area which would benefit from enhancement as a Shoreline Barrier Zone. The outer protected element of the Shoreline Barrier Zone would be a segmented barrier

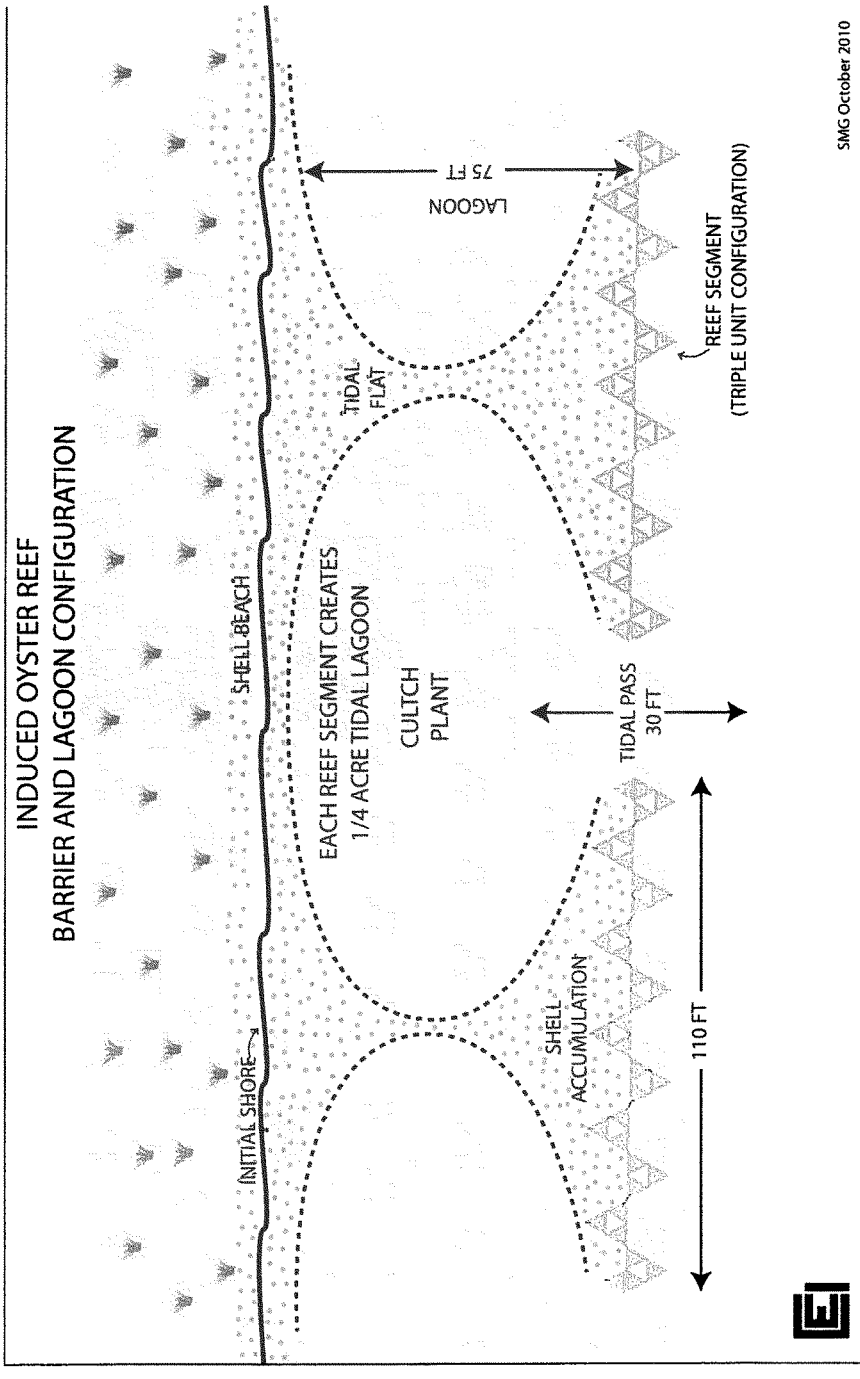


Figure 18. Plan view of proposed stabilization and restoration of an Oyster Zone island.

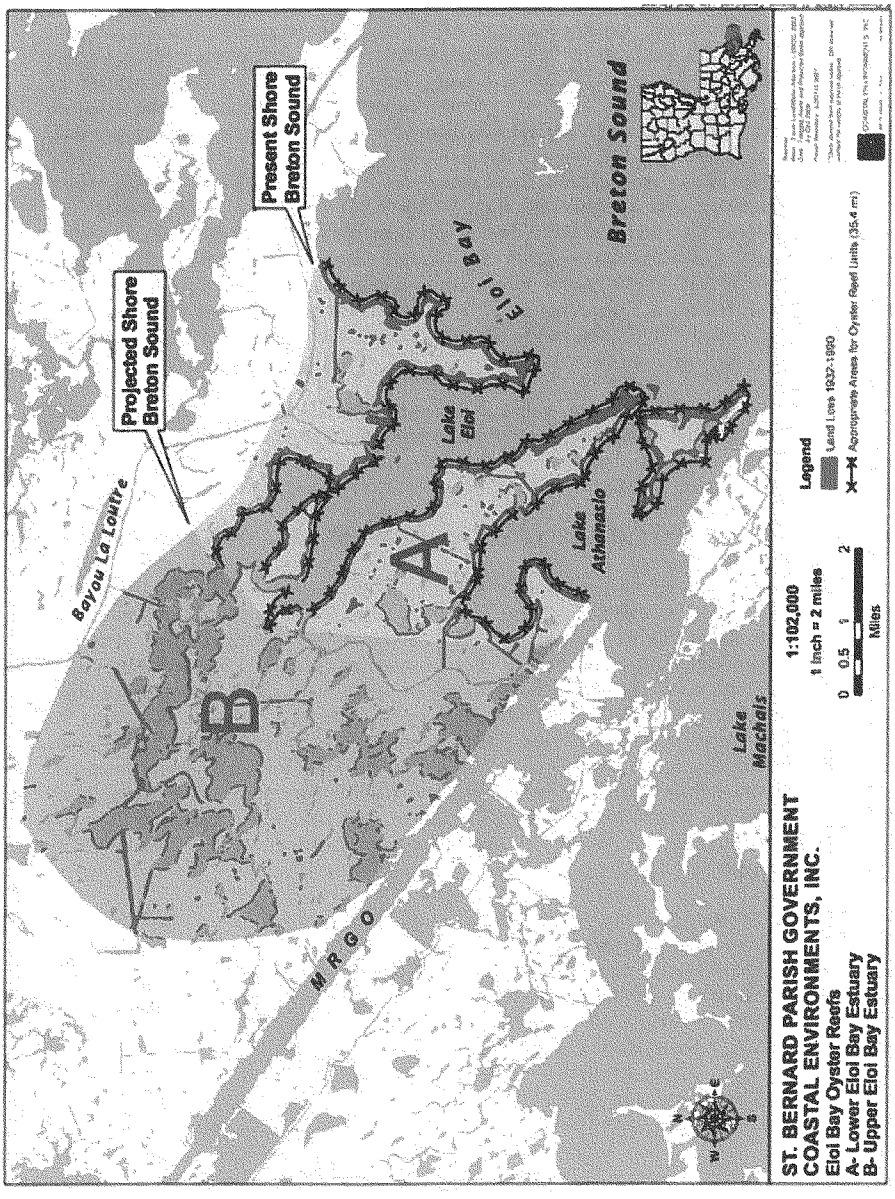


Figure 19. Landward encroachment of the Breton Sound shoreline as the result of edge erosion and interior marsh breakup .

draped around headlands and fringing islands. The barrier forms could consist of a combination of hard structural techniques including rocks and submersible concrete barges across wide gaps and around tidal channels and softer living shoreline techniques such as sand and artificial oyster reefs to restore and sustain shorelines of islands along the alignment. The inner element of the barrier zone would use artificial oyster reefs to control expansion of tidal channels and to reduce expansion of the tidal prism inside of the leaky "structural" barrier to the greatest extent possible.

This barrier feature is not intended as a flood protection levee, but rather as a barrier system across the open seaward ends of estuarine sub-units intended to throttle back tidal exchange and wave energy between the interior of the estuarine sub-units and the open waters of Chandeleur and Breton Sounds. The maximum elevation of individual elements in the barrier system would be approximately 6 feet above mean water level. Passes through the barrier would be maintained, where feasible, at a maximum of 12 feet in depth and would allow tidal exchange, as well as provide passage for fishing boats, oil field vessels and other types of shallow-draft vessels.

Creation of a Shoreline Barrier zone would also include the restoration and maintenance of sand/shell islands with salt marsh and mangrove vegetation for use of colonial nesting, resident and migratory birds. Candidate islands for restoration for bird habitat include Brush Island, Martin Island and Comfort Island.

EASTERN ST. BERNARD ESTUARINE ECOSYSTEM RESTORATION PRIORITIES

St. Bernard Parish is currently in the process of updating its federally and state approved Coastal Management Program. Through this process, as well as through other planning and restoration efforts in which the parish has been involved, the parish has identified restoration and management of the Eastern St. Bernard Estuarine Ecosystem as the highest priority of the parish for coastal restoration because of its highly endangered status, its position within the multiple lines of defense strategy and its exceedingly high productivity and economic benefit to the parish. The major geographical components of this region include Biloxi Marshes, Oyster Zone, East Biloxi Marshes Shoreline Barrier, Lake Lery-Delacroix Marshes, Chandeleur Sound and Chandeleur Islands. It is assumed that the U.S. Fish and Wildlife Service, who has responsibility for management of the Breton National Wildlife Refuge, will take the lead in restoration and management of the Chandeleur Islands. St. Bernard will work with the U.S. Fish and Wildlife Service in that regard.

The Eastern St. Bernard Estuarine Ecosystem has local, state, regional and national values for renewable resources production and functions as well as storm surge reduction for inland communities in Louisiana and Mississippi. The values at stake and the approach to restoration and management have been spelled out in a resolution of the St. Bernard Parish Council, with the full support of President Craig Taffaro, which passed unanimously on May 18, 2010 (Resolution SBPC # 640-05-10) (Appendix A). Copies of this resolution were sent to other state and federal officials, as well as by certified mail to President Barack Obama; Lieutenant General Robert L. Van Antwerp, Chief of Engineers, U.S. Army Corps of Engineers; Brigadier General Michael J. Walsh, President Mississippi River Commission and Colonel Alvin B. Lee, District Commander,

New Orleans District, U.S. Army Corps of Engineers. A copy of the resolution was given to the project manager of the MRGO Ecosystem Restoration Plan in 2010.

A similar resolution was introduced by Senator A. G. Crowe and passed by the Louisiana Legislature during its Regular Session of 2010 (Appendix B). The key component of this resolution was "To urge and request the Coastal Protection and Restoration Authority of Louisiana and the United States Army Corps of Engineers to incorporate the East Biloxi Shoreline Barrier Zone as a vital component in the state and federal master plans for coastal restoration and storm protection."

The Eastern St. Bernard Estuarine Ecosystem plan has been presented to numerous stakeholder groups and has received overwhelming support. For example, the Southeast Louisiana Flood Protection Authority-East at its October 21, 2010 meeting unanimously passed a resolution (#10-21-10-04) recognizing the importance of this area to regional storm surge protection and endorsing emergency implementation of parts of St. Bernard's restoration plan to offset accelerated erosion resulting from the British Petroleum oil well blowout (Appendix C).

Following a presentation on the Eastern St. Bernard Estuarine Ecosystem plan to the Louisiana Oyster Task Force on November 30, 2010, the Task Force unanimously passed a motion to write a letter of support to Governor Bobby Jindal attesting to the importance of the area to the oyster industry and supporting the St. Bernard Parish's position as presented in "Restoration of Oyster Grounds and the Oyster Industry in St. Bernard Parish, Louisiana" (Gagliano et al. 2010). A copy of the Task Force's letter of support and an abstract of the presentation is included in Appendix D.

St. Bernard Comments on TSP for the Eastern St. Bernard Estuarine Ecosystem

The DEIS states that "the study authority mandates the development of a plan to restore natural features of the ecosystem that will reduce or prevent damage from storm surge: (USACOEb: 1-7). The Corps Ecosystem Restoration Study details plans for the majority of the restoration measures to be located within the Central Wetlands inside the hurricane flood protection levees and along the west side of the Biloxi Marshes in St. Bernard Parish. There is virtually no restoration planned for barrier protection on the eastern perimeter of the Biloxi Marshes nor does the study acknowledge or consider the St. Bernard Parish's resolution to establish a Shoreline Barrier along the eastern perimeter of the Biloxi Marshes (Resolution SBPC #640-05-10) (Appendix A). The Study also fails to address the Senate Concurrent Resolution No. 115 by Senator Crowe that was passed in the Regular Session 2010 and identified previously (Appendix B).

The MRGO had direct and indirect impacts on the Eastern St. Bernard Ecosystem particularly along its lower reaches seaward of the Bayou La Loutre ridge. Secondary impacts continue to occur. These impacts are given little acknowledgement in the DEIS, and little mitigation for these impacts is recommended. The implied assumption is that the rock closure dike has remedied the problems.

There is a disconnect between the MRGO Ecosystem Restoration planning area shown in Figure 1-2 of the DEIS (USACOE 2010b: 1-5) and TSP as depicted in Figure 2-20 (USACOE 2010b: 2-86). Maps depicting measures proposed under TSP totally omit the lower reaches of the MRGO channel, including all or parts of MRGO Planning Subunits 10, 14, 15, 31 (USACOE 2010b, Figure 1-2: 1-5).

Other than measures proposed for the western perimeter of the Biloxi Marshes (BS1, BM1, BR1, MRGO4, MRGO6) and a small segment of the Oyster Zone (BS 2 and BS3) (See Figure 2), TSP contains little ecosystem restoration for the majority of the Eastern St. Bernard Estuarine Ecosystem.

SUPPLEMENTAL MEASURES AND METHODOLOGIES FOR ECOSYSTEM RESTORATION IN ST. BERNARD PARISH

The Corps DEIS (USACOE 2010b) contains sections on the study authority, study area, purpose and need for the action, restoration goals, planning objectives, methodologies used in decision making, alternatives formulation, description of affected environments, environmental consequences of alternatives, public involvement, environmental requirements, and conclusions and recommendations, including areas of controversy and unresolved issues. This multi-year work product is supported by voluminous documents derived from literature review and field research, modeling, public outreach and consultation with scientists, public officials and representatives and regulatory agency representatives. While the Corps' DEIS is a commendable work product, St. Bernard Parish is concerned that there are additional measures and methodologies that should be incorporated into the MRGO Ecosystem Restoration Plan for the parish. These measures and methodologies and concerns are presented in more detail in the following sections.

Violet Freshwater Diversion

The proposed Violet Freshwater Diversion is one of the unresolved issues. A freshwater diversion channel designed to convey water from the Mississippi River across the leveed urban corridor and discharge the water into the Central Wetlands and into the Lake Borgne area, the Mississippi Sound and the great marshes and water bodies of eastern St. Bernard Parish is a fundamental part of the proposed restoration plan and one that is supported by St. Bernard Parish.

Based on statements made at the Corps' public meeting of January 20, 2011, in Chalmette, Louisiana, the Violet Freshwater Diversion is the most contentious part of the draft restoration plan. There are issues regarding size, need and location of the conveyance channel, as well as routing and control of discharge into receiving areas. The draft report states that 1000 cfs of Mississippi River water is needed to sustain restored cypress swamp and marsh in the Central Wetlands. The parish requests that the Corps consider delivery of freshwater through four 48-inch siphon tubes. The existing 48-inch siphon pipe at Violet can deliver 250 cfs.

The report also states that 6,000 to as much as 15,000 cfs of river water is needed to reduce salinities within marshes and water bodies of the Lake Borgne Area (Lake Borgne and the Lake

Borgne Shore Zone), the Mississippi Sound and in the Eastern St. Bernard Estuarine Ecosystem (Biloxi Marshes and Oyster Zone) to achieve establishment of the Chatry line. The DEIS modeled freshwater discharges to determine the amount of discharges required to meet the monthly salinity targets needed to achieve the Chatry line. For the general public and property owners presentation of target salinity data in terms of lines under fall maximum and spring minimum salinity conditions within St. Bernard Parish would be more useful, especially with regard to salinity dependent activities such as oyster production.

As demonstrated by the opening of the Caernarvon diversion structure during the BP oil event, excessive salinity reduction can result in a reduction in oyster larval production and an increase in spat and oyster mortality. Freshwater diversion must be controlled and the operation must be based on real-time monitoring from a network of automated, telemetering stations within the receiving areas.

An evaluation should be made of the potential for introduction of Zebra mussels and other invasive species via freshwater discharges. Options for control of such invasive species should be investigated. Ribbed mussel infestation in Lake Borgne in the vicinity of Bayou Dupre has been attributed to operation of the Violet Siphon.

Of the four alignments considered for the diversion, the least acceptable from the standpoint of St. Bernard is the Sinclair route (alternative #1), which was the route selected by the Corps. If a Violet Freshwater Diversion is implemented, St. Bernard Parish favors using the existing Violet Canal (Alternative #3). This would require a small number of business relocations that would require mitigation. Another serious consideration is that the Violet Canal alternative is one of only two safe harbors for small to mid size boats in the parish. A significant part of the commercial fishing fleet took refuge in the Violet Canal during Hurricane Katrina and it is the preferred safe harbor for fishing boats in the eastern end of the Parish because of the safety it provides and the proximity to the fishing villages in the eastern part of the parish.

When evaluating the freshwater diversion plan, Table 2-29 (USACOE 2010b: 2-70), compares base and predicted future without project (FWOP) monthly salinity ranges in the Lake Borgne Ecosystem the study concludes: "As is demonstrated in the table, salinity levels are projected to change in the Lake Borgne area by only 1 part per thousand (ppt) to 2 ppt on average." The FWOP is defined as including proposed Federal, state, local, and private restoration efforts that would affect the MRGO Ecosystem Restoration Area (USACOE 2010b: 2-68 – 2-69), one of which is the WRDA 2007 – The Violet Freshwater Diversion Project." Because the DEIS states that "The Violet WRDA 2007 project is pending the findings of this study," it is unclear which of the Violet Freshwater Diversion alternatives and base and pulsed diversion flow is used to determine FWOP salinities presented in Table 2-29.

With regard to freshwater diversion, the DEIS (USACOE 2010b: 2-70) states that "A small freshwater diversion would not mimic periodic overbank flooding of the Mississippi River, a key process of the estuary that must be restored to reestablish historic salinity gradients, habitat types, and increase self-sustainability in the system" and that "The restoration of a cypress swamp and fresh/intermediate marsh in the Central Wetlands necessitates the introduction of freshwater into this area" (USACOE 2010b: 2-71). In response to these statements, it should be

noted that there was no periodic overbank flooding in the Central Wetlands area immediately prior to construction of the MRGO and that freshwater retention in the area was sufficient to sustain salinities in the 0 to 2 ppt range. The subsequent construction of canals, including the MRGO, short-circuiting of runoff to the MRGO and Lake Borgne, increases in open water areas, subsidence, and Relative Sea Level Rise (RSLR) prohibits restoration of fresh marsh and swamp habitat in the Central Wetlands without an expensive increase in the volume of freshwater diversion. However, it would appear that an acceptable compromise would be to make the existing Violet Canal Diversion more efficient in outflow and dispersal throughout the Central Wetlands in conjunction with treated wastewater discharge and storm water discharge.

Control of the saltwater wedge movement in the blocked MRGO channel and enclosure of the Central Wetlands by the flood protection levees, two conditions that currently exist, would lengthen the retention time of the proposed, as well as the normal processes of freshwater introduction into the Central Wetlands. Restoration of an intermediate-to-brackish marsh using dredge material and selected restoration of cypress swamps on elevated islands of dredged material in the vicinity of freshwater water discharge sites would restore marsh and swamp habitat while requiring smaller volumes of dredged material. This more salt tolerant habitat would be more sustainable under conditions of RSLR and freshwater discharge via the existing Violet Diversion channel; would neither remove nor bisect one of the last large, flood protected development sites in the parish and would be less expensive to implement and sustain.

Hard Structure Shoreline Stabilization and Barriers

Factors influencing the measures available for shoreline restoration and protection, storm surge protection and flood protection include 1) availability and suitability of material for a specific feature, 2) constraints on placement of materials, such as shallow water or unsurveyed pipelines and flowlines, 3) authorized land uses such as easements, designated corridors, oyster leases, refuges, 4) presence of cultural resources, and 5) presence of threatened and endangered species and critical habitats. The scarcity of sand deposits for barrier island and beach restoration and clay for levee construction has led St. Bernard Parish to investigate the use of various types of hard structures for ecosystem restoration and flood protection.

Rocks

Limestone rock has been used extensively for protection along the shoreline of Lake Borgne and for bank stabilization. While this technique has proven to be effective, rocks are expensive and often difficult to acquire because of high demand and long distance transport costs. The placement of rocks requires dredging of barge and small tug access channels, typically about 7 to 8 feet deep, for bringing in construction equipment and rocks. Even when filled after construction, these access channels negatively impact benthic communities and tend to make the near-shore substrate less resistant to erosion. There are additional problems associated with the use of rocks including identification, owner verification, access permission and safety in crossing pipelines and flow lines.

When used in open water, the base of a rock dike is proportional to the crown elevation and is often very large, thus requiring large volumes of stone of sufficient size to avoid displacement of severe storms. Rocks are heavy and through time sink into soft substrate. Once placed, they are difficult and expensive to move. The rocks are inert, but because of their density are not a favored substrate for oysters and other marine organisms.

A-Jax Structures

This category of massive, molded concrete structures is effective in breaking waves but has limitations because of weight and size (Figure 20). It is difficult to achieve much elevation above the bottom. Like rocks, A-Jaxs require large access channels for deployment, and because of their weight, they tend to sink into soft substrate. They are more favored by oysters and other marine organisms than limestone rocks. They are difficult and expensive to move after placement.

Submersible Concrete Barge Surge Breakers and Breakwater Units

One solution to the previous discussion of constraints to the construction of artificial barrier islands and breakwaters is the use of submersible concrete barge technology. This technology was proposed for application in St. Bernard Parish before Hurricane Katrina, but has yet to be demonstrated. Figure 21 shows a proposed surge barrier across the southern part of Lake Borgne to reduce surge and wave height and energy that impacts the outer hurricane protection levees in St. Bernard (Gagliano et al. 2008). It was proposed that this barrier be constructed with submersible concrete barges.

A local manufacturer has custom-designed and built submersible concrete barges as platforms for oil and gas field production facilities for decades (Figure 22). The barges are built of reinforced concrete on a land-based drydock (Figure 23) and floated to the operation site where they are submerged and rest on the bottom of the gulf, coastal bays or lakes. A crushed rock bed is usually placed on the water bottom at the deployment site. It is not uncommon, after decades of service, to re-float a barge, update the production equipment and use the barge at a new location. Some of the barges have been in operation for more than 40 years and the barges have survived surge and waves from the most severe storms.

Large platform barges are 14 feet high and can be floated in 6 feet of water. A vertical extension can be added above the barge to increase the effective height of the barge. For breakwater applications, broad beamed barges are used. "Keels" and "skirts" can be added to the bottoms of the barges to prevent skidding from wave or surge impact. Figures 24 and 25 show a barge under construction in 2007 that was 184 feet long and 72 feet wide. The barge was built as the base for a production platform but a similar design and construction could be used as a surge breaker.

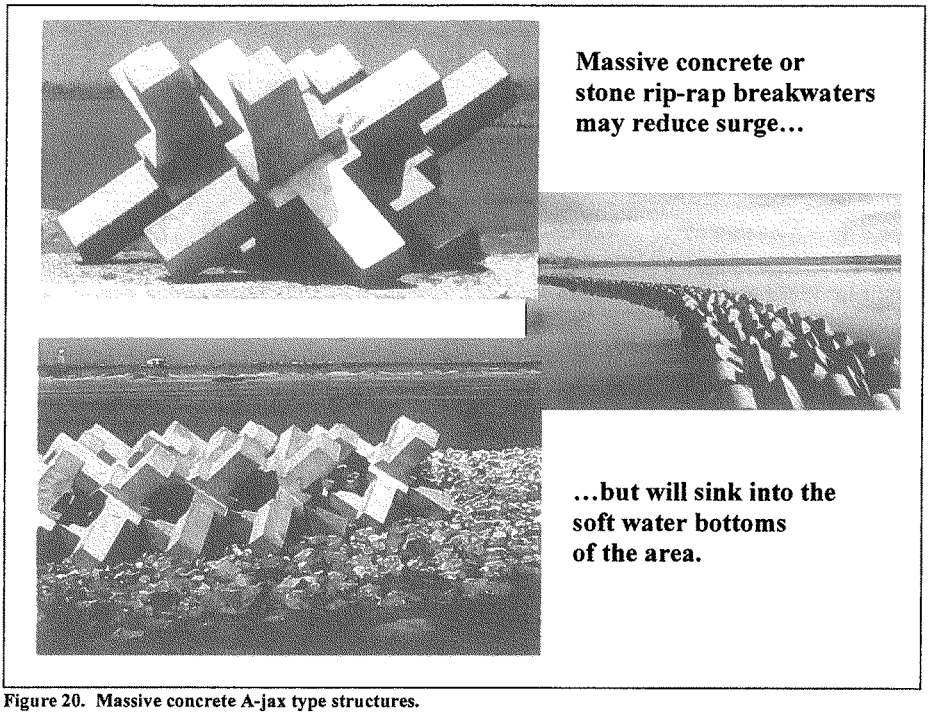


Figure 20. Massive concrete A-jax type structures.

A smaller version is recommended for application in construction of the East Biloxi Marshes Shoreline Barrier. Drawings of the smaller barge are shown in Figure 26. Such barges can be used to bridge large open water gaps between headlands and islands along the shoreline barrier. They can also be used to control enlargement of tidal channels. Smaller barges suitable for breakwater features could be constructed to the following specifications:

- Breaker Unit - 15-foot high
- Hull Length - 80 feet
- Hull Width – 24 feet
- Hull Depth – 12 feet
- Draft – 5.5 feet
- Base Perimeter Skirt – 2.5 feet

Advantages of the barges are that they can be standardized for efficient manufacture at an onshore facility. They can be moved to deployment areas through inland navigation channels by

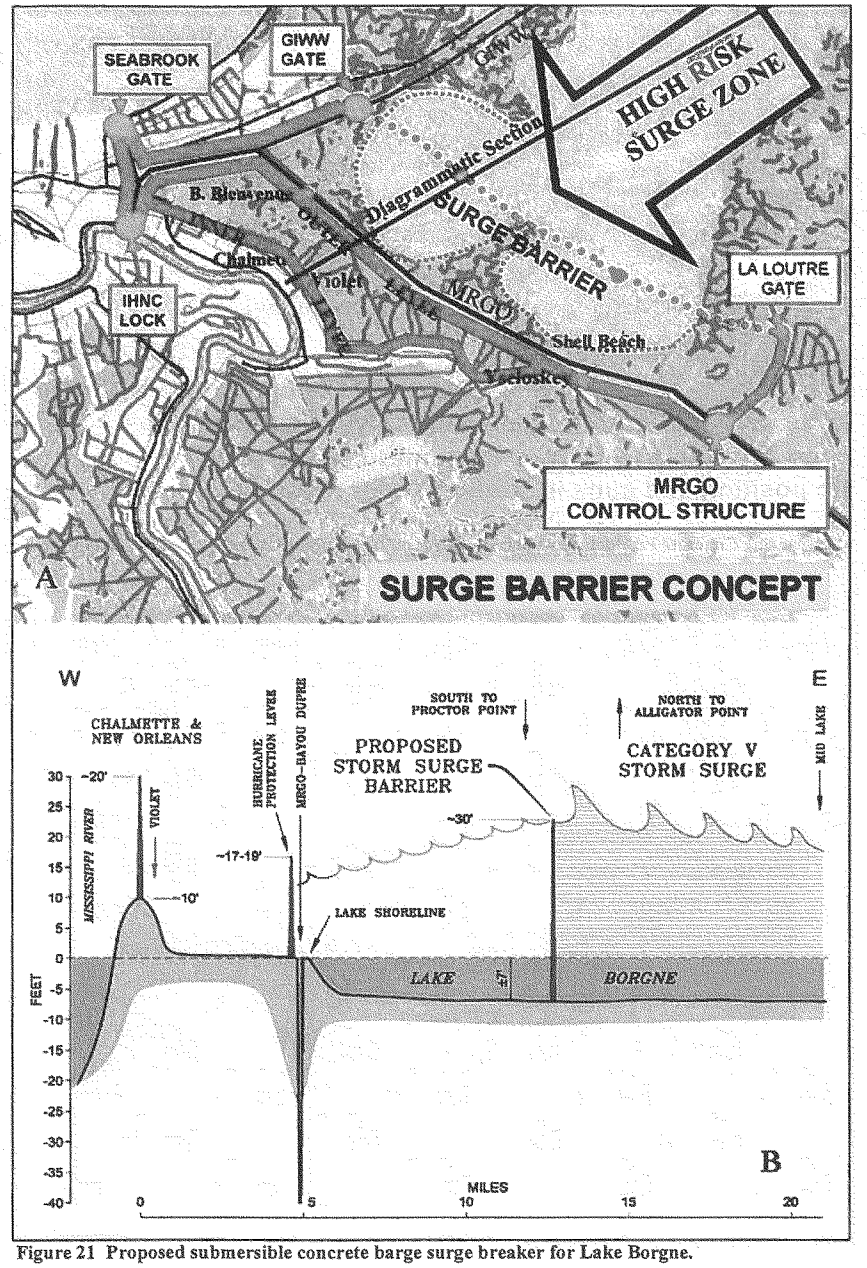


Figure 21 Proposed submersible concrete barge surge breaker for Lake Borgne.

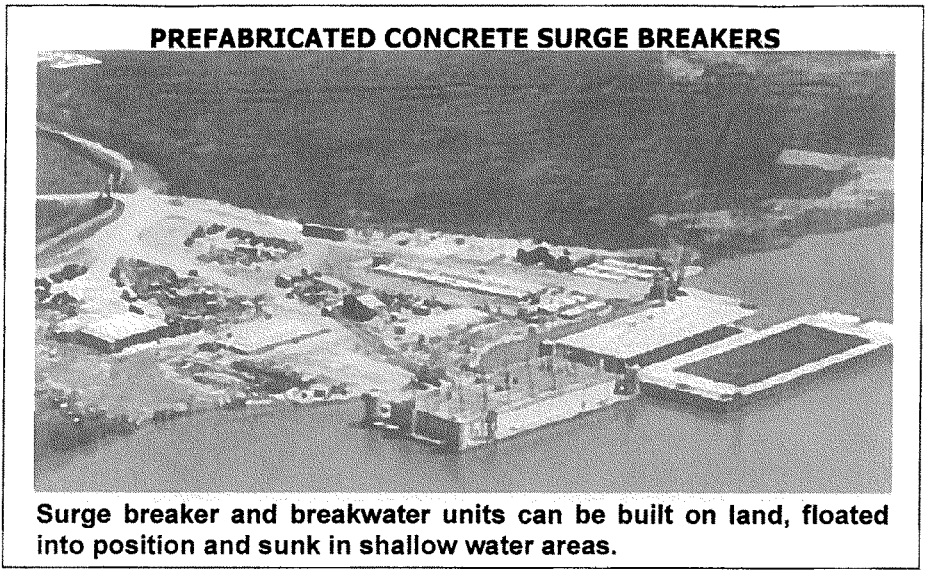


Figure 22. Marine Concrete Products dry dock and plant on the Michoud Canal in New Orleans East.



Figure 23. Submersible concrete barge under construction at Marine Concrete Products Plant.

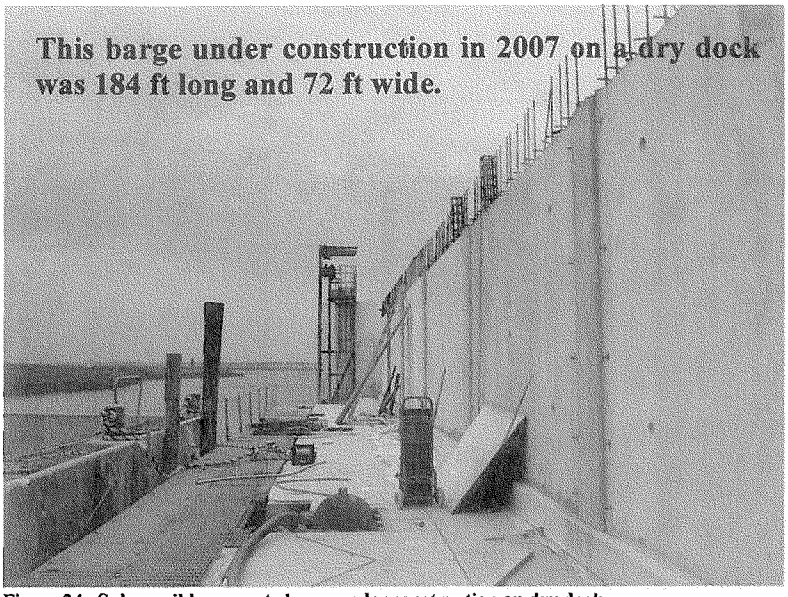


Figure 24. Submersible concrete barge under construction on dry dock.



Figure 25. Internal construction of concrete barge.

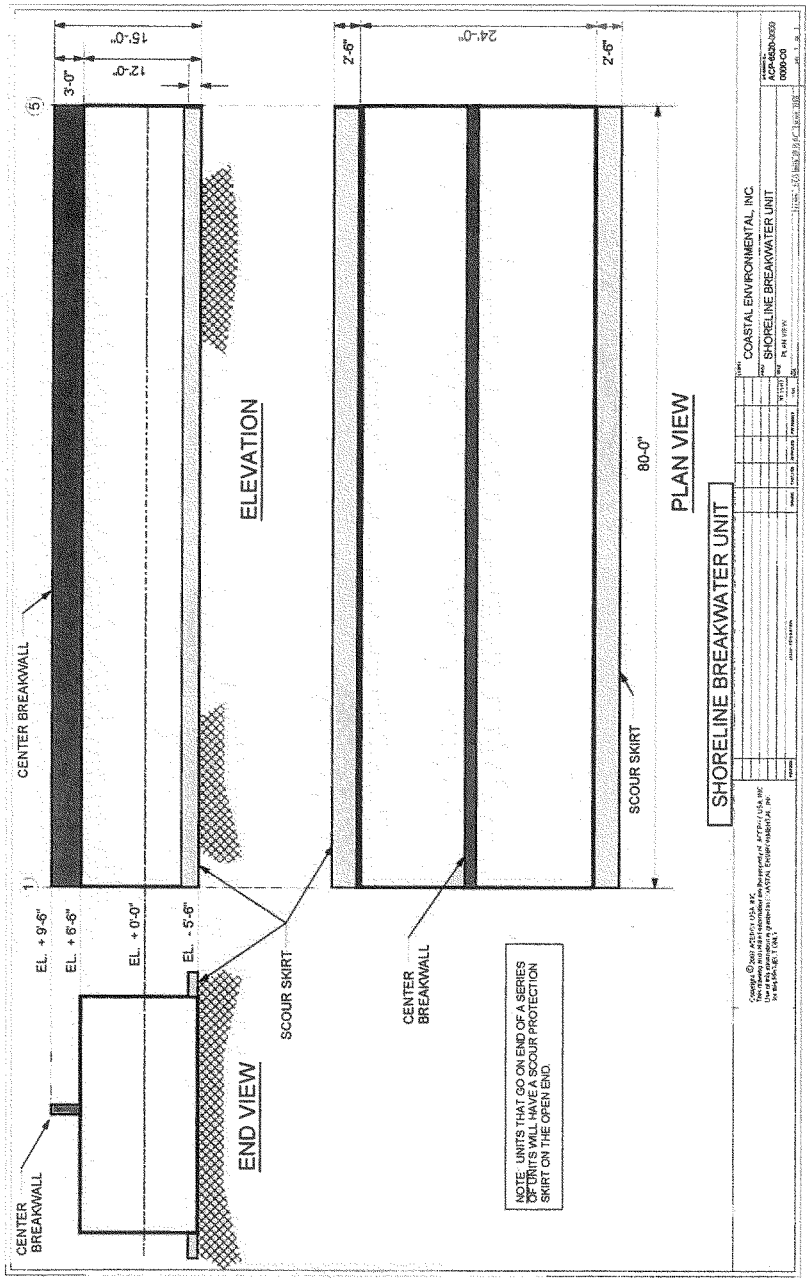


Figure 26. Drawings of concrete beak water unit, 80 ft x 24 ft x 12 ft with a 3 ft center breakwall, Marine Concrete Products.

Tug boats. They can usually be placed without dredging an access channel. They do not sink into the substrate. They are supportive of oyster growth and other marine encrusting organisms. If conditions change, or they are dislodged by a hurricane, the barges can be floated and re-deployed. The barges are a cost effective alternative to the use of heavy rocks and massive concrete structures, as well as dredging buried sand deposits.

The mobility and storm resilience of concrete barges is demonstrated by the Associated Branch Pilots SW Pass Complex which was built onshore in eastern New Orleans and deployed at the mouth of Southwest Pass (Figure 27). This barge was directly in the path of Hurricane Katrina. The only damage incurred was to the sheet metal on the barge roof. Such a structure is envisioned as a feature to ultimately be added to the St. Bernard Parish East Biloxi Shoreline Barrier Zone project. It would function as a destination point. It would be capable of housing personnel for law enforcement, emergency response, fish and wildlife management, research, technical support for data collection, coastal restoration and aquaculture such as fish farming. The concrete barges along this Shoreline Barrier would also function as a destination point for recreational and commercial fishermen and boaters in emergency situations.

Oyster Reef Bioengineering

The MRGO Ecosystem Restoration study describes artificial oyster reefs as "...the ecosystem engineers of bays and estuaries" (USACOE 2010b: 2-101). With implementation of BS2, the Corps proposes to construct 7.5 miles of artificial reef along the shoreline on the western side of Eloi Bay between Eloi Point and the mouth of Bayou La Loutre as one means of shoreline protection. Three types of artificial reef features would be tested along 2.5-mile segments of shoreline to determine their effectiveness for achieving ecosystem restoration objective. The construction methods being considered include: 1) loose oyster shells, 2) interlocking, triangular welded steel structures and 3) interlocking concrete rings.

Loose Oyster Shells

The loose oyster shell technique involves filling mesh bags with a mixture of loose oyster shells and small pieces of broken concrete and stacking the bags in rows along the shoreline line. Generally, bags are stacked to a height of 3 to 4 feet in water no deeper than 3 feet. To create 2.5 miles of reef approximately 56,000 bags would be required. A similar application in the Dauphin Island area of Alabama demonstrated that oysters grow well on this type of structure. However, a very large volume of oyster shell is required and the ratio of reef face to volume is low. A shortage of oyster shells is a limitation to the widespread application of this technique.

Interlocking Concrete Rings

The interlocking concrete rings consist of molded 5 feet diameter, 2 feet high concrete rings that can be stacked and placed in 4 to 5 feet of water (Figure 28). Each ring weights about a ton when deployed. Under TSP 2.5 miles of rings would be arranged in three rows approximately 1 foot from each other. The Nature Conservancy currently has a one-eighth mile long pilot project using interlocking concrete rings in Vermilion Bay on the National Audubon Society's Paul J. Rainey Sanctuary (Figure 29). Because of the weight of the structures they are very resistant to wave energy, but are cumbersome to handle and may be inclined to sink into soft substrate. Individual units have been successfully placed with airboats.

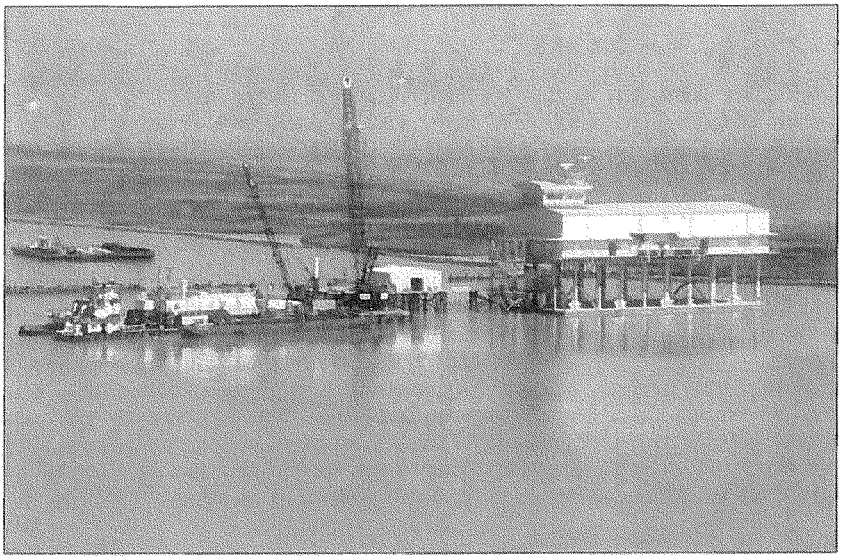


Figure 27. **Associated Branch Pilots quarter boat and operations barge, Southwest Pass, Mississippi River Delta, Louisiana.**



Figure 28. **Molded concrete oyster rings.**



Figure 29. Oyster rings in the Vermilion project area showing oyster growth.

Interlocking, Triangular Welded Steel Reef Units

A third technique identified in TSP utilizes a manufactured reef unit called ReefBlk$_{TM}$. These units consist of a welded frame of steel rods that form a triangular column (Figure 30). The units are 5 feet along each leg of the triangle and are typically 2 feet high. The units can be built in larger sizes. The frames hold 9 aquaculture type mesh containers (e.g., bags). When filled with clean, seasoned oyster shell each mesh container weighs 300 pounds. The welded frame weighs 70 pounds for a total individual ReefBlk$_{TM}$ weight of 370 pounds. The units are typically placed in a saw-tooth pattern parallel to an eroding shore or bank (Figure 31). The units immediately reduce wave energy and turbidity. Oyster larvae become attached to the shells in the ReefBlk$_{TM}$, they become "spat" that grow rapidly (Figure 32). Under average favorable conditions the oysters grow rapidly and within 12 to 18 months the oysters in one unit produce approximately one ton of new shell (Figure 33). At The Nature Conservancy's Clive Runnels Family Mad Island Marsh Preserve project in Texas the artificial oyster reef captured enough sediment behind it in 18 month to completely restore the eroded area and enabled The Nature Conservancy to replant the accreted substrate with marsh grass. Active oyster growth continued on the face of the reef (Figures 34 and 35). The BS2 measure would require approximately 1500 ReefBlk$_{TM}$ units for deployment over a distance of 2.5 miles.

ReefBlk$_{TM}$ units have a solid frame which when interlocked form a stable structure with a broad footprint. They are light in weight when deployed, but gain weight and stability from rapid oyster growth. ReefBlk$_{TM}$ units have a large reef face to mass ratio, with approximately 50 square feet of reef exposure. This feature has the dual advantage of not requiring large volumes of shell, and providing maximum habitat for marine organisms. Because the cultch shell is loosely packed, water and food flows through the reef unit panels accelerating oyster growth and providing favorable habitat for innumerable species of reef attracted organisms. The ReefBlk$_{TM}$ structure provides shelter for larger fish. The individual units are like Lego pieces in that they can be configured for different erosion control and estuarine sculpturing applications.



Figure 30. ReefBlk$_{TM}$ units in a staging area.



Figure 31. Newly placed reef units along the Gulf Intracoastal Waterway at the Mad Island Marsh Preserve, Matagorda, Texas.

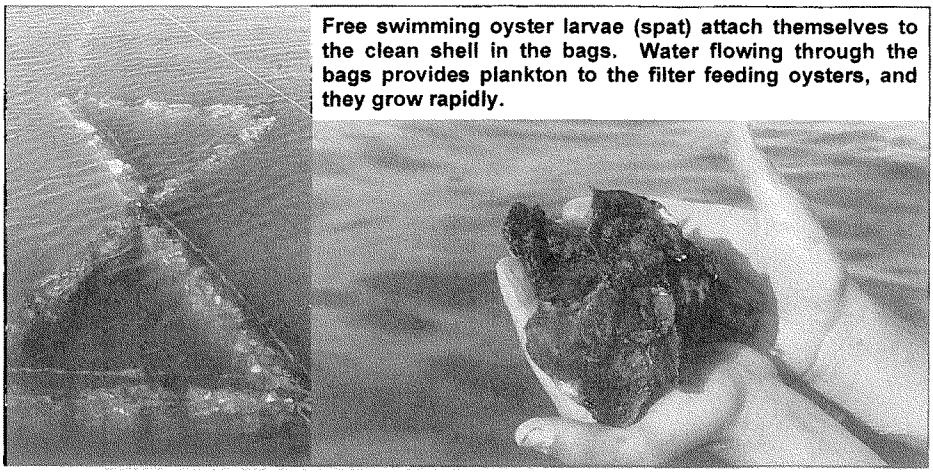


Figure 32. ReefBlk$_{TM}$ units in water showing conditions for oyster spat attachment and growth.

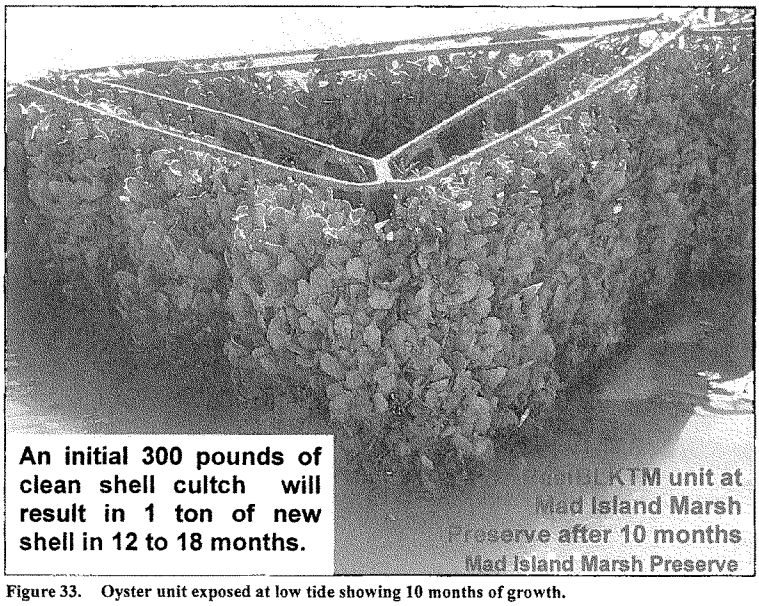


Figure 33. Oyster unit exposed at low tide showing 10 months of growth.

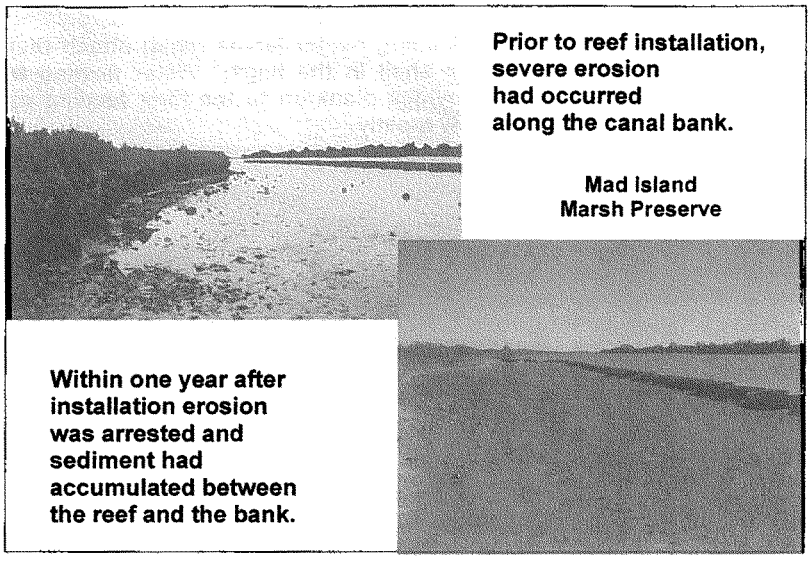


Figure 34. Comparison of conditions at Mad Island Marsh Preserve site at time of reef installation and one year after, both photographs at low tide.

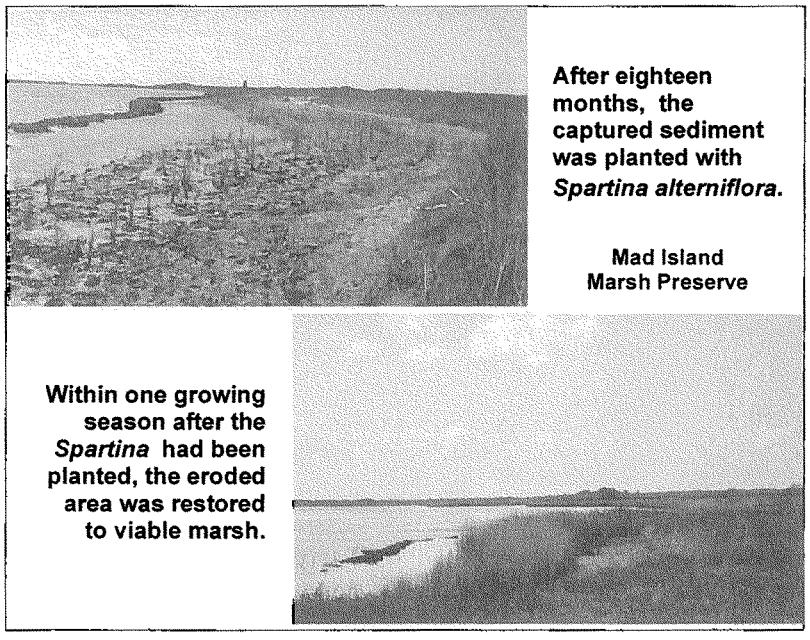


Figure 35. Sediment trapped behind oyster reef units at Mad Island Marsh Preserve restored eroded land and was replanted with marsh vegetation.

Most importantly, the ReefBlk$_{TM}$ units provide a favorable framework onto which living oysters can grow and produce large volumes of shell. Some shells remain on and around the unit and the shells becomes cemented together to produce a true high vertical profile living reef. Other living oysters and shells are ejected or break off from the units and migrate toward shore resulting in development of cluster growths of living oysters or an accumulation of finer shell particles that accumulate along the inner shoreline as beaches and oyster banks.

Construction of artificial oyster reefs using ReefBlk$_{TM}$ units has advanced beyond the demonstration phase to the production phase. Nine projects have been completed successfully in Texas, Louisiana, Alabama and Florida and another major project is underway in Louisiana. The first stage of the NOAA-TNC project in Louisiana involved installation of 6000 feet of ReefBlk$_{TM}$ units on the bay side of Grand Isle. Figure 36 shows a specially designed and equipped shallow draft deployment vessel in the staging area for the NOAA-TNC project in Grand Isle, Louisiana. Figure 37 is an aerial view of newly installed reef units of the Grand Isle project.

The NOAA-The Nature Conservancy Oyster Reef Program in the Oyster Zone

The St. Bernard Parish Government has in place a cooperative project with The Nature Conservancy, a national non-profit environmental organization, to fabricate, deploy and monitor 2.15 miles of induced high vertical profile oyster reefs in the Oyster Zone of the Eastern St. Bernard Estuarine Ecosystem. The currently funded 2.15-mile portion of the project is part of a larger action for which a permit was acquired for construction of 4.54 miles of artificial reef along segments of shoreline in Lake Fortuna, Lake Machais, Lake Athanasio, Lake Eloi and Eloi Bay. This project was selected for American Recovery and Reinvestment Act funding by NOAA as part of the Gulf of Mexico marine habitat stimulus program in 2009. Emplacement of the artificial reef in St. Bernard Parish was delayed by the BP Deepwater oil event. The Hopedale area was selected as the staging area for deployment of the reef system. The NOAA – TNC project is intended to be the beginning of a far reaching reef building program for the Eastern St. Bernard Estuarine Ecosystem.

Cultch Spreading

The spreading of cultch on existing bottom reefs and oyster bottoms is a basic established technique for enhancing oyster productivity. The cultch is usually brought to the deployment area on oyster luggers or barges and washed over the side with a high pressure hose (Figure 38). Clean oyster shells are the preferred material, but crushed and size-graded concrete and other artificial cultch materials is may also be used.

Because oyster shells are scarce St. Bernard, oyster fishermen have recently begun to use crushed concrete as a substitute material. Large quantities of crushed concrete are available in the St. Bernard area from slabs of homes destroyed by hurricane Katrina. Gravel-sized particles of crushed concrete have proven to be an acceptable substitute for the attachment of oyster larvae. St. Bernard oyster fishermen are very skilled man-power source for applying cultch at designated sites through the shallow water areas of eastern St. Bernard because this is a commonly used method for enhancing oyster production on their privately owned leases.

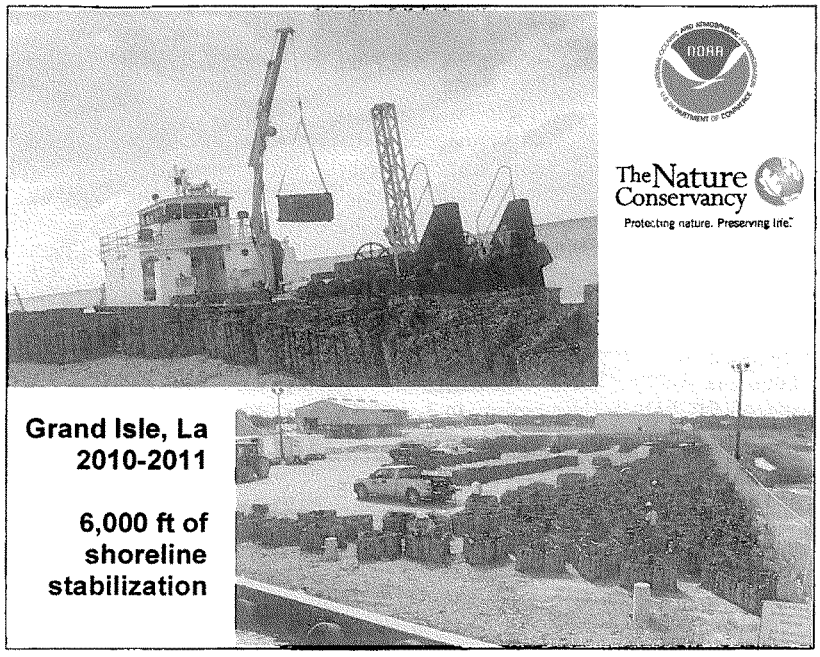


Figure 36. Shallow draft reef deployment vessel and staging area at Grand Isle, Louisiana.

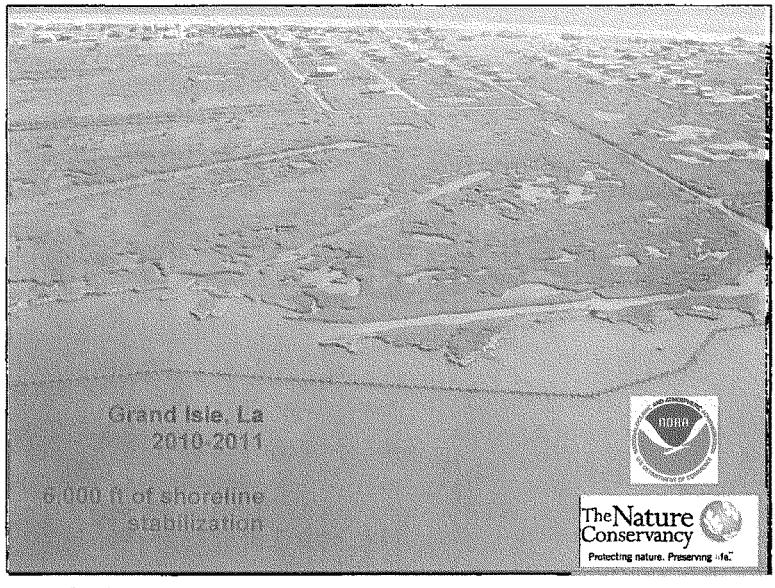


Figure 37. Reef units deployed in Grand Isle, Louisiana.

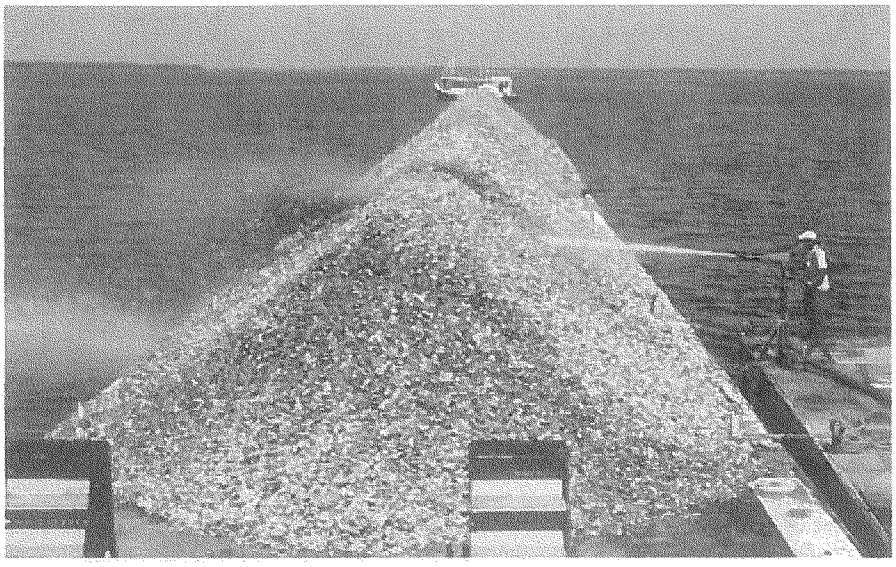


Figure 38. Traditional method of spreading cultch over bottom reefs and oyster leases.

Navigation Issues

The MRGO Ecosystem Restoration study fails to adequately address the need for the establishment, marking and maintenance of safe, inland navigation routes within the project area for use by local citizens and the general public as well as for implementation of the restoration measures. Changes in the volume of traffic on multiple waterways since the placement of the dam on the MRGO east of Bayou La Loutre and construction of future dams will force vessels to more heavily use interior channels, such as the back retention levee canal along the south side of the MRGO and Bayou La Loutre.

No provisions were made in TSP for inland navigation to move seaward of the MRGO rock dam or for maintenance of channels or banks that are now experiencing increased volumes of traffic. Boat wakes from increased traffic as well as swifter currents in Bayou La Loutre since installation of the dam is resulting in increased bank erosion.

The navigation routes presently being used in this area which should be evaluated for bank stabilization and safety include:

- Bayou La Loutre – from the Breton Sound Marina across the MRGO Channel above the dam following Bayou La Loutre to its mouth at Point Lydia at Breton Sound.
- Bayou St. Malo – from Bayou La Loutre northwesterly to the mouth of Bayou St. Malo at Lake Borgne.

- Baker's Canal to Lake Eloi– From south side of Bayou La Loutre east MRGO in a southeasterly direction to the mouth of Baker's Canal at Lake Eloi.
- Baker's Canal to Treasure Pass – From south side of Bayou La Loutre in an easterly direction back to Bayou La Loutre channel east of the Big Bend, thence branching to Treasure Bay.
- Spoil Canal to mouth of MRGO – From Bayou La Loutre near Breton Sound Marina along a canal back of spoil ridge to the MRGO channel approximately 2 miles above its mouth at Breton Sound.
- Bayou La Loutre at Hopedale Lagoon Canal to Lake Robin - From Hopedale Lagoon follows natural bayous south to Lake Robin.
- Bayou Terre aux Boeufs – Natural bayou southeast from Delacroix to the mouth of the bayou.

These seven routes are utilized by commercial and recreational fishermen as well as by work boats serving the oil and gas fields within the area. Since placement of the rock dam in the MRGO water exchange and boat traffic through a number of these channels has increased. As a result bank erosion has increased and some channels are scouring. Some of these same channels will serve as conduits for introduced Mississippi River water if the Violet Diversion is implemented. Measurements of flow and level under various wind, tide, and stage conditions will certainly be required to develop a multi-purpose management plan for this complex stream network.

Judicious Use of Tax Dollars

Because of the time frame for project selection, design, implementation, maintenance and monitoring the MRGO Ecosystem Restoration plan funding will be a major controlling factor on the measures selected for restoration. Tax dollars required to implement the plan are large, scarce and must be justified and allocated by priority of need with regard to sustainability of the ecosystem as a whole. There must be a rational balance between funds spent for restoration within the Central Wetlands and within the marshes, islands, and reefs of the Eastern St. Bernard Estuarine Ecosystem. While the Central Wetlands are more visible to the urban population, the estuarine area constitutes the fishing grounds and protective barriers for inland urban areas.

Recreational Features

The Corps presented several recreational measures that would enhance the public use function of larger ecosystem projects (USACOE 2010b: 2-56 – 2-57). While these measures (e.g., Bienvenue Triangle Overlook, Violet Freshwater Diversion Recreational Feature and Shell Beach Recreational Feature) are highly desirable, they do not appear to qualify as part of an ecosystem restoration feature and would appear to take funds away from habitat restoration. These features also raise issues regarding safety/liabilities, private property takings/purchases/servitudes/easements and operation and maintenance post-construction. It would appear that these features would be better developed through a private enterprise or a grant-based/economic development local-state government enterprise.

A possible constraint to construction may exist with the proposed site of the Bienvenue Triangle Overlook Recreational Feature, Option A in the vicinity of Caffin Ave, Florida Ave., the Norfolk Southern Railroad and the open water area to be filled (CC4). This feature is at the site of the New Florida Avenue Bridge over the Inner Harbor Navigation Canal (S.P.N. 700-19-0108) proposed for construction by the Louisiana Department of Transportation and Development as a TIMED project.

An issue with the Proposed Violet Diversion and Violet Diversion Recreational Feature Option B, is that it bisects one of the largest undeveloped tracts of privately owned, cleared land within the flood protection levees in St. Bernard Parish. In a parish where flood protected, undeveloped land is at a premium, taking this property for flood water diversion and recreation does not appear to be the highest and best use of the property or in the best interest of the public and St. Bernard Parish.

Compatibility With Oil and Gas Activities

While it is impossible to thoroughly evaluate all possible constraints to proposed ecosystem restoration measures in an EIS, more detailed attention should be paid to the fact that there are several oil and gas fields, with hundreds of active and abandoned wells and thousands of miles of large diameter transmission and small diameter flowlines, located within the MRGO Ecological Restoration area. These petroleum related activities are important to the economy of St. Bernard Parish and provide energy to the region and the nation Location of wells, production facilities, pipelines, flowlines, gas plants and access canals must be considered in planning the restoration program. These features affect location and feasibility of restoration features, borrow areas and slurry pipelines.

Landowner Issues

The inability to address and resolve land rights issues in a timely manner can often derail the best intentioned restoration plan. The treatment of land rights issues was not adequately reviewed in the DEIS. Most of St. Bernard Parish consists of privately owned lands, much of which are deteriorated and eroding coastal wetlands. Some issues that should have been discussed in general include:

- Will the right to access these lands, collect data, and implement, monitor, and maintain restoration projects be obtained through easements or fee title acquisitions?
- If easements are to be used, what would be the expected time period of the servitude agreement?
- If properties are obtained in fee, what is the general acquisition process?
- Who will own the restored and enhanced wetlands?
- If private property rights are retained, will there be restrictions on use in area where habitat has been restored and enhanced?
- If restored and enhanced wetlands and ridges become public property or have easements, what would be the types of restrictions on use?

- When will the public be advised of the land rights acquisition approach that the COE intends to use for this project?

Moving Forward

The Corps' DEIS provides a valuable framework for moving forward with refining the draft plan and the decision-making process necessary for implementation. It is critical to resolve all issues in a timely manner so that components of the plan can be implemented to reduce further erosion and deterioration and avoid loss of funds for implementation. In order to facilitate resolution of issues, it is recommended that the traditional procedure for response to comments on the draft plan be replaced with a constructive procedure of interaction within a small steering group consisting of representatives from the Corps, the State of Louisiana, St. Bernard Parish, Orleans Parish, Plaquemines Parish, other indirectly impacted parishes and Hancock County, Mississippi. The steering group should be chaired by an objective "special master." There should also be a Scientific Liaison Team with representatives from the scientific community to provide technical support for the steering group.

REFERENCES

Barras, J. A. 2009. Land area change and overview of major hurricane impacts in coastal Louisiana, 2004-08: U.S. Geological Survey Scientific Investigations Map 3080, scale 1:250, 6 p. pamphlet. Digital data obtained through personal communication.

Coastal Environments, Inc. and St. Bernard Parish Government. 1982. *St. Bernard Parish Coastal Management Program Document.* LA Dept. of Natural Resources and NOAA. Baton Rouge, LA

Gagliano, S. M., M. Gagliano and B. Kappel. 2010. *Restoration of Oyster Grounds and the Oyster Industry in St. Bernard Parish, Louisiana.* A Power Point presentation developed by Coastal Environments, Inc. for the St. Bernard Parish Government. Presented to Governor Bobby Jindal, The Louisiana Oyster Task Force, and other groups.

Gagliano, S. M., K. M. Wicker and B. L. Rivenbark. 2008. *Mississippi River Gulf Outlet (MRGO) Channel Restoration and Mitigation Plan.* Prepared by Coastal Environments, Inc., Prepared for St. Bernard Parish Government, Coastal Management Division Louisiana Department of Natural Resources, and U.S. Environmental Protection Agency. DNR Contract No.:2519-04-02, EPA Grant No. CE-986-494-01., Baton Rouge, 81 p, plus appendix.

Henderson, J. and O'Neil, J. 2003. *Economic Values Associated with Construction of Oyster Reefs by the Corps of Engineers.* Ecosystem Management and Restoration Research Program. 10 p.

Jacobsen, R. and M. Beck. 2010. "Where Oysters Grew on Trees." *The New York Times*, July 24, 2010, Op-ed article.

Miller, Greg. 2010. U.S. Army Corps of Engineers, New Orleans District. Personal communication, November 2010.

The St. Bernard Parish Government. 2010. *Resolution to Establish the East Biloxi Marshes Shoreline Barrier*. Chalmette, LA

U. S. Army Corps of Engineers. 2010a. *Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan: Draft Feasibility Report*. Corps of Engineers, New Orleans District, New Orleans.

U. S. Army Corps of Engineers. 2010b. *Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Study: Draft Environmental Impact Statement*. Corps of Engineers, New Orleans District, New Orleans.

Wicker, K. M., G. J. Castille, III, D. J. Davis, S. M. Gagliano, D. W. Roberts, D. S. Sabins and R. A. Weinstein. 1982. *St. Bernard Parish: A Study in Wetland Management*. Louisiana Department of Natural Resources, Baton Rouge, La. 132 pp.

Appendix A

St. Bernard Parish Council Resolution SBPC #640-05-10, May 19, 2010. Endorsing the establishment of the East Biloxi Marshes Shoreline Barrier Zone in conjunction with the Parish President and the Coastal Advisory Committee.

St. Bernard Parish Council

8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

#11

Wayne J. Landry
Councilman at Large

Frank Auderer

Ray Lauga, Jr.
Councilman
District A

George Cavignac
Councilman
District B

Kenneth "Kenny" Henderson
Councilman
District C

Mike Ginart, Jr.
Councilman
District D

Fred E. Everhardt, Jr.
Councilman
District E

Roxanne Adams
Clerk of Council

EXTRACT OF THE OFFICIAL PROCEEDINGS OF THE COUNCIL OF THE PARISH OF ST. BERNARD, STATE OF LOUISIANA, TAKEN AT A REGULAR MEETING HELD IN THE COUNCIL CHAMBERS OF THE ST. BERNARD PARISH GOVERNMENT COMPLEX, 8201 WEST JUDGE PEREZ DRIVE, CHALMETTE, LOUISIANA ON TUESDAY, MAY 18, 2010 AT ONE O'CLOCK P.M.

On motion of Mr. Everhardt, seconded by Mr. Henderson, it was moved to **adopt** the following resolution:

RESOLUTION SBPC #640-05-10

A RESOLUTION BY THE GOVERNING AUTHORITY, THE ST. BERNARD PARISH COUNCIL, ENDORSING THE ESTABLISHMENT OF THE EAST BILOXI MARSHES SHORELINE BARRIER ZONE IN CONJUNCTION WITH THE PARISH PRESIDENT AND THE COASTAL ADVISORY COMMITTEE.

WHEREAS, the great Biloxi Marshes of St. Bernard Parish constitute one of the largest contiguous tidal estuary areas in the northern Gulf of Mexico region whose bounty is harvested by fishermen from Louisiana, Mississippi, and Alabama and is an indispensable part of the fishing industry and cultural heritage of the region and they also serve as a platform for extraction of oil and gas important to the nation; and,

WHEREAS, because of their strategic location the Biloxi Marshes collectively serve as a barrier island that buffers destructive storm surge and protects inland developed areas along the coast of Louisiana and Mississippi including the Greater New Orleans area, Mandeville, Slidell, Bay St. Louis, Pass Christian and Gulfport; and,

WHEREAS, barrier islands have been identified as the first line of defense that both reduce tropical storm surge and retard erosion along Louisiana's muddy shorelines and thereby reduce wetland loss; and,

WHEREAS, the Chandeleur Island chain, lying east of the Biloxi Marshes historically was the first line of defense to much of southeast Louisiana and adjacent areas of Mississippi providing surge protection, reduction of shoreline erosion forces as well as estuarine influences that resulted in highly productive oyster habitat and formation of reefs that further added to overall protection; and

St. Bernard Parish Council

8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

Wayne J. Landry
Councilman at Large

Frank Auderer

Ray Lauga, Jr.
Councilman
District A

George Cavignac
Councilman
District B

Kenneth "Kenny" Henderson
Councilman
District C

Mike Ginart, Jr.
Councilman
District D

Fred E. Everhardt, Jr.
Councilman
District E

Roxanne Adams
Clerk of Council

WHEREAS, the U.S. Geological Survey (USGS) estimates that the Chandeleur Islands may convert to shoals within 25 years without additional sediment input and neither the State of Louisiana nor the Corps of Engineers has included restoration of the Chandeleur Islands in their respective coastal project budgets; and,

WHEREAS, the harmful consequences of the significant reduction in size of the Chandeleur Islands upon the soft muddy shoreline of the Biloxi Marshes are already apparent and such loss as predicted by the USGS will lead inevitably to rapidly expanding open bays and inner marsh loss that threatens the existence of the Biloxi Marshes; and,

WHEREAS, all Louisiana coastal barrier islands west of the Mississippi have been or will be restored or nourished by the Coastal Protection and Restoration Authority, the residents of southeast Louisiana parishes including St. Bernard, Orleans, St. Tammany, Jefferson and upper Plaquemines east of the Mississippi have received no such protection and investment in barrier protection as regards the Chandeleur Islands or other barrier projects, and,

WHEREAS, Louisiana's Comprehensive Master Plan for a Sustainable Coast (Coastal Protection and Restoration Authority of Louisiana, 2007), the U. S. Army Corps of Engineers draft Louisiana Coastal Protection and Restoration Plan (U.S. Army Corps of Engineers, 2009), and President Barack Obama's Roadmap for Restoring Ecosystem Resiliency and Sustainability Louisiana-Mississippi (Gulf Coast Ecosystem Restoration Working Group, 2010) have all adopted the coastal lines of defense strategy to protect coastal Louisiana from storm surge and shoreline protection for the Biloxi Marshes has been identified as a goal in Louisiana's Master Plan; and,

WHEREAS, sustaining the Biloxi Marshes is critical to the safety, economy, culture and the survival of St. Bernard Parish; and,

WHEREAS, the Biloxi Marshes barrier zone and barrier technology have been endorsed by the St. Bernard Parish Coastal Zone Advisory Committee.

St. Bernard Parish Council

8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

Wayne J. Landry
Councilman at Large

Frank Auderer

Ray Lauga, Jr.
Councilman
District A

George Cavignac
Councilman
District B

Kenneth "Kenny" Henderson
Councilman
District C

Mike Ginart, Jr.
Councilman
District D

Fred E. Everhardt, Jr.
Councilman
District E

Roxanne Adams
Clerk of Council

WHEREAS, after this resolution was originally approved by the St. Bernard Parish Coastal Zone Advisory Committee the alignment of the proposed East Biloxi Marshes Shoreline Barrier became the scene of intensive emergency deployment of temporary oil booms to protect the Biloxi Marshes from detrimental effects of the April 20, 2010 British Petroleum Oil Spill, thus further emphasizing the need for the barrier.

NOW THEREFORE BE IT RESOLVED, That this Council, the governing authority does hereby endorse the establishment of The East Biloxi Marshes Shoreline Barrier Zone, which will consist of a coastal barrier zone extending around the eastern perimeter of the Biloxi Marshes from Isle Aux Pitre to Mozambique Point and encompassing Bay Boudreau, Drum Bay, Morgan Harbor, Eloi Bay, Lake La Fortuna and interconnected smaller lakes and fringing wetlands in conjunction with the Parish President and the Coastal Zone Advisory Committee.

SECTION I. That the Council supports the installation of a segmented barrier as the outer protection element of the barrier zone and of appropriate low energy environments protection leeward of the barrier for back-barrier buildup of shells, trapping of sediment, near-shore protection of the soft shoreline, and habitat enhancement.

SECTION II. That President Obama's Gulf Coast Ecosystem Restoration Working Group consider The East Biloxi Marshes Coastal Barrier Zone as a critical element in the vision for Louisiana-Mississippi coastal ecosystem restoration and that it be given consideration for immediate near-term action.

SECTION III. That the Louisiana Office of Coastal Protection and Restoration and the U. S. Army Corps of Engineers are requested to support expedited evaluation and implementation of The East Biloxi Marshes Shoreline Barrier Zone, including the placement of cost-effective barrier units in the outer protection zone and creation of large–scale oyster reefs (respective of current leaseholders rights) to improve storm surge reduction and for potential economic value to the region.

SECTION IV. That the Council of St. Bernard Parish supports the inclusion of The East Biloxi Marshes Shoreline Barrier Zone in the MRGO Ecosystem Restoration Plan.

St. Bernard Parish Council

8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

Wayne J. Landry
Councilman at Large

Frank Auderer

Ray Lauga, Jr.
Councilman
District A

George Cavignac
Councilman
District B

Kenneth "Kenny" Henderson
Councilman
District C

Mike Ginart, Jr.
Councilman
District D

Fred E. Everhardt, Jr.
Councilman
District E

Roxanne Adams
Clerk of Council

SECTION V. That the Louisiana Office of Coastal Protection and Restoration and the U. S. Army Corps of Engineers are requested to incorporate The East Biloxi Marshes Shoreline Barrier Zone as a vital component in the state and federal master plans for coastal restoration and storm protection.

SECTION VI. That a certified copy of this resolution be forwarded to President Barack Obama; Nancy Sutley, Chairperson of Council on Environmental Quality; Dr. Jane Lubchenco, Administrator of the National Oceanographic and Atmospheric Administration; Lieutenant General Robert L. Van Antwerp, Chief of Engineers, U.S. Army Corps of Engineers; Brigadier General Michael J. Walsh, President Mississippi River Commission; Colonel Alvin B. Lee, District Commander, New Orleans District, U.S. Army Corps of Engineers; the entire Louisiana congressional delegation and the state legislative delegation and chief executives from the parishes of St. Bernard, Plaquemines, Orleans, Jefferson and St. Tammany; Governor Bobby Jindal; Garret Graves, Director of the Governor's Office of Coastal Activities, Lake Borgne Levee District and; the South Louisiana Flood Protection Authority-East.

The above and foregoing having been submitted to a vote, the vote thereupon resulted as follows:

YEAS: Lauga, Cavignac, Henderson, Ginart, Everhardt, Auderer

NAYS: None

ABSENT: None

The Council Chair, Mr. Landry, cast his vote as **YEA.**

And the motion was declared **adopted** on the 18th day of May, 2010.

St. Bernard Parish Council

8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

Wayne J. Landry
Councilman at Large

Frank Anderer

Ray Lauga, Jr.
Councilman
District A

George Cavignac
Councilman
District B

Kenneth "Kenny" Henderson
Councilman
District C

Mike Ginart, Jr.
Councilman
District D

Fred E. Everhardt, Jr.
Councilman
District E

Roxanne Adams
Clerk of Council

CERTIFICATE

I HEREBY CERTIFY that the above and foregoing is a true and correct copy of a motion adopted at a Regular Meeting of the Council of the Parish of St. Bernard, held at Chalmette, Louisiana, on Tuesday, May 18, 2010.

Witness my hand and the seal of the Parish of St. Bernard on this 18th day of May, 2010.

Roxanne Adams
ROXANNE ADAMS
CLERK OF COUNCIL

Appendix B

Senate Concurrent Resolution No. 115, Regular Session of the Louisiana Legislature, 2010. To urge and request the Coastal Protection and Restoration Authority of Louisiana and the United States Army Corps of Engineers to incorporate the East Biloxi Shoreline Barrier Zone as a vital component in the state and federal master plans for coastal restoration and storm protection.

UNITED STATES OF AMERICA

State of Louisiana

Tom Schedler

SECRETARY OF STATE

As Secretary of State, of the State of Louisiana, I do hereby Certify that

the annexed and following pages contain a true and correct copy of Senate Concurrent Resolution No. 115 of the 2010 Regular Session of the Louisiana Legislature as shown by comparison with the original on file in the archives of this office.

In testimony whereof, I have hereunto set my hand and caused the Seal of my Office to be affixed at the City of Baton Rouge on,

this, the 28th day of February, 2011.

Secretary of State

CERTIFICATE SS 103 (Rev. 11/06)

Y6-86

Regular Session, 2010

SENATE CONCURRENT RESOLUTION NO. 115

BY SENATOR CROWE

ORIGINATED

IN THE

SENATE

RECEIVED
BY SECRETARY OF STATE
JUN 24 2010
PUBLICATIONS DIVISION

SECRETARY OF THE SENATE

S-213 (R/83)

Regular Session, 2010 **ENROLLED**

SENATE CONCURRENT RESOLUTION NO. 115

BY SENATOR CROWE

A CONCURRENT RESOLUTION

To urge and request the Coastal Protection and Restoration Authority of Louisiana and the United States Army Corps of Engineers to incorporate the East Biloxi Shoreline Barrier Zone as a vital component in the state and federal master plans for coastal restoration and storm protection.

WHEREAS, the great Biloxi Marshes of St. Bernard Parish constitute one of the largest contiguous tidal estuary areas in the northern Gulf of Mexico region, whose bounty is harvested by fishermen from Louisiana, Mississippi, and Alabama, and serves as an indispensable part of the fishing industry and cultural heritage of the region and as a platform for extraction of oil and gas important to the nation; and

WHEREAS, because of their strategic location, the Biloxi Marshes further serve as a barrier island that buffers destructive storm surge and protects inland developed areas along the coast of Louisiana and Mississippi, including the Greater New Orleans area, Mandeville, Slidell, Bay St. Louis, Pass Christian and Gulfport; and

WHEREAS, barrier islands have been identified as the first line of defense to reduce tropical storm surge, and also retard erosion along Louisiana's muddy shorelines and thereby reduce wetland loss; and

WHEREAS, the Chandeleur Island chain, lying east of the Biloxi Marshes historically was the first line of defense to much of southeast Louisiana and adjacent areas of Mississippi, providing surge protection and reduction of shoreline erosion forces, and also providing estuarine influences that resulted in highly productive oyster habitat and formation of reefs that further added to overall protection, and

SCR NO. 115 ENROLLED

WHEREAS, the United States Geological Survey estimates that the Chandeleur Islands may convert to shoals within twenty-five years without additional sediment input, but neither the state of Louisiana nor the Corps of Engineers has presently included restoration of the Chandeleur Islands in their respective coastal project budgets; and

WHEREAS, the harmful consequences of the significant reduction in size of the Chandeleur Islands upon the soft muddy shoreline of the Biloxi Marshes are already apparent and such loss as predicted by the United States Geological Survey will lead inevitably to rapidly expanding open bays and inner marsh loss that threatens the existence of the Biloxi Marshes; and

WHEREAS, while all Louisiana coastal barrier islands west of the Mississippi have been or will be restored or supplemented by the Coastal Protection and Restoration Authority of Louisiana, the parishes east of the Mississippi, including St. Bernard, Orleans, St. Tammany, Jefferson and upper Plaquemines, have received an inadequate investment in barrier protection; and

WHEREAS, Louisiana's Comprehensive Master Plan for a Sustainable Coast, the Unites States Army Corps of Engineers' draft Louisiana Coastal Protection and Restoration Plan, and President Barack Obama's Roadmap for Restoring Ecosystem Resiliency and Sustainability Louisiana-Mississippi have all adopted the coastal lines of defense strategy to protect coastal Louisiana from storm surge and shoreline protection for the Biloxi Marshes; and

WHEREAS, sustaining the Biloxi Marshes is critical to the safety, economy, culture and the survival of St. Bernard Parish; and

WHEREAS, the Biloxi Marshes barrier zone and barrier technology have been endorsed by the St. Bernard Parish Coastal Zone Advisory Committee and the St. Bernard Parish Council.

THEREFORE, BE IT RESOLVED that the Legislature of Louisiana does hereby urge and request the Coastal Protection and Restoration Authority of Louisiana and the United States Army Corps of Engineers to incorporate the East Biloxi Shoreline Barrier Zone as a vital component in the state and federal master plans for coastal restoration and storm protection.

SCR NO. 115 ENROLLED

BE IT FURTHER RESOLVED that a copy of this Resolution be transmitted to the chairman of the Coastal Protection and Restoration Authority of Louisiana and the commanding general of the United States Army Corps of Engineers.

PRESIDENT OF THE SENATE

SPEAKER OF THE HOUSE OF REPRESENTATIVES

Appendix C

Southeastern Louisiana Flood Control Authority-East Resolution #10-21-10-04, October 21, 2010. To recreate oyster reefs to protect critical reaches of the Biloxi Marsh.

On the motion of Mr. Estopinal,
Seconded by Mr. Barry, the following resolution was offered:

RESOLUTION #10-21-10-04 - ST. BERNARD PARISH EMERGENCY EROSION CONTROL RESOLUTION

WHEREAS, the oil spill resulting from the Deepwater Horizon (BP Well MC 252) accident in the Gulf of Mexico is the largest recorded in U.S. history; and

WHEREAS, oil from the spill impacted significant reaches of the coast of Southeast Louisiana; and

WHEREAS, this oil destroyed coastal wetlands and accelerated shoreline erosion along reaches of the eastern perimeter of the Biloxi Marsh; and

WHEREAS, historically, naturally occurring oyster reefs in the Biloxi Marshes protected nearby coastal shoreline and wetlands from erosion.

BE IT HEREBY RESOLVED, that the Southeast Louisiana Flood Control Authority-East supports the St. Bernard Parish Emergency Erosion Control proposal to recreate oyster reefs to protect critical reaches of the Biloxi Marsh.

The foregoing was submitted to a vote, the vote thereon was as follows:

YEAS: Mr. Barnes, Mr. Barry, Mr. Estopinal, Mr. Jackson, Mr. Losonsky, Mr. Pineda and Mr. Wittie
NAYS: None
ABSENT: Mr. Goins

This resolution was declared adopted this 21st day of October, 2010.

I hereby certify that the above and foregoing is a true and correct copy of a resolution duly adopted by the Southeast Louisiana Flood Protection Authority-East at its meeting of October 21, 2010, held in Harahan, LA, at which a quorum was present.

Louis E. Wittie
Secretary

Appendix D

Louisiana Oyster Task Force, January 25, 2010. A letter of support to Governor Bobby Jindal for Restoration of Oyster Grounds and the Oyster Industry in St. Bernard Parish, Louisiana based on a unanimous motion of the task force



January 25, 2011

The Honorable Bobby Jindal
Governor's Office
PO Box 94004
Baton Rouge, Louisiana 70804-9004

Dar Governor Jindal:

At the regular meeting of our Advisory Commission held at the UNO Advanced Technology Center, on November 30, 2010, Dr. Sherwood Gagliano made a presentation on behalf of the St. Bernard Parish Government entitled "*Restoration of Oyster Grounds, and the Oyster Industry in St. Bernard Parish, Louisiana.*" (Abstract attached)

The proposed oyster restoration program will involve establishment of natural and artificial oyster reefs to reduce storm surge and shoreline erosion while enhancing oyster production in St. Bernard Parish. The program could be extended to other coastal areas as appropriate. This natural process restoration approach conforms with that articulated by the President's Louisiana-Mississippi Gulf Coast Ecosystem Restoration Working Group, the Gulf Coast Ecosystem Restoration Task force and the Louisiana Coastal Protection and Restoration Agency. Oyster reefs as used for restoration and protection are cost-effective, self-sustaining, technologically proven, consensus-oriented, constructed quickly and managed adaptively.

The proposed program will –

1) Help sustain and enhance the estuarine ecosystem of eastern St. Bernard (often referred to as the Biloxi Marshes)
2) Increase oyster spat production
3) Provide additional habitat value to the ecosystem
4) Employ local fishing personnel and manufacturers
5) Expand the economic benefits of fishery industry

Upon unanimous motion of the Louisiana Oyster Task Force, I am writing to express our support of this important program and to recommend that it be incorporated into the state's master plan for coastal restoration.

Sincerely yours,

John Tesvich

John Tesvich, Chariman
Attachment
Cc: Garret Graves
Craig Taffaro

202 Lakeshore Drive, Suite 300
New Orleans, LA 70122
504.283.9893
www LouisianaOysters.org

January 25, 2011

The Honorable Bobby Jindal
Governor's Office
PO Box 94004
Baton Rouge. LA 70804-9004

RE: Restoration of St. Bernard Oyster Grounds and Industry

Dear Governor Jindal:

At the regular meeting of our Advisory Commission held at the UNO Advanced Technology Center, on November 30, 2010. Dr. Sherwood Gagliano made a presentation on behalf of the St. Bernard Parish Government entitled "Restoration of Oyster Grounds. and the Oyster Industry in St. Bernard Parish. Louisiana". (abstract attached)

The proposed oyster restoration program will involve establishment of natural and artificial oyster reefs to reduce storm surge and shoreline erosion while enhancing oyster production in St Bernard Parish. The program could be extended to other coastal areas as appropriate. This natural processes restoration approach conforms with that articulated by the President's Louisiana-Mississippi Gulf Coast Ecosystem Restoration Working Group. the Gulf Coast Ecosystem Restoration Task Force and the Louisiana Coastal Protection and Restoration Agency. Oysters reefs as used for restoration and protection are cost-effective, self-sustaining, technologically proven, consensus-oriented. constructed quickly and managed adaptively.

The proposed program will –

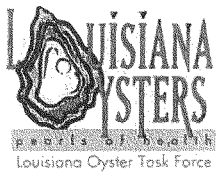
1) help sustain and enhance the estuarine ecosystem of eastern St. Bernard (often referred to as the Biloxi Marshes)
2) increase oyster spat production
3) provide additional habitat value to the ecosystem
4) employ local fishing personnel and manufacturers
5) expand the economic benefits of fishery industry

Upon unanimous motion of the Louisiana Oyster Task Force. I am writing to express our support of this important program and to recommend that it be incorporated into the state's master plan for coastal restoration.

Sincerely yours,

John Tesvich. Chairman

Attachment
Cc: Garret Graves
Craig Taffaro



RESTORATION OF OYSTER GROUNDS AND THE OYSTER INDUSTRY IN ST. BERNARD PARISH, LOUISIANA

Abstract

The Eastern St. Bernard Estuarine Ecosystem is among the most important estuaries of the Gulf of Mexico. It is critical to the fishing industries of St. Bernard Parish, as well as neighboring areas of Louisiana, Mississippi and Alabama.

Geologically, the area is relatively stable and not subject to the high subsidence rates of the coastal area west of the Mississippi River, however, the marshy shorelines characteristic of the area are subject to edge erosion. The narrow islands are becoming segmented and disappearing. The Mississippi River Gulf Outlet (MRGO), Hurricanes Katrina and Rita, and the British Petroleum oil well blowout all accelerated environmental deterioration and consequently severely damaged the commercial and recreational fishing industries.

The American Oyster is the index organism for conditions in this estuarine ecosystem. The oyster is also the framework building organism for system. Oysters produce huge volumes of shell. The shells of growing oyster become cemented together to form reefs. Shell from reefs also washes on shore to form erosion-resistant beaches and ridges.

Oyster growth can be managed for commercial harvest, fish and wildlife habitat enhancement, shoreline erosion control, storm-surge reduction, building up the subsiding landscape, and water quality improvement. Managed oyster growth is the key to a sustainable landscape and fishing industry in this ecosystem. There are two basic approaches, cultch spread over bottom reefs, and induced vertical oyster reefs.

An aggressive oyster ground and fisheries restoration program using these approaches will yield significant economic and social benefits to St. Bernard Parish and the region. Building and maintaining reefs will create jobs. Advanced mariculture techniques will be part of the program. Enhanced habitat will increase fish and wildlife yield and will stimulate commercial and recreational fishing and ecotourism. Fish products will flow into the food industries and domestic supply. Restoration will help preserve traditional occupations fundamental to the social structure of the region.

Through its state and federally approved coastal management program, The St. Bernard Parish Government is developing a vision plan for coastal restoration, of which restoration of the oyster grounds and oyster industry is a major component. This plan is intended to provide a framework to guide environmental, economic, and social restoration of the parish. That is, after billions of dollars of tax dollars are spent to protect the parish from storm induced flooding and to restore its endangered coastal environments, what would the citizens of the parish like to see. Will the dollars be wisely spent? Will the restoration and flood protection be sustainable? How will flood protection and restoration contribute to the

202° Lakeshore Drive, Suite 300
New Orleans, LA 70122
504.283.9893
www.LouisianaOysters.org



economy and social structure of the parish? This vision statement will provide input into broader programs, and plans developed by state and federal partners will be evaluated (establish priorities and the standard for acceptance or rejection of proposed projects).

2021 Lakeshore Drive, Suite 300
New Orleans, LA 70122
504.283 9893

www.LouisianaOysters.org

APPENDIX
Z

Cypress Swamp – bald cypress (*Taxodium distichum*) restoration
Assumption: Construction of cypress swamp habitat would begin after completion of the Violet Diversion (TY0)

TY01 Post-construction dewatering and flushing
Cost per acre: $0

TY 2 Initial Planting/Monitoring
An average of 200 bald cypress trees/acre with 75% bare-root seedlings/saplings and 25% container-grown will be planted from October through March. All will have a nutria protection device. Trees will be monitored monthly for survivorship and will be replaced when necessary.
Cost per acre: $2,000

TY3 to TY12 Operations and management
Yearly O&M monitoring of survivorship and growth rates and invasive species control (nutria)
Cost per acre: $250/yr

Fresh and Intermediate Marsh
Assumption: Construction of fresh and intermediate marsh would begin after completion of the Violet Diversion (TY0)
TY01 Post-construction dewatering and flushing
Cost per acre: $0

TY 2 Initial Planting/Monitoring
An average of 625 plants/acre will be planted on 8ft center on rows 8ft apart. Vegetation will be monitored monthly for survivorship and will be replaced when necessary.
Cost per acre: $2,500

TY3 to TY12 Operations and management
Yearly O&M monitoring of survivorship and growth rates and invasive species control if necessary
Cost per acre: $200/yr

Brackish Marsh
Assumption: Construction of brackish marsh in areas previously defined as saline marsh would begin after completion of the Violet Diversion (TY0)
TY01 Post-construction dewatering and flushing
Cost per acre: $0

TY 2 Initial Planting/Monitoring
An average of 875 plants/acre planted on 7ft centers on rows 7ft apart. Vegetation will be monitored monthly for survivorship and will be replaced when necessary.
Cost per acre: $3,500

TY3 to TY12 Operations and management
Yearly O&M monitoring of survivorship and growth rates and invasive species control if necessary
Cost per acre: $300/yr

Salt Marsh
Assumption: Construction of saline marsh is not dependent upon the completion of the Violet Diversion but upon marsh creation (TY0)
TY01 Post-construction dewatering
Cost per acre: $0

TY 2 Initial Planting/Monitoring
An average of 1,250 plants/acre will be planted 5ft centers on rows 7ft apart. Vegetation will be monitored monthly for survivorship and will be replaced when necessary.
Cost per acre: $5,000

TY3 to TY12 Operations and management
Yearly O&M monitoring of survivorship and growth rates and invasive species control if necessary
Cost per acre: $450/yr

Shoreline Restored Wetlands – with or without shoreline protection.
Because shoreline protection dissipates energy, planting plan for restored marsh landward of shoreline protection will be planted in much the same way as above with species used dependent upon salinity levels and depth and duration of flooding.

In high energy environments such as the intertidal zone, 2 rows of trade gallons on 5-foot alternating centers or 2 rows bare-root vegetative plugs on 3-foot alternating centers will be planted.
Cost per 1,000 linear ft of shoreline: $2,600 – $3,200

TY3 to TY12 Operations and management
Yearly O&M monitoring of survivorship and growth rates and invasive species control if necessary
Cost per acre: $450/yr

Ridge Component
Assumption: a layered, phased approach implemented over 5 to 7 years may be the most suitable to help stabilize the ridge, promote growth of the different tree stories, and create habitat for neotropical migrant birds. Actual timing of phases or actions is dependent on soils conditions, most importantly salinity and pH. Species selection is also dependent on soil salinity.

TY0 to TY1
Site preparation – ripping 1-2ft deep (preferred), or other tilling or cultivation, to fracture hard top surface of ridge (timing is dependent on actual conditions).
Cost per acre: $190

Initial stabilization planting – entire surface or aerial seed application of rye or millet (possibly mixed w/ Bermuda) to entire ridge surface.
Cost per acre: $500

Herbaceous cover will be planted on the entire ridge surface using the brackish wetland species plan of an average of 875 plants/acre planted on 7ft centers on rows 7ft apart.
Cost per acre: $3,500/ac

TY2 – Herbaceous cover planting

Assuming 50% survival of original planting resulting from high mortality due to poor soil conditions so the entire ridge surface will be planted at 50% of typical estimate for brackish wetland species plan.
Cost per acre: $1,750/ac

TY3 to TY5

Midstory/shrub-scrub habitat will be planted using typical 200-300 plant/ac density on ridge top and upper half of ridge side slopes.
Cost per acre: $125/ac

TY5 to TY7

Pre-planting herbicide application/invasive species control (tallow eradication) on entire ridge surface.
Cost per acre: $150/ac

Forest canopy habitat will be planted using 200-300 plant/ac density on ridge top only.
Cost per acre: $125/ac

TY3 to TY16 Operations and management

Yearly O&M monitoring of survivorship and growth rates and invasive species control if necessary
Cost per acre: $250/yr

FOR CONTINUATION OF HOUSE DOCUMENT 113-78

MRGO ECOSYSTEM RESTORATION PLAN
FEASIBILITY STUDY

SEE PART 6