ENVIRONMENTAL ASSESSMENT

ATCHAFALAYA BASIN FLOODWAY SYSTEM
BUFFALO COVE MANAGEMENT UNIT

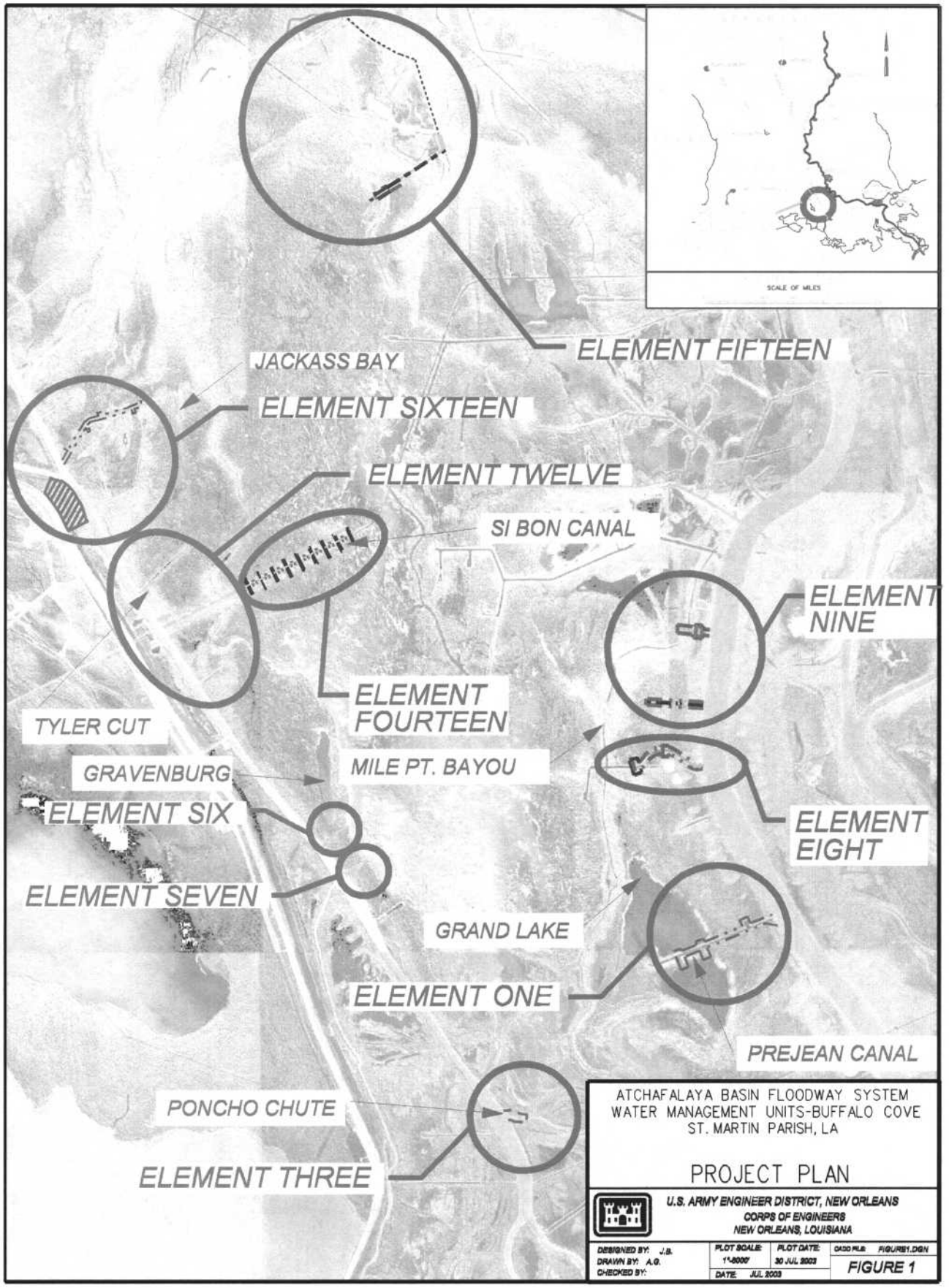
WATER CIRCULATION IMPROVEMENTS AND
SEDIMENT MANAGEMENT INITIATIVES

IBERIA AND ST. MARTIN PARISHES, LOUISIANA

EA # 366

INTRODUCTION

The U.S. Army Corps of Engineers (USACE), New Orleans District (MVN), has prepared this Environmental Assessment #366 (EA #366) to evaluate the potential impacts associated with the construction and maintenance of the proposed circulation and sediment management improvements in the Buffalo Cove Management Unit (BCMU) elements of the Management Unit feature of the Atchafalaya Basin Floodway System, Louisiana project. The Buffalo Cove Management Unit is located in South Central Louisiana (See Figure 1) in the southwestern portion of the lower Atchafalaya Basin Floodway in several parishes including St. Martin, St. Mary and Iberia. The Buffalo Cove Management Unit is located south of Interstate 10 and adjacent to the West Atchafalaya Basin Protection Levee. The project area for the proposed action is located in St. Martin, St.Mary, and Iberia Parishes approximately 10 to 12 miles northeast of the town of Charenton, Louisiana. EA #366 has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's Regulations (40 CFR 1500-1508), as reflected in the USACE Engineering Regulation, ER 200-2-2. The following sections include a discussion of the purpose and need for the proposed action, the authority for the proposed action, alternatives to the proposed action, significant resources affected by the proposed action, and the impacts of the proposed action.


SCALE OF MILES
ELEMENT FIFTEEN
JACKASS BAY
ELEMENT SIXTEEN
ELEMENT TWELVE
SI BON CANAL
ELEMENT NINE
ELEMENT FOURTEEN
TYLER CUT
GRAVENBURG
MILE PT. BAYOU
ELEMENT SIX
ELEMENT EIGHT
ELEMENT SEVEN
GRAND LAKE
ELEMENT ONE
PREJEAN CANAL
PONCHO CHUTE
ELEMENT THREE
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
ST. MARTIN PARISH, LA
PROJECT PLAN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.G.
CHECKED BY:
PLOT SCALE: 1"=8000'
PLOT DATE: 30 JUL 2003
DATE: JUL 2003
CADD FILE: FIGURE1.DGN
FIGURE 1

PURPOSE AND NEED FOR THE PROPOSED ACTION

The Atchafalaya Basin Floodway System (ABFS) incorporates a multipurpose comprehensive plan that provides flood protection to south-central Louisiana, and preserves one of the largest alluvial bottomland hardwood swamps remaining in the continental United States. The floodway system ensures passage of up to one half of the predicted design flood of the combined flows of the Red and Mississippi Rivers, southward from the latitude of the Old River Control Complex to the Gulf of Mexico. The purpose of the ABFS is to protect life and property from major Mississippi River floods by diverting excess flows to the Gulf of Mexico. The ABFS, 1982 feasibility study/final environmental impact statement (FEIS) considered 13 management units in the Lower Atchafalaya Basin Floodway, ultimately recommending authorization of the initial construction of 5 management units with the initial construction of 2 pilot management units at Buffalo Cove and Henderson Lake as authorized features of the Recommended Plan for the floodway system, and construction of Cocodrie, Beau Bayou, and Flat Lake authorized management units to be held in abeyance pending the implementation decision of the Chief of Engineers after evaluating the operational success of the initial 2 pilot management units.

The purpose of the management units feature of the ABFS is to restore historical overflow patterns to the extent practicable, encourage over bank water movement through the management units, and reduce sediment deposition within the ABFS with the ultimate goal of restoring and enhancing the aquatic environment.

Rapid sediment deposition rates, altered hydrological relationships, and reduced water quality are now inducing environmental changes within the Atchafalaya Basin Floodway. The proposed action would produce "stand alone" benefits for specific water management objectives and would make additive contributions to the overall basin. Additional water quality improvements would be expected as successive management units are initiated. Supplemental environmental impact statements will be prepared to address both the direct and cumulative impacts of constructing and operating these future elements within the BCMU and the remaining authorized management units, as funds are obligated. The proposed action would provide for the implementation of an improved water distribution modification based on the previous pilot management studies in the Bayou Eugene area through the construction of the Buffalo Cove Pilot Management Unit, Bayou Eugene, Engineering Design Prototype Model Test. The proposed action evaluated in this EA would initiate both preservation of the area and a more targeted and precise development of an overall design concept for implementing a more integrated construction approach for the Buffalo Cove pilot management unit feature of the ABFS.

The purpose of the current proposed work is to prolong the life expectancy of the productive habitat that would become scarce over time (primarily aquatic and cypress tupelo habitats) by restricting or redirecting sediments, while simultaneously achieving a healthy water circulation pattern that would maintain or restore water quality and reestablish north to south water movement. Sediments would be managed so they would be directed to areas already undergoing accretion, thus prolonging the existence of swamp

and aquatic habitat. These improved modifications would be evaluated for inclusion in an overall water management strategy for the BCMU.

AUTHORITY FOR THE PROPOSED ACTION

The proposed action was authorized by the Flood Control Act of May 15, 1928 (Public Law 391, 70th Congress), as amended and supplemented. Construction of two pilot management units (Buffalo Cove and Henderson Lake) is authorized by the Supplemental Appropriations Act of 1985 (PL 99-88) and the Water Resources Development Act (WRDA) of 1986 (PL 99-662), with construction of three additional authorized management units(Flat Lake, Beau Bayou, and Cocodrie Swamp) to take place upon approval of the Chief of Engineers after evaluation of the operational success of the initial two pilot management units. WRDA 1986 authorized the USACE to carry out the recommended plan for management units as described in the ABFS feasibility report of 1982 and the subsequent Chief of Engineers Report dated February 28, 1983.

PRIOR REPORTS

The 1982 feasibility study/FEIS for the ABFS evaluated the construction of two pilot management units, at Buffalo Cove and Henderson Lake, as an authorized feature of the floodway system feature of the Mississippi River and Tributaries, Atchafalaya Basin project. Engineering and design prototype model testing was not addressed. An EA prepared September 14, 1993, evaluated the impacts of an initial prototype model test in the BCMU along Bayou Eugene. By memorandum dated March 25, 1993, the President of the Mississippi River Commission approved the document entitled, "Flood Control, Mississippi River and Tributaries, Atchafalaya Basin Floodway System, Louisiana, Buffalo Cove Pilot Management Unit, Bayou Eugene, Engineering Design Prototype Model Test" for the construction of the Buffalo Cove Pilot Management Unit, Bayou Eugene Prototype Model Test Project, construction of which project was completed in 1965. This prototype model test was evaluated and monitored to aid in the design of water delivery features that would be used in the overall BCMU. A post construction monitoring report ("Effects of Variation in River Stage on the Water Quality and Biota in the BCMU of the Atchafalaya Basin, Louisiana"), evaluating the effects of the initial hydrologic improvements, was prepared in 1999 under contract to the MVN by the U.S. Fish and Wildlife Service in cooperation with the Louisiana State University Fisheries Department. Modifications to the original Bayou Eugene prototype model test were evaluated in EA #194A prepared in November 2001 entitled "Atchafalaya Floodway System, Buffalo Cove Pilot Management Unit; Bayou Eugene Prototype Model Test Modifications".

Additional actions were taken with the State of Louisiana to actively pursue the water management issue. The Louisiana Department of Natural Resources (LDNR) and the USACE entered into a Memorandum of Understanding (MOU) that was executed October 26, 1998 to initiate water management. Working with the state under this MOU,

the USACE completed the Federal Master Plan for Atchafalaya Basin Floodway System, Louisiana project. The USACE Master Plan was completed in 2000 and serves as a guide in implementing the authorized features of the 1982 feasibility study. In terms of management units, the USACE Master Plan is important because it redefines the methods of implementation of the two pilot management units.

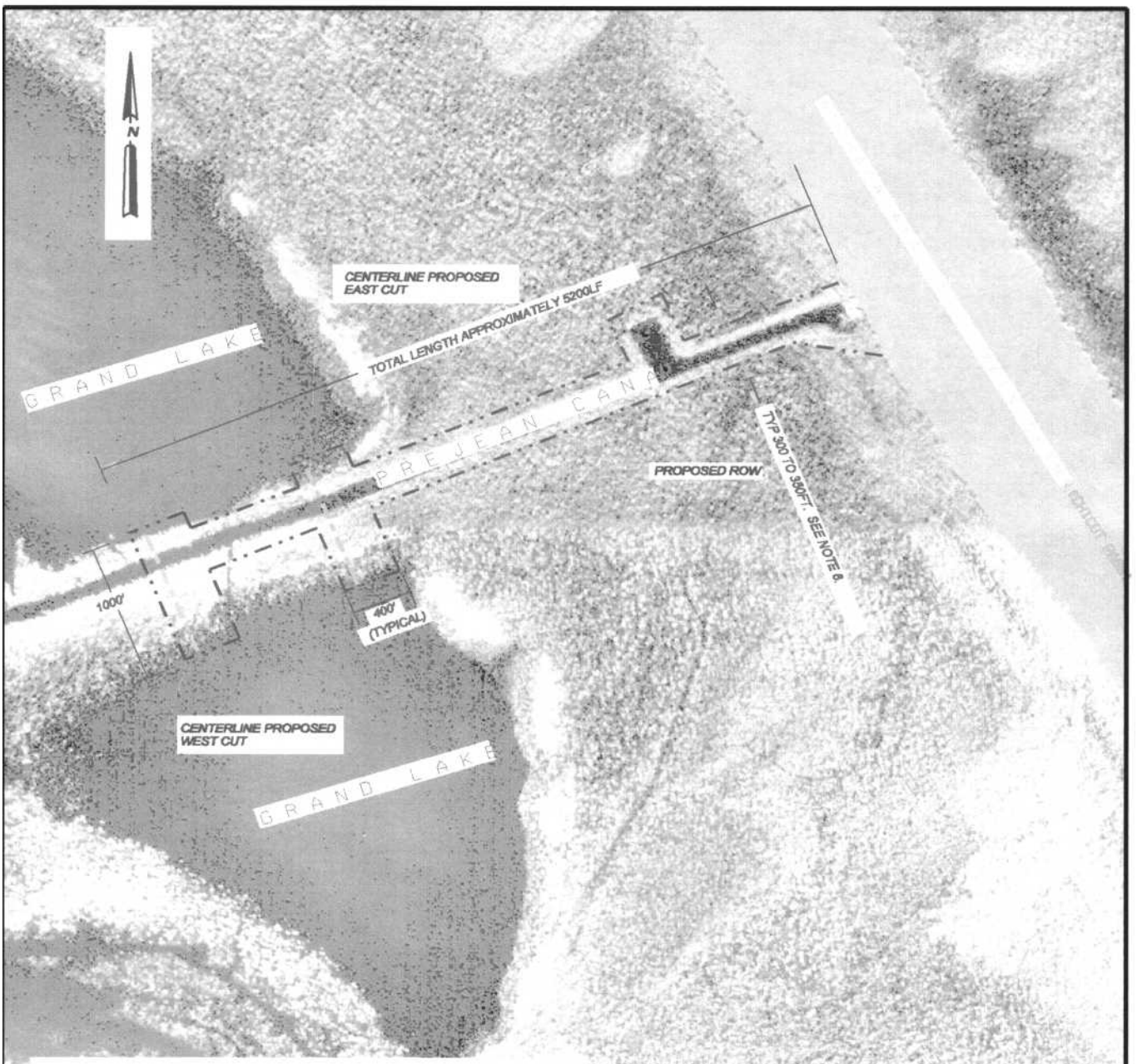
PUBLIC CONCERNS

Residents of the Atchafalaya Basin (the basin) are concerned about the floodway's ability to pass project floods and prevent inundation of property adjacent to the floodway system. Widespread support at state, local, and Federal levels exists for protecting environmental resources within the basin with special emphasis on averting further loss or degradation of wetland and woodland habitats. This support comes from a wide spectrum of the public representing residents as well as recreational and commercial users of the basin's resources. Concerns center on the probability of increased sedimentation and insufficient circulation, which may lead to hypoxic conditions and further reduce or eliminate viable habitat that exists under current conditions. Additionally there is concern for the overall health of the commercial and recreational fishery, the forestry resources, and wildlife habitat in the project area, as well as the passive uses of the basin.

DESCRIPTION OF THE PROPOSED ACTION

PLAN DESCRIPTION

The proposed water management project is designed to improve interior circulation within the swamp; remove barriers to facilitate north to south flow; provide input of oxygenated, low temperature river water; and prevent or manage sediment input into the interior swamps. This would be accomplished by the construction of 10 elements (figures 2-13), which consist of a series of closures and sediment traps (to prevent sediment influx), constructed inputs for river water, and gaps placed in existing embankments (figure 1). Elements 1, 8, 12, and 14 (figures 2, 3, 4, and 5 respectively) are primarily intended to improve drainage and reestablish flow through the interior swamp basin. Cuts would be made through existing dredged material embankments to improve circulation and drainage in the interior swamp or create a connection between two water bodies (element 1). The excavated material would be placed non-continuously, with 50-foot gaps between placements, oriented in a north to south direction to prevent interference with sheet flow across the swamp. Elements 6 and 7 (figures 6 and 7) would function primarily as a means of restricting sediment input. The primary function of elements 9, 15, and 16 (figures 8, 9, and 10) would be to provide an additional source of river water into the management unit. These elements would include sediment traps to allow river water input while limiting sediment transport into the unit. Element 12 also supplements the freshwater input into the swamp through Tyler Cut (figure 4). It reduces sediment input through the closure of the Sibon Canal and improves internal circulation by removing barriers to flow. The remaining element 3 (figure 11), blocks a waterway, which presently acts as a hydraulic dam, preventing drainage of the management unit.



GENERAL NOTES:

1. PREPARED FROM DIGITAL ORTHO QUADS LAKE CHICOT(SW), CHARENTON(NE), AND CENTERVILLE NORTHWEST(NW) FLOWN JANUARY 1996.
2. ENTIRE PLAN SHEET LOCATED WITHIN IBERIA PARISH, LOUISIANA.

ROW AND ENVIRONMENTAL NOTES:

1. TOTAL EASEMENT REQUIRED = 55 ACRES
2. TOTAL OPEN WATER WITHIN EASEMENT = 15 ACRES
3. TOTAL LENGTH OF EAST CUT = 980 LINEAR FEET
4. TOTAL LENGTH OF WEST CUT = 950 LINEAR FEET
5. ROW IS NECESSARY FOR CLEARING, EXCAVATION, SPOIL, AND ACCESS.
6. ROW ALONG PREJEAN CANAL EXTENDS 100 FT FROM WATER'S EDGE. TREES MAY BE FELLED TO PROVIDE CONSTRUCTION EQUIP. ACCESS.
7. NO SPOIL SHALL BE PLACED WITHIN THE BANKS OF PREJEAN CANAL.
8. BOTH CUTS LOCATED WITHIN T12S AND R9&10E.

SCALE: 1" = 1000'

1000' 0 1000' 2000'

ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LOUISIANA

PLAN VIEW-ELEMENT ONE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: J.B.	PLOT SCALE: 1"=1000'	PLOT DATE: 30 JUL 03	CADD FILE: FIGURE2.DGN
DRAWN BY: A.G.			FIGURE 2
CHECKED BY:	DATE: JUL 2003		

1. TOTAL EASEMENT REQUIRED = 47 ACRES
2. TOTAL OPEN WATER WITHIN EASEMENT = 12 ACRES.
3. TOTAL LENGTH OF WEST CUT = 1298 LINEAR FEET.
4. TOTAL LENGTH OF EAST CUT = 982 LINEAR FEET.
5. CLOSURE SHALL BE CONSTRUCTED TO ELEV (+)15.0 WITH A 100FT CROWN. EXACT LOCATION SHALL BE DETERMINED UPON COMPLETION OF ENGR ANALYSIS WITH COMPLETE DATA.
6. ROW IS NECESSARY FOR CLEARING, EXCAVATION, SPOIL, AND ACCESS.
7. ROW ALONG SAN HILL CANAL EXTENDS 100FT FROM WES.
8. NO SPOIL SHALL BE PLACED WITHIN THE BANKS OF SAND HILL CANAL.

GENERAL NOTES:

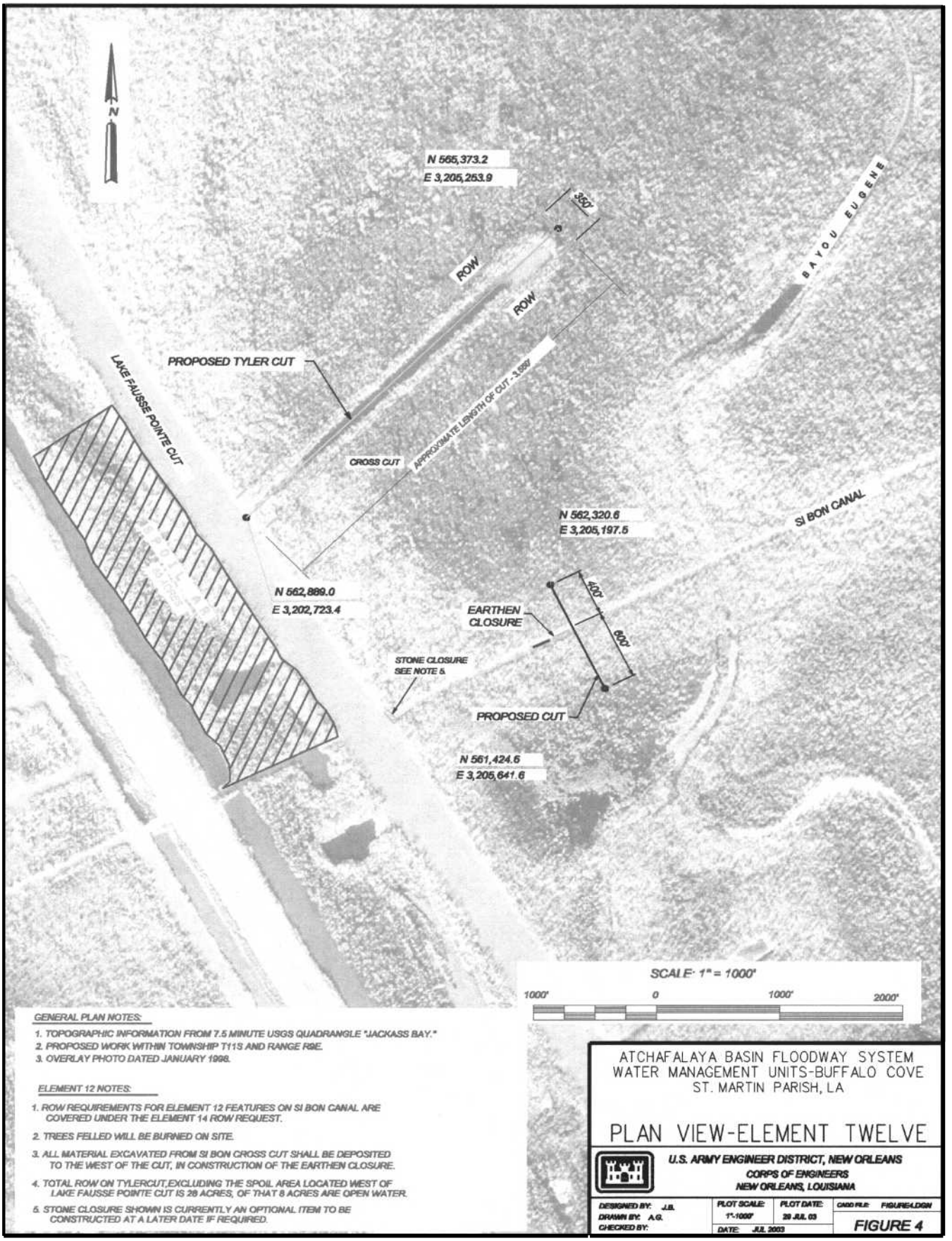
1. PREPARED FROM DIGITAL ORTHO QUADS JACKASS BAY(SE) AND LAKE CHICOT (SW) FLOWN IN JANUARY 1998.

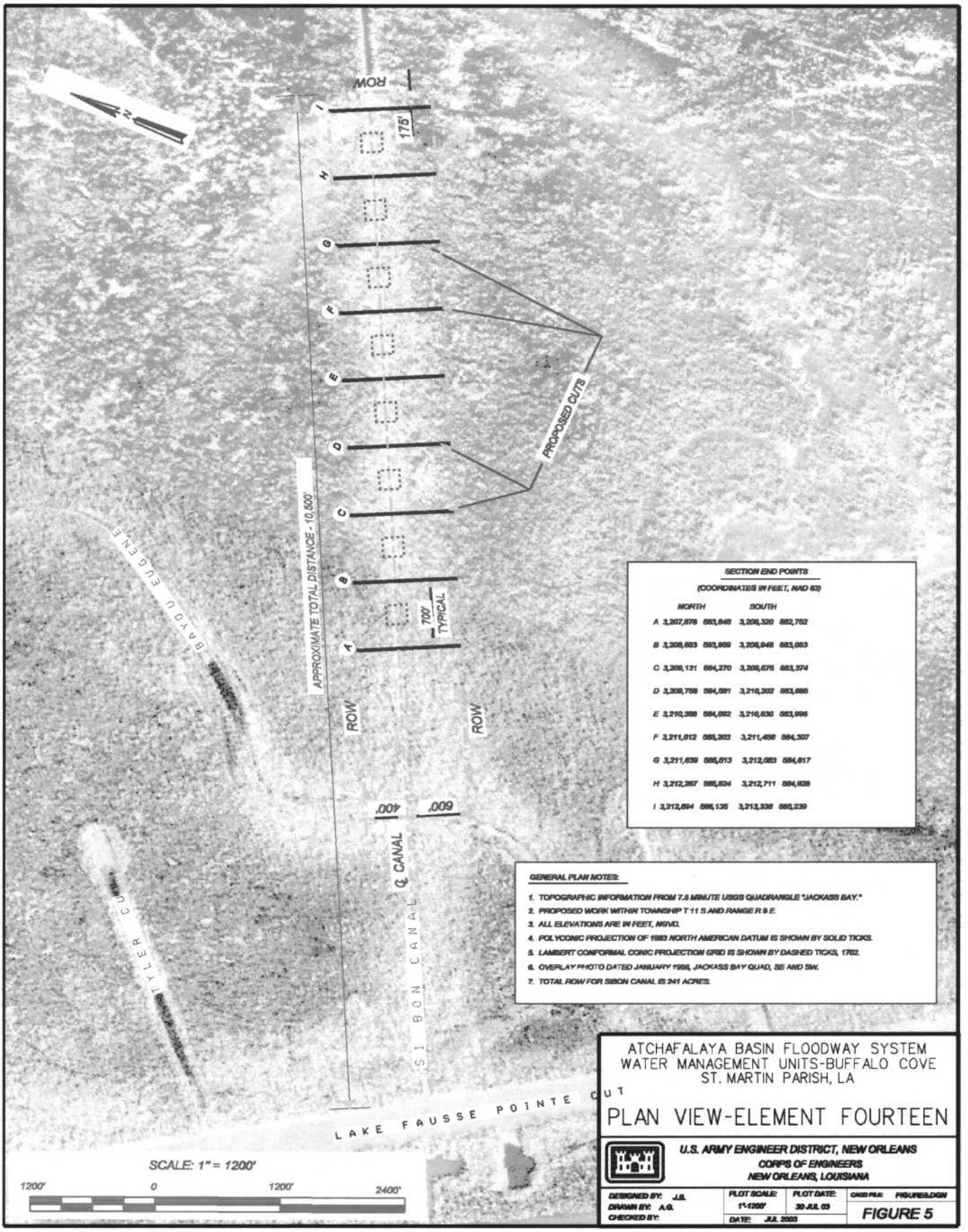
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LOUISIANA

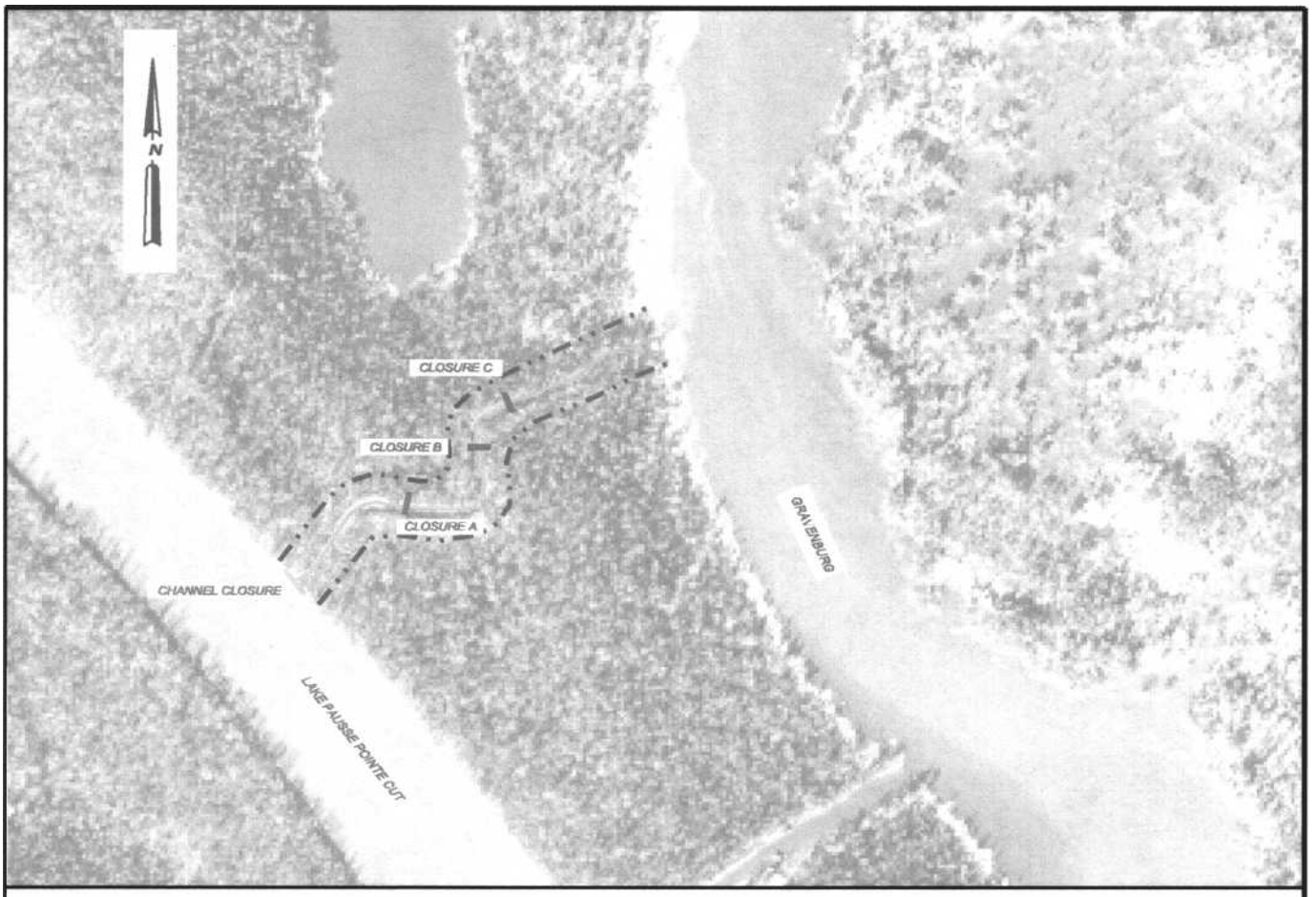
PLAN VIEW-ELEMENT EIGHT

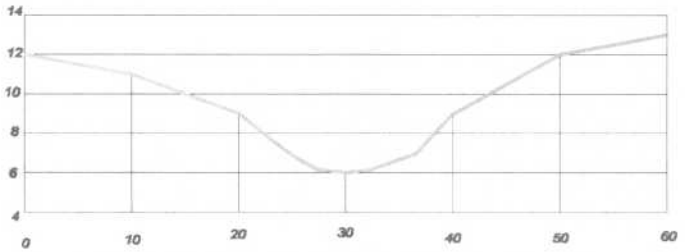
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: J.B.	PLOT SCALE: 1"=1000'	PLOT DATE: 30 JUL 03	CADD FILE: FIGURE3.DGN
DRAWN BY: A.G.			FIGURE 3
CHECKED BY:	DATE: JUL 2002		


N
N 565,373.2
E 3,205,253.9
350'
ROW
ROW
BAYOU EUGENE
PROPOSED TYLER CUT
LAKE FAUSSE POINTE CUT
APPROXIMATE LENGTH OF CUT - 3,550'
CROSS CUT
N 562,320.6
E 3,205,197.5
SI BON CANAL
N 562,869.0
E 3,202,723.4
400'
600'
EARTHEN CLOSURE
STONE CLOSURE SEE NOTE 5.
PROPOSED CUT
N 561,424.6
E 3,205,641.6
SCALE: 1" = 1000'
1000'
0
1000'
2000'
GENERAL PLAN NOTES:
1. TOPOGRAPHIC INFORMATION FROM 7.5 MINUTE USGS QUADRANGLE "JACKASS BAY."
2. PROPOSED WORK WITHIN TOWNSHIP T11S AND RANGE R9E.
3. OVERLAY PHOTO DATED JANUARY 1998.
ELEMENT 12 NOTES:
1. ROW REQUIREMENTS FOR ELEMENT 12 FEATURES ON SI BON CANAL ARE COVERED UNDER THE ELEMENT 14 ROW REQUEST.
2. TREES FELLED WILL BE BURNED ON SITE.
3. ALL MATERIAL EXCAVATED FROM SI BON CROSS CUT SHALL BE DEPOSITED TO THE WEST OF THE CUT, IN CONSTRUCTION OF THE EARTHEN CLOSURE.
4. TOTAL ROW ON TYLERCUT, EXCLUDING THE SPOIL AREA LOCATED WEST OF LAKE FAUSSE POINTE CUT IS 28 ACRES, OF THAT 8 ACRES ARE OPEN WATER.
5. STONE CLOSURE SHOWN IS CURRENTLY AN OPTIONAL ITEM TO BE CONSTRUCTED AT A LATER DATE IF REQUIRED.
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
ST. MARTIN PARISH, LA
PLAN VIEW-ELEMENT TWELVE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.G.
CHECKED BY:
PLOT SCALE: 1"=1000'
PLOT DATE: 29 JUL 03
DATE: JUL 2003
CADD FILE: FIGURE4.DGN
FIGURE 4

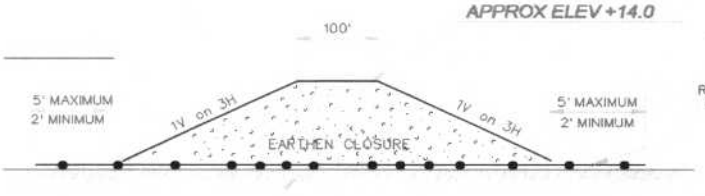

ROW
175'
I
H
G
F
E
D
C
B
A
700' TYPICAL
PROPOSED CUTS
APPROXIMATE TOTAL DISTANCE - 10,500'
BAYOU EUGENE
ROW
ROW
400'
600'
℄ CANAL
SIBON CANAL
TYLER CUT
LAKE FAUSSE POINTE CUT
SCALE: 1" = 1200'
1200'
0
1200'
2400'
SECTION END POINTS
(COORDINATES IN FEET, NAD 83)
NORTH SOUTH
A 3,207,876 583,648 3,208,320 582,752
B 3,208,503 583,969 3,208,948 583,063
C 3,209,131 584,270 3,209,575 583,374
D 3,209,758 584,591 3,210,202 583,685
E 3,210,386 584,892 3,210,830 583,996
F 3,211,012 585,203 3,211,456 584,307
G 3,211,639 585,513 3,212,083 584,617
H 3,212,267 585,834 3,212,711 584,938
I 3,212,894 586,135 3,213,338 585,239
GENERAL PLAN NOTES:
1. TOPOGRAPHIC INFORMATION FROM 7.5 MINUTE USGS QUADRANGLE "JACKASS BAY."
2. PROPOSED WORK WITHIN TOWNSHIP T 11 S AND RANGE R 9 E.
3. ALL ELEVATIONS ARE IN FEET, NGVD.
4. POLYCONIC PROJECTION OF 1983 NORTH AMERICAN DATUM IS SHOWN BY SOLID TICKS.
5. LAMBERT CONFORMAL CONIC PROJECTION GRID IS SHOWN BY DASHED TICKS, 1702.
6. OVERLAY PHOTO DATED JANUARY 1996, JACKASS BAY QUAD, SE AND SW.
7. TOTAL ROW FOR SIBON CANAL IS 241 ACRES.
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
ST. MARTIN PARISH, LA
PLAN VIEW-ELEMENT FOURTEEN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.G.
CHECKED BY:
PLOT SCALE: 1"=1200'
PLOT DATE: 30 JUL 03
DATE: JUL 2003
CADD FILE: FIGURE5.DGN
FIGURE 5





CROSS SECTION @ EARTHEN CLOSURE

APPROX ELEV +14.0



TYPICAL EARTHEN CHANNEL CLOSURE DESIGN SECTION

NOT TO SCALE

DETAILED PLAN NOTES:

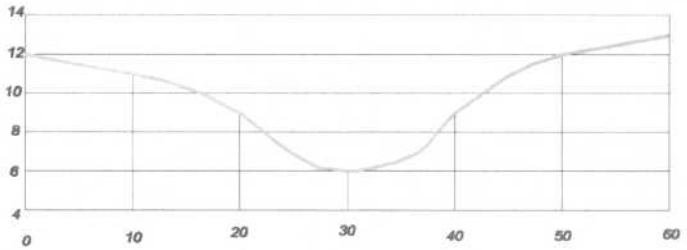
1. TREES FELLED WITHIN THE FOOTPRINT OF CONSTRUCTION SHALL BE PLACED DOWNSTREAM OF THE EARTHEN CLOSURES.
2. BORROW MATERIAL FOR EARTHEN CLOSURES SHALL BE OBTAINED FROM THE EXISTING BANKS LOCATED DOWNSTREAM OF THE PROPOSED EARTHEN CLOSURE.
3. EARTHEN CLOSURES SHALL BE CONSTRUCTED WITH A CREST ELEVATION 1-FT HIGHER THAN ADJACENT UPSTREAM BANKS.
4. TOTAL REQUIRED ROW IS 10 ACRES, OF WHICH 1 ACRE IS OPEN WATER.

ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LA

ELEMENT SIX
PLAN VIEW AND DESIGN SECTION

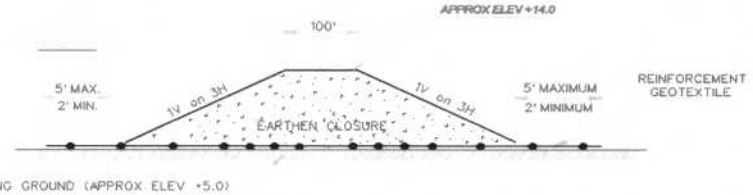
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: J.B.	PLOT SCALE: N.T.S.	PLOT DATE: 30 JUL 03	CADD FILE: FIGURES.DGN
DRAWN BY: A.G.			FIGURE 6
CHECKED BY:	DATE: JUL 2003		



CROSS SECTION @ EARTHEN CLOSURE

NOT TO SCALE



TYPICAL EARTHEN CLOSURE DESIGN SECTION

NOT TO SCALE

GENERAL NOTES:

1. PREPARED FROM AERIAL PHOTOS FLOWN IN JANUARY 1998.

DETAILED PLAN NOTES:

1. TREES WITHIN THE FOOTPRINT OF CONSTRUCTION SHALL BE PLACED DOWNSTREAM OF THE CLOSURE.
2. BORROW MATERIAL FOR EARTHEN CORE SHALL BE OBTAINED FROM WITHIN THE AVAILABLE ROW DOWNSTREAM OF THE PROPOSED CLOSURE.
3. CLOSURE SHALL BE CONSTRUCTED WITH A CREST ELEVATION 1-FT HIGHER THAN ADJACENT BANKS.
4. ACCESS CORRIDOR = 350 LINEAR FEET, EXTENDING 50' BEYOND TOP OF EITHER BANK.
5. TOTAL REQUIRED ROW IS 1.3 ACRES, OF WHICH 0.3 IS OPEN WATER.

QUANTITY ESTIMATES KEYHOLE CANAL

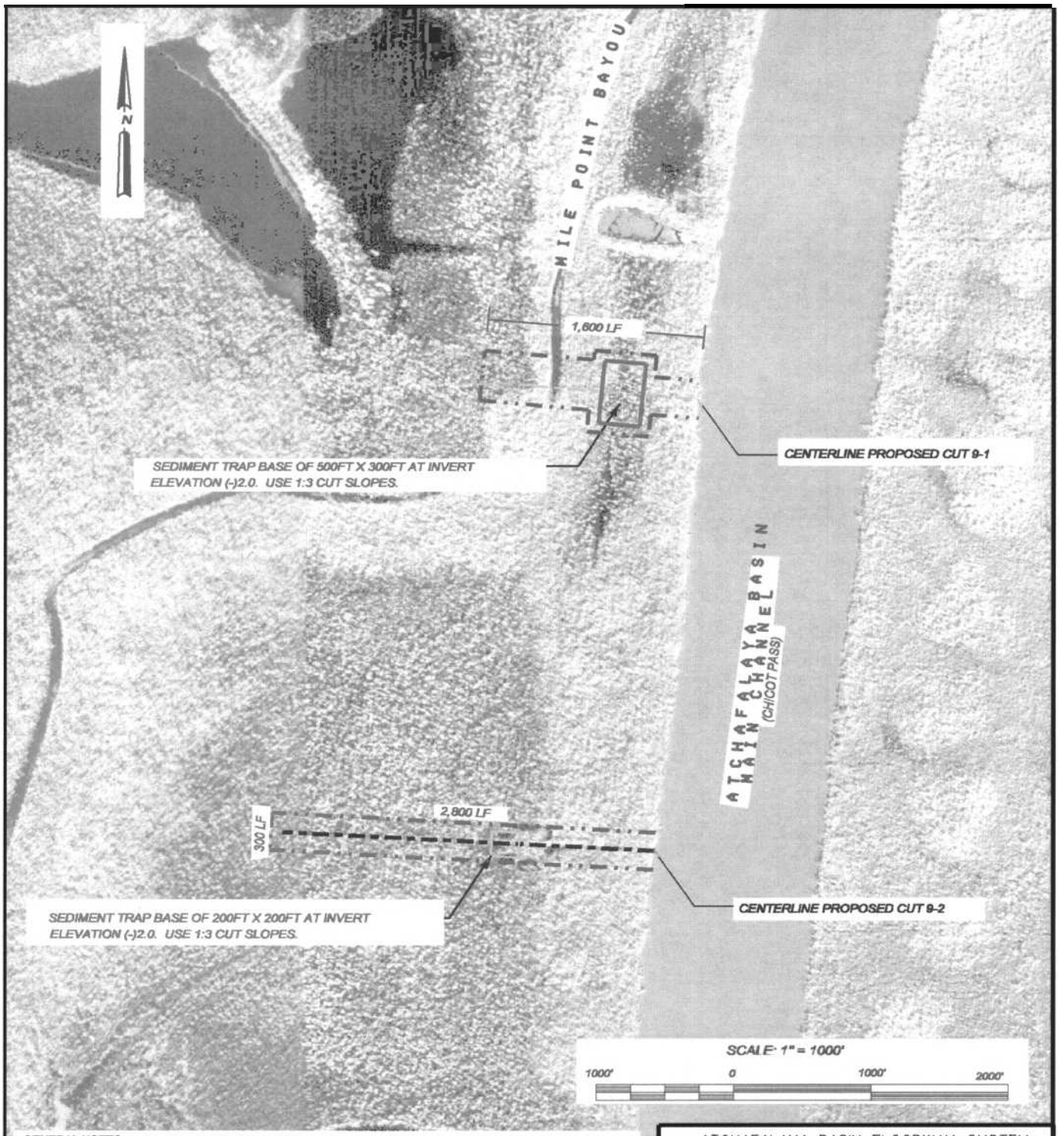
EARTHEN FILL	1,950 CUBIC YARDS
REINFORCEMENT FABRIC	1,250 SQUARE YARDS

ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LA

ELEMENT SEVEN
PLAN VIEW AND DESIGN SECTION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: J.B.	PLOT SCALE: 1"=1000'	PLOT DATE: 30 JUL 03	CADD FILE: FIGURE7.DGN
DRAWN BY: A.G.			FIGURE 7
CHECKED BY:	DATE: JUL 2003		



GENERAL NOTES:

1. PREPARED FROM DIGITAL ORTHO QUADS JACKASSBAY(SE) AND LAKECHICOT(SW) FLOWN JANUARY 1998.

ELEMENT NINE NOTES:

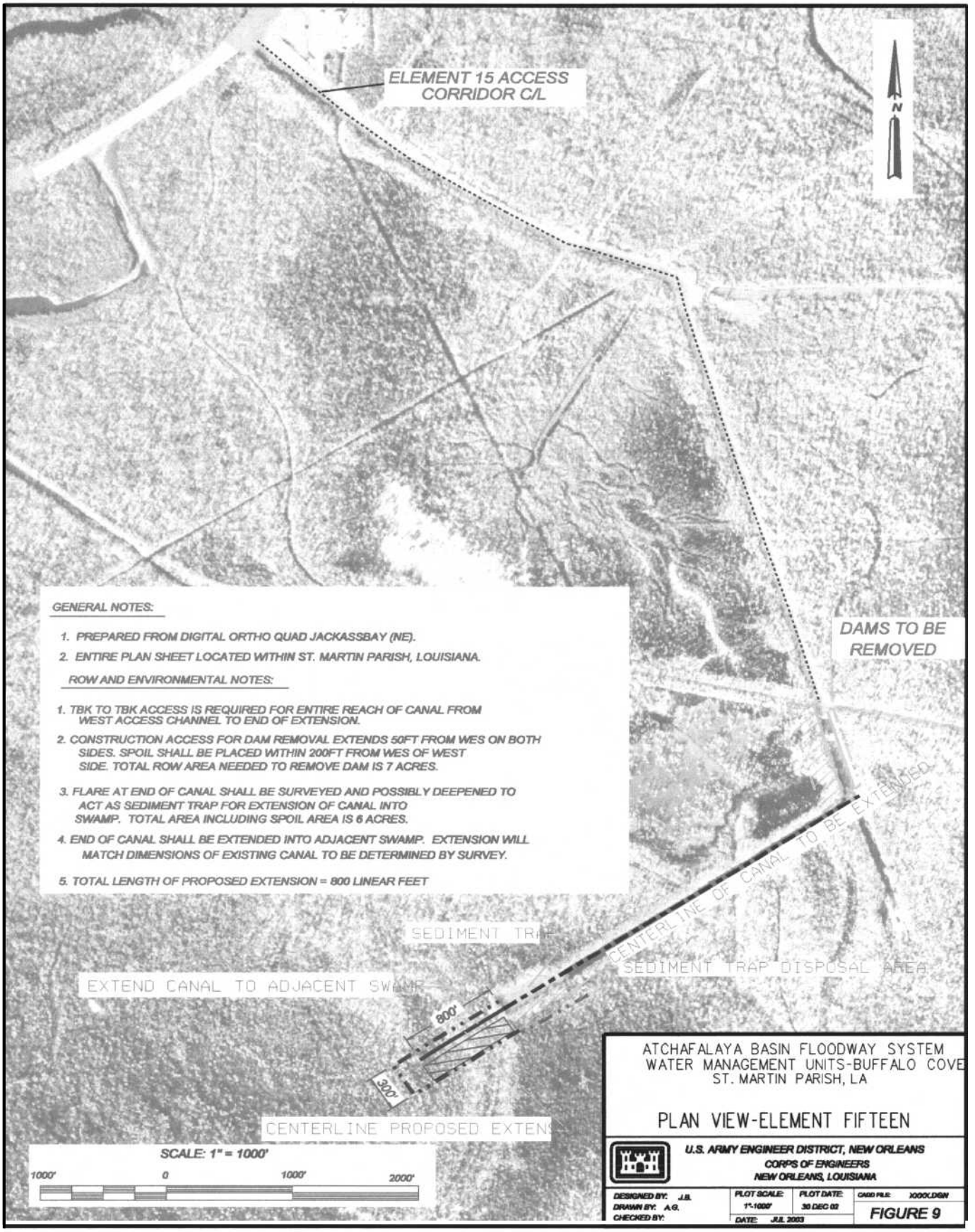
1. TOTAL EASEMENT NEEDED FOR CONSTRUCTION OF 9-1 IS 17 ACRES. TOTAL EASEMENT NEEDED FOR CONSTRUCTION OF 9-2 IS 20 ACRES. OF THE TOTAL 37 ACRES, 0.5 ACRES OF WATER WITHIN MILE POINT BAYOU MIGHT BE IMPACTED.
2. AN EARTHEN CLOSURE SHALL BE PLACED NORTH OF THE CUT 9-1 TO ENSURE MILE POINT BAYOU DOES NOT CAPTURE FLOW.
3. ALL SPOIL, EXCEPT THAT USED TO CONSTRUCT CLOSURE SHALL BE DEPOSITED INTO THE MAIN CHANNEL.

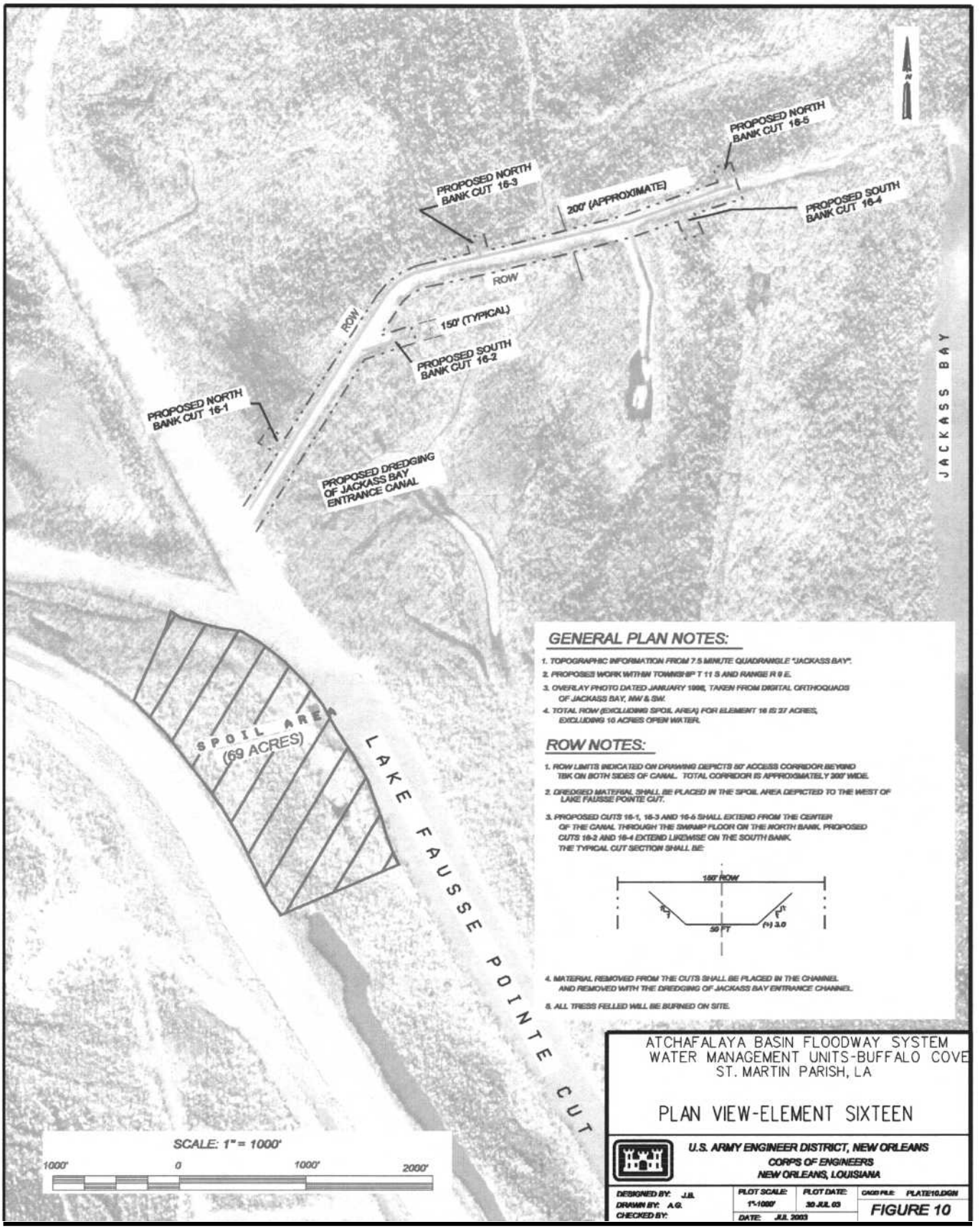
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LA

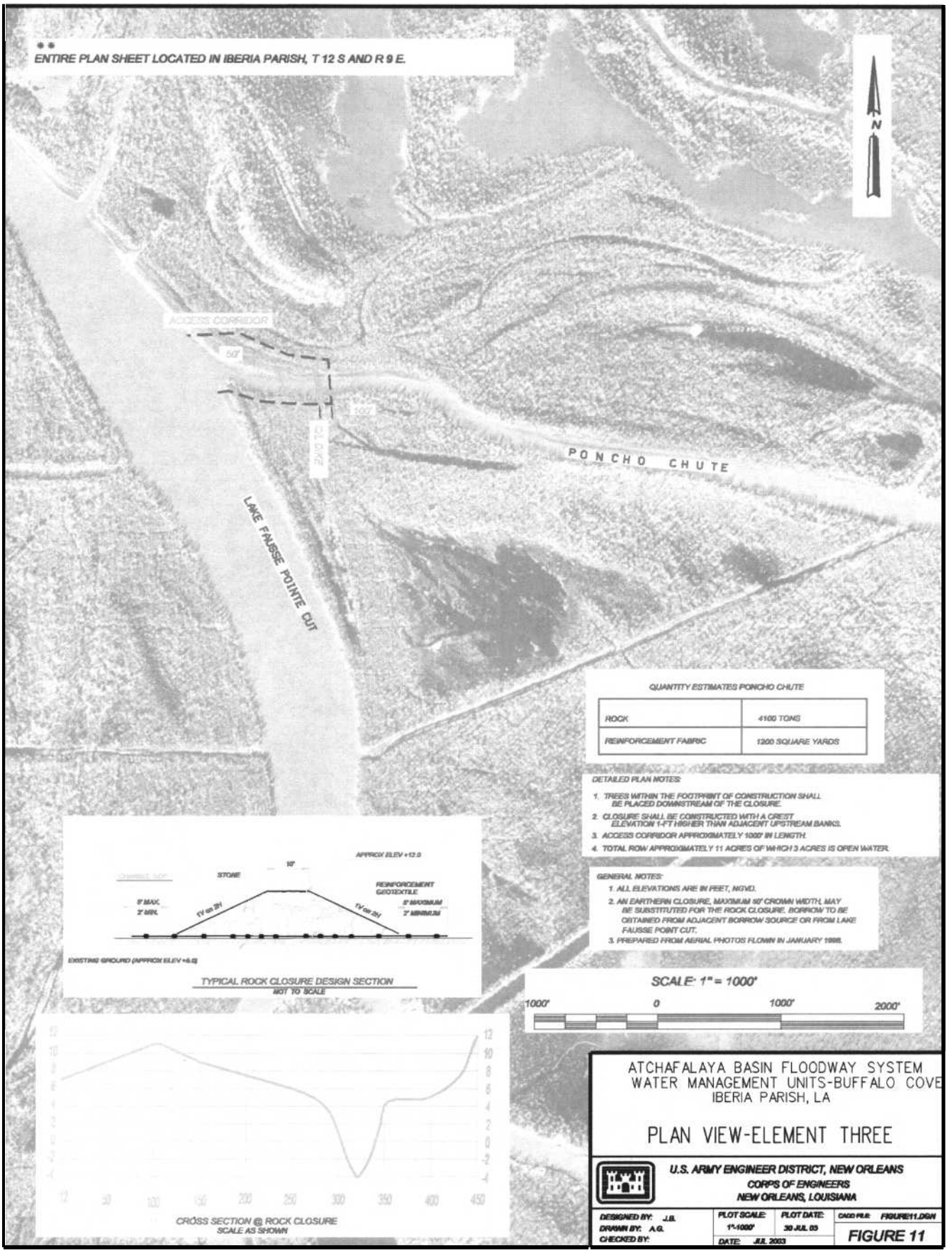
PLAN VIEW-ELEMENT NINE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: J.B.	PLOT SCALE: 1"=1000'	PLOT DATE: 30 JUL 03	CADD FILE: FIGURE8.DGN
DRAWN BY: A.G.			FIGURE 8
CHECKED BY:	DATE: JUL 2003		


ELEMENT 15 ACCESS CORRIDOR C/L
N
DAMS TO BE REMOVED
GENERAL NOTES:
1. PREPARED FROM DIGITAL ORTHO QUAD JACKASSBAY (NE).
2. ENTIRE PLAN SHEET LOCATED WITHIN ST. MARTIN PARISH, LOUISIANA.
ROW AND ENVIRONMENTAL NOTES:
1. TBK TO TBK ACCESS IS REQUIRED FOR ENTIRE REACH OF CANAL FROM WEST ACCESS CHANNEL TO END OF EXTENSION.
2. CONSTRUCTION ACCESS FOR DAM REMOVAL EXTENDS 50FT FROM WES ON BOTH SIDES. SPOIL SHALL BE PLACED WITHIN 200FT FROM WES OF WEST SIDE. TOTAL ROW AREA NEEDED TO REMOVE DAM IS 7 ACRES.
3. FLARE AT END OF CANAL SHALL BE SURVEYED AND POSSIBLY DEEPENED TO ACT AS SEDIMENT TRAP FOR EXTENSION OF CANAL INTO SWAMP. TOTAL AREA INCLUDING SPOIL AREA IS 6 ACRES.
4. END OF CANAL SHALL BE EXTENDED INTO ADJACENT SWAMP. EXTENSION WILL MATCH DIMENSIONS OF EXISTING CANAL TO BE DETERMINED BY SURVEY.
5. TOTAL LENGTH OF PROPOSED EXTENSION = 800 LINEAR FEET
CENTERLINE OF CANAL TO BE EXTENDED
SEDIMENT TRAP DISPOSAL AREA
EXTEND CANAL TO ADJACENT SWAMP
800'
300'
CENTERLINE PROPOSED EXTENS
SCALE: 1" = 1000'
1000' 0 1000' 2000'
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
ST. MARTIN PARISH, LA
PLAN VIEW-ELEMENT FIFTEEN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.G.
CHECKED BY:
PLOT SCALE: 1"=1000'
PLOT DATE: 30 DEC 02
DATE: JUL 2003
CADD FILE: XXXX.DGN
FIGURE 9


PROPOSED NORTH BANK CUT 16-5
PROPOSED NORTH BANK CUT 16-3
200' (APPROXIMATE)
PROPOSED SOUTH BANK CUT 16-4
ROW
ROW
150' (TYPICAL)
PROPOSED SOUTH BANK CUT 16-2
PROPOSED NORTH BANK CUT 16-1
PROPOSED DREDGING OF JACKASS BAY ENTRANCE CANAL
JACKASS BAY
SPOIL AREA (69 ACRES)
LAKE FAUSSE POINTE CUT
GENERAL PLAN NOTES:
1. TOPOGRAPHIC INFORMATION FROM 7.5 MINUTE QUADRANGLE "JACKASS BAY".
2. PROPOSES WORK WITHIN TOWNSHIP T 11 S AND RANGE R 9 E.
3. OVERLAY PHOTO DATED JANUARY 1998, TAKEN FROM DIGITAL ORTHOQUADS OF JACKASS BAY, NW & SW.
4. TOTAL ROW (EXCLUDING SPOIL AREA) FOR ELEMENT 16 IS 27 ACRES, EXCLUDING 10 ACRES OPEN WATER.
ROW NOTES:
1. ROW LIMITS INDICATED ON DRAWING DEPICTS 50' ACCESS CORRIDOR BEYOND TBK ON BOTH SIDES OF CANAL. TOTAL CORRIDOR IS APPROXIMATELY 200' WIDE.
2. DREDGED MATERIAL SHALL BE PLACED IN THE SPOIL AREA DEPICTED TO THE WEST OF LAKE FAUSSE POINTE CUT.
3. PROPOSED CUTS 16-1, 16-3 AND 16-5 SHALL EXTEND FROM THE CENTER OF THE CANAL THROUGH THE SWAMP FLOOR ON THE NORTH BANK. PROPOSED CUTS 16-2 AND 16-4 EXTEND LIKEWISE ON THE SOUTH BANK. THE TYPICAL CUT SECTION SHALL BE:
150' ROW
50 FT
(+) 3.0
4. MATERIAL REMOVED FROM THE CUTS SHALL BE PLACED IN THE CHANNEL AND REMOVED WITH THE DREDGING OF JACKASS BAY ENTRANCE CHANNEL.
5. ALL TREES FELLED WILL BE BURNED ON SITE.
SCALE: 1" = 1000'
1000'
0
1000'
2000'
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
ST. MARTIN PARISH, LA
PLAN VIEW-ELEMENT SIXTEEN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.G.
CHECKED BY:
PLOT SCALE: 1"=1000'
PLOT DATE: 30 JUL 03
DATE: JUL 2003
CADD FILE: PLATE10.DGN
FIGURE 10


** ENTIRE PLAN SHEET LOCATED IN IBERIA PARISH, T 12 S AND R 9 E.
N
ACCESS CORRIDOR
50'
1027'
22x3 TIE
PONCHO CHUTE
LAKE FAUSSE POINTE CUT
QUANTITY ESTIMATES PONCHO CHUTE
ROCK 4100 TONS
REINFORCEMENT FABRIC 1200 SQUARE YARDS
DETAILED PLAN NOTES:
1. TREES WITHIN THE FOOTPRINT OF CONSTRUCTION SHALL BE PLACED DOWNSTREAM OF THE CLOSURE.
2. CLOSURE SHALL BE CONSTRUCTED WITH A CREST ELEVATION 1-FT HIGHER THAN ADJACENT UPSTREAM BANKS.
3. ACCESS CORRIDOR APPROXIMATELY 1000' IN LENGTH.
4. TOTAL ROW APPROXIMATELY 11 ACRES OF WHICH 3 ACRES IS OPEN WATER.
GENERAL NOTES:
1. ALL ELEVATIONS ARE IN FEET, NGVD.
2. AN EARTHERN CLOSURE, MAXIMUM 50' CROWN WIDTH, MAY BE SUBSTITUTED FOR THE ROCK CLOSURE. BORROW TO BE OBTAINED FROM ADJACENT BORROW SOURCE OR FROM LAKE FAUSSE POINT CUT.
3. PREPARED FROM AERIAL PHOTOS FLOWN IN JANUARY 1998.
APPROX ELEV +12.0
10'
STONE
REINFORCEMENT GEOTEXTILE
5' MAX.
2' MIN.
1V on 2H
5' MAXIMUM
2' MINIMUM
EXISTING GROUND (APPROX ELEV +6.5)
TYPICAL ROCK CLOSURE DESIGN SECTION
NOT TO SCALE
SCALE: 1" = 1000'
1000'
0
1000'
2000'
CROSS SECTION @ ROCK CLOSURE
SCALE AS SHOWN
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LA
PLAN VIEW-ELEMENT THREE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.G.
CHECKED BY:
PLOT SCALE: 1"=1000'
PLOT DATE: 30 JUL 03
DATE: JUL 2003
CADD FILE: FIGURE11.DGN
FIGURE 11

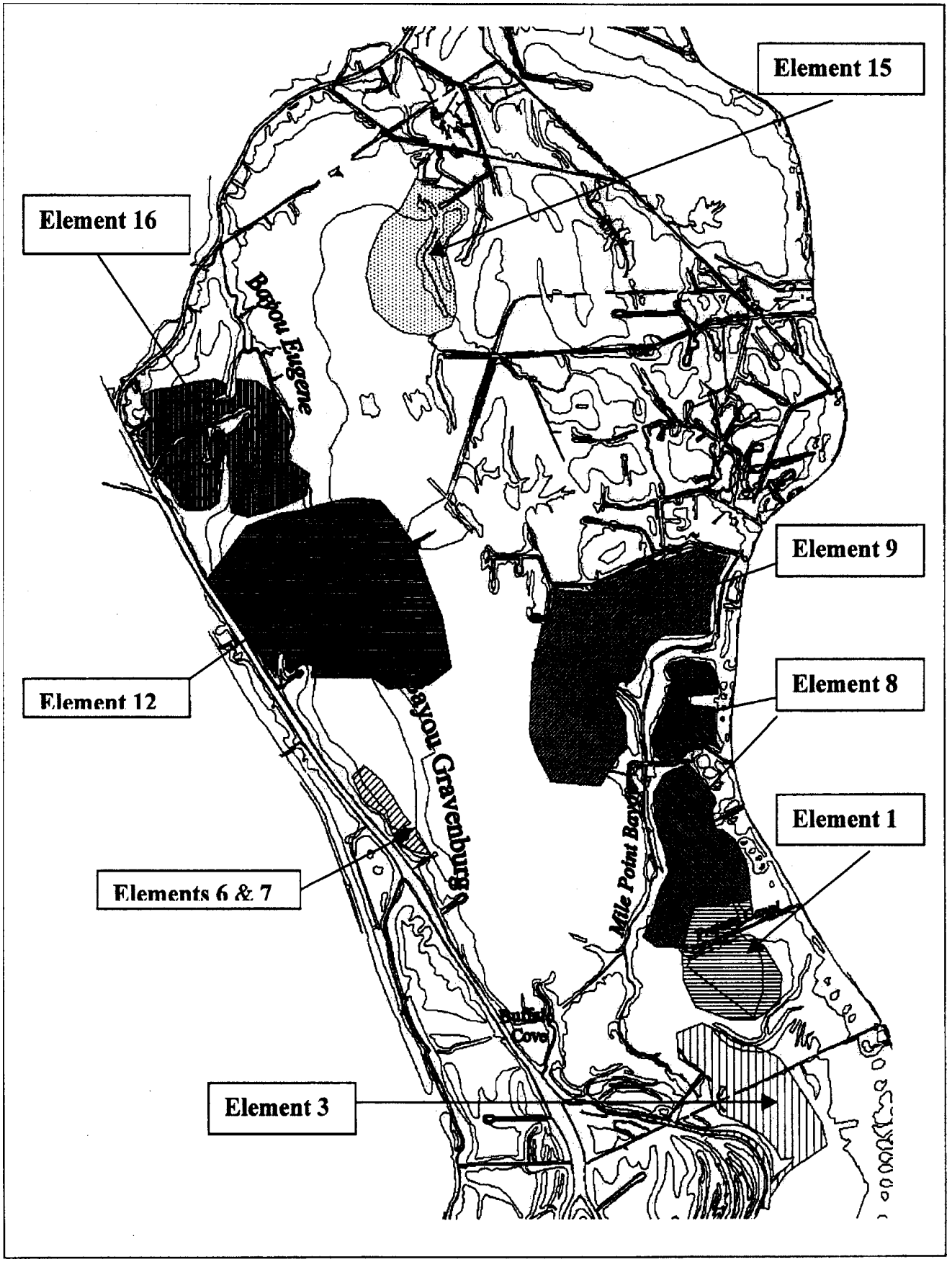
MAINTENANCE

The "monitored pilot project" will employ certain regularly scheduled maintenance, like traditional projects due to the uncertainty of maintenance needs. Maintenance frequency and need will be dictated by the results of the post construction monitoring. The monitored results will determine the amount and intensity of the work needed to maintain the function of the water management feature or changes needed to modify the feature to achieve an intended water management function.

However, the types of maintenance expected and addressed in this EA would entail annual inspections, periodic maintenance of sediment traps; light clearing of debris from cuts, maintaining design cross-section of elements, debris removal and maintain design elevations of closures. If rebuilding, enlarging, or reconfiguring of the elements beyond the original design footprint is needed, based on the post construction monitoring, approval for implementation of project modifications shall be requested for approval at higher United States Corps of Engineers (USACE) authority. All of the dredged material or sediment associated with these maintenance activities will be deposited in previously disturbed or designated disposal sites. The material will be used beneficially to the greatest extent possible in the reconstruction or enlargement of closures or placed where local agencies can access the material for other beneficial uses. This EA addresses the areas of impact associated with disposal placement. Areas recommended for disposal are within in the disturbed rights of way or previously designated rights of way associated with borrow locations including the deep-water disposal in the Atchafalaya River or Lake Fausse Point Cut.

MEASURABLE GOALS

In order to determine the success of the water management project, a number of measurable goals have been established and would be monitored to determine success. The measurable goals are as follows: 1) reduce the levels of the average annual water column hypoxia established at previously monitored sites by 50 percent, 2) increase water movement (velocity) in a north to south direction to a velocity greater than 0 feet per second, 3) limit sediment accretion to less than 1 inch per year in the areas of influence (figure 12) 200 yards or more from water inlets or bank shavings, as well as the open water areas of Jackass Bay, Bayou Gravenburg, the remnants of Grand Lake near Prejean Canal, and the area to the east of Poncho Chute; 4) introduce water into the unit at lower river stages in those areas influenced by water inlet projects. Monitoring would be completed or samples would be taken both in the target area for each element, and outside of the target areas within the BCMU. The data would be used to assess the effect of individual elements as well as the overall success of the entire project.


Element 15
Element 16
Bayou Eugene
Element 9
Element 12
Element 8
Bayou Gravenburg
Element 1
Elements 6 & 7
Mile Point Bayou
Cove
Element 3

If the monitored results indicate that an element or elements does not produce the desired result, MVN will recommend modifications to the appropriate element or additional elements, to be designed and sited as needed to accomplish the water management objective. A separate monitoring plan would be prepared that would provide a detailed description of monitoring and a detailed explanation of measurable goals, including long range monitoring of the forest condition.

Water-based equipment, small track, or low impact marsh vehicles would accomplish the proposed work where feasible in order to reduce access corridor impacts. The work would be done during both low water and higher water stages depending on the type of equipment and method of access used. The least damaging method of access may be accomplished utilizing water-based equipment, thus the potential need for high water during construction. The project would be maintained as deemed necessary, based on the monitored results of the elements. All closures include the possibility of using stone, earth, sheet pile, or combinations. Final determination would be made upon completion of borings and surveys. The best engineering option with concerns for both economics and the environment would be chosen. The construction of earthen closures would utilize the dredged material (spoil) excavated during embankment removal and gap construction in order to minimize the impacts of both dredged material placement and borrow acquisition. A total of approximately 547 acres of forested wetland would be impacted by the project. Of the total acreage impacted, approximately 48 acres of a willow, scrub /shrub, cypress swamp, and immature bottomland hardwoods mixture, would be impacted as a result of cuts made in existing dredged material embankments, closures that block existing waterways, and the construction of sediment traps. Approximately 182 acres of scrub/shrub and low-value bottomland hardwood forest would be impacted by the placement of dredged material that could not be beneficially used for closures. At least 134 of the 182 acres have already been impacted by excavation. Dredge material produced from drainage cuts will be used to fill existing waterside borrow ponds or placed in adjacent areas within the waterside site. These areas are located within the Atchafalaya levee system right of way and designated for borrow. Portions of the area have been utilized for borrow in the past, leaving either borrow canals or borrow ponds. The planned placement of dredged material would result in accessible borrow being available for use in future levee work in the area. By providing accessible dredged material storage, the material can be used for future projects in the Atchafalaya, thus reducing the need for additional borrow sites in the basin, resulting in a net savings of bottomland hardwood habitat. The remaining 317 acres is a worst-case estimate of the area needed for access, to get construction equipment into the area of work. Only a small portion of these 317 acres is likely to be cleared of trees for access. In addition, approximately 15 acres of water bottoms would be permanently impacted by construction of cuts, placement of closures, or dredged material. Of this acreage, approximately 5 acres of water bottoms would be impacted through either deepening or widening or both, but would still function as water bottoms.

An estimated total of 236,200 cubic yards of dredged or excavated material would be produced from construction of the cuts or removal of closures or spoil banks. Earthen closures would require the placement of 15,850 cubic yards of material. The earthen

closures would utilize the excavated material from the construction described above. In addition, 7,600 tons of quarry stone would be used for closures and armor where needed. The stone would be obtained from a commercial quarry source. The dredge/fill material is considered to be free of contaminants. This determination is based on the isolated nature of the area, the land use history studies done for this area, lack of Coast Guard spill accounts, and information from the intermittent dredging activities in the vicinity. A Phase I Hazardous Toxic and Radioactive Waste (HTRW) Land Use Analysis and initial site assessment indicates that the risk of encountering HTRW in the work areas is low. A Storm Water Pollution Prevention Plan would be prepared and a storm-water discharge permit would be obtained from the Louisiana Department of Environmental Quality as necessary.

DESCRIPTION OF PLAN ELEMENTS

Each of the proposed elements is described below in as much detail as advanced engineering allows. It is noted that the elements are not numbered consecutively. This lack of consecutive numbering results from choosing these particular plans, based on completeness of design and application, from an array of previously formulated plans that that will be further evaluated and implemented at a later time.

Element 1 - Prejean Canal (figure 2)

This element consists of cuts in both the north and south banks of Prejean Canal at 2 locations, with 50-foot bottom widths at elevation 0 ft NGVD, and 1:3 side slopes. The total length of the cuts would be 980 ft for the east cut and 960 ft for the west cut. Disposal would be done on the east side of the cut, a minimum distance of 20 ft from the top of the cut, with the disposal height not to exceed 9 ft NGVD in the back swamp area. This elevation assumes a natural ground elevation of 0 ft NGVD, which will be verified by surveys. No disposal will be place in the Prejean Canal. The elevation of the bottom of the cut would be the same as the elevation of the remnants of Grand Lake, which is believe to be elevation 0 ft NGVD, but will be verified by surveys. Maintenance material would be placed in disposal areas adjacent to the cuts.

Element 3 - Poncho Chute (figure 11)

This element consists of a rock closure in Poncho Chute near Lake Fausse Point Cut. The closure would be constructed with a crest elevation of 12 ft NGVD, a 10 ft crown width, and 1:2 side slopes. Geotextile material would be added as necessary. The final dimensions of the closure and geotextile would be determined from boring and survey information taken prior to preparation of plans and specifications.

Element 6 - Gravenburg Cut (figure 6)

This element consists of 1 to 4 rock or earthen closures in Bayou Gravenburg Cut with a crest elevation of 14 ft NGVD, a maximum crown width of 100 ft, and 1:3 side slopes. The crest elevation would be 1 ft higher than existing bank elevations which will be verified by surveys. Geotextile material would be added as necessary. The final

number and dimensions of the closures and geotextile would be determined from boring and survey information taken prior to preparation of plans and specifications. Borrow material would be obtained from the existing banks of the Bayou Gravenburg Cut on the east side of each closure to facilitate water movement through the banks of the Bayou Gravenburg Cut.

Element 7 - Keyhole Canal (figure 7)

This element consists of a rock or earthen closure in Keyhole Canal leading to Bayou Gravenburg with a crest elevation of 14 ft NGVD, a maximum crown width of 100 ft, and 1:3 side slopes. The crest elevation would be 1 ft higher than existing bank elevations which will be verified by surveys. Geotextile material would be added as necessary and extend from 2 to 5 ft beyond the toe of the east and west sides of the closure. The final dimensions of the closure and geotextile would be determined from boring and survey information taken prior to preparation of plans and specifications. Borrow material would be obtained from the existing banks of the Keyhole Canal on the east side of the closure to facilitate water movement through the banks of Keyhole Canal.

Element 8 - Sand Hill Canal (figure 3)

This element consists of cuts in both the north and south banks of Sand Hill Canal at 2 locations, with 50 ft bottom widths at elevation 3 ft NGVD, and 1:3 slide slopes. The length of the cut would be 630 ft for the west cut and 470 ft for the east cut. Disposal would be on the east side of the cut a minimum distance of 20 ft from the top of the cut, with the disposal height not to exceed 11 ft NGVD in the back swamp area. This assumes a natural ground elevation of 5 ft NGVD, to be verified by surveys. No disposal would be placed in Sand Hill Canal. The elevation of the bottom of the cut would be 1 ft below the swamp floor, which is believed to be at an elevation of 4 ft NGVD, but will be verified by surveys. Maintenance material would be placed in disposal areas adjacent to the cuts.

This element also consists of a rock or earthen closure to elevation 15 ft NGVD in Sand Hill Canal adjacent to the Atchafalaya Basin Main Channel. The precise location of the closure would be based on surveys and borings. The closure would have maximum crown width of 100 ft crown and 1:4 minimum side slopes. Geotextile material would be added as necessary. The final dimensions of the closure and geotextile would be determined from boring and survey information. The borrow source would be within the right of way area to the west of the closure.

Element 9-1 - Chicot North (figure 8)

This element consists of a new channel at a 90-degree angle to the Atchafalaya Basin Main Channel, with bottom width of 100 ft at elevation 3 ft NGVD and 1:3 side slopes for a distance of approximately 1,500 ft. The channel would extend a minimum distance of 100 ft from the Atchafalaya Basin Main Channel, then expand into a sediment trap with dimensions of 300 ft minimum length, 500 ft bottom width, and bottom elevation -2 ft NGVD. The expansion slopes would be 1:4, and the bottom slope would be 1:10. The

channel bottom would rise to elevation 5.0 ft NGVD, with a minimum bottom slope of 1:10. The bottom width would then change from 500 ft to 100 ft, with minimum contraction slopes of 1:4. The channel would continue with dimensions of 100 ft bottom width, a bottom elevation 5.0 ft NGVD, and side slopes of 1:3 to the swamp west of Mile Point Bayou. The bottom elevation would be 1 ft below swamp floor, which is believed to be 6 ft NGVD, but will be verified by surveys.

This element also consists of a closure in Mile Point Bayou on the north side of the new channel, with a top width of 25 ft, and 1:3 side slopes. The closure would be a minimum distance of 20 ft from the top of the new channel. The elevation of the closure would be 1 ft above the top of bank elevation of Mile Point Bayou, which has an estimated elevation of 14 ft NGVD. The elevation would be verified by surveys. The closure would prevent diverted flow from entering the Amerada Canal area to the north and ensure that the flow reaches the target area. Geotextile material would be added as necessary. The final dimensions of the closure and geotextile would be determined from boring and survey information. The borrow source would be within the right of way area.

Dredged material generated during construction and maintenance would be placed in the Atchafalaya Basin Main Channel. Stone armor may be added to the new channel, as necessary, if significant scour occurs upon completion of the excavation. The stone armor may extend from the Atchafalaya Basin Main Channel to the eastern edge of the sediment trap.

Element 9-2 - Chicot South (figure 8)

This element consists of a new channel at a 90-degree angle to the Atchafalaya Basin Main Channel, with a bottom elevation of 5 ft NGVD, a bottom width of 50 ft and 1:3 side slopes for a distance of approximately 2,700 ft, which would extend to the 6 ft NGVD contour, the assumed elevation of the back swamp. A sediment trap would be constructed in the new channel approximately 1,000 ft from the Atchafalaya Basin Main Channel. The bottom elevation of the sediment trap would be -2 ft NGVD. The trap would have a bottom width of 200 ft and bottom length of 200 ft. Expansion and contraction side slopes should be 1:4 at a minimum. The channel bottom transitions would be 1:10 from elevation -2 ft NGVD to elevation 5 ft NGVD.

Material during construction and maintenance would be placed in the Atchafalaya Basin Main Channel. Stone armor may be added to the new channel, as necessary, if significant scour occurs upon completion of the excavation. The stone armor may extend from the Atchafalaya Basin Main Channel to the eastern edge of the sediment trap.

Element 12 - Tyler Cut (figure 4)

This element consists of closing the Sibon Canal approximately 1,500 ft east of its intersection with Lake Fausse Point Cut. The closure structure would have an elevation of 14 ft NGVD. The earthen closure would have a maximum top width of 100 ft and side slopes of 1:3. Any depressions along the north and south bank of Sibon Canal between Lake Fausse Point and the closure would be filled in to ensure elevation of the north and

south banks in this location are greater than or equal to 14 ft NGVD. The material for the closures would come from degrading the canal banks where gaps would be placed. A stone closure may be constructed at a later date, if required.

This element would also consist of cuts in the north and south bank of Sibon Canal, on the east side of the closure, a minimum of 20 ft from the toe of the closure. The cuts would have 50 ft bottom widths at elevation 3 ft NGVD and 1:3 side slopes. The length of the cuts would be 400 ft on north side of Sibon Canal and 600 ft on south side of Sibon Canal. Material excavated from the cuts would be used to construct the closure. The cut may be enlarged as necessary to ensure adequate material for closure. Elevation for the bottom of the cuts would be 1 ft below the swamp floor, which is assumed to have an elevation of 4 ft NGVD, but will be verified by surveys.

This element also includes dredging Tyler Cut north of Sibon Canal. The new channel would be 100 ft wide at the bottom with an elevation of 2 ft NGVD and side slopes at 1:1 for a minimum distance of 100 ft. The slope of the canal bottom would be a minimum of 1:10 from elevation 2 ft NGVD to elevation -5 ft NGVD over a minimum distance of 70 ft. also adjusting the bottom width from 100 ft to 80 ft. The channel would continue with a bottom width of 80 ft at elevation -5 ft NGVD and side slopes of 1:1 until the keyhole at its end is reached, where the elevation rises to -3 ft NGVD. This would occur over a distance of approximately 2,900 ft. A cross cut would be constructed in the north and south banks of the canal with 10 ft bottom width at elevation 6 ft NGVD and 1:3 side slopes. Disposal of all material would be in a designated disposal area on the west side of Lake Fausse Point Cut. The cross cut on the north and south banks of the canal would be maintained if necessary to reduce velocities in the channel in order to increase effectiveness of the sediment trap. The final location and dimensions of the cross cuts would be based on the elevation of the back swamp at the end of the cross cut. To be effective, the back end of the cross cut would be opened to the back swamp. All maintenance material would be placed in the designated disposal area to the west of Lake Fausse Point Cut.

Element 14 - Sibon Canal (figure 5)

This element would consist of lateral cuts in both the north and south banks of Sibon Canal at 9 locations. The cuts would have 50 ft bottom widths at elevation 3 ft NGVD and 1:3 slide slopes. The lateral cuts on would be on 700 ft centers. The lateral cut on the north side of Sibon Canal would be 400 feet long. The cut on the south side would be 600 feet long. Disposal of the excavated material would be on the west side of the lateral cuts at a minimum distance of 20 ft from top of any cut, within the right of way, with disposal height not to exceed 8 ft NGVD in back swamp area and not to exceed 6 ft NGVD in Sibon Canal. The highest invert elevation in Sibon Canal would be determined by surveys. The elevation of the bottom of the lateral cut would be 1 ft below the swamp floor, which is estimated to be at an elevation of 4 ft NGVD and will be verified by surveys. Maintenance material would be placed in disposal areas adjacent to the cuts.

This element also consists of interior cuts on the north and south banks of Sibon Canal at 8 locations. Each interior cut would be centered between two of the lateral cuts

described above. For each interior cut, a 200 ft section of the bank would be cut to a depth of two ft below the existing bank elevation. Disposal would be within the right of way at any location as long as disposal is a minimum distance of 20 ft from top of any cut. The disposal height would not exceed 8 ft NGVD in the back swamp area and 6 ft NGVD in Sibon Canal. The highest invert elevation in Sibon Canal would be determined by surveys. The elevation of the bottom of the interior cut would also be verified by surveys.

Element 15 (figure 9)

This element consists of removing two dams in an access canal to match existing canal dimensions. The material from the dam would be disposed of on the west side of the access canal, with the disposal height not to exceed 15 ft NGVD. This assumes a natural ground elevation of 8 ft NGVD, which would be verified by surveys. At the end of the access canal, a sediment trap would be constructed, with disposal on the south side of the canal. The disposal height would not exceed 13 ft NGVD. This is assuming a natural ground elevation of 6 ft NGVD, which will be verified by surveys. The canal would be extended to the swamp floor with a 50 ft bottom width, and 1:3 side slopes. The bottom of the extension would be 5 ft NGVD over a distance of 800 ft. Disposal would be on the south side of canal a minimum distance of 20 from the top of extension, with disposal height not to exceed 15 ft NGVD. This is assuming a natural ground elevation of 8 ft NGVD, which will be verified by surveys. The elevation of the bottom of the extension would be 1 ft below the swamp floor, which is estimated to be at an elevation of 6 ft NGVD but will be verified by surveys. Maintenance material would be placed in the two aforementioned disposal areas.

Element 16 - Jackass Bay (figure 10)

This element consists of dredging out the location canal leading to Jackass Bay and deepening it to form a sediment trap. The new channel dimensions would have a 60 ft bottom width at elevation 2 ft NGVD at its confluence with Lake Fausse Point Cut, with minimum side slopes at 1:1 for a minimum distance of 200 ft from top of bank of Lake Fausse Point Cut. The bottom width may be adjusted so that canal banks would not be removed. The bottom of the canal would be sloped 1:10 from elevation 2 ft NGVD to elevation -5 ft NGVD over a minimum distance of 70 ft. The bottom width would also be adjusted, if necessary, to ensure that canal banks are not removed. The bottom width may be 36 to 50 ft. The channel would continue with this bottom width at elevation -5 ft NGVD and minimum side slopes 1:1 for a minimum distance of 3,500 ft. forming the sediment trap. The bottom of the canal would then rise at a minimum slope of 1:10 to elevation 0 ft NGVD with a 20 ft bottom width to just past the cross canal, leaving the connection to Jackass Bay as shallow as it is presently. The connection has an estimated elevation somewhere above 0 NGVD. Disposal would be across Lake Fausse Point Cut in the designated area.

This element also consists of 3 cross-cuts in the north bank and 2 cross cuts in the south bank of the location canal. All cross cuts have 10 ft bottom widths at elevation 7 ft NGVD and 1:3 side slopes. The elevation of the bottom of the cuts would be 1 ft below

swamp floor, which is believed to be at an elevation of 8 ft NGVD but will be verified by surveys. The cross cuts on the north and south banks of the canal will be maintained if necessary to reduce velocities in the channel in order to increase the effectiveness of the sediment trap. The final dimensions of the cross cuts would be based on the elevation of the back swamp at the end of the cross cut. To be effective, the back end of the cross cut must be open to the back swamp. All maintenance material would be placed in the designated disposal areas to the west of Lake Fausse Point Cut.

CONSTRUCTION SEQUENCE

It must be noted that the proper construction sequence is essential to achieving the desired outcome noted in the measurable goals, as stated previously. Some elements may not be constructed without their companion element(s) since the overall beneficial effect is premised on multiple elements being linked hydrologically and functioning simultaneously. The impacts assessed in this EA are based on all of the elements being constructed within a two-year period after the project is funded. If two or more of the elements can not be constructed during this time period then the USACE project delivery team would consult with the resource agencies to evaluate the sequence of construction for remaining elements and reevaluate the impacts. Currently, it is assumed that the elements on state owned lands (figure I; elements 1, 8, and 9) would be constructed first and the resolution of the real-estate issues with private landowners would determine, to some extent, the order of construction for the remaining elements. At a later time, a recommendation may also be made to higher USACE authority, based on monitoring data and field observations, to take corrective action if needed on constructed elements. This corrective action, if approved by higher USACE authority, may result in modifying existing elements or designing a new element in a new location. In the event that modifications are necessary, the appropriate NEPA documents would be prepared at the appropriate time.

HYDRO-BIOLOGICAL EVALUATION MONITORING PROGRAM

As noted above, the monitored pilot approach must include an effects monitoring program to evaluate the goals and objectives of the plan and adjust the features or elements as necessary based on the monitoring outcome. Each of the elements noted in the proposed plan has an estimated area of influence (figure 12). Each element has a stated measurable objective by which it would be evaluated through the monitoring process. A monitoring program would be conducted within both the area of influence as well as areas outside of the area of influence to assess changes in sedimentation rates, water quality, water movement in the interior swamp (circulation patterns), and the effect of various river stages at specified locations. The purpose of this monitoring program would be to assess the effects of the various plan elements on the specific problems they are trying to correct. Water quality monitoring would be located within the areas of proposed influence throughout the affected portion of the unit during high water. Water quality monitoring and sediment analysis related to sport and commercial fishery would be focused on the interior swamp. These stations would be placed in a manner to build on the existing historical stations for stage and velocity that have already been established by the USACE. The water quality monitoring stations would be located both to reflect

the quality of "source" water entering the management unit as well as to assess the seasonal changes in the water quality of the interior swamp which contributes to the viability of commercial and sport fishery. Spot monitoring of the commercial crawfish production in the interior swamp would be accomplished by sub-sampling known crawfish producing areas. Water quality along with spot sampling of viable sport fishing areas would be monitored. Existing stage recorders and velocity meters would be monitored as necessary to detect fluctuations in water levels and circulation patterns. Parameters observed would include dissolved oxygen, pH, temperature, oxidation-reduction potential, conductivity, suspended sediments, depth, and turbidity.

Sediment monitoring would be designed to determine the operational affects of the elements on both the spatial distribution and accretion rates of any incoming sediment. In addition, sediment monitoring would measure the efficiency of the sediment traps to determine if they are functioning properly.

The Louisiana Department of Agriculture and Forestry (LDAF) would consider the results of sediment monitoring along with other factors that they would monitor in cooperation with the LDNR. The LDAF would initiate their monitoring program to record any changes in forest health and type as it relates to changes in hydrology and sedimentation. Based on landscape changes over time it is thought to be possible to determine if the forest is being affected positively or negatively and if management for a particular species or even landform is needed. If the landowner desires a forest management plan, the LDAF will assess the viability for forest management based on their monitoring plan and develop the appropriate action with the landowner. Forest management plans developed by the LDAF and the landowner must be developed in a manner that is consistent with the real estate interests acquired by the USACE for the other features of the ABFS project, including, but not limited to, the environmental protection and management unit features.

A minimum of three years of post-construction monitoring would record any localized effects of the proposed modifications and design changes as they relate to targeted water quality improvements in the interior swamps and areas adjacent to the cuts. In addition, a combination of biological and water quality sampling (available creel survey information and photo interpretative analysis of habitat changes) would be used to estimate fishery productivity in various representative habitats before and after implementation. Data would be used to derive estimates of reproductive success, relative abundance, and year-class strength of harvestable commercial and sport species within the study area.

ALTERNATIVE APPROACHES TO THE PROPOSED ACTION

INTRODUCTORY BACKGROUND

The overall approach to the water management in the Buffalo Cove area consists of developing features that would allow water to enter the BCMU from the north and flow through the area, exiting from the southern portion of the unit. This, together with

limiting the amount of sediment carried into the unit, would be expected to improve water quality and reduce sedimentation problems. The management of the BCMU would be governed by functional components, each comprised of groups of individual features or elements that would produce the desired outcome for that functional component, i.e. outlet improvement, interior circulation improvement, or water infusion.

A supplemental EIS is currently being scheduled that will address the implementation of additional features in the in the BCMU to achieve the goals of the overall water management strategy within the BCMU. A comprehensive plan will be developed to combine functional components in a systematic way. A monitored pilot approach is expected to be a part of this plan because it provides the flexibility needed to account for the dynamic nature of this hydrologic system.

While the elements described in this EA provide "stand alone" benefits to both water quality and circulation within their targeted areas of the BCMU, the implementation of the planned additional elements within the BCMU management units would supplement and possibly broaden the beneficial affect of the elements addressed in this EA. The proposed actions is a combination of elements that would remove barriers to flow, improve outlets, and minimize or manage sediment input in the management unit.

DESCRIPTION OF ALTERNATIVE PLAN APPROACHES CONSIDERED

The Atchafalaya Basin is made up of many distinct hydrologic units such as Buffalo Cove. These management units are living, dynamically changing systems. These changes are process driven by variations in circulation, sedimentation, and flows, or event driven by hurricanes, flood events, and human induced activities associated with oil and timber production. To clarify the reasoning that drives the alternative selection process for this type of project, water management must be defined. Water management is defined here as controlling the quantity, quality, and flow of water to achieve a specific goal that results in overall positive environmental affects. There are two approaches that may be used to achieve this water management goal. Normally management approaches are not considered or discussed as part of the alternative selection process. However, in the case of water management it is logical to assume that the type of management approach taken would be a determinant as to the outcome and success of reaching water management goals in a living dynamic system. Therefore, there will be discussion of the management approaches along with the alternatives descriptions in this EA.

EIS Plan Alternative: Traditional Active, Structural Approach

This is the water management plan originally considered in the 1982 Atchafalaya Basin Floodway system feasibility EIS. The water management concept presented in the EIS is similar to an artificial impoundment. Under this original plan, perimeter levees would be constructed around the unit to a height equal to the river's average annual peak flow. Water control structures (flap gates, weirs, etc.) and channel and bayou closures would control water in and out of the unit. Excavation of channels, degrading of banks, and channel closures would control water movement within the unit. Boat rollovers or similar navigable structures would provide access into the area. This was to be

accomplished by a traditional active, structural approach. This type of water management assumes that the biological and hydrological processes influencing the swamps and watercourses in the management unit are basically predictable and somewhat static. This approach lacks flexibility and cannot easily accommodate timely and responsive changes needed when working in a dynamic environment, and can cause increased first costs and unnecessary increases in construction and maintenance costs. The structural approach makes no allowances for changes in goals, objectives, or response to significant events that may occur during the course of the project. The traditional approach calls for designing and building the complete project, all at one time. Thus, using this traditional approach it is difficult to design a project that can respond well to an area that is continually evolving and changing. This approach may also result in increased initial costs, since future construction is based on projected data, rather than on monitored and measured results from phased, future construction. Projected, estimated construction applied to dynamic environments tends to lead to overbuilding and over-designing, in an effort to assure that all the variations in environmental conditions are addressed by the proposed features.

Proposed Action: Circulation Improvement and Sediment Management Plan (CSMP); "A Monitored Pilot Approach"

The BCMU was authorized for construction as a pilot unit by the Supplemental Appropriations Act of 1985 (PL99-88) and the WRDA 1986 (PL99-662). This pilot status was designated due to the uncertainty inherent in the use of traditional engineering design to achieve a specific hydro-biological effect in a dynamic swamp ecosystem. This approach allows for a preliminary design or pilot to be established for individual elements whose combined purpose is to produce an overall effect that meets the measurable goals desired for the management unit. While each element would have a monitored area of influence there would also be sites monitored outside the area of immediate influence to determine if the measurable goal for the BCMU as a whole has been met. If the elements are not performing as expected they could be modified or actually relocated and redesigned based on the monitoring information.

As has been noted in previous sections, these management units are dynamic living, evolving systems. It is because of these ongoing changes that the traditional water management approach would not be effective. Under the monitored pilot approach, allowances are made for modifications or additions in project elements based on the continual monitoring of conditions prior to, during, and following project construction. The monitored pilot approach is a continuing process of planning, implementation, monitoring, and evaluation to adjust management strategies and project components to meet a set of measurable goals. The uniqueness of this plan is that the integral project facets would be designed, constructed, and operated simultaneously, along with effects monitoring of a particular facet to determine its compatibility with the overall plan. Each subsequent facet would be phased-in and funded, based on its ability to meet the goals of the overall plan.

No Action Alternative

The existing and the expected future without project conditions define the no action alternative. No engineering and design for various features to reduce sediment inputs, improve the interior circulation, or assist in improving north/south flow in the BCMU would be constructed. Under this alternative, conditions would remain conducive for sedimentation and stagnation, and ponding of poor quality water would continue to exist and may potentially worsen. It would be expected that sedimentation would eventually not only fill in viable fishery habitat, but would also add to the internal circulation problems that contribute to the ponding and stagnant conditions of the water in the back swamp. No-flow to low flow conditions lead to poor water quality and therefore extend areas of hypoxic conditions into once viable aquatic habitat. If this is allowed to happen, the natural succession of the Atchafalaya Basin to bottomland hardwoods or invasive species would occur at the expense of the viable open water habitats that are prime producers of fish and crawfish.

PLAN APPROACHES ELIMINATED

Aside from the USACE-MVN analysis of plans, the planning process was coordinated with state and Federal resource agencies such as Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Environmental Quality (LDEQ) as well as Federal agencies including U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and the United States Environmental Protection Agency (USEPA). The USFWS along with others agreed with the USACE analysis that the EIS plan was too restrictive, inflexible, and generally unsuited for assessing the dynamic nature of the system in which the water management activities are proposed. In addition, USFWS opposed the EIS plan on the basis that artificially-maintained water levels, using actively managed water control structures, could jeopardize timber production and could degrade wildlife habitat. In addition, by retaining water on the unit longer than would naturally occur could potentially cause increases in poor water quality especially if low river stages reduces or eliminate the amount of water flowing through the management unit. It could also reduce the support of potentially cooperative landowners. Again, another factor in the elimination of this plan is that this type of structural plan cannot easily accommodate the timely and responsive changes needed when working in a dynamic environment, and can cause increased first costs and unnecessary increases in construction and maintenance costs. In addition, in this type of plan there is no allowance for changes in goals, objectives, or responses to significant events that may occur during the course of the project. In this traditional structural approach to water management it is difficult to design a project that can respond well to an area that is continually evolving and changing. Thus, cost, flexibility, and ability to meet possibly changing goals eliminates this plan from further consideration. Therefore, the CSMP along with the elements that comprise this plan will be carried forward as the proposed plan with the no action plan as the alternative.

FORMULATION OF PLAN ELEMENTS

INTRODUCTION TO FORMULATION OF PLAN ELEMENTS

In 2001 and 2002, a series of meetings were held with representatives of state and Federal resource agencies with interest in the BCMU area as well as university personnel, community groups and organizations, and individual citizens. In addition, USACE personnel participated in scheduled public meetings with LDNR Atchafalaya Basin Water Management committees. A considerable amount of time and coordination was spent with the following agencies to formulate and recommend a plan for the BCMU. Federal resource agencies involved include USACE; USFWS; Natural Resources Conservation Service; National Park Service; and the USEPA. State agencies consulted include LDNR, LDWF, and Louisiana Department of Environmental Quality, Louisiana Department of Agriculture and Forestry as well as Department of State Lands. In addition coordination was accomplished with statewide public interest groups such as Acadiana Area Waterways Committee; Audubon Society; Common Claws; Louisiana BASS Federation; Louisiana Forestry Association; Louisiana Landowners' Association; Louisiana Travel Promotion Association; Louisiana Wildlife Federation; Mid-Continent Oil and Gas; The Nature Conservancy; The Sierra Club; Commercial Fishers and Crawfishers, and others.

Four objectives for the BCMU were identified to increase the value of the project area for fish and wildlife resources.

1. Introduce river water from the north,
2. Improve internal circulation,
3. Remove barriers to southerly flow, and
4. Reduce and/or redirect sediment deposition

Given the fact that almost 18 years have past since receipt of congressional authorization for implementing the BCMU features, the resource agencies agreed that the short-term strategy for implementing the BCMU should be to start construction as soon as possible before additional critical habitat is lost. Therefore, elements to be considered, formulated, and designed were identified based on several parameters:

1. Elements can meet one or more of the four objectives.
2. Elements are located in areas where real estate acquisition appears readily available.
3. Elements are located in areas that would be easily accessible from the river or other existing access areas. This would minimize mobilization costs, reduce impacts and negate lengthy permits, and thereby simplify environmental compliance.
4. Elements are located in areas that would complement the work being done in adjacent areas.

5. Elements can be designed based on existing information.

PRELIMINARY ARRAY OF ELEMENTS

Initially, 8 elements were formulated to meet the above objectives and were all located on lands within the BCMU where real estate acquisition appeared readily obtainable (see figure 13 depicting considered alternatives). A problem, goal and objective statement was developed for each element as shown in table 1.

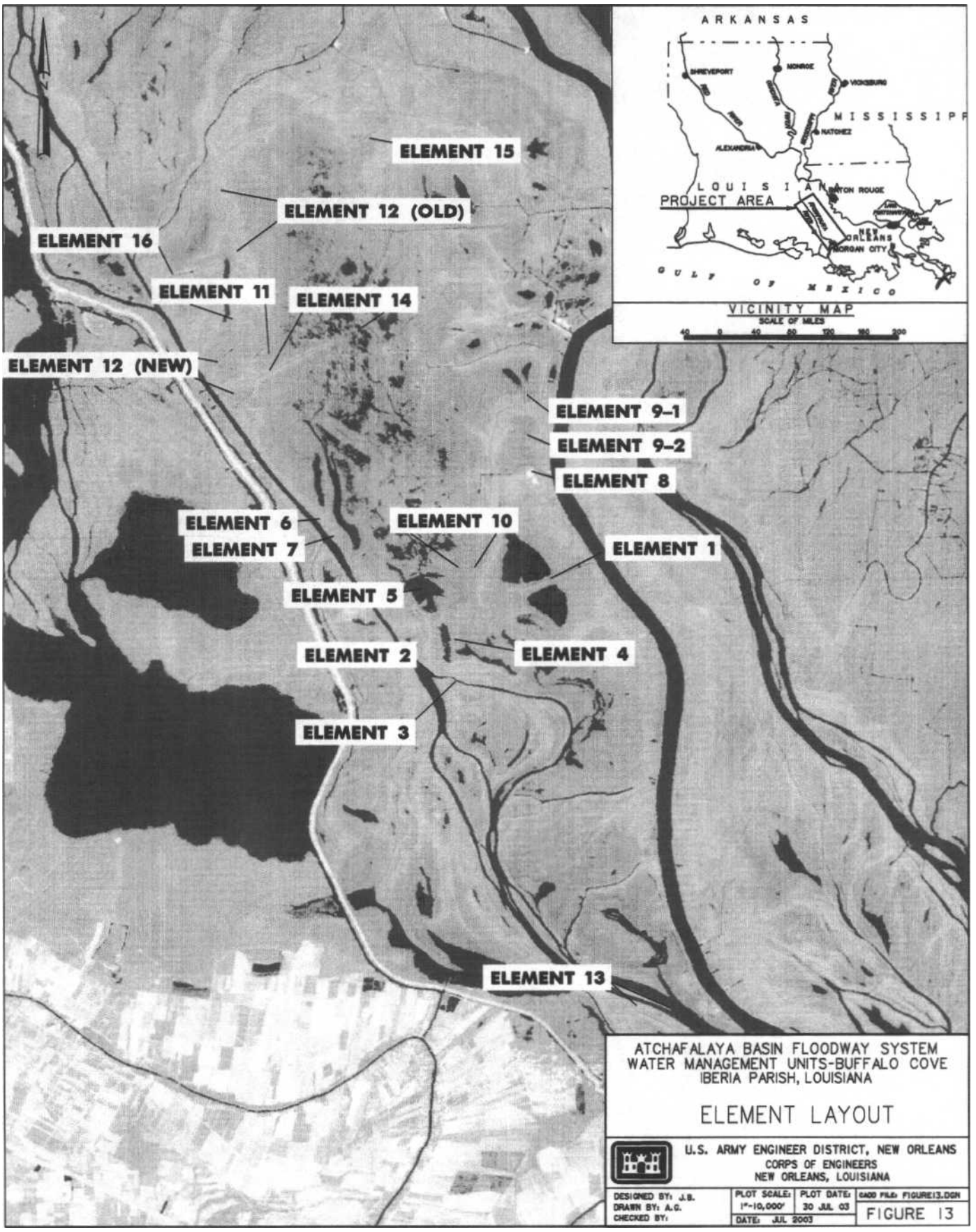

ELEMENT 15
ELEMENT 12 (OLD)
ELEMENT 16
ELEMENT 11
ELEMENT 14
ELEMENT 12 (NEW)
ELEMENT 9-1
ELEMENT 9-2
ELEMENT 8
ELEMENT 6
ELEMENT 7
ELEMENT 10
ELEMENT 1
ELEMENT 5
ELEMENT 2
ELEMENT 4
ELEMENT 3
ELEMENT 13
ARKANSAS
SHREVEPORT
MONROE
VICKSBURG
MISSISSIPPI
NATCHEZ
ALEXANDRIA
LOUISIANA
BATON ROUGE
PROJECT AREA
NEW ORLEANS
MORGAN CITY
GULF OF MEXICO
VICINITY MAP
SCALE OF MILES
ATCHAFALAYA BASIN FLOODWAY SYSTEM
WATER MANAGEMENT UNITS-BUFFALO COVE
IBERIA PARISH, LOUISIANA
ELEMENT LAYOUT
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY: J.B.
DRAWN BY: A.C.
CHECKED BY:
PLOT SCALE: 1"=10,000'
PLOT DATE: 30 JUL 03
DATE: JUL 2003
CADD FILE: FIGURE13.DGN
FIGURE 13

Table 1
Problem Statements, Goals, and Objectives
Preliminary Array of Elements

Element 1	
Problem Statement	Spoil material from prior canal dredging associated with oil and gas exploration placed continuously on the northern and southern banks (of Prejean Canal) bisected remnants of Grand Lake, creating high spoil banks that impede southerly flow and pond water east of Mile Point Bayou, and north to Sand Hill Canal, and is degrading aquatic habitat.
Primary Goal	To remove hydraulic barriers to southerly flow.
Objective	To reintroduce hydraulic connections between upper and lower remnants of Grand Lake
Element 2	
Problem Statement	River water, during the rising and falling limbs of the hydrograph enters Buffalo Cove Lake, flows north through the opening at the southern end of the lake, creates a hydraulic barrier to southerly flow in Buffalo Cove swamp, then ponds overland and flows north to the West Access Channel. The resultant sediment deposit accompanying these flows degrades deep-water aquatic and cypress-tupelo habitats. River sediment also enters Buffalo Cove Lake flowing north through the opening at the southern end depositing into open water. This decreases lake and swamp depths in the receiving area, and reduces existing aquatic and cypress-tupelo habitats.
Primary Goal	To redirect sediment input into Buffalo Cove **Lake** and swamp from the Lake Fausse Point Cut.
Objective	Reduce the sediment concentration in the water entering the channel leading to Buffalo Cove Lake.
Element 3	
Problem Statement	During a falling hydrograph, river water enters Mud Cove through Poncho Chute and creates a hydraulic barrier **to** southerly flow in Buffalo Cove Lake. This barrier results in the ponding of water in the Buffalo Cove swamp north of Buffalo Cove Lake and to the West Access Channel. This ponding results in sediment deposition, which degrades the back swamp habitat. River sediment on the falling limb of the hydrograph enters Mud Cove through Poncho Chute depositing in open water, decreasing channel depth in the receiving area, and reducing existing aquatic habitat
Primary Goal	To reduce river water and sediment input into Mud Cove from Poncho Chute.

Objective	To close hydraulic connection between Lake Fausse Pointe Cut and Mud Cove.
Element 4	
Problem Statement	River water, during the rising and falling limbs of the hydrograph enters Buffalo Cove Lake from the south, flows north through the opening at the southern end of Buffalo Cove Lake, and creates a hydraulic barrier to flows south out of the Buffalo Cove swamp. As a result, the water ponds overland in the back swamps north of Buffalo Cove Lake and to the West Access Channel degrading aquatic and cypress-tupelo habitats. River sediment enters Buffalo Cove Lake with the river water, flowing north through the opening at the southern end depositing in open water, decreasing lake and swamp depths in the receiving area, and reducing existing aquatic and cypress-tupelo habitats.
Primary Goal	To redirect river water and sediment input into Buffalo Cove Lake and swamp from Lake Fausse Pointe Cut.
Objective	Reconnect the bayou entering the Buffalo Cove area to the old distributary/bifurcation at the first bend facing north of Mile Point Bayou. This reconnection would be directed south into the area known as the Ice Box.
Element 5	
Problem Statement	River water, during the rising and falling limbs of the hydrograph enters Buffalo Cove Lake **from** the south and flows north through the opening at the southern end creating a hydraulic barrier to southerly flow in Buffalo Cove swamp, ponding overland flow north to the West Access Channel, and degrading aquatic and cypress-tupelo habitats. River sediment during rising and falling hydrographs enters Buffalo Cove Lake flowing north through the opening at the southern end depositing in open water, decreasing lake and swamp depths in the receiving area, and reducing existing aquatic and cypress-tupelo habitats.
Primary Goal	Increase lake, swamp depths, and provide for future sediment deposition.
Objective	Remove sediment deposition in Buffalo Cove Lake and swamp from Lake Fausse Pointe Cut and provide depositional area for future sediment deposition.
Element 6	
Problem Statement	River flow during the high water season transports sediment through an enlargement connection with Lake Fausse Pointe cut into Bayou Gravenburg reducing deep-water habitat.
Primary Goal	To reduce sediment input into Bayou Gravenburg from Lake Fausse Pointe Cut.

Objective	To close low water hydraulic connection between Lake Fausse Pointe cut and Bayou Gravenburg.
Element 7	
Problem Statement	Existing conditions allows water access to Bayou Gravenburg from Lake Fausse Pointe Cut, increasing the probability of bank degradation and channel enlargement due to boat and wave actions. The probable result would be river sediment transporting through the enlarged connection, reducing deep-water habitat.
Primary Goal	To eliminate water access into Bayou Gravenburg from Lake Fausse Pointe Cut.
Objective	To construct a closure.
Element 8	
Problem Statement	Spoil material from past canal dredging associated with oil and gas exploration, placed continuously on the northern and southern banks of Sand Hill Canal, created high spoil banks that impede southerly flow and pond water east and south of Mile Point Bayou which is degrading terrestrial habitats. River sediment from historical over bank flow in Mile Point Bayou associated with high water events deposited continuously on the northern and southern banks of the east-west reach of Mile Point Bayou creating high spoil banks that impede southerly flow and force water to flow southwesterly into the Buffalo Cove swamp which is degrading cypress/tupelo and aquatic habitats.
Primary Goal	To remove hydraulic barrier to southerly flow.
Objective	To introduce a hydraulic connection above Mile Point Bayou to below Sand Hill Canal

SECOND ARRAY OF ELEMENTS

As previously noted, it is of primary importance to initiate the proposed project immediately in order to minimize further deterioration of the BCMU. While the importance of constructing elements 4 and 5 (as presented in Table 1) is understood, the time constraints noted above resulted in the elimination of these elements from further consideration at this time because information for the engineering design was unavailable within the time frame required to initiate the current project. Thus, construction for elements 4 and 5 would slip the schedule for constructing the remaining 6 elements.

There was concern from the resource agencies regarding the impact to the BCMU if Element 2 did not work as designed. Specifically there was concern due to the ownership (existing camps) in the area of element 2 and its potential for negative impacts. Due to a lack of information required to adequately design elements 2, 4, and 5, they were removed from current consideration with the understanding that these elements would be

considered under a future decision document (supplemental environmental impact statement) and project cooperation agreement.

The remaining 5 elements (elements 1, 3, 6, 7, 8) were presented to the LDNR, state and Federal resource agencies, representatives from Louisiana State University (LSU), representatives of community groups, and interested citizens in May 2003. Comments received on these 5 elements indicated the plan presented lacked the necessary components that delivered oxygenated river water into the BCMU from the north. As a result of the feedback, additional elements were identified and presented to the resource agencies at a subsequent meeting in August 2002. The problem statements, goals, and objectives for these elements are shown on table 2 and the general locations shown on figure 13.

TABLE 2
Problem Statements, Goals, and Objectives
Second Array of Elements

Element 9	
Problem Statement	Spoil material (from past canal dredging associated with oil and gas exploration) placed continuously on the northern and southern banks of Amerada Hess Canal created high spoil banks that impedes southerly flow and ponds water east and south of Mile Point Bayou, degrading terrestrial habitats. River sediment from historical over bank flow in Mile Point Bayou associated with high water events deposited continuously on the northern and southern banks of the east-west reach of Mile Point Bayou creating high spoil banks that impede southerly flow and force water to flow southwesterly into the Buffalo Cove swamp which is degrading cypress/tupelo and aquatic habitats.
Primary Goal	To increase the volume of water available for southerly flow and to remove hydraulic barrier to southerly flow.
Objective	To be determined. This may include a volume of water computation, such as introduction of a minimum of volume of water when the Buffalo Cove stage is above a certain level.
Element 10	
Problem Statement	Log rafts and high banks at the south end of Buffalo Cove provide a barrier for part or all of the year. The magnitude of the problem is not known.
Primary Goal	To remove the hydraulic barriers to southerly flow.
Objective	To be determined. One objective may be to increase the exchange of water between the Buffalo Cove Lake swamp and the Icebox.
Element 11	
Problem Statement	River sediment has filled Bayou Eugene from a bottom elevation of-10 ft to a bottom elevation of 4 to 5 ft. The sediment has

	decreased the ability of Bayou Eugene to convey water from the north. The spoil banks from the construction of the Sibon Canal block the movement of water south toward Bayou Gravenburg.
Primary Goal	To increase the volume of water available for southerly flow and to remove the hydraulic barrier to southerly flow.
Objective	Restore the Bayou Eugene channel to historic dimensions and utilize the bayou to convey water in a southerly direction.
Element 12	
Problem Statement	Sediment deposition and spoil banks from the construction of the Sibon Canal created barriers that impede southerly flow south of Sibon Canal resulting in degrading terrestrial habitats. Bayou Eugene no longer conveys water from the north into Bayou Gravenburg area because the banks of Sibon Canal prevent this movement. Seasonally, hypoxic water is present in the Red Eye swamp area and in the Bayou Gravenburg area north of Buffalo Cove.
Primary Goal	To remove the hydraulic barrier to southerly flow. To introduce oxygenated river water into the north that can move north to south.
Objective	To introduce another hydraulic connection into the BCMU with a design to reduce the introduction of sediments accompanying the oxygenated water.
Element 13	
Problem Statement	River sediment has filled the lower end of Lake Fausse Pointe Cut/Myette Point channel near the Atchafalaya Basin Main Channel. The sediment has contributed to the decrease in conveyance of the lower portion of this channel, and is increasing the deposition.
Primary Goal	To remove hydraulic barrier to southerly flow.
Objective	Restore the channel to historic dimensions and improve its conveyance capacity.
Element 14	
Problem Statement	Spoil material (from past canal dredging associated with oil and gas exploration) placed continuously on the northern and southern banks of Sibon Canal, impedes southerly flow and ponds water north of Sibon Canal, degrading aquatic habitat. Banks along Sibon Canal are at an elevation of 13 ft NGVD in some areas.
Primary Goal	To remove hydraulic barrier to southerly flow.
Objective	To reintroduce hydraulic connection between the areas north and south of Sibon Canal

Element 15	
Problem Statement	The volume of river water from the West Access Channel into the BCMU area has diminished over time. The bank of the channel has been raised by maintenance dredging in the 1970s. Channels connected to the West Access Channel, such as Bayou Eugene, have filled over time, reducing the volume of water entering from West Access Channel. The eastern portion of Red Eye Swamp receives minimal direct river water input.
Primary Goal	To increase the volume of water available for southerly flow through the Red Eye Swamp.
Objective	To introduce another hydraulic connection into the BCMU with a design to reduce the introduction of sediments accompanying the oxygenated water.

ADDITIONAL ELEMENTS

After further discussions concerning how the above elements (9, 10, 11, 12, 13, 14, and 15) would function in conjunction with elements 1, 3, 6, 7, and 8, it was determined that elements 10, 11, and 13 would be removed from current consideration due to the inability to get accurate engineering field data needed for design. An additional element 16 was formulated. The final objectives and guidance from the resource agencies for elements 9, 12, 14, 15, and 16 are listed in table 3 and the general locations are shown in figure 13.

TABLE 3

Primary Purposes of Additional Elements

Element 9	Primary Purpose: Input water from east that will flow to the south. 9-1 - Introduce water into the western portion of Mile Point Bayou, minimize sedimentation, and the depth of cut is inconsequential. 9-2 - Introduce water south of Mile Point Bayou, modify Element 8 to keep the boundary between features 1 and 2. If the design of features 1 and 2 is implemented, then it is recommended to eliminate the northern cut of Element 8.
Element 12	Primary Purpose: To provide a source of sediment-free or low sediment water into the Gravenburg area and the interior swamp below Sibon Canal. Completely block Sibon Canal and gap adjacent canal banks, open Tyler Cut and gap adjacent banks on the southern side and gaps east of cut to Bayou Eugene. A - Closure away from Sibon. B - Gapping north and south banks between Lake Fausse Pointe Cut and Bayou Eugene. C - Enlarge Tyler Cut opening and construct sediment trap, construct gaps on south side of the Tyler Cut location canal.
Element 14	Primary Purpose: Remove barriers to north-south water movement that would allow water from the north to enter the interior swamp. Gap on both sides to the end of the canal to unknown area. Cut to or below swamp floor, 50 foot gap every 300 feet
Element 15	Primary Purpose: Add water from the northern part of the unit to refresh the upper interior swamp north of Sibon Canal with oxygen rich water. Remove two closures. Design sediment trap.
Element 16	Primary Purpose: Introduce low water to the south on the west side of the unit. Clean out Jackass Bay Canal (possible clear and snag) and install sediment trap offset from the river entrance.

Elements 1, 3, 6, 7, 8, 9, 12, 14, 15, and 16 were forwarded by the Federal and state interagency group to the USACE Planning Delivery Team (PDT) for consideration as part of the final recommended plan. In addition to formulating various elements to meet the objectives, goals and purposes of the BCMU, various alternatives were developed to meet the intended purpose of each element. Various alternative construction methods were considered in developing each of the elements in order to ensure an optimal and cost effective design for each element. Modifications to existing features within the BCMU were designed to introduce new and additional source water, improve water circulation, and extend the penetration of higher quality water into the back-swamp of the BCMU. Additionally, it is intended that these actions would also result in reducing sedimentation in deep-water aquatic habitat.

ENVIRONMENTAL SETTING

GENERAL

The Atchafalaya Basin is a large, shallow depression lying within the deltaic plain of the Mississippi River in south-central Louisiana. The Atchafalaya River is the largest distributary of the Mississippi River. A series of connected lakes; Lake Fausse Point, Grand Lake, Six Mile Lake, and Flat Lake historically transported water through the Atchafalaya Basin. Diversion of Mississippi and Red River waters to the Atchafalaya river since the mid-nineteenth century has forced these lakes to act as settling basins or sediment traps, leaving only small remnants of the original lakes. Likewise, construction of the ABFS has accelerated natural and artificial trends that are currently altering the character of the basin's fish and wildlife habitats. These trends include high sedimentation rates, hydrological changes, and changes in vegetation composition and development.

Sedimentation in swamps and lowlands has raised ground elevations, effectively reducing the extent and duration of over bank flooding throughout the basin. Bottomland hardwood forests have replaced swamps in many areas, with a corresponding loss of aquatic habitats. The basin's natural hydrology has also been altered by flood protection works such as navigational features, dredging operations, protection levees, and borrow pits. The East and West Atchafalaya River Guide Levees, for example, and certain channel closures, confine flows to the main river channel during low stages, which reduces the extent of backwater aquatic habitat previously available during the low-water season. The resulting impediments to water circulation during low river stages reduce water quality in various areas of the basin. Access canals for the oil and gas industry have further disrupted north to south flows through the interior swamps ("back-swamps").

Sediment accretion in the southwestern portion of the basin increased in 1933 when Fausse Point Cut was dredged to provide fill material for the West Atchafalaya Basin Protection Levee (Wicker, 1975). The BCMU was formed between 1935 and 1969 as sediment deposited by Fausse Point Cut and the Atchafalaya River filled the southwest portion of Grand Lake. Natural deposition of sediment along Fausse Point Cut restricted water flow into and out of the adjacent floodplain to the east, while oil exploration and logging canals with their associated spoil banks restricted water flow within the floodplain. Grand Lake was virtually filled with sediment by 1969, and subsequently created a barrier to water flowing south out of the BCMU when Fausse Point Cut merged with the Atchafalaya River. Crook Chene Bayou joins the two waterways to surround the large area of backwater swamp and lakes in the southwest region of the basin. Because of these changes in hydrology within the bounds of these channels, the MVN designated this area as a hydrologically separate area now recognized as the BCMU. This area is important to many species of terrestrial wildlife such as deer, squirrel, rabbit, raccoon, and potentially Louisiana black bear. Portions of the study area are used by several avian species such as wading birds, over-wintering waterfowl, various water birds, passerines, and songbirds. The back-swamp is one of the better commercial crawfishing areas in the state. In the deeper distributaries and shallow lakes within the BCWMA, largemouth

bass, sunfishes, and crappie are recreationally fished. There is also a commercial deepwater fishery for shad, buffalo, some freshwater drum, and catfish in the adjacent river channel and deep water access channels (i.e. Fausse Point Cut).

Sediment deposition from dredging and high Atchafalaya flows have built up the natural levees of the main channel, West Access Channel, Lake Fausse Point Cut, and oilfield and pipeline canals, thus reducing over-bank flows. The oilfield and pipeline canals disrupt the north to south direction of flow. Access canals, such as Sibon Canal, convey water and sediment from the main channel into the center of the area. Many of the interconnecting channels are filled with sediment and snags. Water levels in the Atchafalaya Basin main channel and the Grand Lake area to the south of the BCMU area have risen over time. The local users of the area affirm that the Atchafalaya flows enter the management unit from the lower end of Grand Lake, impeding the north-south movement of water through the swamp. Increased sediment deposition occurs as flows entering from the north of the management area are held in the area until water levels in Grand Lake decrease.

In the BCMU, as in most of the Atchafalaya Basin, the manner in which flooding and dewatering of the swamp occurs has greatly changed over time. Historically, river water would enter the swamp primarily through over bank flooding, initially from the many small streams connecting the swamp and the surrounding major channels. Eventually it would enter through overflow, across the natural levees of channels such as the Atchafalaya Basin Main Channel and channels incorporated in the West Access Channel. Water was dispersed and circulation was maintained throughout the swamp by means of an intricate network of small interconnecting channels that comprised the interior drainage system. Presently, barriers to flow across the back swamp consist of a combination of ridges, berms, and dredged material placements associated with man-made disturbances. These barriers are a result of wellhead placement, construction and maintenance of pipeline canals, and sedimentation occurring along corridors of intermittent water influx during periods of over bank flow. Due to all of the man made and naturally induced sedimentation and isolation from natural over bank flow, many interior areas are experiencing increased sedimentation and poor water circulation. Specific to this study is the increasing amount of sediment presently entering Gravenburg Lake from Lake Fausse Point Cut, as well as backing up through the entrance channel to Buffalo Cove Lake. These problems in combination with the poor drainage, lack of sediment-free water inputs, and lack of outlets in the southern end of the management unit are continuing to contribute to poor water circulation and the resulting seasonal degradation of the water quality. The primary water quality concerns stem from the lack of interior circulation, introduction of unwanted sediment and nutrients, and an insufficient introduction of oxygenated water into the back swamp at lower river stages.

Various types of habitat are affected by variable flooding and dewatering regimes and may be used as spawning, feeding, or refuges for various species of fish and crawfish. Various deepwater habitats found in the few lakes, canals, and bayous within the management unit are used as refugia from the shallow water hypoxic areas at certain times of the year as the shallow water habitats in the back swamps heat up and become hypoxic. Terrestrial habitat is comprised of mid- to late-successional bottomland

hardwoods and cypress tupelo swamp. Future forest regeneration of both these hardwood and cypress species is also dependent on highly oxygenated water purposed by the project. The proposed project elements are designed to improve water quality, as well as preserve terrestrial and aquatic habitats within the management unit. These improvements will be accomplished by excluding or managing the sediment-laden water; removing barriers to improve interior circulation; and providing sufficient outlets for drainage in order to promote southerly flow.

CLIMATE

The climate of the BCMU area is humid, subtropical, and subject to significant polar influences during winter as cold air masses periodically moves southward over the area displacing warm moist air. The annual normal temperature is 67.7 degrees Fahrenheit (°F), based on the 30-year normals (1971-2000) at Franklin, Louisiana (located approximately 10 to 14 miles south of the management unit). Monthly temperature normals vary from 81.4°F in July to 51.9°F in January. The area has a total annual normal precipitation of 65.13 inches based on records taken at Franklin. August is the wettest month with a monthly normal of 7.76 inches. The driest normal month is October, which averages only 3.72 inches. Prevailing winds are mostly southerly and create a strong maritime character. Winds average 7.5 miles per hour based on records at the New Orleans and Baton Rouge Airports. Maximum winds are caused by hurricanes and tropical storms that pass through the area. The monthly and annual normal temperature and precipitation for Franklin are shown in tables 4 and 5.

TABLE 4

Monthly and Annual Average Temperature (°F), Franklin, Louisiana
30-Year Normals (1971-2000)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
51.9	55.1	61.3	67.2	74.6	79.7	81.4	81.1	77.4	68.6	60.3	54.1	67.7

Source: National Climatic Data Center

TABLE 5

Monthly And Annual Total Precipitation (inches), Franklin, Louisana
30-Year Normals (1971-2000)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
5.43	3.92	4.73	5.09	4.92	7.06	7.37	7.76	5.85	3.72	4.46	4.82	65.13

Source: National Climatic Data Center

GEOLOGY

The study area is located in the Atchafalaya Basin Floodway between the West Atchafalaya Basin Protection Levee and the Atchafalaya River near Atchafalaya River mile 90 in Iberia, St. Martin, and St. Mary Parishes, Louisiana. This is an area of low relief ranging from +5 to +10 feet (NGVD) in elevation. Most of the study area was part of a shallow lake system, which has gradually filled with lacustrine delta and back swamp deposits. There are no existing borings at the specific study site; however, there are borings on the West Atchafalaya Basin Protection Levee. The information from these borings was used to estimate the geologic environments in the study area. The surface deposits consist of back swamp, lacustrine delta, abandoned distributary, and natural levee. Back swamp deposits consist of soft to stiff, organic, fat clay interbedded with occasional lenses of soft to medium lean clay, silt, and wood and average 115 feet thick. Lacustrine delta deposits are interbedded with back swamp deposits and consist of interbedded medium to stiff, fat and lean clays, silt, and sands with occasional shell fragments. Lacustrine delta deposits vary widely in thickness, but average 20 feet thick. Abandoned distributary deposits consist of interbedded clays, silt, and sands and vary in thickness, ranging from approximately 10 to 40 feet thick. Natural levee deposits are intermittent and occur adjacent to the larger distributaries. These deposits consist of interbedded soft to stiff fat and lean clays and silt with occasional lenses of sand and range from approximately 2 to 8 feet thick. Thin point bar deposits underlie a significant portion of the back swamp deposits and consist of sands and silt with occasional clays. The point bar deposits range from approximately 8 to 20 feet thick and are found between -100 to -130 feet in elevation. Substratum sands underlie the back swamp, point bar, and abandoned distributary deposits and consist of massive silty sand and sand with occasional gravel. These sands average 140 feet thick. Pleistocene deposits underlie the substratum sands and consist of interbedded, stiff to very stiff, highly oxidized, fat and lean clays, silt, and sands. The surface of the Pleistocene deposits in the study area ranges from approximately -200 to -375 feet in elevation and these deposits extend to an unknown depth.

Ground water in this area is at or near the surface and the silt and sands of the natural levee and lacustrine deposits may be hydraulically connected to the Atchafalaya River. Long-term relative subsidence rates average approximately 0.5 ft/century in the study area. Future eustatic sea level rise is currently estimated to contribute an additional 1.0 ft/century to the relative subsidence rates (USEPA, 1995). Combined, the relative subsidence rate is estimated to be 1.5 ft/century over the next 100 years.

SIGNIFICANT RESOURCES

This section contains a description of significant resources and the impacts of the proposed action on these resources. The significant resources described in this section are those recognized by: laws; executive orders; regulations; and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

AQUATIC RESOURCES

These resources are institutionally significant because of the Fish and Wildlife Coordination Act of 1958, as amended. Fisheries and aquatic resources are technically significant because: they are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of various freshwater and marine habitats; and many species are important commercial resources. Fisheries resources are publicly significant because of the high priority that the public places on their esthetic, recreational, and commercial value.

This aquatic resources section will discuss the various aquatic habitats as well as the fishery and the other aquatic components that contribute to or utilize the various aquatic habitats found within the management unit. "While it is recognized and acknowledged that questions and opinions exist as to public access of waters within the project area, this subject is a matter of Louisiana real property law and, further, is not an authorized feature of the project."

Existing Conditions

Almost all aquatic habitats within the BCMU, whether permanent or ephemeral, provide some component of the necessary requirements for food, shelter, and/or reproduction for resident fish species. Although the environment consists of a mosaic of habitat types, the aquatic habitat that supports fisheries can be generalized into three categories; riverine (larger distributaries of the Atchafalaya River), lakes (permanently inundated lakes, canals, and bayous), and *swamps* (seasonally inundated floodplain forest, mainly cypress/tupelo or willow). While recent environmental monitoring in the BCMU indicates that very few fish species are exclusive to a particular habitat, the frequency of occurrence for each species within the three habitat types indicates species-specific habitat discrimination for species like largemouth bass, bluegill, crappie, paddlefish, sturgeon, and others. Other species in the BCMU are generalists and are equally likely to be found in any aquatic habitat. Gar and mullet are examples of generalist species, possibly because they can utilize atmospheric oxygen when necessary and are the least threatened by hypoxic conditions that occur during the summer months of each flood cycle. Buffalo and shad also show little preference for either habitat and are often found in association with gar and mullet when hypoxia is present in swamp or lake habitats, but are less likely to be present in extreme hypoxic conditions. The presence or absence of each species in a particular habitat of the BCMU is influenced by the preference or need for that species to use that type of habitat, the presence of other species, and the quality or suitability of that habitat to provide essential needs. Recently observed changes in fish assemblages in the BCMU indicate undesirable or insufficient conditions for one or more of those factors.

Since specific habitat preferences are likely to remain unchanged for most species, temporal variation in species composition for a particular habitat is likely a response to changes in habitat suitability or the presence of other species. Whether it is associated with the avoidance of predator species or physical habitat alteration, most shifts in fish assemblages can be tied to some aspect of the Atchafalaya River hydrograph and the

associated water quality changes in the BCMU. Changes in water level and water quality alter habitat characteristics and override species-specific habitat preferences by diminishing one or more essential habitat requirements. Lake species are forced to occupy riverine habitats when lake habitats become too shallow or hypoxic, and riverine species are distributed throughout swamp during high water. Previous studies in the Atchafalaya Basin indicate that the species composition changes seasonally in all habitats as the environment changes with fluctuation of river stage, and that the changes impact each species differently. The ultimate condition of each fishery is dependent on the amount of each habitat that is negatively impacted by poor water quality during each flood cycle, the reaction of that species to the altered environmental conditions, and the availability of alternate acceptable habitats.

Riverine habitat is the most seasonally stable in terms of species composition because of the environmental stability. Waterways like Fausse Point Cut, Alligator Bayou, and the Atchafalaya River are continuously flowing water bodies that support species like sturgeon, flathead catfish, blue catfish, carp, paddlefish, shad, mullet, striped bass, white bass, and other species that are adapted for life in deep, turbid, fast-flowing habitat where habitat complexity is minimal relative to the floodplain. The volume of water flowing into the Atchafalaya River from the Mississippi River is great enough, and the channel deep enough, to resist local changes in ambient temperature. The combination of temperature stability and turbulent flow that continually replenishes dissolved oxygen by rotating the water column provides a stable environment for riverine species. Although water temperature may be higher and oxygen concentration lower in summer months relative to spring, fall, or winter months, there is normally sufficient oxygen and low enough temperatures to accommodate fish during all seasons. Riverine habitats are rarely excluded as a refuge because of poor water quality. If accessible, most species would utilize riverine habitat during low water or when water quality is poor in lakes and swamp habitats.

Conversely, swamp habitat is the most environmentally variable habitat in the BCMU. Its environment fluctuates between terrestrial and deep water as water-surface elevation varies in the Atchafalaya River, and is by far the most abundant habitat comprising over 80 percent of the BCMU. Areas within the swamp that remain aquatic during low water are typically very shallow and can support dense stands of aquatic vegetation, have very low concentrations of dissolved oxygen. While crawfish can take refuge in underground burrows throughout the drained swamp until the subsequent flood cycle these areas provide little suitable habitat most fish species. New terrestrial vegetation grows on the nutrient-rich swamp floor during low water periods and new trees sprout as old plant material decomposes through oxidation. The new growth, along with remnant organic material yet to decompose, represents organic material that must be assimilated by the aquatic environment during subsequent high water. The cost of assimilation is observed in the consumption of aquatic oxygen by the decomposition of the vegetation, and varies in severity with the annual variation in the flood cycle. Ultimately, the timing and magnitude of the flood cycle would determine the amount of, vegetation growth, decomposition, oxygen supply, oxygen requirements of the system, and how fisheries would be impacted by environmental conditions in the swamp.

The typical spring rise in river stage occurs when water temperature is low, biological respiration is minimal, and oxygen solubility is high. Crawfish can emerge from burrows providing new food sources for fish, mammals, birds, reptiles, and amphibians. If suitable reproductive habitat is made available at the appropriate time, fish can spawn in shelter from predation in shallow swamp habitat. Nearly all species of fish, whether riverine or lake species, are found in swamp habitat during high water, so the assemblage of fishes found in inundated swamp is diverse and represents a combination of riverine and lake guilds. Since a large portion of swamp habitat in the BCMU is not aquatic for some portion of most years, the fish assemblage is seasonally and annually variable.

Once the swamp in the BCMU is inundated, the factors that determine habitat suitability for aquatic organisms have a cumulative impact on the water quality and determine the makeup of the aquatic community. Currently, the environmental factor that most limits the suitability and availability of fisheries habitat is dissolved oxygen. Some swamp areas experience hypoxic conditions more frequently and for a greater duration than others and are less likely to provide adequate habitat for either spawning or foraging. The least useful habitat for fisheries is swamp that is remote to river water input. These areas are the first to experience oxygen depletion, and the decrease in oxygen is most rapid when water movement is minimal. As a result, the most stationary swamp habitats are areas immediately downstream of barriers to water flow such as oilfield canals and pipelines. Swamp habitat, like the area west of Mile Point Bayou, south of the Amerada Hess Oilfield canal, and others are the first to become hypoxic and remain hypoxic the longest. Similar circumstances exist in other areas of the BCMU when internal circulation is thwarted by hydrologic barriers, but hydrologic barriers fluctuate with river stage and water quality problems associated with physical barriers are more severe and long-lasting. Hypoxia is intensified if aquatic vegetation density id high enough to block sunlight and reduce photosynthesis. The vegetation also adds to the oxygen debt by contributing additional organic material as portions of the vegetation die and add to the already oxygen-deficient system. Fish are usually absent or in low abundance in these areas except at the highest river stages when flow-barriers are breached.

Hypoxia has a direct physiological impact on fish in swamp habitat as well as the few deep-water areas that have previously maintained a resident sport fish population. Recent studies have shown that sustained hypoxia can have chronic effects on fish populations by reducing fecundity of spawning adults, decreasing fitness of young, and increasing mortality of relatively immobile larvae. Less obvious is the indirect impact to fish populations as stagnant areas drain into previously well-oxygenated lake habitats. While the direct impact of hypoxia is observed in reproductive success and recruitment, the abundance and composition of the fish community is also altered when certain species avoid unfavorable conditions by seeking alternate suitable habitat. As water levels in the river fall, much of the hypoxic swamp water can drain into lake habitats on its way back to riverine habitat. Some flood cycles yield an insignificant volume of hypoxic water and the impact on fisheries maybe minimal if spawning is successful and refuge areas can overcome the impact of draining mildly hypoxic swamp. Other flood cycles would yield a much larger volume of hypoxic water in the swamp, which may represent an insurmountable oxygen debt for those areas that ultimately drain such swamps. Suitable

refuge areas decrease in availability as the volume of hypoxic water increases. There is little lake habitat in the BCMU and the increasing frequency of swamp hypoxia continues to reduce the available refuge, particularly during falling river stages.

Lakes are typically less environmentally variable than swamp habitat, but more variable than riverine habitat. While riverine habitat can be used by most species as refuge in order to avoid hypoxic conditions, the typical resident fish assemblages found in lake habitats are unlikely to remain stable if they are forced to depend on riverine refuge. Sport fish like largemouth bass, black crappie, and bluegill can survive in riverine habitat, but require the specific environmental conditions provided by lake habitats in order to maintain stable populations. In addition, sedimentation is reducing the accessibility of riverine as even temporary refuge, emphasizing the importance of lake habitat. Deep lakes, like Bayou Gravenburg and the borrow pond north of Sandy Cove boat launch can function as lentic systems by replenishing oxygen through photosynthesis. Much of the water's surface is free of obstruction to sunlight by either canopy cover or aquatic vegetation and the average water depth is usually greater than 2 m in depth during the low water period. They are more likely to attract sport fish species like largemouth bass, crappie, bluegill (and other sunfish), channel catfish, and other species that are typically found in less turbid, more structurally complex habitats. Water movement is either minimal or stationary and fits the habitat requirements of those species. Other lakes like Buffalo Cove Lake, Jackass Bay, and the two lakes north and south of Prejean Canal, are very shallow during most of the year, especially during the low water period, and intermittently provide suitable habitat for fish. Shallow lakes are typically densely vegetated and experience poor water quality every year, especially when ambient temperatures are highest.

Bayou Gravenburg is the largest and deepest lake in the BCMU and has the greatest potential for habitat improvement. It is surrounded by swamp habitat, some of which is stagnant and routinely contributes to poor water quality. Its location is in the drainage path of the isolated swamp and the lake must accommodate the drainage or hypoxic water that routinely depletes oxygen supplies in the lake. The problem is particularly evident when the Atchafalaya River is either stationary or falling. In spring of 2001 young-of-the-year largemouth bass were plentiful immediately following the spring spawn, but immediately declined in abundance as water levels fell and much of the lake became hypoxic. The fish assemblage after the river fell showed that the majority of fish in the lake were predatory garfish that outnumbered sport fish by 100 to 1. The refuge capacity of lakes like Bayou Gravenburg are diminished or eliminated if lake species are forced to migrate to riverine habitat to avoid hypoxia. Reproduction and recruitment decline as young bass and sunfish are more vulnerable to predation in the lake, in transition to riverine habitat, and while inhabiting riverine habitat.

Location in the floodplain is also an important factor in determining the extent to which environmental conditions would be suitable for fish in a particular lake. Interior lakes that are surrounded by swamp habitat that sustain acceptable water quality would be less likely to experience comprehensive changes in the fish community. Fish samples from the borrow pond north of the Sandy Cove boat launch indicate a more consistent fish assemblages than Bayou Gravenburg. The Sandy Cove pond is subject to no hypoxic

swamp drainage and is sufficiently deep to serve as refuge habitat during low water. Although it is directly connected to the Fausse Point Cut and has riverine species in its assemblage, the proportion of sport fish is much more consistent and never absent. The comparison of fish assemblages from the two lakes suggest that lakes like Gravenburg would continue to experience unstable fish populations as long as water quality in the lake is subject to a significant volume hypoxic drainage.

Future Conditions with No Action

Without implementation of the proposed action, continued sedimentation would eventually fill the southern portion of Bayou Gravenburg, resulting in a potential loss of up to 255 acres of deep-water habitat. Water quality problems would get progressively worse as organic material accumulates and internal circulation is reduced. Deteriorating water quality would likely lead to unsuccessful reproduction due to either unsuitable spawning conditions or increased mortality of young fish. Fish assemblages would likely continue to become more transient as the frequency of hypoxia increases habitat variability. Recreational fishermen in Bayou Gravenburg, Prejean Canal, and other internal canals have experienced reduced success in recent years as hypoxia has become more common, and the trend would likely continue. The stagnant water conditions and low dissolved oxygen concentrations in swamp habitat caused crawfish mortality during harvest during the latest flood cycle, resulting in financial losses for commercial fishermen in the BCMU. The commercial crawfishing industry would continue to experience increases in the frequency of mortality during harvest under the existing environmental conditions.

Future Conditions with Proposed Action

In order to consider the benefits of the proposed plan to the BCMU, it must be described as preliminary habitat manipulation that would alter the future hydrology of swamp habitat. The currently proposed set of BCMU elements was not designed to completely eliminate water quality problems in the BCMU. It is assumed that future elements would be implemented in the BCMU after the impact of the current plan is assessed. Future modifications to the BCMU are presently being considered for implementation during a period of post construction monitoring, evaluation and approval by higher USACE authority and would also be designed to take advantage of the current alterations. The proposed addition of river water into the BCMU would increase the distribution and circulation of water and it is anticipated that the projects would directly improve the water quality in over 7,500 acres of swamp habitat. The direct improvement, as well as indirect improvements, in water quality would reduce swamp hypoxia and subsequently decrease larval mortality, increase reproductive success, and stabilize the refuge characteristics of existing deep-water habitat.

Specifically, fisheries in the BCMU would benefit from a more stable lake environment in Bayou Gravenburg, particularly sport fish. The closure of the Gravenburg inlet (element 6, figure 6) and the Keyhole Canal (element 7, figure 7)) are designed to reduce sedimentation in Bayou Gravenburg that is filling in deep-water habitat. Between three and five acres of deep-water habitat has been lost in the last decade due to sediment

entering the lake through the Gravenburg inlet. Deep-water lakes, especially Bayou Gravenburg, are important because they are necessary for suitable fish refugia during low water and the BCMU has a limited area of potential refuge. However, the closure of the inlet also results in a net decrease in river water to the BCMU, and Bayou Gravenburg directly. Water from the inlet provides oxygenated river water to the lake and to the adjacent swamp east of the lake. The inlet allows water into the BCMU when the river stage at Butte LaRose is about 10 feet and is the only source of water between the Sibon Canal and the Buffalo Cove Channel. The inlet is also an important component of the hydrology because it generates eastward water movement and directs circulation toward that part of the BCWMA that most frequently experiences hypoxia.

However, additional river water would be introduced into the lake via the swamp north of Gravenburg (elements 12 and 14; figures 4 and 5 respectively), which would not only offset the reduction, but would likely improve internal circulation in the area surrounding the lake. Along with the closure of the inlet, element 6 would also lower the elevations of levees along the inlet that currently restrict north to south water exchange across the inlet. It is anticipated that water quality conditions in the region north and south of the lake would be improved in roughly 1,200 acres. The annual drainage of hypoxic water from this area would be reduced and benefit to aquatic life in the lake. Although difficult to quantify, additional improvements to water quality in the lake are likely through similar improvements in other areas of the BCMU (elements 9, 15, and 16; figures 8, 9,and 10 respectively).

Access to refuge would be limited if hypoxic conditions develop because the inlet is the most direct route to Fausse Point Cut. Water quality in the inlet is typically suitable and provides a short, well-oxygenated route from the lake to Fausse Point Cut. Closing the inlet would exclude the most direct route for migration between the lake and Fausse Point Cut. The only remaining access to refuge would be restricted to passage through the swamp and out of the Buffalo Cove channel. However, anticipated improvements to water quality in the area would likely reduce the necessity for fish to traverse hypoxic swamp habitat in order to seek refuge.

Another closure (element 3; figure 11) is proposed on Poncho Chute, a distributary of Fausse Point Cut. The channel closure would reduce sedimentation in an area below Mudd Cove, which is an efficient outlet for drainage of BCMU swamp at high river stages. Although the Mudd Cove area is very shallow and provides little permanent fish habitat, the closure would also preserve the potential to restore additional deep-water habitat in the BCMU. The conversion of the Poncho Chute channel from lotic to lentic habitat would improve habitat conditions for sport fish species in its existing form. Habitat conditions in the channel may also be improved in the future by dredging the canal to provide additional deep-water habitat. Sediment deposition in the channel would be retarded in the channel, improving the prospect of adding sustainable deep-water habitat in the BCMU.

There are at least three other open-water areas that have potential to sustain resident sport fish populations. The first two are roughly 533 acres of open-water habitat in the lakes on Prejean Canal. They are shallow, densely vegetated, and develop poor water

quality much of the year. The closure on Poncho Chute would allow water to move into and out of the Prejean lakes more efficiently and compliment the construction planned for elements 8 and 9-2. These two construction elements would improve circulation by adding water into the area north of Prejean lakes, and in turn improve water quality in the lakes. These areas would likely provide more stable environmental conditions that favor successful spawning and recruitment in the future, but the greatest benefit may be the potential to add additional deep-water habitat in these areas. The lakes are currently too shallow to provide low-water refuge, but the currently proposed water management plans would prevent further habitat degradation and preserve the option to manage the habitat in the future.

The third open-water area is a 150-acre lake west of element 9. The current habitat conditions of this area are not well documented, but the isolated nature of the lake and the lack of access to refuge from hypoxia suggest that it is similar in nature to the Prejean lakes. It would likely benefit from improvements in circulation and additional river water in the same manner as the Prejean lakes, but may be better suited for providing stable fish habitat. Its proximity to the river and a continuous connection to the Whisky Bay Pilot channel would provide a continuous source of well-oxygenated water and fish to areas that are currently isolated from both. Similar to the Prejean lakes, it provides the potential for adding much needed deep-water habitat to the BCMU. Unfortunately, the lake is located in very close proximity to the discharge of element 9-1. Accordingly, emphasis must be placed on the sediment filtering function of the sediment trap on element 9-1 in order to prevent sedimentation in the lake.

WATER QUALITY

Existing Conditions

The BCMU is approximately 57,000 to 58,000 acres in area. Most of this area is state owned land with the remainder owned by private landowners and the Federal government, which owns approximately 300-400 acres on the southwest side of the BCMU. Oil and gas operations are present in areas such as the Amerada Oil Field in the northeast portion of the BCMU as well as in numerous canals that cross the BCMU. There are also numerous privately owned camps and river houses scattered throughout the BCMU.

Generally, the Atchafalaya River does not contribute considerably to the interior floodplain of the BCMU during low water stages. According to a 1999 report funded by the USACE-MVN, as the river's stage at Butte LaRose (BLR) reaches 9 feet there is limited flow of water into the swamp. At 13 feet BLR, water begins to flow into the floodplain while at 17 feet BLR most waterways are over bank causing most swamp and interior areas to be inundated with river water (USACE-MVN, 1999). During the low water stages, the isolated, interior areas tend to have stagnant water resulting in poor water quality conditions.

Section 303(d) of the Clean Water Act requires that States prioritize all impaired waters within the State. Once the impaired waters are prioritized, restoration activities

can be implemented using tools such as total maximum daily loads (TMDLs). A TMDL is the calculation of the amount of a pollutant that a water body can receive and still meet water quality standards. The Atchafalaya River is listed on Louisiana's 1999 Section 303(d) list. The target completion date for Louisiana to develop the river's TMDL is March 31, 2009. The BCMU is affected by the quality of the water in the Atchafalaya River since it is the major source of inflow.

The following paragraphs discuss the recent and existing conditions in the Atchafalaya River and the BCMU for certain water quality parameters. The data used for this assessment were collected in 1997 through 1998 (USACE, 1999), and in 2001 through 2002 except for the nutrient data. The 1997 and 1998 data were collected primarily during the months of February through June and July, respectively. The 2001 data were collected in February through May and September through December. The 2002 data were collected during January through June except for March.

Nutrients

The USEPA recently published the "Integrated Assessment of Hypoxia in the Northern Gulf of Mexico"(USEPA, undated), which attributes the hypoxia issue in the northern Gulf of Mexico to the excessive nutrients in the Mississippi-Atchafalaya River Basin. According to the report (referring to the hypoxic area), "...the largest zone of oxygen - depleted coastal waters in the U.S., and the entire western Atlantic Ocean, is found in the northern Gulf of Mexico on the Louisiana/Texas continental shelf. The area affected is about the size of the State of New Jersey" (USEPA). The "1999 Non -Point Source Pollution Plan," states that "...the high levels of eutrophication in some Louisiana lakes and streams can be attributed to the nutrients derived from agricultural lands, primarily nitrogen and phosphorus" (LDEQ, 1999). The LDEQ plan also states that nutrient over - enrichment leads to "...an imbalance in natural nutrient cycles, changes in water quality and a decline in the number of desirable fish species" (LDEQ, 1999).

The Louisiana Water Resources Division of the USGS maintains current and historical nutrient data for the Atchafalaya River. The data were collected from November 1997 through March 2002 and show averages for the river of approximately 0.6 mg/L as N of Total Kj eldahl Nitrogen, 1.2 mg/L as N of NO2 (nitrite) + NO3 (nitrate), and 0.06 mg/L as P of orthophosphate. The USGS has also collected nutrient data in the floodplain area just north of the BCMU in and around Bayou Darby. Readings for NO3 - N (nitrate-nitrogen) in March and July of 2000 averaged approximately 0.08 mg/L in the floodplain area. For reference, the NO3 - N readings in Lake Fausse Pointe Cut, which is representative of the river, averaged approximately 1.7 mg/L in March and July of 2000.

LDEQ does not have numerical standards set for nutrient levels, but the state is working through the Non - Point Source Pollution Program to implement watershed management strategies over the next 5 - 10 years. The USEPA report mentioned above states that some researchers have suggested an approximate boundary of 1.5 mg/L for total nitrogen and 0.075 mg/L for total phosphorus.

Dissolved Oxygen

The LDEQ standard for dissolved oxygen (DO) is 5 mg/L. This criterion was designed to "protect indigenous wildlife and aquatic life species associated with the aquatic environment" (LDEQ, 2000). In addition, this standard ensures a diversified population of fresh, warm water biota including sport fish. Levels below this standard begin to stress certain aquatic species. According to the USEPA, DO levels below 5 mg/L slightly affect the rate of growth of fish and other aquatic life; however, levels at 3 mg/L and below are acutely lethal to some fish (USEPA, 1986).

The report, "Effects of Variation in River Stage on Water Quality and Biota in the Buffalo Cove Management Unit of the Atchafalaya Basin, Louisiana", published in 1999 and submitted to the USACE-MVN by Glenn Constant; William Kelso, Ph.D.; and D. Allen Rutherford, Ph.D. of Louisiana State University analyzed water quality data collected in the years 1997 and 1998. A summary of the results for DO data (surface and bottom of water column) is presented below.

1. The 1997 monitoring program covered a small area in the northern portion of the BCMU while the 1998 monitoring program was adjusted to cover a larger area in the northern and southern portions of the BCMU. The results for DO readings in 1997 revealed spatial variations for the surface DO readings during primary (BLR 6.5 ft to 13.8 ft) and secondary (BLR 13.8 ft to 17 ft) inundation. Less spatial variation occurred during the period of over bank inundation (BLR > 17 ft). However, in 1998 no significant spatial variations were detected for surface readings during primary and secondary inundation. According to Constant and others, the spatial variation of 1997 "...suggested a relationship between water quality within the floodplain and the distance from the source of river-water input." During primary and secondary inundation, surface DO readings were typically lower in the interior area of the BCMU than on the perimeter of the. BCMU. During over bank inundation, the surface DO readings were similar in the interior area to the perimeter area. Relative to the LDEQ standard of 5 mg/L, approximately 15 percent of the total surface readings for 1997 were below the standard. Approximately 20 percent of the total surface readings for 1998 were below the standard.

2. In both 1997 and 1998, bottom DO readings were low at all locations and only increased slightly with the higher water stages. Moreover, bottom DO readings at interior sites were much lower than bottom DO readings at perimeter sites. Relative to the LDEQ standard of 5 mg/L, approximately 30 percent of the total bottom DO readings in 1997 were lower than the standard while approximately 60 percent of the total bottom readings in 1998 were below the standard.

3. The data collected in 2001 through June 2002 contain DO readings at the surface, middle, and bottom of the water column. The number of sampling sites has expanded since the monitoring programs in 1997 and 1998. See table 6 for the percentages of DO readings below the LDEQ standard for the years 1997, 1998, 2001, and January through

June 2002.

TABLE 6
1997, 1998, 2001 and 2002 Percentages of
Yearly Dissolved Oxygen Readings less than 5 mg/L

YEAR	SURFACE	MIDDLE	BOTTOM
1997*	*15%*	NA	30
1998	20%	NA	60
2001	*50%*	70%	75
2002	65%	70%	75

*Note: 1997 was an above-average, high-water year.

During the 1997 monitoring program, Constant and others assessed that surface DO readings appeared to be affected by the amount of water hyacinth covering the water's surface; especially when the stage at BLR was less than 17 feet. Interior sampling sites that experienced water hyacinth cover at or near 100 percent also experienced surface DO saturations less than 20 percent. The perimeter sampling sites did not experience the same level of water hyacinth cover or DO saturations. The monitoring program results also showed that water hyacinth cover had a greater influence on DO near the surface of the water column than near the bottom.

Temperature

The BCMU is comprised of natural bayous, swamps, manmade canals, and open water lake systems. The water temperature varies depending on the local environment, i.e. extent of tree canopy, depth of water, and hydrologic setting.

The 2001 and 2002 monitoring programs collected temperature data at the surface, middle, and bottom of the water column for each sampling site. Three of the sampling sites, BC 8, BC 12, and BC 30, are located at the perimeter, southern interior, and the northern interior of the BCMU, respectively (see figures 14 and 15). BC 30 is located in an area with more tree canopy than BC 12; therefore, the water temperatures tend to be higher at BC 12. See table 7 for the summaries of the temperature data for these three sites from 2001 and 2002. During the monitoring programs of 1997 and 1998, Constant and others assessed that the surface and bottom temperatures were "statistically similar among sites in both years" (USACE, 1999).

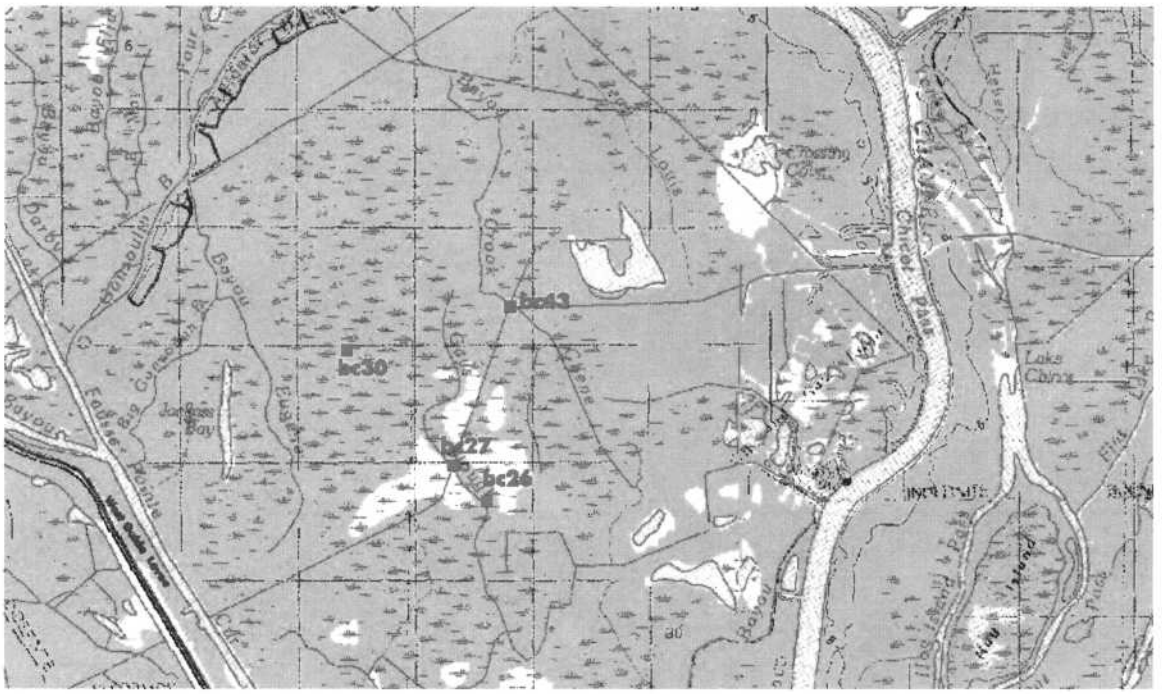


FIGURE 14
Monitoring Sites BC 26, 27, 30 and 43

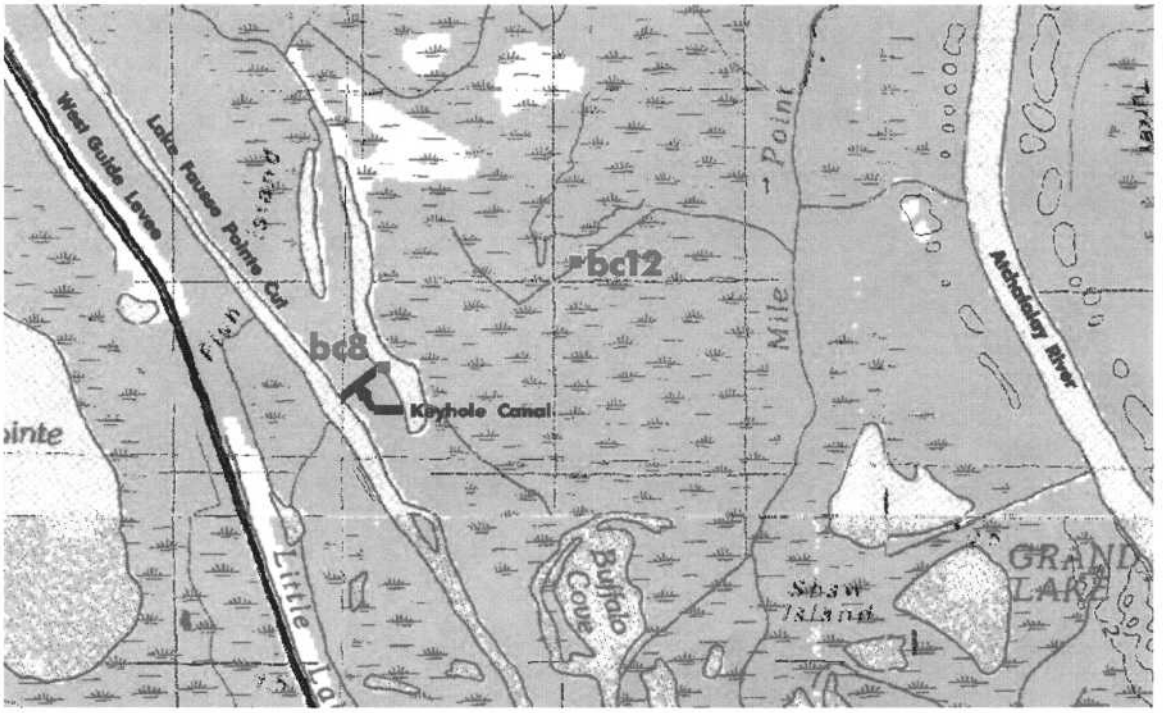


FIGURE 15
Monitoring Sites BC 8 and 12

TABLE 7
Average Temperature Readings for Surface, Bottom,
and Middle of Sites BC 8, BC 12, and BC 30

Site/Water Column		Temperature (Degrees C)		
		Maximum	**Minimum**	**Average**
BC 8	Surface	26.55	10.39	20.39
	Middle	26.47	10.38	20.05
	Bottom	25.68	10.31	19.44
BC 12	Surface	26.50	10.47	20.82
	Middle	25.93	10.39	19.04
	Bottom	26.22	10.38	20.14
BC 30	Surface	24.74	10.60	18.54
	Middle	24.31	10.52	18.06
	Bottom	24.11	10.47	17.65

Note: Readings from February-May and September-December 2001 and January-June 2002.

pH and Turbidity

The LDEQ criteria for pH allow an acceptable range from 6.0 to 9.0. During the monitoring programs of 1997 and 1998, Constant and others recorded a pH range of 6.5 to 8.0 for both years, which meets the LDEQ standard and is within the tolerance limits of fish and invertebrate species that inhabit the BCMU.

The LDEQ has established criteria for turbidity in the state's many different water bodies and major aquatic habitat types. The standard for the Atchafalaya River is 150 NTU (nephelometric turbidity units). The standard for bayous and canals is 50 NTU while the standard for freshwater lakes is 25 NTU. The BCMU contains bayous, canals, and freshwater lakes. Turbidity readings for the BCMU in 2001 and 2002 vary depending on the level of influence by the Atchafalaya River during high water stages. Sampling site BC 26, which is located in Gays Slough in the northern portion of the BCMU (figure 14), had average turbidity readings of 34 NTU, 32 NTU, and 32 NTU for the surface, middle, and bottom of the water column. Sampling site BC 27, which is located at the intersection of Sibon Canal and Gays Slough in the northern portion of the BCMU (figure 14), had average turbidity readings of 16 NTU, 15 NTU, and 15 NTU for the surface, middle, and bottom of the water column. Sampling site BC 43, which is located at the intersection of Sibon Canal and Phillips Canal in the northern portion of the BCMU (figure 14), had average turbidity readings of 38 NTU, 41 NTU, and 41 NTU for the surface, middle, and bottom of the water column. BC 26 and BC 43 had maximum turbidity readings of 55 NTU and 73 NTU, respectively, on April 19, 2002. The stage at Butte LaRose was 17.3 feet on April 19, 2002, which is a high water stage.

As stated previously, the LDEQ and USEPA have identified the Atchafalaya River as one of Louisiana's impaired water bodies. The Atchafalaya River Main stem -

Simmesport to Whiskey Bay Pilot Channel at mile 54 is designated as drinking water supply, primary contact recreation, secondary contact recreation, and fish and wildlife propagation. The suspected causes of impairment for this section of the river include flow alteration, non-priority organics, oil and grease, other habitat alterations, and siltation. The Lower Atchafalaya Basin Floodway - Whiskey Bay Pilot Channel at mile 54 to U.S. Highway 90 Bridge in Morgan City (including Grand Lake and Six Mile Lake) has designated uses of drinking water supply, primary contact recreation, secondary contact recreation and fish and wildlife propagation. The suspected cause of impairment for this section of the river is metals (mercury). LDEQ has reported mercury levels in fish in Buffalo Cove at averages of 0.292 parts per million (ppm) and a maximum of 0.662 ppm. The types of fish sampled include bigmouth buffalo, blue catfish, bowfin, freshwater drum, largemouth bass, and white crappie. LDEQ and the Louisiana Department of Health and Hospitals will consider issuing a health advisory limiting fish consumption for pregnant or breast feeding women and children under seven for locations and species where the average concentration of mercury exceeds 0.5 ppm in fish and shellfish.

Future Conditions with No Action

Without the proposed actions, the BCMU would likely continue to experience poor water quality conditions for extended periods between the yearly flood cycles. This would be more stressful than existing aquatic species can tolerate, therefore, continuing their decline.

The backswamp and interior areas of the BCMU would continue to be disconnected from the Atchafalaya River due to the lack of input sources. This would continue to cause poor water quality conditions in some disconnected areas until stages reached at or above 17 feet BLR. As natural deposition continues to occur on the banks of waterways causing higher bank elevations, the durations of disconnect from the river water would increase in the backwamps and interior areas. The natural periodic flooding of the alluvial river swamp would be reduced and water quality in these areas would degrade further.

The water movement in the interior of the BCMU would continue to be disrupted. High banks on manmade canals that run east to west and natural levees along waterways would continue to isolate the interior areas from river water and hinder the natural north to south flow within the BCMU. Hydraulic barriers would continue to hinder the natural draining of the interior areas during the falling stages of the hydrograph. These hindrances would continue to degrade water quality conditions within the interior of the BCMU.

Sediment deposition would continue to occur in sensitive aquatic areas that are targeted for preservation. The reduced depths and area in places such as the Buffalo Cove Lake and Bayou Gravenburg would cause higher water temperatures and water quality conditions not suitable for desired aquatic species.

Future Conditions with Proposed Action

The proposed actions for the BCMU include Elementsl, 3, 6, 7, 8, 9, 12, 14, 15, and 16 as previously described. These elements are the first in a series of efforts for the BCMU feature. The proposed actions would benefit the water quality in the BCMU, which is important in achieving the goal to sustain the aquatic and wildlife habitats.

Ashby (2002) lists the water quality wetland functions as follows:

1. Retention or removal of imported material, which reduces the transport of nutrients downstream.

2. Accumulation of peat, which results in the retention of nutrients, metals, and other substances.

3. Accumulation of inorganic material and sediments, which results in the retention of sediments and some nutrients.

Ashby explains that scientists (M.R. Walbridge) have concluded that, "sediment and nutrient removal and transformations in southern forested wetlands may provide the greatest value to society of these types of systems, particularly when they are located along low-order streams."

The elements of the proposed actions would collectively benefit the water quality within the BCMU by introducing more river water for a longer period during the seasonal high water stages of the Atchafalaya River and its tributaries; improve the movement of this river water into, within, and out of the BCMU; and reduce the amount of sediment entering the BCMU during the seasonal high water stages.

The BCMU is part of the alluvial river swamp of the Atchafalaya River. According to Gosselink (2000), "An alluvial river swamp often has water quality very different from that of the adjacent river." For example, during low water stages when the backswamps are isolated from the river, they may experience low DO concentrations. For long periods of time, this may be stressful to certain aquatic species. Typically, backswamps naturally experience periodic inundation with river water, which is important in sustaining the aquatic and wildlife habitats. Over time, the area delineated as the BCMU has become increasingly isolated from the Atchafalaya River due to natural and man influenced obstructions. The proposed actions would alleviate some of the stresses on the ecosystem due to these obstructions by reintroducing longer periods of inundation of the backswamps with river water. According to Mitsch and Gosselink, "water chemistry in Louisiana backswamps in the Atchafalaya Basin is distinct from that of the adjacent rivers and streams except during the flooding season, when the waters of the entire region are well mixed" (Gosselink, 2000). This "mixing" promotes the natural chemical transport processes and chemical transformations associated with wetlands biogeochemistry such as denitrification, phosphate sorption, nutrient uptake, decomposition of organic material, sorption of heavy metals, and retention of toxics (Ashby, 2002).

Along with the increased duration of river water inundation in the interior areas of the BCMU, the proposed actions would improve the movement of water into, within and out of the BCMU. Proposed modifications to pipeline canal spoil banks and naturally occurring, high stream banks would improve the movement of water within the BCMU. This would allow for areas of stagnant water due to flow hindrances to flood with riverine water and drain during falling river stages. The proposed actions would also remove hydraulic barriers in the BCMU so that interior areas may drain out of the area WMU during the falling river stages. This would allow for natural exchange of the stagnant, back swamp waters with river water during the flooding cycle further promoting the biogeochemical processes in the forested wetlands/back swamps.

The proposed actions would also improve water quality by reducing the amount of sediment entering the sensitive habitat areas. The historical sedimentation in the BCMU has resulted in reduced depths in lakes and open waters. This reduced depth has resulted in higher water temperatures in areas with little to no tree canopy, which may be stressful for certain aquatic species.

Application for the Louisiana State Water Quality Certification has been prepared along with the 404(b)1 evaluation and the appropriate public notices. A Storm Water Pollution Prevention Plan is being prepared and a discharge permit would be applied for from LDEQ if necessary. Construction would not proceed until all of the proper water quality documentation has been approved.

FORRESTED WETLANDS

Existing Conditions

Like the aquatic habitats, there are diverse forested landscapes and terrestrial habitats within the basin. The primary forest type found within the BCMU is cypress-tupelo, with the early and mid successional hardwoods dominating the higher dryer edges of the units. Frequency and duration of flood events, topography, and soil type are probably the most important factors regulating ecological succession and species composition within the basin. Landform changes in the basin occur with maturation of the river system (floodplain), or as a result of deposition materials from the Atchafalaya River, often dramatically altering the landscape. As these landform changes occur, species associations within the landscape shift, such that those sites found on the older, more stable soils have the most advanced forest succession (Putnam et al. 1960 in: USFWS 1981).

Establishment of early successional hardwoods is dependent upon the presence of bare mineral soil seedbed and the absence of overhead shade and competition from nearby vegetation (Putnam et al. 1960, Fowells 1965, Johnson 1973 in: USFWS 1981). Consequently, species composition in early successional bottomland hardwood forests is determined by the pioneer species already present on soils exposed by man's activities or by sediment carrying pioneer seed into an area at the time of deposition. The primary tree species of the early successional bottomland hardwood forest are moderately to highly tolerant of siltation and flooding (Teskey and Hinkley 1977 in: USFWS 1981). These

species include black willow, sandbar willow, eastern cottonwood, and American sycamore (Hoffnan 1973 in: USFWS 1981). Soils supporting mid/late successional bottomland hardwoods are generally more mature, better drained (although seasonally flooded), extremely nutrient rich, and receive less sedimentation than those associated with the early successional bottomland hardwoods (Putnam et al. 1960, Johnson 1973 in: USFWS 1981). Cypress-tupelo forests types in the basin occur most often, but are not successful on very low, poorly drained flats, in deep sloughs, and in natural sumps that are flooded for approximately 9 months during the year (USDI 1974). Soils associated with this vegetative type are characterized as heavy clays and muck[s] that are dewatered only during the lowest river stages (Fowells 1965 in: USFWS 1981).

Future Conditions with No Action

Long term, the area would potentially undergo a series of successional changes triggered by a combination of increased sedimentation and drying cycles. Without proper purposeful introduction of more desirable species, willow and tallow are the pioneer species moving into bare ground (sediment) under the cypress-tupelo (Allen 1997). With all of the man made alterations in the surrounding basin (i.e., construction of oilfield canals and the placement of dredged material in the back swamp) the chance of getting a quality bottomland hardwood forest within the higher elevations of the back swamp is marginal at best, without proper forest management. However, it is understood that any forest management completed on these private lands would result from willing landowners working with their state forestry agency in a manner that is consistent with the silvicultural practices that are required by the easements to be acquired by the USACE in support of the ABFS environmental protection feature.

As previously discussed, frequency and duration of flood events are probably the most important factors regulating ecological succession and species composition within the BCMU. Under current conditions, cypress-tupelo forests appear to be merely surviving in continuously flooded areas, now common throughout the basin. Though most woody plants are poorly adapted for growth and survival in continuously flooded soils (Kozlowski et al. 1991), certain species such as baldcypress have adapted to growing in water-logged soils, more specifically, soils that are flooded for no longer than 4 to 5 months of the year (Hosner 1958, Broadfoot and Williston 1973, Baker 1997, Conner and Day 1986, USDA Report 1980). Other species, such as swamp tupelo and water tupelo, are highly resistant to flooding in clear water, but are easily damaged by muddy, sediment-laden water (Broadfoot and Williston 1973).

There are some species that cannot tolerate even short periods of water logging during critical stages of growth. This group is typified by yellow-poplar seedlings, which can withstand only 2 to 4 days of flooding during the growing season (Hook 1984). If nothing is done to improve environmental conditions in the BCMU, the future of sustainable forestry, as well as sport fishing and crawfishing would be threatened.

Regardless of species, trees survival is inherently related to the individual's ability to maintain a functional balance, internally, in direct response to a proportional allocation of resources available on site (Kozlowski et al. 1991). This simply means that there must be

adequate resources (fresh, oxygenated water, and mineral soils) on site for proper growth and survival of any vegetation.

Future Conditions with Proposed Action

Implementation of this action would aid in producing annual flooding and dewatering cycles that would greatly benefit forest communities that are now either drying out or that exist in stagnant, waterlogged conditions. Over bank flooding prepares bare mineral soil seedbeds for species such as willow, cottonwood, and cypress by washing away heavy deposits of organic material. Floodwater dispersal selectively establishes some species on bare ground, while immersion improves the germination rates of others. However, with more frequent spring flooding, successful regeneration of some bottomland hardwood species could be adversely affected. Because complete submergence checks seedling growth and prolonged submergence often kills seedlings, regeneration would be prevented if new seedlings were drowned in successive years.

It is not expected that the proposed elements would have any affect on the overall frequency, magnitude or duration of flooding in the BCMU. The controlling factor for these parameters are dependent on the Mississippi River, Red River their tributaries, and the climate. With inundation or saturation persisting longer than 5 months of the growing season and a 100 percent probability of annual flooding, cypress regeneration would be virtually impossible. It is possible with the proposed project that the back swamp will actually be better able to completely drain, resulting in better conditions for forest regeneration and a reduction in the existing hypoxic conditions. This reduction of hypoxic conditions could improve the vigor of trees that are experiencing stress from such conditions.

The removal or reduction in hypoxic conditions in the back swamp where standing water may still exist would improve. In addition; mast-producing species on lower ridges could be replaced by willow, tallow, and box elder, thereby reducing habitat value for wildlife. Regeneration of low-quality hardwood species (buttonbush) that break seed dormancy to germinate late, after floodwaters have receded, could also occur. However, it must be noted that these low quality hardwoods such as buttonbush still provide valuable wildlife habitat, especially for songbirds. Flooding longer than 5 months during the growing season would restrict the growth of ground vegetation that contributes to detritus production and provides forage for terrestrial wildlife. Conversely, aquatic organisms and their terrestrial predators would benefit from the periodic expansion of the floodplain habitat and the prolonged existence of the aquatic swamp habitat.

In general, the proposed action would enhance maintenance of existing cypress-tupelo swamps north and east of Buffalo Cove Lake. Persistence of cypress-tupelo wetlands requires flooded conditions for four to five months during the growing season, for an average of three out of five years. As noted previously, frequency, the Mississippi River and its tributaries along with climate govern magnitude and duration of flooding to a great extent.

Approximately 230 acres of forested wetlands (cypress tupelo/mixed hardwoods) would be directly impacted by project construction. One hundred and eighty two acres of this 230 acres impacted would be used for dredged material disposal and would affect primarily early successional hardwoods mixed with willow. Tree survival in this area would be dependent on species, age and depth of disposal. It is more likely that existing tree species would be displaced by less desirable scrub/shrub and early successional hardwood species.

The remaining 48 acres of impact would result from the construction of the cuts, closures, and sediment traps. At these locations trees would actually be either removed or encounter extremely disturbed landscape conditions and therefore would be permanently lost. The majority of the impacts would be modifying previously disturbed spoil banks along manmade canals or natural levees formed along bayous from overflow. Due to the higher ground elevations and the periodically disturbed nature of these areas, a large portion of the forested areas affected would be young willow and scrub shrub habitat.

Three hundred and seventeen acres of mixed hardwoods would be removed or disturbed by providing an access corridor for the land-based equipment. These acreages are representing the worst-case scenario and may be revised downward if water access is feasible. As noted before, the elements are designed to mostly self maintain but would be monitored to assure maintenance if needed. If the determination is made that no or infrequent maintenance is necessary the access corridor could be selectively replanted to at least partially restore the habitat found to the extent practicable in the forested wetlands.

As with other floodplain systems, the Atchafalaya Basin is not static, and for this reason, specific requirements for optimal hardwood regeneration, growth, and survival have been difficult to determine. Because of this uncertainty, measures have been taken to minimize the impacts to woody vegetation in the BCMU. The first step toward maximizing success in the BCMU is to define the different forest types as they relate to variations in site, define the individual function of each forest type with regard to the overall ecology of the management unit within the Atchafalaya Basin, and require a management plan for each forest type that is assumed to change. The second step is to initiate a monitoring system for recording baseline information on the forest and subsequent changes regarding forest health and forest type as they relate to alterations in hydrology and sedimentation.

With or without human intervention, biotic and abiotic processes and components of the Atchafalaya Basin floodplain would change, over time. However, with the monitoring in place proposed by the LDAF, and the USFWS, the USACE would be better able to document how the forest is affected (negatively or positively), and document the degree to which it is affected. If bottomland hardwood management techniques are in place before an area transitions from one forest type to another, management would have a better chance of directing reforestation, rather than leaving regeneration of the once forested wetlands to chance succession. It must be noted that while the project would result in improved conditions for both forestry and wildlife it is the ultimate responsibility

of the landowner, with assistance from the LDAF, to develop a long-term forest management plan for the property.

WILDLIFE

Existing Conditions

The viability of the wildlife resources in the Atchafalaya Basin are directly linked to the health of the bottomland hardwood forests, wooded swamps, and the margins of permanent water bodies provided within these management units. The wildlife resources of the Atchafalaya Basin have historically been diverse and abundant due to the variety and magnitude of available habitat. Wildlife species include game animals, fur animals, endangered species, and numerous other non-game species (USFWS, 1981). The basin provides prime habitat for a variety of diving and wading birds including anhinga, great blue heron, green-backed heron, little blue heron, cattle egret, great egret, snowy egret, tricolored heron, yellow-crowned night heron, and white ibis (Kennedy, 1977 in: USFWS, 1981). All of these species are known to nest in the Atchafalaya Basin (Martin and Lester, 1990). During breeding season, eight wading bird-nesting colonies contained more than 50,000 breeding birds (Kennedy, 1977; Portnoy, 1977 in: USFWS, 1981). Since that time, an additional nine colonies have been identified (Martin and Lester, 1990). Other avifauna found in the basin includes waterfowl, shorebirds, raptors, woodpeckers, and passerines. Over 170 bird species have been observed in, and immediately adjacent to, the basin (USFWS, 1981). The Atchafalaya Basin is an important wintering area for waterfowl in the Mississippi flyway (USFWS, 1981). The forested wetlands and shallow margins of permanent water bodies provide prime feeding and resting areas for significant numbers of American coot and dabbling ducks, such as the mallard and the northern pintail. Diving ducks are most common in the larger lakes and streams in the basin. Other game birds found in the basin include American woodcock, common snipe and wild turkey. The principal big game species in the Basin is the white-tailed deer. Overall, the relative abundance of deer is greatest in mid/late-successional bottomland hardwood and least in baldcypress-tupelogum swamps. However, seasonal variation in habitat preference has been noted (Evans, 1976, in: USFWS, 1981).

Future Conditions with No Action

Under current conditions in the BCMU, sedimentation and lack of circulation are filling in the shallow water habitat used by waterfowl and wading birds. In addition, the circulation problems within the swamp are not allowing the proper dewatering cycles to occur that are conducive to either waterfowl, bottomland hardwoods, or the young aquatic vegetation on which certain wildlife species depend. Without the continuation of the supporting habitats for the lower levels of the food chain, the upper levels of the chain cannot be supported.

Future Condition with Proposed Action

The with project conditions would initiate the restoration of the annual flooding and dewatering cycle, which would greatly benefit forest communities and that are now either drying out or subjected to stagnant conditions, such as cypress tupelo swamp. While the cypress tupelo swamp is not a prime wildlife habitat for producing wildlife it is an extremely important habitat for sustaining wildlife. Many of the food sources for waterfowl, wading birds, amphibians, and furbearers are produced in these shallow swamps in the form of crawfish, salamanders, small fish, snakes, and many aquatic insects. These areas are also beneficial as waterfowl nesting areas.

The reduced sedimentation the improved circulation within the interior swamp would tend to work against the establishment of young bottomland hardwoods in the interior swamp. However the new water circulation patterns expected would favor conditions for bottomland hardwoods along the low and high sedimentary ridges that parallel the various watercourses within the swamp where cypress is currently established. These young bottomland hardwoods along with an under story of scrub shrub habitat would provide nesting, cover, and forage areas for various species of small mammals. In addition, wildlife corridors into the interior swamp would be established as a result of providing construction access. The higher elevations created by the non-continuous deposition of excavated material created as a result of construction of water conveyance channels and construction access would provide habitat for small game animals as well as cover, nesting and resting areas for songbirds and other passerines. In addition, these access corridors would likely provide additional forest edge and water edge interface that could be used by small game species and their food base.

The reduction of ponding, along with the circulation improvements proposed here, would eventually improve conditions for bottomland hardwoods and the associated wildlife dependent on them. The immediate study area in this portion of the management unit is comprised of approximately 32,000 acres of cypress-tupelo gum with willow and mixed hardwood forest on the small amount of the elevated ridges. Historical over bank flooding regimes would have impacted most of the interior of the study area approximated at 16,000 acres.

ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH), as outlined in the Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Public Law 104-297), has been considered, but based on lack of appropriate substrates, vegetation, and of Federally managed estuarine species, it has been determined that EFH is not found in the project area. Coordination with the National Marine Fisheries Service, Baton Rouge field office on July 9, 2002, affirmed that EFH does not occur in the project area.

ENDANGERED OR THREATENED SPECIES

This resource is institutionally significant because of: the Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald Eagle

Protection Act of 1940. Endangered (E) or threatened (T) species are technically significant because the status of such species provides an indication of the overall health of an ecosystem. These species are publicly significant because of the desire of the public to protect them and their habitats.

Existing Conditions

Eight Federally-listed endangered or threatened species may occur or once occupied the proposed work area. The pallid sturgeon (E) inhabits large, turbid, free-flowing rivers, including the Atchafalaya, but does not appear to use forested wetland overflow areas. The American Alligator is listed as threatened under the "Similarity of Appearance" clause to the Endangered Species Act, but population levels in the area are sufficient to legally allow a state-regulated trapping season. The ivory-billed woodpecker (E) and Bachman's warbler (E) were formerly associated with bottomland habitats within the study area, but lack of recent sightings casts doubt on their current presence. The Eskimo curlew (E) historically migrated through the southern parts of Louisiana during its northward spring migration. The bald eagle (T) is known to nest in cypress-tupelo swamps bordering the nearby Lake Fausse Point, eastern Grand Lake, Duck Lake, and Upper Grand River Flats, and probably forages in the study area. The Florida panther (E) historically inhabited bottomland forests in the Basin, and a small population of the Louisiana black bear (T), a subspecies of the American black bear, is currently known to exist in southern St. Mary and Iberia Parishes.

Future Conditions With No Action

Without implementing the proposed plan the interior swamp would continue to receive sediment and the interior shallow water lakes and open water swamps would eventually be less likely to provide for bald eagles food base which is needed to attract them to the area. Other species such as the Bachman's warbler could possibly use the area if man made alterations do not prevent the now cypress tupelo swamp to complete its succession to bottomland hardwood forest.

Future Conditions With Proposed Action

The MVN has prepared a biological assessment (BA) of implementation impacts on the Louisiana black bear (appendix, available upon request). Based on information from the USFWS, animals are occasionally reported from the Bayou Eugene study area. The proposed construction of circulation and drainage improvements combined with managed sedimentation should help preserve and provide long-term stability of cypress-tupelo swamps, and bottomland hardwoods and would neither significantly improve nor degrade habitats important to the Louisiana black bear. Recent coordination with USFWS (July 25, 2002) concurred with MVN's findings that the proposed activities are not likely to adversely impact listed or proposed threatened or endangered species, not their critical habitats.

CULTURAL RESOURCES

This resource is institutionally significant because of: the National Historic Preservation Act of 1966, as amended; the Native American Graves Protection and Repatriation Act of 1990; and the Archeological Resources Protection Act of 1979; as well as other statutes. Cultural resources are technically significant because of: their association or linkage to past events, to historically important persons, and to design and/or construction values; and for their ability to yield important information about prehistory and history. Cultural resources are publicly significant because preservation groups and private individuals support their protection, restoration, enhancement, or recovery.

Existing Conditions

An extensive study of the Atchafalaya Basin was published by Jon Gibson in 1982, and much of the discussion below borrows from that study. The prehistory of the Atchafalaya Basin is indistinct at its earliest phases, with no evidence of Paleo-Indian Period occupations in the basin proper. However, characteristic Paleo-Indian artifacts have been discovered at locations on the western edge of the basin, suggesting that traces of human occupation within the basin proper have been obliterated by river activity in the intervening millennia. This is also true of Archaic Period occupations, which again appear on the older and higher landforms at the margins of the Atchafalaya Basin around 6000 to 4000 B.P., and on the elevated lands of the Teche Ridge in the northern portion of the basin. Also, during the Late Archaic, Poverty Point-affiliated communities are known from the Basin. In the Tchula Period, Tchefuncte sites become more numerous, again placed prominently on stable, elevated, older landforms. Note that this patterning of sites in early prehistory is reasonable both from the standpoint of long-term site preservation from geologic / hydrologic disturbances, but also from the point of view of the ancient inhabitants, who would have preferred elevated, dry lands with good visibility of the overall landscape, as would be found at basin and river margins.

Early in the first millennium A.D., socio-politically complex Marksville populations occupied other areas of the lower Mississippi River valley. However, the Atchafalaya Basin seems to have been scarcely populated during this period. Shortly thereafter, Issaquena and Troyville populations settled into the swamps, lakeshores, and bayous of the Basin proper, but also continued living on the natural levees and higher lands of the basin margin. A similar pattern was seen in late Prehistory, during the Coles Creek and Plaquemine periods, with an increase in population size and number of villages throughout the region.

Within and nearby the larger BCMU project area, the Chitimacha Tribe of Louisiana has a long and continuous history. Jon Gibson cites an account from 1784, at which time numerous Chitimacha settlements were in existence in the lower Bayou Teche region and adjoining areas. The Chitimacha Tribe of Louisiana today still claims and maintains portions of these lands as their aboriginal homelands. In addition to the many ancient Chitimacha village locations recorded on State Records, the Chitimacha Indians remember, respect, and maintain numerous traditional cultural properties within Iberia,

St. Mary, and St. Martin Parishes and in close proximity to the current project area.

When Europeans arrived in the area, the earliest settlers were Acadian, French, and Spanish soldiers, trappers, and missionaries. The 1803 Louisiana Purchase transferred the territory to U.S. hands, which brought an influx of English-speaking settlers. Forests were cleared, lands were drained, and levees were constructed to protect the fertile agricultural lands. However, the Atchafalaya River corridor itself remained sparsely inhabited. The earliest settlers planted subsistence crops and made a brief foray into indigo production, which was wiped out by a caterpillar infestation between 1793 and 1796. By the early 1800s, however, cotton was the main commercial crop in the immediate area. Despite its poor navigability, the Atchafalaya River provided a means of transporting cash crops to market. This situation was slightly improved with the introduction of the first steamboat to the Atchafalaya Basin in 1819. These early boats had an average draft of only 28 inches when loaded, and were able to manage the low-water Atchafalaya River. Other than the economic disturbance associated with war and Reconstruction, the Civil War had little impact on the Atchafalaya Basin, since the swampy lands were unsuitable for troop movements.

According to the records held by the Louisiana State Office of Historic Preservation, there has been no cultural resources survey of construction areas within the Buffalo Cove area, and no prehistoric or historic archaeological sites or cultural resources are known within the construction areas of the project. Cultural Resources have been recorded within the BCMU area, but these are some distance from areas of planned construction or modification. The cultural resource sites nearest to any current or future construction area are Sites 161B42, 161B43, and 161B44 near Buffalo Cove and Grand Lake/Prejean Canal. These sites were first recorded in 1953 as shell middens, but could not be relocated either by Gibson's Atchafalaya survey team in the 1970's, or by MVN archeologists in 2002. These sites are presumed to be deeply buried by recent flood deposits. One proposed construction area is located near the former Bayou Chene community and the historic resources identified there, but the nature of work at this area and the distance from the historic settlements do not endanger any cultural resources.

Natural levees form the most prominent geologic features, averaging 4-5 meters above the surrounding swamp, generally less than 0.5 km in width. The principal force in the formation and subsequent alteration of these levees is intermittent flooding of the Atchafalaya and Mississippi Rivers, combined with lateral erosion and deposition of soils associated with migratory meanders. There has been recent, rapid, over bank deposition of fine-grained sediments due to increased flows in the Atchafalaya River since the early 1950s. Over the past 50 years, the project area has experienced significant sedimentation. Recent archeological survey for the former Bayou Chene community demonstrated over 6 feet of recent sediments over historic land surfaces. This flood deposition can be expected to have buried any historic or prehistoric cultural remains.

Site visits have been made to all proposed construction areas of the project area by a MVN archeologist, in both low water and high water. Random shovel tests were made, and surface examination of the areas was conducted. No evidence of significant cultural resources was found in any of the project areas.

Future Conditions with No Action

Without implementation of the proposed action, any undiscovered or unreported cultural resources would remain intact and in their current state of preservation. The burial of historic land surfaces would continue in the current pattern. There is no reason to believe that no action would have any positive or negative impact to cultural resources.

Future Conditions with Proposed Action

With implementation of the proposed action, any undiscovered cultural resources may be damaged during construction operations. However, the limited nature of the proposed work should not impact any historic land surfaces in the project construction areas. In addition, sedimentation during the past century should have buried any undiscovered cultural resources below the depth of potential construction impacts. Therefore, no direct impacts to cultural resources are expected. Throughout the larger area, it is possible that cultural resources may be indirectly impacted by increased water velocity caused by a return of natural drainage patterns. However, no known cultural resources exist in close proximity to the areas most likely affected in this way and no unknown cultural resources are expected to exist in areas most affected. Therefore, there is no reason to believe that the proposed action would have any positive or negative impact to cultural resources. Future monitoring of known cultural resources in the project vicinity would determine what impacts are taking place, and appropriate actions would be taken.

RECREATIONAL RESOURCES

This resource is institutionally significant because of the Federal Water Project Recreation Act of 1965, as amended, and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically significant because of the high economic value of recreational activities and their contribution to local, state, and national economies. Recreation resources are publicly significant because of the high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana; and the large per-capita number of recreation boat registrations in Louisiana. "While it is recognized and acknowledged that questions and opinions exist as to public access of waters within the project area, this subject is a matter of Louisiana real property law and, further, is not an authorized feature of the project."

The Atchafalaya Basin Floodway is bountiful in recreational opportunities. Within the 45-mile radius of the proposed project is a population exceeding 280,000. Many of that number engage in multiple recreational uses. On any given day during the year, families can be seen fishing, boating, bicycling, hiking, bird watching, crawfishing, canoeing, and hunting near the project. Included within the proposed project's market area are: 21,652 registered boats, 21,329 resident fishing licenses, and 17,080 resident hunting licenses.

Existing Conditions

Due to the fluctuating levels of the river, heavy sediment-laden water pours into the lower portion of the Atchafalaya Basin. This heavy sediment load affects the water quality, which in turn impacts the quality and quantity of the sport fishing and crawfishing available to the recreating public.

It should be noted that the Buffalo Cove area is a favorite canoeing spot for local paddling clubs and the Louisiana Chapter of the Sierra Club. It is considered to be a very aesthetically pleasing paddle for the beginner as well as the experienced paddler. While recreating in this part of the basin, individuals can observe abundant numbers of migratory waterfowl and songbirds.

Future Conditions With No Action

Without implementation of the proposed action, the BCMU would continue to be impacted by increasing amounts of sediment and nutrients being introduced into it. Poor water circulation would lend itself to vegetation/habitat changes that would be generally negative to the recreating public. While natural population growth would bring more visitors to the site over time, their experience would be diminished by the negative impacts of no action.

Future Conditions With Proposed Action

Future forest regeneration of hardwood and cypress species is dependent on highly oxygenated water. This would be important to the ever-increasing numbers of people who observe and enjoy bird watching and nature photography. The proposed project elements are designed to improve water quality, preserve terrestrial and aquatic habitats within the management units, and provide sufficient outlets for drainage in order to promote a southerly flow. These improvements would provide the basis for quality recreation experiences in this portion of the Atchafalaya Basin. Fishing, hunting, and canoeing are the most obvious recipients of the benefits, but the overall improved aesthetics would provide a positive natural outdoor experience for all users.

AIR QUALITY

This resource is considered institutionally significant because of the Louisiana Environmental Quality Act of 1983, as amended, and the Clean Air Act of 1963, as amended. Air Quality is technically significant because of the status of regional ambient air quality in relation to the National Ambient Air Quality Standards (NAAQS). It is publicly significant because of the desire for clean air expressed by virtually all citizens.

Existing Conditions

St. Martin, St. Mary, and Iberia Parishes are currently classified as "in attainment" of all NAAQS. This classification is the result of area-wide air quality modeling studies.

Future Conditions With No Action

Without the implementation of the proposed action any erosion or wind driven sediment would be minimal due to the both remote and rural location of the project area. In addition, due to the vegetated cover and moisture content of the adjacent soils, little wind blown particulate would be expected. Within the area adjacent to the project an occasional pipeline canal maintenance operation may leave excavated material that may become wind blown as it dries.

Future Conditions With Proposed Action

With the implementation of the proposed action, localized air quality may be minimally elevated above ambient due to emissions from excavating equipment. However, due to the minimal amount of equipment involved (backhoe) and the short length of construction applicability determinations noted that emissions were determined to be "de minimus"according to terminology of the Louisiana Department of Environmental Quality and no further action would be required. Indirect affects would be related to the spread of the emissions beyond the area of impact to the area of no action.

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

The MVN is obligated under Engineer Regulation 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all Hazardous, Toxic, and Radioactive Waste (HTRW) contamination within the vicinity of the proposed action. A HTRW Land Use History and a Phase I HTRW Initial Site Assessment (ISA #198) have been completed for the proposed action and are on file at the MVN. Based on information gathered during the preparation of this preliminary assessment, it is reasonable to assume that no hazardous, toxic, or radioactive wastes would be encountered during the course of construction activities. Land use in the project area encompasses undeveloped cypress-tupelo swamp and bottomland hardwood forest. The project should proceed as scheduled with construction. However, before initiation of construction activities, additional site visits should be conducted for those elements not visited due to access problems. Should the construction methods change or the area of construction be more than evaluated, the HTRW risk would require re-evaluation.

CUMULATIVE IMPACTS

The Council on Environmental Quality (CEQ) defines "cumulative impact" as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

Past actions within the project area involved, natural disasters, and construction of flood control measures (channel training, levee construction, dredged material placement), floodway construction, various real estate features (developmental control and environmental easements), construction of recreation feature (Myette Point boat

launch), oil exploration and production, occasional maintenance dredging, wildlife management activities and USACE (U.S. Army Corps of Engineers) water management activities (Bayou Eugene Prototype model studies and modifications). The Old River Control Structure (ORCS) and its associated components (the low sill and over bank structures) do not directly impact the proposed water management strategy or the proposed project. The presence of the ORCS along with the Mississippi River and Tributaries Project does affect the base hydrological conditions (stage and duration) used as a reference for project planning. Past actions, with the exception of the Corps water management activities, have resulted in isolating the interior swamps from the water inputs of the Atchafalaya River, made barriers to north south flow within the interior swamps, caused changes in interior circulation and drainage patterns, which contributed to the factors causing poor water quality. Natural disasters such as floods and hurricanes have also added their share of blockages to internal circulation through the influx of sediment or forming impediments to flow causing localized sedimentation. The increase influx of detritus (plant material) brought in through the hurricane surge has also added to the poor water quality and further deterioration of the area. The resulting man made and natural intervention in this area of the Atchafalaya Basin has caused premature conversion of one forest type to another and is discussed in the forested wetland section of this EA. Willow/tallow forests are quickly becoming more common on the west side of the Atchafalaya Basin from Butte La Rose, east to Beau Bayou, and south to the BCMU (pers. corn., Debossier, LDWF, 2003). As a result of these activities the woodland habitats have changed as well as the aquatic habitats. The commercial and recreational fishery in the area has been diminished by the past actions as the sediment fills in deep water habitat and internal circulation problems continually cause poor water quality. The variations in seasonal flooding caused by the past activities have in some cases affected the viability and access to timber and timber harvest. All of the mentioned actions collectively have had effects on the water quality of the ABFS and the BCMU. The possibility of affects of these past activities on cultural resources are actually for the most part unknown since only Federally-funded projects were tasked with the preservation and protection of cultural resources.

Presently at the State level, the LDNR is currently planning and designing State projects to complement the efforts of the ABFS Project's BCMU feature. The projects include Bayou Sorrel Cuts, Upper Grand River and Pigeon Bay Cuts, Bayou Postillion Opening, Henderson Lake Access Channel, and Schwing Chute Opening. LDNR's projects are not located in areas in which the USACE-MVN is authorized to construct BCMU elements under the ABFS authority and the State will not be entitled to seek in-kind credit under the ABFS MU authority for the LDNR projects. These projects along with the projects proposed in this EA would have a combined positive affect on improving water quality, water movement and better habitat for high quality forest species. Environmental, developmental control and public access easements acquired by the USACE in the ABFS would have an additive positive cumulative affect to the ABFS as a whole. Any additional oil and gas exploration and associated pipelines would continue within the ABFS, in areas where the USACE has not purchased easements. However, it is reasonable to believe that mitigation required for these permitted oil and gas activities would ensure that these actions do not have a cumulative negative effect in the ABFS. Private landowner activities continue in accordance with State and Federal

laws and regulations. These activities, while reduced and mitigated, may result in camp or housing development with attendant habitation and construction impacts on the environment.

In the recent past and foreseeable fixture, improvements within the management unit from both the environmental and cultural resources stance should be greatly improved. While oil exploration would continue the activities are now regulated and permitted by both a Federal and state process. If proper funding is forthcoming for enforcement and inspection of new pipeline and production facility installations the problems with water flow and circulation would be addressed. The state, Federal and private entities all have a better understanding of environmental friendly construction and are seen to willingly mitigate for damages. Regulatory policies within the state of Louisiana presently don't allow the construction of open pipeline canals with continuous elevated dredged material disposal. This practice has been replaced with non-continuous alternating bank disposal leaving gaps in the material banks for water passage. Additionally regulatory authorities require tunneling the pipe subsurface without canal construction if soil conditions allow. The proposed action will independently benefit target areas of impact and is expected not only to complement, but expand the area of water quality improvement, as additional features of the various management units are implemented as part of the basin wide strategy for improving water quality, circulation and sediment management.

In addition excavation and fill placement would be done in such a way as to not impede flow. In the near future there would be an additional pipeline placement in the existing Wanda Canal bordering the northern side of the BCMU. The USACE has coordinated with the US Fish and Wildlife Service, the pipeline company and regulatory agencies to assure that their pipeline installation is compatible with the USACE's overall Buffalo Cove Water Management Plan. This compatibility between plans assures the chances for blockages of internal circulation or north to south flow of water is eliminated. The USACE would continue internal coordination on all projects within the USACE dealing with the Atchafalaya Basin or affected by it. The affects of coastal projects or changes in Old River Structure operations would be assessed and coordinated. If changes in flows or circulation patterns are sufficiently aggressive to produce flows that may unearth artifacts, cultural resource monitoring or surveying would be initiated as advised by the MVN's staff archaeologist.

The benefits provided by the proposed water management elements evaluated in this EA will complement and enhance the water quality improvements that are expected to result from implementing the remaining management unit features for the Atchafalaya Basin. The Federal plans along with water management activities planned by the state would result in long term improvements in the water quality, allocation and circulation in ABFS. At the state level, the LDNR is currently planning and designing State projects to complement the efforts of the ABFS Project's WMU feature. The projects include Bayou Sorrel Cuts, Upper Grand River and Pigeon Bay Cuts, Bayou Postillion Opening, Henderson Lake Access Channel, and Schwing Chute Opening. LDNR's projects are not in areas that the USACE-MVN is authorized to construct WMU elements under the ABFS authority and the State will not be entitled to seek an in-kind credit under the ABFS MU authority for the LDNR projects. These projects would be built in a manner

as to not increase sedimentation or add additional impediments to flow within the basin. The plans being considered are for the most part removing existing barriers to flow, clearing, maintaining or improving existing entrances to flow rather than just constructing additional inputs.

In conclusion, in the foreseeable future water quality improvements along with decreased sedimentation and reduction in hypoxic conditions should continue to progress resulting in an overall more conducive environment for fish and wildlife. The expected results of these improvements, while beneficially effective alone, will continue to contribute to the entire comprehensive BCMU improvements in water quality and habitat that will be expanded as additional planned elements are added in the future. Future elements, beyond those designed would be included, in a future decision document and accompany the Supplemental EIS. On a national level, the Mississippi River Basin would see the implementation of practices to "reduce, mitigate, and control hypoxia in the Gulf of Mexico" (USEPA). These practices include reducing inputs of nitrogen to streams and rivers in the Basin and restoring and enhancing natural denitrification processes in the Basin. At the State level, the LDEQ's Non-Point Source Pollution Program would continue to establish TMDLs for the Atchafalaya River as mandated by a 1999 court order and implement watershed management strategies. With these efforts, water quality within the Atchafalaya River would improve which would translate into improved water quality in the floodplain of the river. At the ABFS and BCMU level, oil and gas exploration and the laying of pipelines would likely continue within the ABFS in accordance with the state and Federal laws and regulations. The LDNR would continue planning, designing, and constructing state projects to complement the efforts of the ABFS Project's WMU feature. With respect to landowner activities, the USACE, MVN has authorization to purchase approximately 338,000 acres of developmental control and environmental protection easements through the ABFS project flood control and environmental protection features. These real estate acquisitions are on - going in the ABFS and would limit timber harvesting, future development of camps, and other activities that may be detrimental to the environment. Activities on private lands within the BCMU upon which Federal environmental protection and developmental control easements have not been purchased would remain regulated through the USACE regulatory authority over wetlands until such easements are acquired by USACE.

COORDINATION

Preparation of this EA and a draft Finding of No Significant Impact (FONSI) has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, are receiving copies of this EA and draft FONSI:

U.S. Department of the Interior, Fish and Wildlife Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, National Marine Fisheries Service
U.S. Natural Resources Conservation Service, State Conservationist
Advisory Council on Historic Preservation

Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality, PER-REGC
Louisiana Department of Environmental Quality, EP-SIP
Louisiana State Historic Preservation Officer

MITIGATION

The proposed project is a feature of the ABFS project. The proposed project along with other features of the project, including the purchase of lands and environmental control easements, public access improvements, developmental and timber easements, and water management in other management units within the basin, are designed to offset the adverse impacts of other project features, such as borrow pits associated with levee upgrading and navigation channel improvements. The proposed project would improve fish and wildlife habitat by reducing the amounts of low quality, ponded water, managing the influx of sediment, and creating an environment conducive for regeneration of forest resources. Even though there are direct construction impacts, these are expected to be fully offset with benefits to over 58,000 acres of forested wetlands, and improvements in water quality and deep water and terrestrial habitat within the BCMU.

COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Environmental compliance for the proposed action would be achieved upon: coordination of this EA and draft FONSI with appropriate agencies, organizations, and individuals for their review and comments; USFWS and NMFS confirmation that the proposed action would not be likely to adversely affect any endangered or threatened species; LDNR concurrence that the project action is outside the coastal zone and is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program; receipt of a Water Quality Certificate from the State of Louisiana; completion of the Section 404(b)(1) Evaluation; receipt of the Louisiana State Historic Preservation Officer Determination of No Affect on cultural resources; receipt and acceptance or resolution of all USFWS Fish and Wildlife Coordination Act recommendations; receipt and acceptance or resolution of all LDEQ comments on the air quality impact analysis documented in the EA. The draft FONSI would not be signed until the proposed action achieves environmental compliance with applicable laws and regulations, as described above.

CONCLUSION

The proposed work would to reestablish north to south flows, provide water inputs, improve interior circulation and improve drainage outlets through a series of closures, gaps, and connecting water inlets that would be monitored and through adaptive

management would be modified as necessary to achieve the project goals. The proposed work would be accomplished by water based equipment or low impact marsh vehicles where feasible in order to reduce access corridor impacts. The work would be done during low water stages and should be complete within 3 to 6 months. This office has assessed the environmental impacts of the proposed action and has determined that the proposed action would have no impact upon cultural resources and no significant impact on aquatic resources, forested wetlands, fisheries, wildlife, essential fish habitat, endangered or threatened species, recreation, hydrology, water quality, and air quality. Other elements considered but were either not impacted or applicable to the area; prime and unique farmlands, coastal zone consistency issues, geology, and climate.

PREPARED BY

EA # 366 and the associated draft FONSI were prepared by Larry Hartzog, biologist, with relevant sections prepared by: Casey Rowe--HTRW; Paul Hughbanks--Cultural Resources; Jay Gamble--Recreational Resources; DannyWiegand--Water Quality; and Nancy Powell--Hydrology. The address of the preparers is: U.S. Army Corps of Engineers, New Orleans District; Planning, Programs, and Project Management Division, CEMVN-PM; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

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