



Coastal Protection and
Restoration Authority of Louisiana

**State of Louisiana
Office of Coastal Protection and
Restoration**

2010 Annual Inspection Report

for

**BRADY CANAL HYDROLOGIC
RESTORATION PROJECT (TE-28)**

State Project Number TE-28
Priority Project List 3

December 28, 2010
Terrebonne Parish

Prepared by:

Brian Babin, P.E.
Office of Coastal Protection and Restoration
Operations Division
Thibodaux Field Office
1440 Tiger Drive, Suite B
Thibodaux, La. 70301

Table of Contents

I. Introduction.....	1
II. Inspection Purpose and Procedures	1
III. Project Description and History.....	2
IV. Summary of Past Operation and Maintenance Projects.....	3
V. Inspection Results	6
VI Conclusions and Recommendations	9

Appendices

Appendix A	Project Features Map
Appendix B	Photographs
Appendix C	Three Year Budget Projections
Appendix D	2009/2010 Work Plan

I. Introduction

The Brady Canal Hydrologic Restoration Project consists of 7,653 acres located in the Terrebonne Basin, within the Bayou Penchant - Lake Penchant watershed in Terrebonne Parish, Louisiana. The project is bounded by Bayou Penchant, Brady Canal, and Little Carencro Bayou to the north, Bayou Decade and Turtle Bayou to the south, Superior canal to the east, and Little Carencro Bayou and Voss Canal to the west (Appendix A – Project Features Map).

The Brady Canal Project is a hydrologic restoration project consisting of the installation and maintenance of a fixed crest weir with barge bay, a rock plug, several variable crest weir structures, earthen embankments and overflow banks, rock dikes, rock armored earthen embankments and rock armored channel liners. These structures were designed to reduce the adverse tidal affects and saltwater intrusion in the project area and to promote freshwater introduction for better utilization of available freshwater, and retain sediment, as well as to encourage re-establishment of emergent and sub-aquatic vegetation in eroded areas (Folse, August 2003)

The Brady Canal Hydrologic Restoration Project (TE-28) is co-sponsored by the Natural Resource Conservation Service (NRCS) and the Louisiana Office of Coastal Protection and Restoration (OCPR). The project was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended and approved on the third Priority Project List.

II. Inspection Purpose and Procedures

The purpose of the annual inspection of the Brady Canal Hydrologic Restoration Project (TE-28) is to evaluate the constructed project features, identify any deficiencies, and prepare a report detailing the condition of the project features including recommendations for corrective actions, as needed. Should it be determined that corrective actions are required, OCPR shall provide in the inspection report, a detailed cost estimate for engineering, design, bidding, construction oversight and supervision, project contingencies, and an assessment of the urgency of such repairs (LDNR_CRD; Pyburn and Odom, 2002 OM&R Plan). The annual inspection report also contains a summary of the completed maintenance projects and an estimated projected budget for the upcoming three (3) years for operations, maintenance and rehabilitation. The three (3) year projected operations and maintenance budget is shown in Appendix C. A summary of completed operation and maintenance projects are outlined in Section IV of this report.

An inspection of the Brady Canal Hydrologic Restoration (TE-28) project was held on April 22, 2010 under clear skies and windy conditions. In attendance were Brian Babin and Todd Folse from OCPR, Quin Kinler, Warren Blanchard and J. Boatman with NRCS, and the landowners; B. McElroy with ConocoPhillips and F. Fields representing Apache Minerals, Inc. The attendees met at the Falgout Canal Boat Launch. The inspection began at approximately

9:00 a.m. at the intersection of Turtle Bayou and Bayou Decade and ended at 1:00 p.m. along Brady Canal near the Apache Camp.

The field inspection included a complete visual inspection of all constructed features within the project area. Photographs of all project features were taken during the field inspection and are shown in Appendix B. Staff gauge readings, where available, were documented and used to estimate approximate water elevations, elevations of rock weirs, earthen embankments, and other project features.

III. Project Description and History

The Brady Canal Hydrologic Restoration project is bisected by the Mauvais Bois Ridge, resulting in different hydrologic regimes to the north and south of the ridge. The northern section of the project area receives freshwater and sediments which are provided by over-bank flow from Bayou Penchant, Little Carencro Bayou, and Brady Canal (USDA/NRCS 1995). The Mauvais Bois Ridge forms a barrier through the project area reducing the outflow of freshwater to the southern portion of the project area. Freshwater and sediment retention in the southern portion of the project area has diminished due to unimpeded through-flow and tidal exchange combined with a lack of freshwater introduction from the north (USDA/NRCS 1995). In addition, oilfield access canals extending from within the project area to the Bayou Decade levee ridge have also increased tidal exchange and provided direct routes for saltwater intrusion and a reduction in freshwater and sediment retention (USDA/NRCS 1995).

Major changes to the hydrology of the Penchant Basin, both natural and human induced, have resulted in a complex hydrologic setting (USDA/NRCS 1995). Under natural hydrologic conditions, the Penchant Basin is confined by natural levee ridges and is open to the west and southwest where it connects with the Lower Atchafalaya River, Atchafalaya Bay, and Fourleague Bay. Historically, this hydrologic setting produced an estuarine system created by freshwater introduction in the upper basin and tidal exchange with the bays. Over time, hydrologic conditions in the Penchant Basin were altered by the construction of numerous canals, levees, local water management structures, and major public works projects. Some of the major projects that have contributed to the change in the hydrologic conditions of the basin are the Atchafalaya Basin Floodway, the Avoca Island Levee project along the Lower Atchafalaya River, the Gulf Intracoastal Waterway (GIWW), the Bayou Chene, Boeuf, and Black Projects, the rock weir at Wax Lake, and the Houma Navigation Canal (USDA/NRCS 1995).

The objective of the Brady Canal Hydrologic Restoration Project is to maintain and enhance existing marshes in the project area by reducing the rate of tidal exchange and improving the retention of introduced freshwater and sediment (Folse T., 1998). Specific goals of the project are to (1) decrease the rate of marsh loss, (2) maintain or increase the abundance of plant species typical of a freshwater and intermediate marsh, (3) decrease variability in water level within the project area, (4) decrease variability in salinities in the southern portion of the project, (5) increase vertical accretion within the project area and (6) increase the frequency of occurrence of SAV within the project area. (Folse T., 1998)

The Brady Canal Hydrologic Restoration Project (TE-28) was completed in July 2000 and involved the installation of the following project features:

Structure 6 – fixed crest weir with barge bay
Structure 7 – rock plug
Structure 10 – stabilization rock armored channel liner
Structure 14 – fixed crest weir with variable crest section
Structure 20 – stabilization rock armored channel liner
Structure 21 – fixed crest weir with three (3) variable crest sections
Structure 23 – fixed crest weir with two (2) variable crest sections
Structure 24 – fixed crest weir
4,405 linear ft. – rock armored earth embankment
3,660 linear ft. – rock dike
8,531 linear ft. – Earthen embankment
Maintenance of existing over-flow banks (21,600 ft.)

IV. Summary of Past Operation and Maintenance Projects

General Maintenance: Below is a summary of maintenance projects and operation tasks performed since the completion of the Brady Canal Hydrologic Restoration (TE-28) project.

Under Article II of the Brady Canal Cost Share Agreement, the landowners, ConocoPhillips, formerly Burlington Resources and the Apache Minerals Corporation were granted in-kind service credits to repair existing earthen embankments within the project area. Below is a description of work and cost associated with the maintenance performed by the landowners:

In Kind Service Credits

7/30/2007 – Apache Corporation contracted Dupre Brothers Construction, Inc. of Houma, La. to repair several breaches along the east bank of Jug Lake and reinforce earthen embankment tie-ins adjacent to variable crest weir structures #21, #23, and #24. The repairs were completed on 7/30/2008 at a total cost of \$9,103.12

9/30/2006 – Conoco Phillips contracted Dupre Brothers, Inc. of Houma, La. to repair several breaches along Carencro Bayou, Little Carencro Bayou and Brady Canal using material from adjacent bayous. The total cost for refurbishment and repair of these breaches was \$25,890.

9/20/2006 - Apache Corporation contracted Frisco Construction Co. Inc. of Houma, La. to repair breaches and refurbish low areas of the spoil banks along the east bank of Jug Lake and embankment tie-ins adjacent to structures #21,

#23 and #24. The repairs were completed on 9/20/2006 at a total cost of \$9,265.

10/31/2003 - Apache Corporation contracted Berry Bros. General Contractors to completed 5,050 linear feet of levee refurbishment along the west bank of Jug Lake. The cost for the levee refurbishment including construction oversight was \$34,284.87. Following the levee refurbishment, Shaw Coastal performed an as-built survey of the repairs at a cost of \$5,100.60. The total project cost for this maintenance event was \$39,385.47.

8/15/2003 – ConocoPhillips, formerly Burlington Resources, completed the repair of two (2) large breaches along Little Carencro Bayou following Hurricane Lili. The maintenance project was completed on 8/15/2003 at a total cost of \$31,642.57, including construction oversight and administration.

10/21/2002 - Apache Corporation contracted Frisco Construction Co. to repair and restore the existing levee embankment along Turtle Bayou, Superior Canal, and along the west bank of Jug Lake. This work was completed at a total cost of \$5,310,.

Brady Canal Breach Repair Project (2003) – LDNR: This maintenance project was completed on August 13, 2003 and included the installation of approximately 9,667 tons of riprap along the north bank of Bayou Decade, 2,325 linear feet of levee refurbishment and earthen breach repair along Turtle Bayou and Superior Canal, and replacement of a timber pile on the navigational aid structure at Weir 6. The cost associated with the engineering, design and construction of the 2003 Brady Canal Breach Repair Project is as follows:

Construction:	\$471,329.65
Engineering & Design:	\$ 54,473.00
Bidding:	\$ 4,100.00
Construction Administration:	\$ 8,020.00
Construction Oversight:	\$ 49,635.00
As-built Survey and Drawings:	<u>\$ 12,873.00</u>
Project Total:	\$600,430.65

Structure Operations: In accordance with the operation schedule outlined in the Operation and Maintenance Plan, Structures #14, #21, and #23 have been operated twice annually beginning in April 2002. Below is a summary of costs incurred for structure operations:

03/02	Pyburn & Odom	\$9,772.50
09/02	CEEC	\$4,674.00
03/03	CEEC	\$4,022.58
09/03	CEEC	\$3,612.93

03/04	Shaw Coastal	\$4,676.18
09/04	Shaw Coastal	\$5,365.25
03/05	T. Baker Smith	\$8,804.83
09/05	T. Baker Smith	\$8,886.60
03/06	T. Baker Smith	\$7,668.59
09/06	T. Baker Smith	\$9,970.37
03/07	T. Baker Smith	\$8,602.12
09/07	T. Baker Smith	\$9,203.61
03/08	T. Baker Smith	\$7,595.99
10/08	Apache Minerals	\$6,000.00
03/09	Apache Minerals	\$6,000.00
10/09	Apache Minerals	\$6,000.00
03/10	Apache Minerals	\$6,000.00

Prior to the scheduled operations in September 2008, the OCPR entered into a sole-source agreement with Apache Minerals for the landowner to assume responsibility of operating all water control structures associated with the Brady Canal (TE-28) project. The cost proposal submitted by Apache to complete this work in accordance with terms of the agreement is \$12,000, annually. Apache began structure operations in September 2008.

Navigational Aids Maintenance: During the operation and maintenance phase of the Brady Canal Hydrologic Restoration (TE-28) Project, the navigational aids at Structure 6 along Bayou Decade have been repaired several times. Below are the dates and costs associated with the repair and maintenance of these navigation lights:

2/2007 – LDNR received bids for a state-wide maintenance contract for inspection, diagnostic testing and maintenance of twenty-seven (27) navigational aid systems at ten (10) separate locations throughout the state. Four (4) the twenty-seven (27) navigational aid structures are located at Structure 6 within the Brady Canal project area. The total cost of the state-wide maintenance contract is approximately \$83,000 annually, with an option to extend the contract for an additional two (2) years. Inspections of the navigational aids at Structure 6 began in February 2007 under the current maintenance contract.

11/2003 – Ernest P. Breaux Electrical Inc. replaced 20 lamps, 4 – batteries, 1 – lamp changer, 1 – photo cell at structure 6. The cost for parts and labor to service these navigational aids was \$4,132.30.

8/2002 - Automatic Power, Inc. of Larose, La. performed trouble shooting services to determine a schedule of parts requiring replacement – Cost: \$465

8/2002 – B&B Electromatic of Norwood, La. repaired the navigation lights at structure 6 including parts and labor for a total cost of \$2,039.

Since the fall of 2008, Apache Minerals has taken over responsibilities for operating the three (3) variable crest weir structures within the project area. The sole-source contract between Apache Mineral and the OCPR requires the structures be operated in accordance with the project permits. At the time of the inspection, the stop logs at Structure No.14 were positioned at the lowest position or channel bottom.

V. Inspection Results

Structure 6 – Fixed crest weir with barge bay

Structure 6 appears to be in good condition with no obvious defects in the steel bulkhead or washouts around the bulkhead tie-ins to the earthen embankment. The only documented deficiency was moderate to severe damage to the two (2) timber pile dolphins on the south side of the structure (Bayou Decade side). The batter piles were off center and split down the middle, and the steel cable wraps around the pile clusters were very loose. Due to the orientation of the barge bay structure with Bayou Decade, requiring a 90 degree turn, it is apparent that the oilfield service barges are having difficulties accessing the barge opening and are using the timber dolphins as navigation guides to maneuver through the barge bay, causing wear and tear on the timber structures. To alleviate future damage and wear, we are recommending that the existing timber dolphins be removed and replaced with a more rigid timber structure including additional batter piles for more lateral stability, if possible. It is also recommended that all signs on navigational aid structures be replaced. These modifications will be included in the upcoming 2010 Maintenance Project scheduled to begin later this year. All navigation lights appear to be in good condition and operational. (Appendix B, Photos 1 through 5)

Structure 7 – Rock Plug

Structure 7 appears to be in very good condition with no signs of erosion near the earthen embankment tie-ins or displacement of the rock plug which would require maintenance or refurbishment. There are no recommendations for corrective actions of Structure 7 (Photos not available).

Structure 10 – Stabilization rock armored channel liner

The rock armored channel liner along Voss Canal appeared to be in good condition with no apparent structural damage, settlement or displacement. Staff gauge readings at the center of the channel liner indicated that the water depth above the rock crest was approximately 6.5' below the water line. From water level readings on April 22 of +1.0' NAVD, obtained from a CRMS station north of Structure No.6, it is estimated that the crest of the structure is currently at -5.5' NAVD. As reported in the 2009 inspection report, several of the warning signs marking the boat bay of the structure were damaged. The timber piles were leaning over in a horizontal position just above the water surface. Under the 2010 Maintenance Project, the planned corrective action is to remove and replace the existing timber piles and warning signs. (Appendix B, Photos 6 through 8)

Structure 14 – fixed crest weir w/ variable crest section

The variable crest weir structure located along the east bank of Bayou Carencro appeared to be in very good condition with no noticeable damage to the steel sheet pile, grating platform, steel railings or warning signs. The earthen embankment tie-ins were in fair condition with minor erosion on the bayou side of the structure. Since the structure is located in a low wave energy environment and we have not noticed a significant change over the past several inspections, we are not recommending corrective actions at this time. These areas will be monitored on future site visits for any change or increased erosion. (Appendix B, Photos 9 through 11)

Structure 20 – Stabilization rock armored channel liner

The rock armored channel liner along the west bank of Jug Lake appeared to be in fair condition with minor displacement of the rock riprap along the banks on both sides of the structure. Based on measurements taken during the inspection, the crest of the rock liner at the center of the boat bay was approximately 8.0' below the water line. Elevations were estimated using elevation data from an existing sonde station north of Structure 6. From the as-built drawings, the elevation at the center of the bay opening was constructed to an elevation of -4.75 NAVD 88. Based on water elevation readings of 1.0' on April 22, this would indicate that the structure had settled approximately 3' in the center. Prior to any corrective actions, we are recommending that a survey profile across the entire structure be conducted to verify field measurements. (Appendix B, Photos 12 and 13)

Structure 21 – fixed crest weir w/ three (3) variable crest sections

The variable crest weir structure with three (3) stop log bays appeared to be in good condition with no visible corrosion of structural components or damage. Although the structure is in good condition, the earthen embankment tie-ins have eroded exposing the end of the steel sheet pile bulkhead on the north side of the structure. Although the earthen embankment is not breached, the tie-ins to the steel bulkhead continue to be prone to erosion from wave energies from the lake. To alleviate the erosion of the earthen tie-ins, we have included provisions in the 2010 Maintenance Project for a hardened structure on both sides of the structure near the earthen embankment tie-ins. This work would include reconstructing the earthen tie-ins with in situ material from the lake and armoring approximately 100 linear feet on both sides of the structure with riprap in an attempt to slow erosion. The signs and supports for Structure 21 are in good condition and will not require replacement (Appendix B, Photos 16 through 18).

Structure 23 – fixed crest weir w/ two (2) variable crest sections

The variable crest weir structure appeared to be in good condition with no visible damage to the steel sheet pile wall, hand rails, deck grating or other structural components. However, as noted in previous reports, the north side of the earthen embankment tie-in has eroded leaving a small breach opening to the interior marsh. Although the breach has been refurbished on several occasions, erosion at the tie-ins continues to be a reoccurring problem requiring

periodic maintenance. Subsequent to the 2010 annual inspection, the south side of the earthen embankment has also breached. To alleviate the erosion of the earthen tie-ins, we have included provisions in the 2010 Maintenance Project for a hardened structure on both sides of the structure near the earthen embankment tie-ins. This work would include reconstructing the earthen tie-ins with borrow material from the lake and armoring approximately 100 linear feet on both sides of the structure with riprap in an attempt to slow erosion. The signs and supports for Structure 23 are in good condition and will not require replacement or maintenance. (Appendix B, Photos 19 through 21)

Structure 24 – fixed crest weir

The fixed crest weir located along the southeast bank of Jug Lake appeared to be in very good condition with no visual signs of corrosion of the structural components or erosion of the earthen tie-ins. The earthen tie-ins were refurbished by Apache Minerals, Inc. in July 2007 and are holding up well. Although the earthen wing-walls appear to be stable, we plan to construct a rock revetment on both sides of the structure under the 2010 Maintenance Project to protect the tie-ins which are normally vulnerable to erosion during storm events and bank overflow during high tides. All signs and timber supports were also in good condition. (Appendix B, Photo 22 through 24)

Earthen Embankments

The annual inspection of earthen embankments began at the southeast end of the project area and included Turtle Bayou and Superior Canal, along unarmored sections of Bayou Decade, through Voss Canal, Bayou Carencro and ended at the northern end of the project along Brady Canal near the Apache Camp. The earthen embankments along Turtle Bayou and Superior Canal were in good condition with no noted breaches or low thin areas in the embankment which would require maintenance. An inspection of Bayou Decade revealed a low area along the unarmored section along the north bank of Bayou Decade west of Jug Lake to the rock revetment reach east of Structure 6 (Appendix B, Photo 44). This stretch of embankment has been identified and included in the 2010 Maintenance Project for refurbishment. Repairs shall consist of dredging borrow material from Bayou Decade to rebuild the original design section. This section will not be armored. The remaining unarmored segments of the earthen embankment along Bayou Decade were in fair condition with large cut banks visible in isolated areas west of Structure 7 between Structures 7 and 10 (Photos not available). The consensus of the inspection team is that breaching was not imminent and that the inspection team will continue to monitor the erosion in these areas on future site visits rather than proceeding with refurbishment under the 2010 Maintenance Project. As indicated on previous inspections, there were a total of eight (8) breaches identified for repairs along Little Carencro Bayou, Carencro Bayou and Brady Canal. Subsequent to the 2010 field inspection, ConocoPhillips had repaired six (6) of the eight (8) breaches with exception of Breach 6 adjacent to an existing timber bulkhead at the end of Brady Canal (Appendix B, Photo 48) and Breach 7 located along the south bank of Brady Canal, just north of the timber bulkhead (Appendix B, Photo 47). The repair of Breaches 6 and 7 are included in 2010 Maintenance Project expected to begin in 2011. The locations of all breaches, including repaired breaches, are shown in the 2009/2010 Work Plan under Appendix D. Other deficiencies included low

and degraded sections of the earthen embankment along Voss Canal north of Structure No.10. The bank line in this area appears to have receded since the completion of construction. Although the existing embankment is in fair condition and does not warrant maintenance at this time, we are recommending vegetative plantings along the slopes and berm for added protection against erosion.

Over the past several years, since Hurricanes Katrina and Rita, the earthen levee surrounding Jug Lake has become very thin and narrow, particularly on the southeast side of the lake. Of all the overflow banks and levee embankments making up the boundary of Brady Canal project, the perimeter of Jug Lake has become an area of most concern. The Jug Lake boundary is approximately 20,000 ft. in length and is oriented in a northeasterly to southwesterly direction with very little marsh remaining on either side of the bank line. For this reason, both sides of the earthen embankment are exposed to high wave energies from the lake and open water on the inside of the project area. The degradation of this levee would have negative impacts to the project by rendering the three (3) water control structures along the lake boundary inoperable and allow large volumes of high saline waters into the northern portions of the project area which is primarily brackish. Considering the negative impacts associated with the failure of the earthen embankment system surrounding Jug Lake, OCPR has implemented the 2010 Maintenance Project to restoring the entire 20,000 linear foot rim of the lake. Restoration of the lake rim shall consist of reconstructing the earthen embankment using borrow material from the lake. To address the erosion problems adjacent to the water control structures (Structures 21, 23 &24), a 100 foot rock revetment will be installed above the newly constructed earthen embankment on both sides of the control structures to protect the embankment tie-ins (Appendix B, Photos 25 through 43).

Rock Armored Embankments

Rock armored embankments along the north bank of Bayou de Cade and Voss Canal appear to be in good to fair condition. The earthen embankment with rock revetment beginning at the intersection of Bayou Decade and Voss Canal to Structure 10 along the east bank of Voss Canal appeared to have settled slightly with moderate displacement since construction. Although low, there were no indications of breaching in the dike or severe rock displacement. OCPR will continue to monitor the condition of rock dike structure on future field investigations. The earthen embankment with rock revetment along Bayou Decade between Structure 6 and 7 and just west of Structure 7 appear to in very good condition with no apparent settlement or rock displacement. The rock dike constructed under the 2003 Maintenance Project along the north bank of Bayou Decade between Turtle Bayou and Jug Lake appeared to be in fair condition with moderate displacement and isolated low areas. Although there are minor deficiencies noted along the rock dike, there is no indication that the structure is not performing as intended so we are not recommending maintenance of the rock dike at this time (Appendix B, Photos 50 through 55).

VI. Conclusions and Recommendations

Since annual inspections of the Brady Canal Hydrologic Restoration (TE-28) project began in 2001, a number of deficiencies have been documented that will require maintenance and/or refurbishment. In January 2010, OCPR initiated maintenance of the Brady Canal Project – 2010 Maintenance Project by contracting Arcadis, Inc. of Baton Rouge to perform the design and the preparation of the necessary contract documents for maintenance of the deficiencies outlined in Section V of this report. The 2010 Maintenance Project will be the second major maintenance event since the 2003 Maintenance Project to refurbish earthen embankments along Turtle Bayou, Superior Canal, and the installation of the rock dike along the north bank of Bayou Decade between Turtle Bayou and Jug Lake was completed. Prior to the design and plan preparations, OCPR contracted with T. Baker Smith, Inc. of Houma, La. to perform the necessary design surveys for the project. The initial survey for the project was completed at the end of May 2010; however, a task amendment was issued in June 2010 to collect additional data for deficiencies identified during the 2010 Annual Inspection. All survey work for design has been completed. As of December 2010, Arcadis, Inc. is approximately 90% complete with the design of the project. We anticipate the project manual and bid documents will be completed by the middle of February 2011 and construction to begin by the summer of 2011.

Below is a summary of the identified deficiencies and recommended methods of repair that will be included in the Brady Canal - 2010 Maintenance Project (Appendix D, 2010 Work Plan):

Structure 6 – Timber Cluster Pile Replacement

The timber cluster pile replacement shall include removal of two (2) existing timber pile structures on the south side of Structure 6 and replacing them with new treated timber piles, supports, cables and hardware. It is also recommended that the new structure be more rigid with additional lateral support. This could be accomplished by adding another batter pile to the timber pile cluster. This work shall also include removal and reinstallation of the navigation aid system and installation of new signs.

Structure 10 – Warning Sign Replacement

Warning sign replacement shall include the removal of four (4) existing timber piles and signage and replacement with new material including timber piles, hardware and warning signs.

Structure 21, 23 and 24 – Variable Crest Weir Structures

Maintenance to Structures No. 21, 23 and 24 shall include refurbishment of the earthen wing walls using borrow material from Jug Lake to restore the existing embankment to the original design elevations. Once the embankment is restored, a 100' long rock riprap blanket will be

constructed over the new constructed embankment to protect the tie-ins at the wing walls on both sides of the structures.

Earthen Embankments – Jug Lake

The refurbishment of the lake rim shall include clearing and grubbing trees and brush along 20,000 linear feet of the existing embankment and excavating material from the lake bottom to restore the embankment to the original designed section, followed by seeding of the entire crest and slope of the embankment.

Earthen Embankments – Bayou Decade

The refurbishment of a low, unarmored section along the north bank of Bayou Decade east of Structure 6 shall include clearing and grubbing trees and brush along the existing embankment and excavating material from Bayou Decade to restore the existing embankment to the original design elevations. The entire crest and slope of the 1,200 linear foot section shall be seeded following reconstruction of the embankment.

Earthen Embankments – Breaches 6 and 7

Due to the depth of Breach 6 and the close proximity to an existing timber bulkhead, the breach will be closed using rock riprap. Prior to placement of the rock riprap material, a geotextile fabric shall be used to line the breach and adjacent bank. The breach closure shall be constructed to the existing elevation of the timber bulkhead. Repairs to Breach 7 shall include excavating material from Brady Canal to reconstruct the existing overflow bank to the permitted elevation. The new constructed breach closure shall be seeded after construction is complete.

Vegetative Plantings

In addition to seeding the earthen embankment along Jug Lake following the levee refurbishment project, we also would like to plant a salt tolerant smooth-cord grass along the most critical sections of the degraded embankment along Voss Canal north of Structure No.10. At this time, we are unsure of the number of plants that will be required to cover the degraded areas.

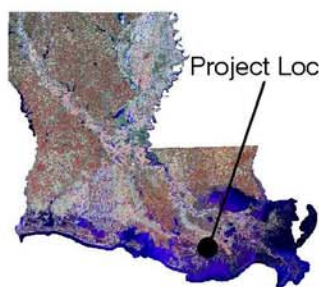
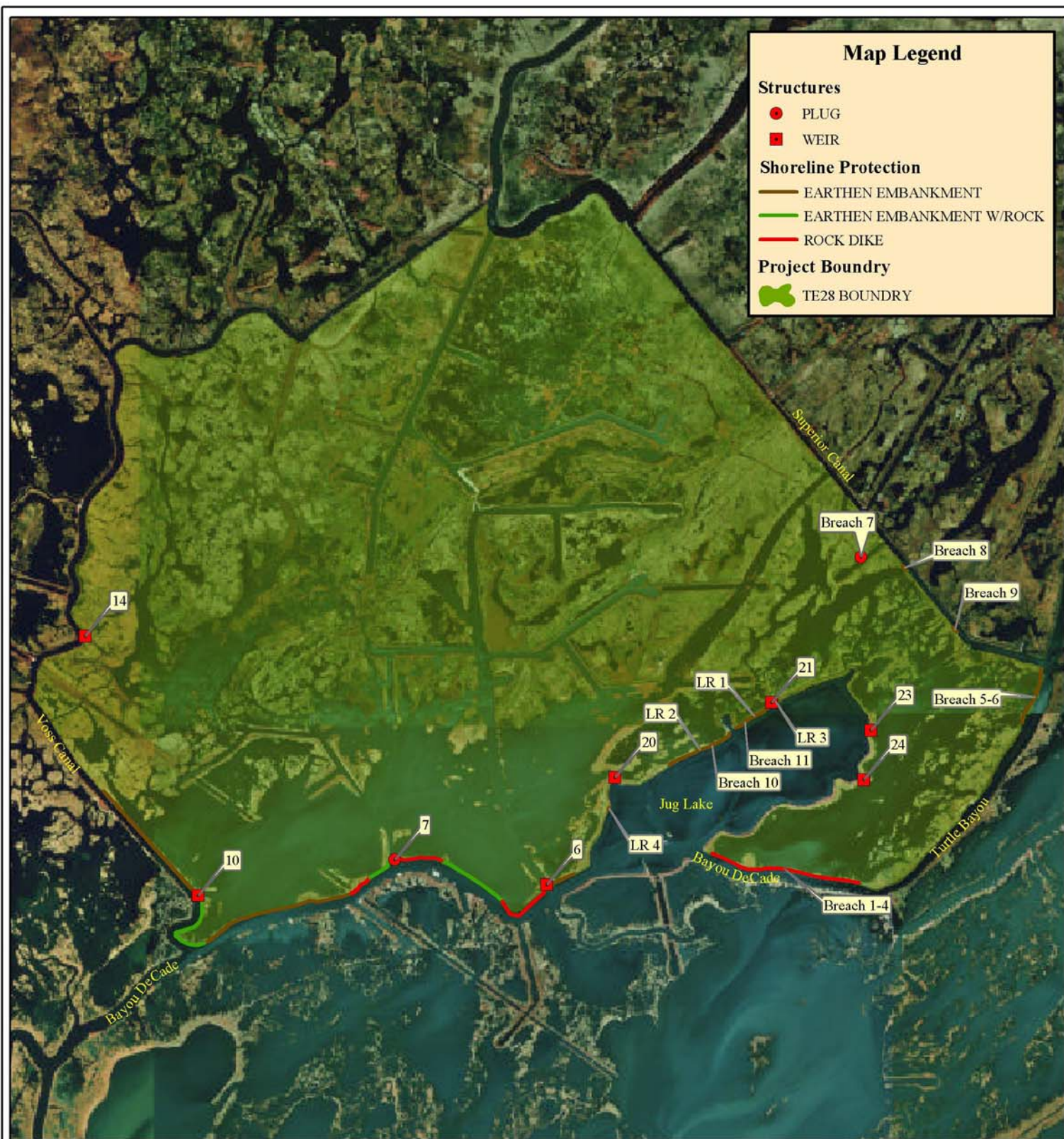
References:

Folse, T. August 2003. Monitoring Plan for the Brady Canal Hydrologic Restoration Project (TE-28), Louisiana Department of Natural Resources, Coastal Restoration Division, 16pp.

Louisiana Department of Natural Resources – Coastal Restoration Division and Pyburn and Odom, Inc. 2002. Operation, Maintenance and Rehabilitation Plan for the Brady Canal Hydrologic Restoration Project (TE-28)

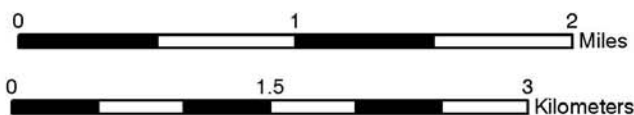
United States Department of Agriculture – Natural Resources Conservation Service 1995. Project Plan and Environmental Assessment for the Brady Canal Hydrologic Restoration Project.

Appendix A
Project Features Map



TE28 - Brady Canal Hydrologic Restoration

PROJECT FEATURES MAP



Data Source:

LA Dept. Natural Resources
Coastal Engineering Division
Thibodaux Field Office

1998 DOQQ AERIAL

Date: March 2, 2005

Map ID: 2005-TFO-010

Appendix B

Photographs



Photo No.1 – rock breach closure “Breach 7” installed in 2003 along an existing location Canal off of Superior Canal looking northeast.



Photo No.2 – rock breach closure “Breach 7” installed in 2003 along an existing location Canal off of Superior Canal looking northeast.



Photo No.3 – rock breach closure “Breach 7” installed in 2003 along an existing location Canal off of Superior Canal looking northeast.



Photo No.4 – view of north bank of Bayou Decade near the intersection of Turtle Bayou and Bayou Decade.



Photo No.5 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.6 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.7 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.8 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.9 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.10 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.11 - view of rock dike and breach closure (Breach 1 thru 4) constructed along the north bank of Bayou Decade in 2003 looking north.



Photo No.12 – view of existing shoreline along the north bank of Bayou Decade at the entrance to Jug Lake looking northwest.



Photo No.13 – view of thin bank line along the southern bank of Jug Lake west of Structure No.24. The refurbishment of this bank line is included in the 2010 Maintenance Project.



Photo No.14 – view of thin and low bank line along the southern bank of Jug Lake west of Structure No.24. The refurbishment of this bank line is included in the 2010 Maintenance Project. Note the large breach on the left side of the photo that has opened up since Hurricanes Gustave and Ike.



Photo No.15 – view of large breach in the south bank of Jug Lake west of Structure No.24. The breach opened up after Hurricanes Gustave and Ike. The refurbishment of this bank line is included in the 2010 Maintenance Work Plan.



Photo No.16 – view of thin and low bank line along the southern bank of Jug Lake west of Structure No.24. The refurbishment of this bank line is included in the 2010 Maintenance Project.



Photo No.17 – view of thin and low bank line along the southern bank of Jug Lake west of Structure No.24. The refurbishment of this bank line is included in the 2010 Maintenance Project.



Photo No.18 – view of thin and low bank line along the southern bank of Jug Lake west of Structure No.24. The refurbishment of this bank line is included in the 2010 Maintenance Project.



Photo No.19 – view of thin and low bank line along the southern bank of Jug Lake west of Structure No.24. The refurbishment of this bank line is included in the 2010 Maintenance Project.



Photo No.20 – view of bank line along the southern bank of Jug Lake just west of Structure No.24. This section of bank line is heavily vegetated and appears to be stable. The refurbishment of this bank line is included in the 2010 Maintenance Project.



Photo No.21 – view of earthen bank tie-in on the west side of Structure No.24 in Jug Lake. The refurbishment of this earthen embankment tie-in is included in the 2010 Maintenance Project and will be armored with rock riprap approximately 100' west of the structure.



Photo No.22 – view of earthen bank tie-in on the east side of Structure No.24 in Jug Lake. The refurbishment of this earthen embankment tie-in is included in the 2010 Maintenance Project and will be armored with rock riprap approximately 100' east of the structure.



Photo No.23 – view of earthen bank tie-in on the south side of Structure No.23 in Jug Lake. The earthen embankment tie-in is nearly breach on this side with a small amount of material connecting the structure to the embankment. This section of tie-in will be armored with rock riprap approximately 100' south of the structure.



Photo No.24 – view of the two (2) bay variable crest structure (Structure No.23) located in Jug Lake on the northeast side of Jug Lake.



Photo No.25 – view of earthen bank tie-in on the north side of Structure No.23 in Jug Lake. The earthen embankment tie-in is breached on this side. This section of tie-in will be armored with rock riprap approximately 100' north of the structure.



Photo No.26 – view of shoreline of Jug Lake on the north side of the lake near what appears to an old existing slip.



Photo No.27 – view of shoreline of Jug Lake on the north side of the lake northeast of Structure No.21.



Photo No.28 – view of the exposed steel bulkhead on the northeast side of Structure No. 21 along the north bank of Jug Lake. This embankment will be reconstructed and armored with riprap under the 2010 Maintenance project.



Photo No.29 – view of the three (3) bay variable crested weir structure along the north bank of Jug Lake looking north.



Photo No.30 – view of the three (3) bay variable crested weir structure along the north bank of Jug Lake looking north.



Photo No.31 – view of the bank line and marsh along the north bank of Jug Lake south of Structure No. 21. This section of earthen embankment was reconstructed by the landowner in 2005. This section of earthen embankment will be refurbished under the 2010 Maintenance Project.



Photo No.32 – view of the bank line and marsh along the north bank of Jug Lake south of Structure No. 21. This section of earthen embankment was reconstructed by the landowner in 2005. This section of bank will be refurbished under the 2010 Maintenance Project.



Photo No.33 – view of the bank line and marsh along the north bank of Jug Lake south of Structure No. 21. This section of earthen embankment was reconstructed by the landowner in 2005. This section of bank will be refurbished under the 2010 Maintenance Project.



Photo No.34 – view of the bank line and marsh along the north bank of Jug Lake south of Structure No. 21. This section of earthen embankment was reconstructed by the landowner in 2005. This section of bank will be refurbished under the 2010 Maintenance Project.



Photo No.35 – view of the bank line and marsh along the north bank of Jug Lake south of Structure No. 21. This section of earthen embankment was reconstructed by the landowner in 2005. This section of bank will be refurbished under the 2010 Maintenance Project.



Photo No.36 – view of the bank line and marsh along the north bank of Jug Lake south of Structure No. 21. This section of earthen embankment was reconstructed by the landowner in 2005. This section of bank will be refurbished under the 2010 Maintenance Project.



Photo No.37 – view of the rock channel liner along the south bank of Structure 20.



Photo No.38 – view of the rock channel liner along the north bank of Structure 20.



Photo No.39 – view of a breach in the bank of an existing channel on the interior marsh of Structure 20.



Photo No.40 – view of a breach in the bank of an existing channel on the interior marsh of Structure 20.



Photo No.41 – view of the rock lined channel of Structure No.20 looking northeast from the interior.



Photo No.42 – view of the existing bank line and marsh along the west bank of Jug Lake south of Structure 20.



Photo No.43 – view of the existing bank line and marsh along the west bank of Jug Lake south of Structure 20.



Photo No.44 – view of the existing bank line and marsh along the west bank of Jug Lake south of Structure 20.



Photo No.45 – view of the existing bank line and marsh along the west bank of Jug Lake south of Structure 20.



Photo No.46 – view of the existing bank line and marsh along the west bank of Jug Lake south of Structure 20.



Photo No.47 – view of the existing bank line along the north bank of Jug Lake east of Structure No.6. This bank line appears to be low and will be added to the 2010 Maintenance Project for refurbishment.



Photo No.48 – view of the fixed crest weir with barge bay and navigational aids at Structure No.6.



Photo No.49 – view of the fixed crest weir with barge bay and navigational aids at Structure No.6.



Photo No.50 – view of timber pile dolphin with navigational aid and the bank tie-in on the west side of the Structure No.6.



Photo No.51 – view of the fixed crest weir, warning signs and navigation aid structure at the entrance to the barge bay of Structure No.6 looking south.



Photo No.52 – view of the fixed crest weir, warning sign and bank tie-in on the east side of Structure No.6



Photo No.53 – view of timber pile warning signs and the southern end of the rock riprap channel liner of Structure No.10. The timber piles that are leaning over were damaged during Hurricane Ike and will be repaired under the 2010 Maintenance Project.



Photo No.54 – view of timber piles, warning signs and the rock riprap channel liner of Structure No.10. The timber piles that are leaning over were damaged during Hurricane Ike and will be repaired under the 2010 Maintenance Project.



Photo No.55 – view of timber piles, warning sign and the northern end of the rock riprap channel liner of Structure No.10.



Photo No.56 – view of steel bulkhead and earthen embankment tie-in on the south side of Structure No. 14 along Bayou Carencro.



Photo No.57 – view of steel bulkhead and earthen embankment tie-in on the north side of Structure No. 14 along Bayou Carencro.



Photo No.58 – view of single bay variable crest weir Structure No.14 along the east bank of Bayou Carencro.



Photo No.59 – view of breach located along Brady Canal near the intersection of Carencro Bayou.



Photo No.60 – view of breach located adjacent to an existing bulkhead at the intersection of Brady Canal and Carencro Bayou.

Appendix C

Three Year Budget Projection and Worksheets

Brady Canal/ TE-28 / PPL 3				
Three-Year Operations & Maintenance Budgets 07/01/2010 - 06/30/13				
Project Manager	O & M Manager	Federal Sponsor	Prepared By	
	Brian Babin	NRCS	Brian Babin	
	2010/2011	2011/2012	2012/2013	
Maintenance Inspection	\$ 5,908.00	\$ 6,085.00	\$ 6,268.00	
Structure Ops/ Nav Aid	\$ 17,000.00	\$ 17,000.00	\$ 17,000.00	
OCPR Administration	\$ 23,000.00	\$ 7,000.00	\$ 7,000.00	
COE Administration	\$ 1,240.00	\$ 1,257.00	\$ 1,274.00	
Maintenance/Rehabilitation				
10/11 Description: Breach Repair, Jug Lake rim restoration, structure armorment, timber pile replacement, Nav aid mainten				
E&D	\$135,754.00			
Construction	\$1,196,160.00			
Construction Oversight	\$77,750.00			
Sub Total - Maint. And Rehab.	\$ 1,409,664.00			
11/12 Description: Routine Breach Repairs and Navigational Aid inspection and maintenance				
E&D		\$ -		
Construction		\$ 57,881.00		
Construction Oversight		\$ 3,000.00		
Sub Total - Maint. And Rehab.		\$ 60,881.00		
12/13 Description: Routine Breach Repairs and Navigational Aid Inspection and Maintenance				
E&D			\$ -	
Construction			\$ 60,775.00	
Construction Oversight			\$ 3,000.00	
		Sub Total - Maint. And Rehab.	\$ 63,775.00	
	2010/2011	2011/2012	2012/2013	
Annual O&M Budgets	\$ 1,456,812.00	\$ 92,223.00	\$ 95,317.00	
O & M Budget (3 yr Total)			\$1,644,352.00	
Unexpended O & M Funds			\$1,408,231.00	
Remaining O & M Budget (Projected)			(\$236,121.00)	
Note: 2010-2013 Unexpended O&M budget includes a deduction of \$94,083 for MIPR O&M funds allocated for NRCS (see attached worksheet for 09-12 accounting)				

OPERATIONS & MAINTENANCE BUDGET WORKSHEET

Project: TE-28 Brady Canal Hydrologic Restoration

FY 10/11 –

OCPR Administration	\$	23,000*
COE Administration	\$	1,240
O&M Inspection & Report	\$	5,908
Operation/Navigational Aid Maintenance:	\$	17,000**
Maintenance:		\$1,409,664
E&D:	\$	75,754
Surveying:	\$	60,000
Construction:	\$	1,196,160***
Construction Oversight:	\$	77,750****

Operation and Maintenance Assumptions:

Refurbishment of the earthen embankments along the perimeter Jug Lake estimated to be approximately 20,000 linear feet in length. The proposed embankment sections shall be constructed to an elevation of +4.0' NAVD with a 10' wide top width and 6:1 side slopes. It is assumed that the existing embankment will make up 40% of the proposed section. Therefore, we are reducing the cross sectional area of the proposed section by 40%.

Area: $276 \text{ sf.} \times 20,000 / 27 = 204,444 \text{ cy} - 81,777 = 122,666 \text{ cy}$. Use: 123,000 c.y.

Cap approximately 100 linear feet of the earthen embankment on both ends of Structures 21, 23, & 24. The rock blanket shall be approximately 2' thick and extend the lake floor.

Area: $166 \text{ sf.} \times 200' / 27 = 1,230 \text{ cy.} \times 1.5 = 1,845 \text{ tons} \times 3 \text{ (structures)} = 5,535 \text{ tons}$

Breach closures at eight (8) locations along Carencro Bayou, Little Carencro Bayou and Brady Canal.

Replacement of timber piling and warning signs at Structure No.10.

Seeding of refurbished levee and installation of salt tolerant plants to protect earthen embankment.

Structure Operations: 3 – structures are operated twice annually by landowner for a total \$12,000**, OCPR administration: \$3,000*

Navigational Aid inspection, maintenance and repairs: \$5,000**

2010/2011 Maintenance Project - Construction Cost:

Mobilization and Demobilization:	\$ 75,000	
Clearing and Grubbing:	\$ 25,000	
Earthen Embankments: (123,000 cy. @ \$3.00/cy.)	\$369,000	
Armored embankment: (5,535 tons @ \$80/ton)	\$442,800	
Breach Repairs (CarenCro Bayou):	\$ 25,000	
Replacement of signs (Structure 10):	<u>\$ 10,000</u>	
Seeding and Vegetative Plantings	<u>\$ 50,000</u>	
	\$996,800	
Contingency: (20%)	\$199,360	
Total Construction Costs:		\$1,196,160***

Engineering and Design Cost:

Design, Plans and Specifications: (Actual Cost Proposal)	\$75,754	
Surveying: (Actual Cost Proposal)	\$60,303	
Construction Inspection: (1000hrs @ \$65/hr)	\$65,000*****	
Construction Administration: (150 hrs @ \$85/hr)	\$12,750*****	
OCPR Administration:	<u>\$20,000*</u>	
Total E&D and Construction Oversight:	\$233,807	

Total Overall Estimated 2010 Maintenance Project: \$1,429,967

FY 11/12 –

Administration	\$ 7,000*
COE Administration	\$ 1,257
O&M Inspection & Report	\$ 6,085
Operation:	\$ 12,000**
Maintenance:	\$ 65,881
E&D:	\$ 0
Construction:	\$ 57,881***
Construction Oversight:	\$ 3,000****
Navigation Aid Maintenance	\$ 5,000*****

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually by landowner for a total \$12,000**, OCPD administration: \$3,000*

Routine Breach Repairs/Levee Refurbishment: 55,125 x 5% inflation = \$57,881***

Construction Oversight: \$3,000****

OCPD Admin: \$2,500*, NRCS Admin: \$1,500*

Navigational Aid inspection, maintenance and repairs: \$5,000*****

FY 12/13 –

Administration	\$ 7,000*
COE Administration	\$ 1,274
O&M Inspection & Report	\$ 6,268
Operation:	\$ 12,000**
Maintenance:	\$ 68,775
E&D:	\$ 0
Construction:	\$ 60,775***
Construction Oversight:	\$ 3,000****
Navigation Aid Maintenance	\$ 5,000*****

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually by landowner for a total \$12,000**, OCPD Administration: \$3,000*

Routine Breach Repairs/Levee Refurbishment: 57,881 x 5% inflation = \$60,775***

Construction Oversight: \$3,000****

OCPD Admin: \$2,500*, NRCS Admin: \$1,500*

Navigational Aid inspection, maintenance and repairs: \$5,000*****

2010-2013 Accounting

Unexpended funds from Lana Report:

\$ 1,510,418.25

FY09/10 Expenditures by LDNR

\$ -8,103.92

MIPR O&M for NRCS

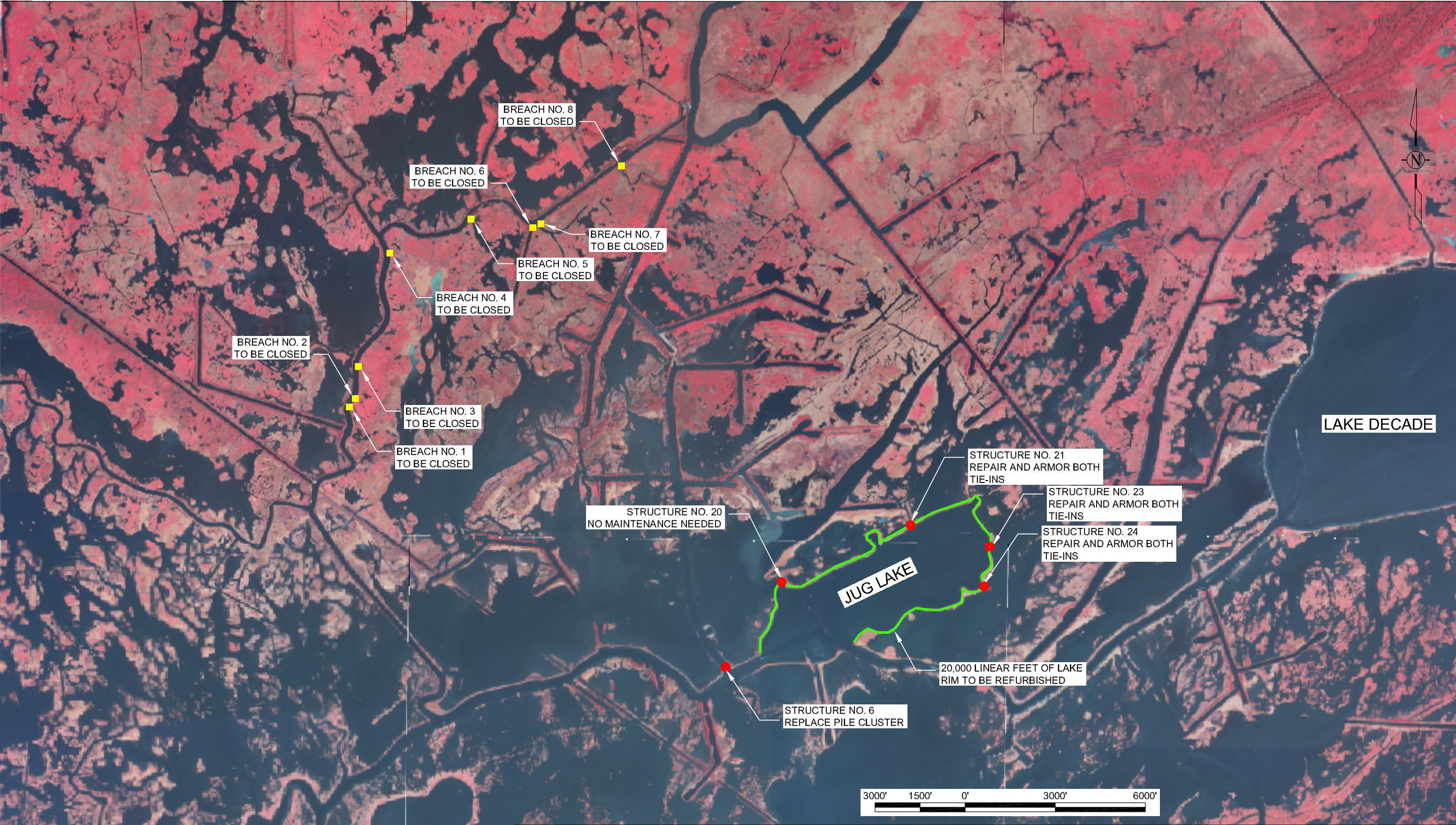
\$ -94,083.00

Estimated Unexpended Funds:

\$ 1,408,231.33

Appendix D

2009/2010 Work Plan

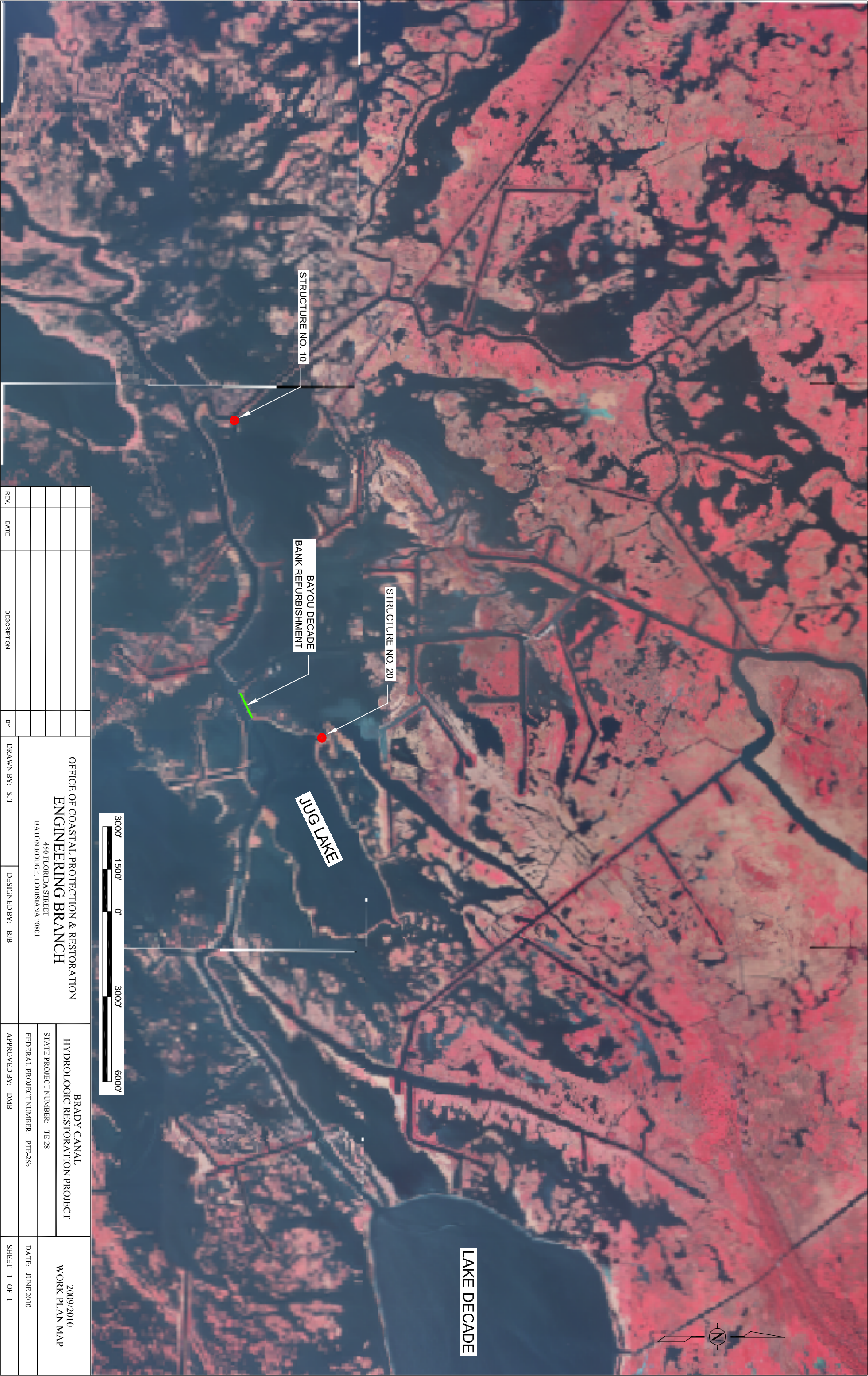


REV.	DATE	DESCRIPTION	BY

OFFICE OF COASTAL PROTECTION & RESTORATION ENGINEERING BRANCH 450 FLORIDA STREET BATON ROUGE, LOUISIANA 70801	
DRAWN BY: SJT	DESIGNED BY: BJB

BRADY CANAL HYDROLOGIC RESTORATION PROJECT	
STATE PROJECT NUMBER: TE-28	
FEDERAL PROJECT NUMBER: PTE-26b	
APPROVED BY: DMB	

2009/2010 WORK PLAN MAP	
DATE: JUNE 2009	
SHEET 1 OF 1	



			OFFICE OF COASTAL PROTECTION & RESTORATION ENGINEERING BRANCH 450 FLORIDA STREET BATON ROUGE, LOUISIANA 70801			BRADY CANAL HYDROLOGIC RESTORATION PROJECT STATE PROJECT NUMBER: TE-28 FEDERAL PROJECT NUMBER: PTE-26b		2009/2010 WORK PLAN MAP	
REV.	DATE	DESCRIPTION	BY	DRAWN BY: SJT	DESIGNED BY: BJH	APPROVED BY: DMB	DATE: JUNE 2010	SHEET 1 OF 1	