State of Louisiana
Department of Natural Resources
Coastal Restoration Division and
Coastal Engineering Division

2007 Operations, Maintenance, and Monitoring Report

for

BRADY CANAL HYDROLOGIC RESTORATION

State Project Number TE-28
Priority Project List 3

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Terrebonne Parish

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2007 Operations, Maintenance, and Monitoring Report
for
Brady Canal Hydrologic Restoration (TE-28) Project

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I. Introduction

The Brady Canal Hydrologic Restoration (TE-28) Project consists of 7,653 ac (3,097 ha) located in Terrebonne Parish, within the Bayou Penchant-Lake Penchant Basin. 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 (Figure 1).

Historically, the Atchafalaya River provided freshwater and sediments to the Penchant Basin through the diversion of flood waters into Bayou Cocodrie via Bayou Boeuf at Morgan City, and into Bayou Penchant via Bayou Shaefer and Bayou Chene (USDA/NRCS 1995). The Atchafalaya River influenced the establishment of freshwater plant species within the Brady Canal Hydrologic Restoration (TE-28) Project area (USDA/NRCS 1995). In 1968, the vegetation in the project area was classified as freshwater, intermediate, and brackish marsh (Chabreck et al. 1968). In 1978, the project area was classified as intermediate marsh with a small area of brackish marsh in the southern portion of the project along Bayou Decade (Chabreck and Linscombe 1988). 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, resulting in diminished freshwater input and sediment retention. Additionally, the dredging of numerous canals in the basin resulted in the breaching of natural hydrologic barriers, allowing for a strong tidal influence from the south. These anthropogenic changes have resulted in an acceleration of tidal exchange between freshwater distribution channels and tidal channels, thus reducing freshwater retention, accelerating erosion, and facilitating saltwater intrusion (USDA/NRCS 1995).

The existence of a natural ridge, the Mauvais Bois Ridge, which bisects the Brady Canal Hydrologic Restoration (TE-28) Project, further complicates the hydrologic balance in the project area, resulting in different hydrologic regimes to the north and south of the ridge. The northern section of the project area still receives freshwater and sediments which are provided through overbank flow from Bayou Penchant, Little Carencro Bayou, and Brady Canal. However, freshwater and sediment retention has diminished in the southern portion of the project area due to unimpeded through flow and tidal exchange combined with a decrease in available freshwater and sediment.

Land loss data show that during the period from 1932 to 1990, about 1,818 ac (736 ha) of land were converted to open water in the Brady Canal Hydrologic Restoration (TE-28) Project area. Approximately 52% of the loss occurred over a 16-year period between 1958 and 1974. The average loss between 1932 and 1958 was approximately 18 ac (7.3 ha) per year while the average loss of 31 ac (12.5 ha) per year occurred between 1983 and1990.

The increase of land loss in the project area was a result of major changes: (1) the hydrology of the Penchant Basin, both natural and human induced, was altered, (2) the natural levee ridge of Bayou Decade had eroded below marsh elevation along the southern end of the

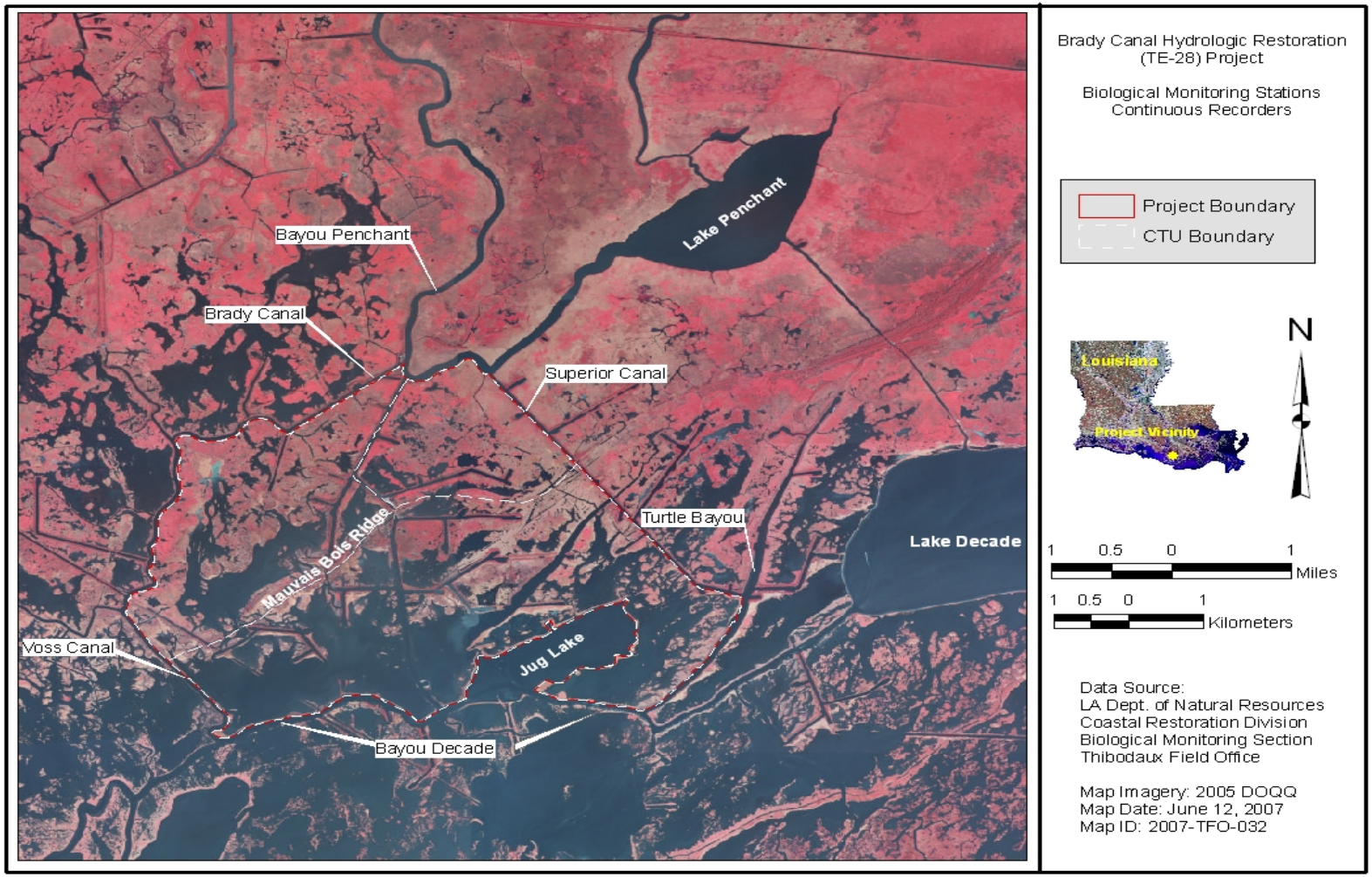

Figure1. Brady Canal Hydrologic Restoration (TE-28) Project location.

project area, (3) higher salinity waters from the south began infiltrating the lower saline environment, (4) the tidal exchange at the southern end of the project area began to increase, and (5) there was a reduction in freshwater and sediment retention.

The infiltration of higher salinity waters and increased tidal exchange can be attributed to the degradation of the natural levee ridge of Bayou Decade along the southern boundary of the project. This has created a direct hydrologic connection between the higher salinity waters from the south and the project area, and has led to decreasing protection from storm surges and tidal scouring. 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 reduced freshwater and sediment retention (USDA/NRCS 1995).

The Brady Canal Hydrologic Restoration (TE-28) Project involved the installation and maintenance of canal plugs along with the repair, construction, and maintenance of levees, several different types of weirs, rock plugs, earthen and/or rock and earthen embankments, as well as the construction and maintenance of stabilized channel cross-sections. The structures are designed to reduce adverse tidal effects in the project area as well as to better utilize available freshwater and sediment. Project construction began in August 1999 and was completed on July 10, 2000. During this period, the following features were constructed: three fixed crest weirs with variable crest section(s) (Figure 2, Structures 14, 21, and 23), a fixed crest weir with barge bay (Figure 2, Structure 6), a fixed crest weir (Figure 2, Structure 24), two rock armored channel liners (Figure 2, Structures 10 and 20), a rock plug (Figure 2, Structure 7), and three different embankment types (rock armored earthen embankment, rock dike, and earthen embankment) (Figure 2).

A subsequent project, the Penchant Basin Plan (TE-34), authorized under the 6th Project Priority List, encompasses the entire Penchant Basin Project, which includes the Brady Canal Hydrologic Restoration (TE-28) Project. Due to ongoing development of the Penchant Basin Plan (TE-34), two (2) construction features originally planned to be included under the Brady Canal Hydrologic Restoration (TE-28) Project were never constructed. These features included the northernmost structure located along Bayou Penchant and the overflow banks along Brady Canal in the northern section of the project. The Brady Canal Hydrologic Restoration (TE-28) Project also included provisions for the closure of several large breaches along Bayou Decade between Jug Lake and Turtle Bayou, which were not closed due to budget constraints. However, in August 2003, Louisiana Department of Natural Resources (LDNR) completed the closure of these breaches through the operation, maintenance, and rehabilitation program.

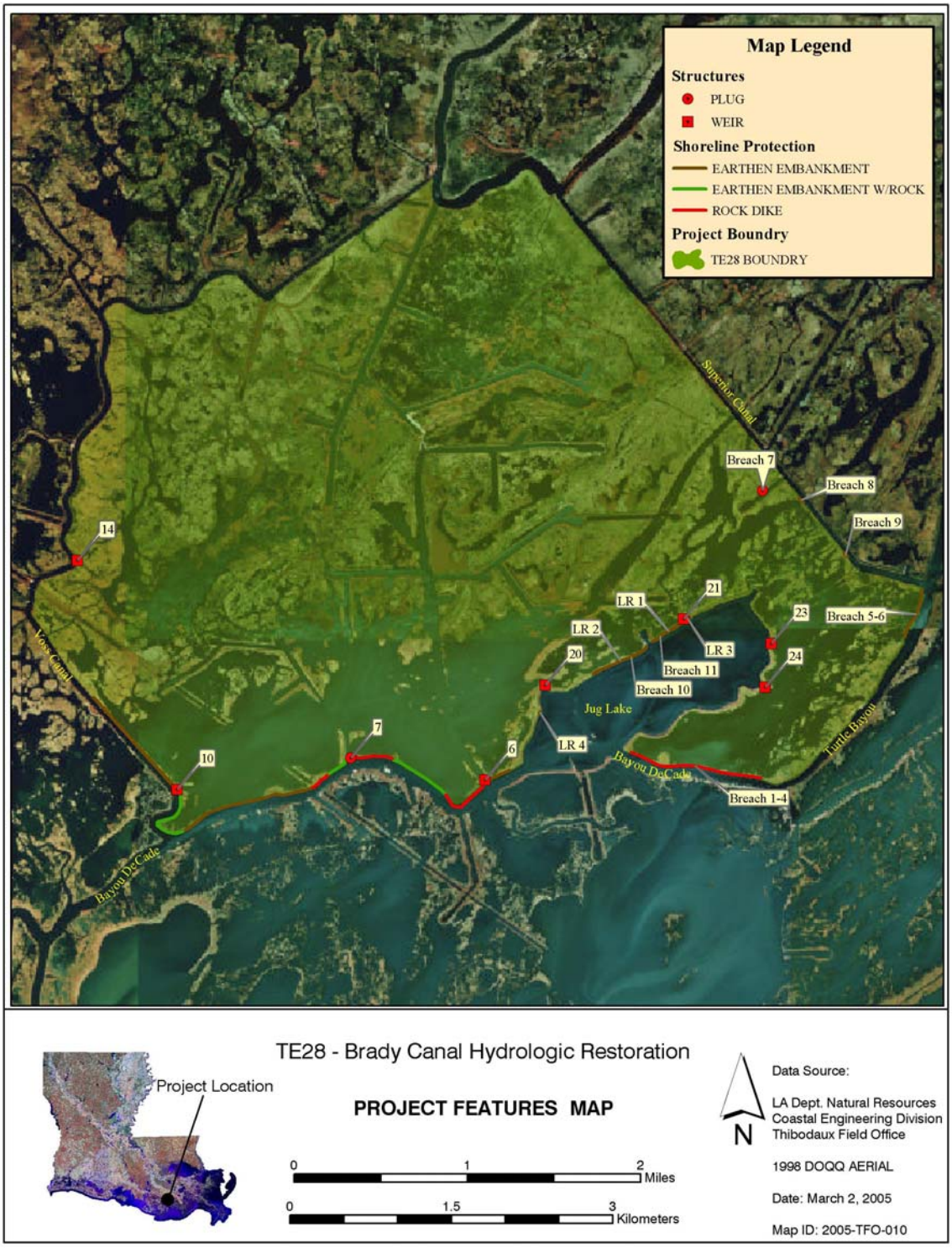

Figure 2. Brady Canal Hydrologic Restoration (TE-28) Project features map.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Brady Canal Hydrologic Restoration (TE-28) Project is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommended corrective actions needed. Should it be determined that corrective actions are needed, LDNR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs (LADNR/CRD and Pyburn and Odom, Inc. 2002). The annual inspection report also contains a summary of maintenance projects which were completed since construction and an estimated projected budget for the upcoming three (3) years for operation, maintenance, and rehabilitation. Inspection photos and the three (3) year projected operation and maintenance budget for the Brady Canal Hydrologic Restoration (TE-28) Project are shown in Appendices A and B. A summary of past operation and maintenance events completed in the operation and maintenance phase of the project are outlined in section II.c.

An inspection of the Brady Canal Hydrologic Restoration (TE-28) Project was held on February 14, 2007, under partly cloudy skies and cool temperatures. In attendance were Brian Babin and Shane Triche from LDNR, Warren Blanchard representing NRCS, Baird McElroy with Burlington Resources, and Tim Allen with Apache Corporation. All parties met at the Falgout Canal Marina in Theriot, La. The annual inspection began at approximately 8:30 a.m. on the east side of the project near Turtle Bayou and ended at 1:00 p.m. on the west end of the project area at Little Carencro Bayou and Brady Canal.

The field inspection included a complete visual inspection of structures 6, 7, 10, 14, 20, 21, 23, and 24, rock armored embankments, earthen embankments, rock dikes, and overflow banks. Staff gauge readings and existing temporary benchmarks, where available, were used to determine approximate water elevations at the time of the inspection. GPS readings were used to mark low areas and breaches in the earthen embankments and overflow banks which may require corrective actions or re-evaluation on future site visits. Field inspection notes were completed in the field to record measurements and deficiencies (Appendix C).

b. History and Project Description

The Brady Canal Hydrologic Restoration (TE-28) Project was completed in July 2000 and involved the installation and maintenance of fixed crest weirs with barge bays and variable crest sections, construction and maintenance of earthen embankments, rock and rock armored earthen embankments, and the placement of rock armor to stabilize

channel cross-sections. These structures are designed to reduce the adverse tidal effects in the project area (that have occurred through man-made channels and the enlarged natural channels) and to promote freshwater introduction to better utilize available freshwater and encourage sediment retention (Folse 2003). The principle project features of the Brady Canal Hydrologic Restoration (TE-28) Project include the following:

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)

c. Summary of Past Operation and Maintenance Projects

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since the construction completion date (July 2000) of the Brady Canal Hydrologic Restoration (TE-28) Project.

Under Article II of the Brady Canal Hydrologic Restoration (TE-28) Project Cost Share Agreement, the landowners, Burlington Resources and Apache 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 landowners:

In-Kind Service Credits

9/20/2006 - Apache Corporation contracted Frisco Construction Co. Inc. of Houma to repair breaches and refurbished 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 complete 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 - Burlington Resources completed the repair of two (2) large breaches along Little Carencro Bayou resulting from 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 embankments along Turtle Bayou, Superior Canal, and along the west bank of Jug Lake. Apache repaired these breaches for a total 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 broken stone riprap, 2,325 linear feet of earthen breach repair and refurbishment, and replacement of a timber pile on dolphin cluster at structure 6. The cost associated with the engineering, design and construction of the 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:	$ 12,873.00
Project Total:	$600,430.65

2003 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. In 2006, structures 14, 21, and 23 were adjusted in March and September by T. Baker Smith at a total cost of $17,639.

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

2/2007 - Automatic Power, Inc. of Larose, La., was awarded a maintenance contract for the inspection, diagnostic testing, repair, and maintenance of all navigational aids state-wide. The total cost of the 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, and 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.

d. Inspection Results

Structure 6 – Fixed crest weir with barge bay

Overall, the condition of structure 6 was good with moderate erosion noted along the earthen embankment tie-in on the west side of the structure. The timber dolphin supporting the navigation lights on the southwest side of the structure along Bayou Decade was damaged from vessels accessing the barge bay. The batter piling was off center and split down the middle and the steel cable tying the piling together was very loose. The landowner indicated that maneuvering through the barge bay is sometimes difficult because barges and tugs have to turn perpendicular to the bank line in shallow waters to clear the structure. The inspection team will continue to monitor the condition of the timber dolphin. We noted that the steel pipe railing and timber pile guards on the west side of the barge bay opening were damaged. The timber piling on the west side of the entrance was missing and the steel pipe railing attached to the channel cap was bent. The signs and navigations lights appear to be in good condition with no apparent damage. The navigational aids at this structure are included in the maintenance contract awarded to Automatic Power, Inc. of Larose in January 2007. Automatic Power's contract includes quarterly inspections, and diagnostic and maintenance repairs (Appendix A, Photos 1 through 5).

Structure 7 – Rock plug

Other than debris littering the rock plug, structure 7 was in very good condition with no visible settlement or breaching around the ends of the structure. The signs and timber supports were also in good condition (Appendix A, Photos 6 and 7).

Structure 10 – Stabilization rock armored channel liner

The rip-rap lined channel along the Voss Canal appeared to be in very good condition with no noticeable settlement along the rock embankments of the structure. The visual assessment of the structure is limited since a large portion of the channel liner is below the water line. Without a survey profile of the centerline of the structure, we are unable to determine if the rock rip rap below the water line has settled. At some point

in the future, it is recommended that a maintenance survey be performed to determine the degree of settlement, if any. The signs and timber supports were also in good condition (Appendix A, Pages 8 and 9).

Structure 14 – Fixed crest weir with variable crest section

The steel sheet pile weir and bulkhead was in good condition with no physical damage or major corrosion noted. The inspection team did notice moderate erosion and cut banks along the earthen tie-ins on both sides of the structure. The earthen tie-ins remain stable and no breaching is expected to occur during this maintenance cycle. A visual inspection of the marsh adjacent to the structure revealed that the depth of water was very shallow. Without further investigation, the inspection team does not believe that the shallow water is negatively impacting the operations of the structure. This structure was last operated in March 2007 by T. Baker Smith under Indefinite Deliverable Indefinite Quantity (IDIQ) contract to LDNR. Nine (9) stop logs were removed on March 16, 2007, to a crest elevation of -5.57 ft NAVD88. The structural components, signs, and timber supports were in good condition. The erosion noted at the earthen bank tie-ins shall be monitored on future site visits (Appendix A, Photos 10 and 11).

Structure 20 – Stabilization rock armored channel liner

The rip-rap lined channel located along the west bank of Jug Lake appeared to be in very good condition with no noticeable settlement along the rock embankments of the structure above the water line. Without a survey profile of the structure, we are unable to determine if the rock rip rap lining the channel has settled over the years. At some point in the future, it is recommended that a maintenance survey be performed to determine the degree of settlement, if any. The signs and timber supports were also in good condition (Appendix A, Photo 12).

Structure 21 – Fixed crest weir with three (3) variable crest sections

The variable crest weir structure appears to be in good condition. The earthen wing walls were recently refurbished in October 2006 by the Apache Corporation under in-kind services agreement and are holding up well. The water elevation at the time of the inspection was 0.54 ft NAVD88 measured from the hex bolt benchmark on the steel sheet pile wall. All signs and timber supports were also in good condition. The variable crest weir structure was operated on March 16, 2007, at which time a total of 17 stop logs were removed (5 logs east bay, 10 logs center bay, 2 logs on the west bay). The structure components, signs, and timber pile supports were all in good condition (Appendix A, Photo 13 - Note: Other photos taken the day of the inspection are not available).

Structure 23 – Fixed crest weir with two (2) variable crest sections

The variable crest weir structure appeared to be in good condition. The earthen wing walls on both sides of the structure were recently reinforced in October 2006 by Apache Corporation under their in-kind services agreement with LDNR. The structural components, signs, and timber supports were all in good condition with no visible sign of damage. The variable crest weir structure was operated by T. Baker Smith on March 16, 2007, at which time a total of 20 logs were removed (10 logs from the north bay and 10 logs from the south bay)(Appendix A, Photo 14 – Note: Other photos taken the day of the inspection are not available).

Structure 24 – Fixed crest weir

The fixed crest weir structure appeared to be in good condition. The earthen wing walls were recently repaired in October 2006 by Apache Corporation under their in-kind services agreement with LDNR. The structural components, signs, and timber supports were also in good condition (Appendix A, Photo 15).

Earthen Embankments: The inspection of earthen embankments consisted of a visual inspection of recently repaired breaches by Apache Corporation, breach repairs performed under the 2003 Brady Canal Breach Repair Project, Levee Refurbishment Project along Jug Lake, which was completed in 2003, as well as an inspection of existing embankments and overflow banks making up the boundary of the Brady Canal Hydrologic Restoration (TE-28) Project. Below are the results of the earthen embankment inspections:

Brady Canal Maintenance Project (2003)

Breach Repair 1 through 4 involved the closure of large openings in the low-lying levee along Bayou Decade (Figure 2). Due to the elevation of the existing bank line and the size of the openings in the levee, a rock dike was constructed along the length of Bayou Decade from Turtle Bayou to Jug Lake. The rock dike was in fair condition with several low areas and moderate displacement of rock from Hurricane Rita. The earthen embankment tie-ins on both sides of the lengthy structure are areas of concern. These areas were not repaired under the 2003 maintenance project and remain low and vulnerable to erosion. The inspection team will continue to monitor the condition of the tie-ins (Appendix A, photos 16 and 17).

Breach Repair 5 and 6 – consisted of a low area along Turtle Bayou from the mouth of Superior Canal 1500 ft southward. This low area was refurbished using dredge material from Turtle Bayou. The overall length of the refurbished levee is in good condition. However, we did notice moderate cut banks along the entire length of the levee. Although erosion is evident, the embankment is structurally sound and in good condition (Appendix A, Photos 18 and19).

Breach Repair 7 – located along an existing oilfield canal off of Superior Canal. Due to the depth of the opening in the levee, rock rip rap was used to close the breach (Appendix A, Photo 20). The rock rip-rap plug looked to be in very good condition with no noticeable settlement. It was estimated that the crown elevation of the rock plug was +3.5 ft NAVD88. A small breach located across the canal from structure 7 was repaired in 2006 by the Apache Corporation (Appendix A, Photo 21).

Breach Repair 8 – approximately 200 ft long located along Superior Canal adjacent to an existing pipeline right-of-way. This breach was repaired using dredge material from Superior Canal. The earthen embankment in this area was in good condition. We did note that cut banks along the face of the embankment have developed since the breach repair. The vegetation along the breach repair was thick and plentiful (Appendix A, Photo 22).

Breach Repair 9 – approximately 250 ft long located along Superior Canal near the bend. This breach was repaired using dredge material from Superior Canal. The earthen embankment in this area was in good condition with no noticeable erosion or settlement. Vegetation was plentiful (Appendix A, Photo 23 and 24).

Levee Refurbishment Project along Jug Lake

An inspection of the 5,000 ft section of embankment, repaired by the Apache Corporation in 2003, revealed large cut banks along the length of the repaired levee (Figure 2, Breach 10 and Breach 11). This is expected because Jug Lake produces high energy waves which continuously impact the west bank of the lake. Considering this, the levee embankment is in good condition and will not require corrective actions.

Existing Earthen Embankments and Overflow Banks

Since the completion of the Brady Canal Hydrologic Restoration (TE-28) Project, it has become apparent that there has been an increase in breaching of the overflow banks along the northern boundary of the project area (Carencro Bayou, Little Carencro Bayou, and Brady Canal). It appears that these conditions have been more frequent since the closure of the large breaches (Breaches 1 through 4) and/or outlets on the southern project boundary along Bayou Decade. The landowners have done a good job of identifying these potential problem areas and reinforcing overflow banks as needed.

In 2006, the Apache Corporation completed breach repairs along the east bank of Jug Lake, along Carencro Bayou and Brady Canal, and the tie-ins to wing walls of structures 21, 23, and 24 (Appendix A, Photos 25 through 31).

During the 2007 inspection of all the earthen embankments and overflow banks that make up the boundary of the project, we have identified a couple of low areas along the east bank of Jug Lake and one (1) location along the north bank of Bayou Decade

northeast of structure 6 (Appendix A, Photos 32 through 34). We also identified several breaches in the overflow banks along Bayou Carencro and Brady Canal (Appendix A, Photos 35 through 37; Figure 3). The landowner has indicated that he may be interested in reinforcing the low areas and repairing breaches identified during the inspection under their in-kind services agreement with LDNR and NRCS. LDNR and NRCS will continue to work with the landowners on facilitating levee reinforcement and breach repairs as needed. Overall, the earthen embankments bordering the project area appear to be in fair condition. The inspection team will continue to monitor the condition of levees and overflow banks on future site visits.

Rock Armored Embankments

Rock armored embankments along the north bank of Bayou Decade and Voss Canal appear to be in good condition (photos not available). The rock dike without earthen embankments along Voss Canal appeared to have settled some but remain stable with no change from previous inspection. The inspection team will continue to monitor this area in the future.

e. Maintenance Recommendations

i. Immediate/Emergency

As a result of the 2007 annual inspection, we concluded that all project features of the Brady Canal Hydrologic Restoration (TE-28) Project are in good to fair condition with no major damage or corrective actions required. Therefore, we are not recommending any immediate or emergency repairs at this time.

ii. Programmatic/Routine

As outlined in the inspection results of the earthen embankments and overflow banks, we did identify several breaches along Carencro Bayou and Brady Canal that will require maintenance and repairs (Figure 3). Over the past few years, we have noticed a frequent reoccurrence of breaches in the overflow banks along the northern boundary of the project (Little Carencro Bayou, Carencro Bayou, and Brady Canal).

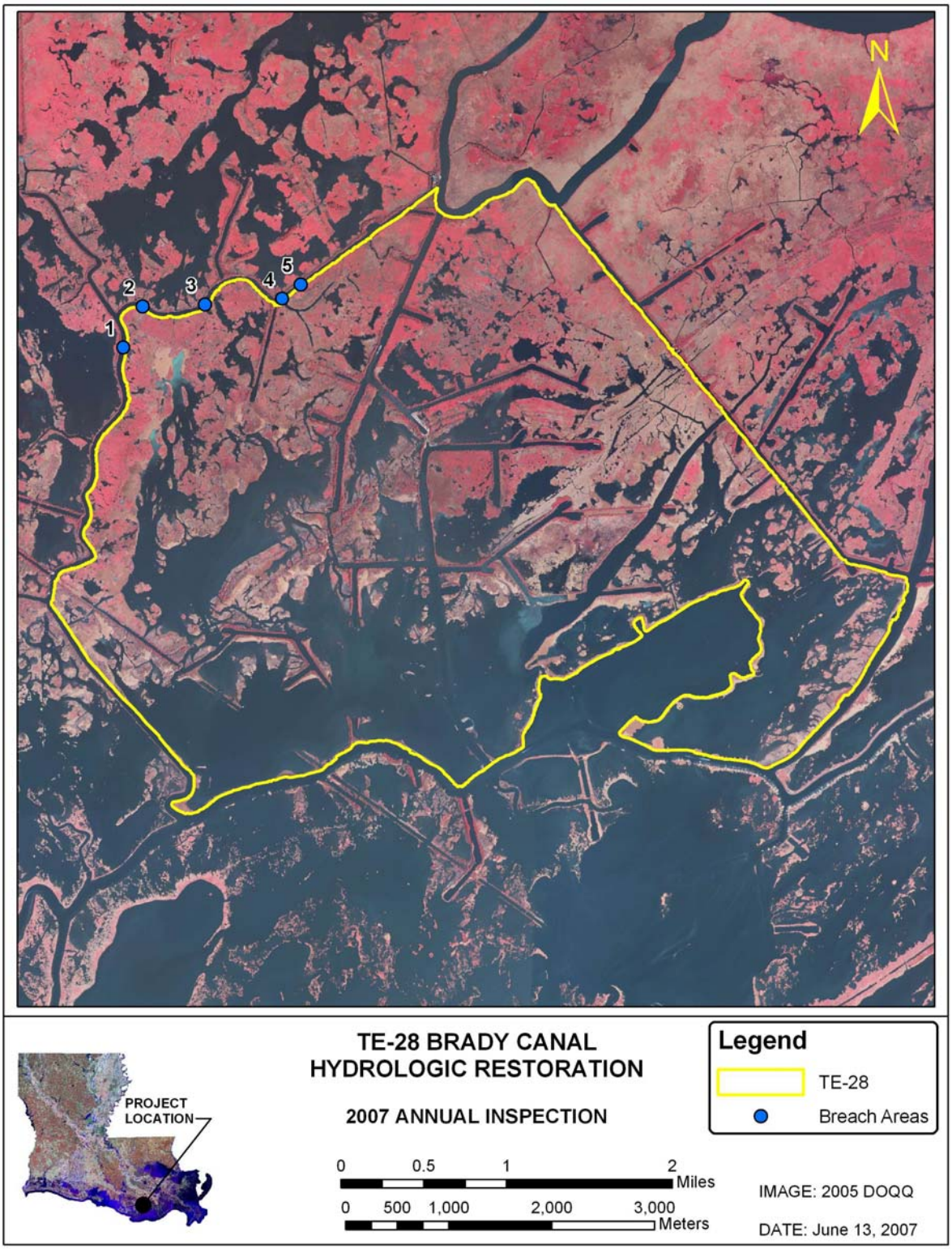

Figure 3. Breach locations identified during the 2007 annual inspection.

The breaching along the northern boundary is evidence that the earthen banks in these areas are overtopped during storm events and high tides resulting in severe erosion. LDNR and the landowners will continue to maintain the earthen banks in accordance with the Operation, Maintenance and Rehabilitation Plan for the Brady Canal Hydrologic Restoration (TE-28) Project.

As on previous breach repair projects, the landowners have indicated a willingness to facilitate the breach repairs under their current in-kind services agreement with LDNR and NRCS. Maintenance costs associated with proposed breach repairs identified in Figure 2 are outlined in the three (3) year budget projections in Appendix B.

III. Operation Activity

a. Operation Plan

Within the Brady Canal Hydrologic Restoration (TE-28) Project, structures 14, 21, and 23 are variable crest weirs and require active operations. Generally, during the fall (September 1) of each year, all stop logs shall be placed at a maximum elevation and during the spring (March 15) of each year, stop logs will be lowered or removed to the natural channel bottom. This operation schedule may change once the Penchant Basin Project comes on-line and cuts in the southern portion of the project are repaired. Therefore, the operation of the variable crest weir structures shall be observed and revised as needed.

The Brady Canal Hydrologic Restoration (TE-28) Project area is divided into Conservation Treatment Unit (CTU) #1, CTU #2 and CTU #3. Operation plans and procedures for CTU #1 are designed to stabilize water fluctuations. Below is a description of the Operation and Water Management Schedule regarding operations of water control structures within the Brady Canal Hydrologic Restoration (TE-28) Project:

Operation and Water Management Schedule

CTU #1 Structure 14: Fall (September 1) of each year, set structures to maximum elevation. Spring (March 15) of each year, lower or remove stop logs to natural channel bottom.

CTU #3 Structures 21 and 23: Fall (September 1) of each year, set structures to maximum elevation. Spring (March 15) of each year, lower or remove stop logs to natural channel bottom.

In accordance with the Operation and Water Management Schedule above, structures 14, 21, and 23 were adjusted twice a year (March and September) beginning in April

2002. Details of each operation period are documented in an Operations Report which can be obtained from LDNR – Thibodaux Field Office.

b. Actual Operations

Below is a summary of structure operations performed over the last operation period (2006-2007).

September 2006 – Operations of the water control structures 14, 21, and 23 was performed on September 5 and 6, 2006, by T. Baker Smith of Houma, La., at a cost of $9,970. Below are details of the stop log installation:

Structure 14 - nine (9) stop logs were installed in the single bay structure to an elevation of -1.26 ft NAVD88.

Structure 21 - five (5) stop logs were installed in east bay to an elevation of an elevation of -0.23 ft NAVD88, ten (10) logs were installed in the center bay to an elevation of +0.09 ft NAVD88 and two (2) stop logs were installed in the west bay to an elevation of -0.26 ft NAVD88.

Structure 23 – ten (10) stop logs were installed in the northern bay to an elevation of -0.34 ft NAVD88 and ten (10) logs were installed in the south bay to an elevation of -0.45 ft NAVD88.

March 2007 – Operations of the water control structures 14, 21, and 23 was performed on March 16, 2007, by T. Baker Smith of Houma, La., at a cost of $8,602. Below are details of the stop log installation:

Structure 14 - nine (9) stop logs were removed in the single bay structure to an elevation of -5.57 ft NAVD88.

Structure 21 - five (5) stop logs were removed in east bay to an elevation of an elevation of -2.64 ft NAVD88, ten (10) logs were removed in the center bay to an elevation of -5.27 ft NAVD88 and two (2) stop logs were removed from the west bay to an elevation of -1.17 ft NAVD88.

Structure 23 – ten (10) stop logs were removed from the northern bay to an elevation of -5.49 ft NAVD88 and ten (10) logs were removed from the south bay to an elevation of -5.45 ft NAVD88.

IV. Monitoring Activity

a. Monitoring Goals

The objective of the Brady Canal Hydrologic Restoration (TE-28) Project is two-fold: (1) to maintain and enhance existing marshes in the project area by reducing the rate of tidal exchange and (2) to improve the retention of introduced freshwater and sediment.

The following goals will contribute to the evaluation of the above objective:

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.
6. Increase the frequency of occurrence of submerged aquatic vegetation (SAV) within the project area.

b. Monitoring Elements

Habitat Mapping

To document vegetated and non-vegetated areas, color infrared aerial photography (1:12,000 scale with ground controls) will be obtained. The photography will be photointerpreted, scanned, mosaicked, georectified and analyzed by National Wetlands Research Center (NWRC) personnel according to the standard operating procedure described in Steyer et al. (1995). The photography was obtained in 1998 (pre-construction) and in 2002 (post-construction), and will be obtained in 2008 and 2017 (post-construction).

Salinity

One continuous recorder is located in each CTU to monitor salinities. One additional recorder is located outside the project area on Bayou Penchant, where Brady Canal begins, near a water control structure. Discrete salinities are measured monthly at sites within each CTU and at the reference recorder on Bayou Penchant (TE28-07R). Salinity data have been collected from 1996 to 2000 (pre-construction) and from 2000 to 2006 (post-construction), and will continue. Hourly and discrete salinity data collection was discontinued in the reference areas in April 2004 due to the implementation of CRMS-*Wetlands*. Figure 4 illustrates location of active and inactive hourly sampling stations, while Figure 5 illustrates the location of discrete sampling stations.

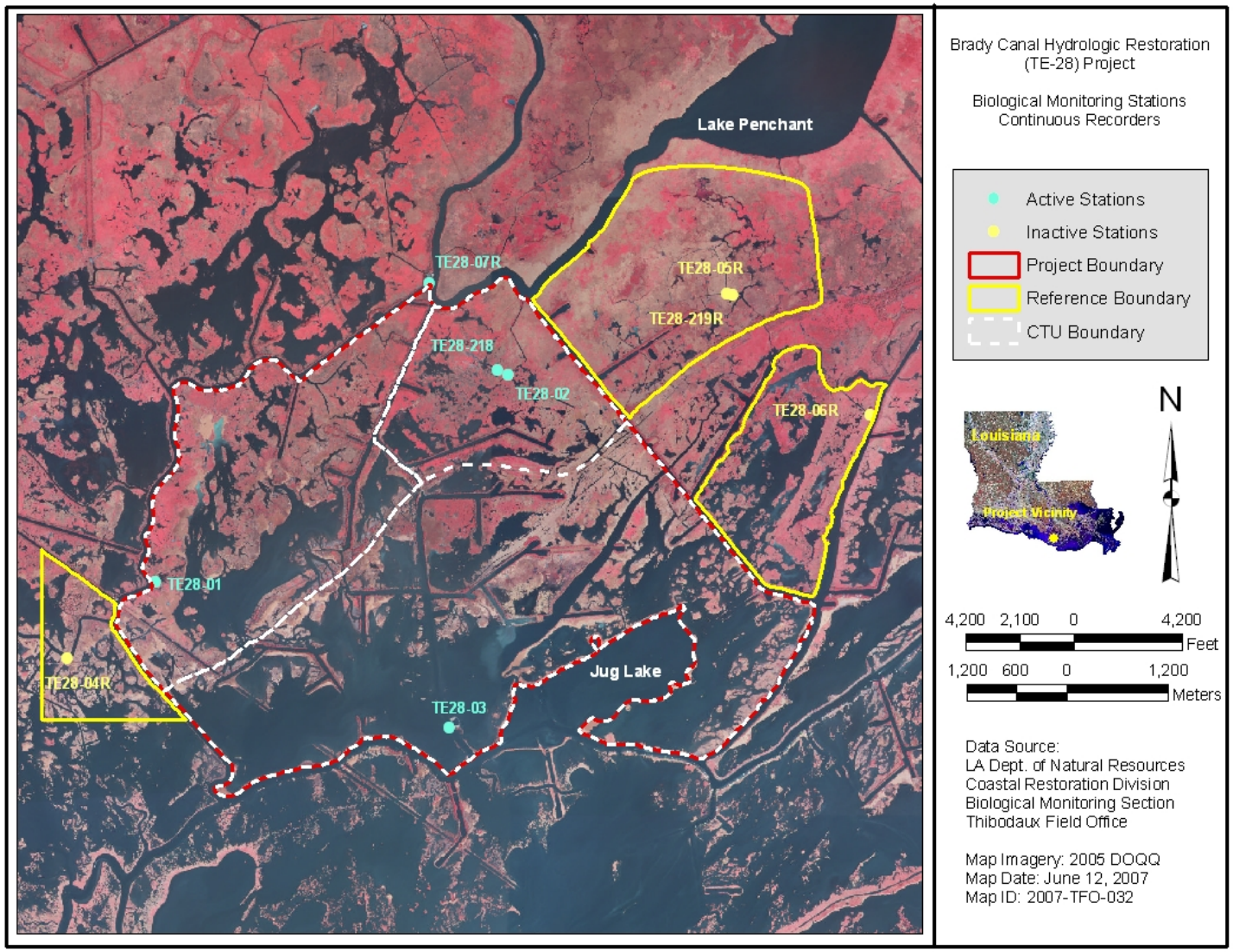

Figure 4. Location of active and inactive continuous salinity and water level recorders in the Brady Canal Hydrologic Restoration (TE-28) Project. Stations were inactivated in April 2004 as a result of CRMS-*Wetlands*.

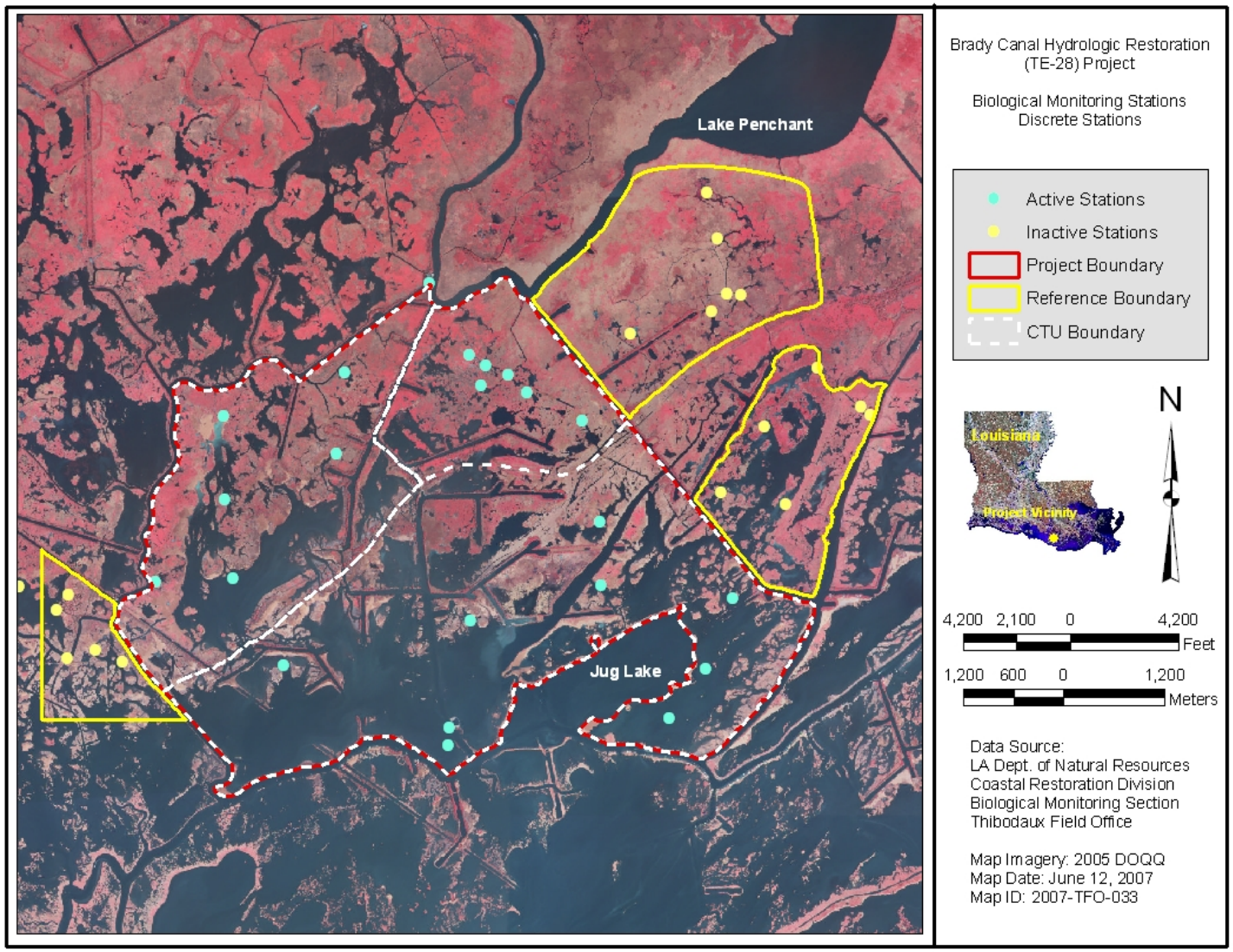

Figure 5. Location of active and inactive discrete sampling stations in the Brady Canal Hydrologic Restoration (TE-28) Project. Stations were inactivated in April 2004 as a result of the CRMS-*Wetlands* program.

Water Level

To monitor water level variability, one continuous recorder is located within each CTU (Figure 4). One additional recorder, TE-28-07R, is located outside the project area on Bayou Penchant near a water control structure. Water level data was collected from 1997 to 2000 (pre-construction) and 2000-2006 (post-construction), and will continue. Hourly water level data was discontinued in the reference areas, except for station TE28-07R, in April 2004, due to the implementation of CRMS-*Wetlands*.

Emergent Vegetation

Species richness and relative abundance are evaluated in the project using the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974). Five sites were chosen within each CTU and reference area prior to 2006, and replicate samples are collected at each site (Figure 6) for a total of ten stations. Relative abundance will be documented in permanent plots to allow revisiting over time. Sites were sampled in 1996 (pre-construction), 1999 (as-built), and in 2002 and 2006 (post-construction) and will be sampled in 2009, 2012, and 2015 (post-construction). Emergent vegetation data were not collected in 2004 due to the implementation of CRMS-*Wetlands* as intended per the monitoring plan (Folse 2003). Data were not collected from stations in the reference areas in 2006.

Accretion

Vertical accretion is determined in triplicate at each of the five representative stations within each CTU, and reference area prior to 2006, using techniques described in Steyer et al. (1995). The location of vertical accretion sites corresponds with the location of vegetation sampling sites (Figure 6). Sites were sampled in 1997/1998 (pre-construction), and in 2000/2001 and 2006/2007 (post-construction), and will be sampled in 2009, 2012, and 2015 (post-construction). Accretion data were not collected in 2004 due to the implementation of CRMS-*Wetlands*. Data were not collected from stations in the reference areas in 2006.

Marsh Mat Movement

One continuous recorder (TE28-218) is located within CTU #2 to monitor marsh mat movement (Figure 4). Mean daily water level variability and duration and frequency of flooding of floating marshes were determined for pre-construction vs. post-construction comparisons and project vs. reference comparisons from 1998 until February 2002, when the reference area recorder was removed.

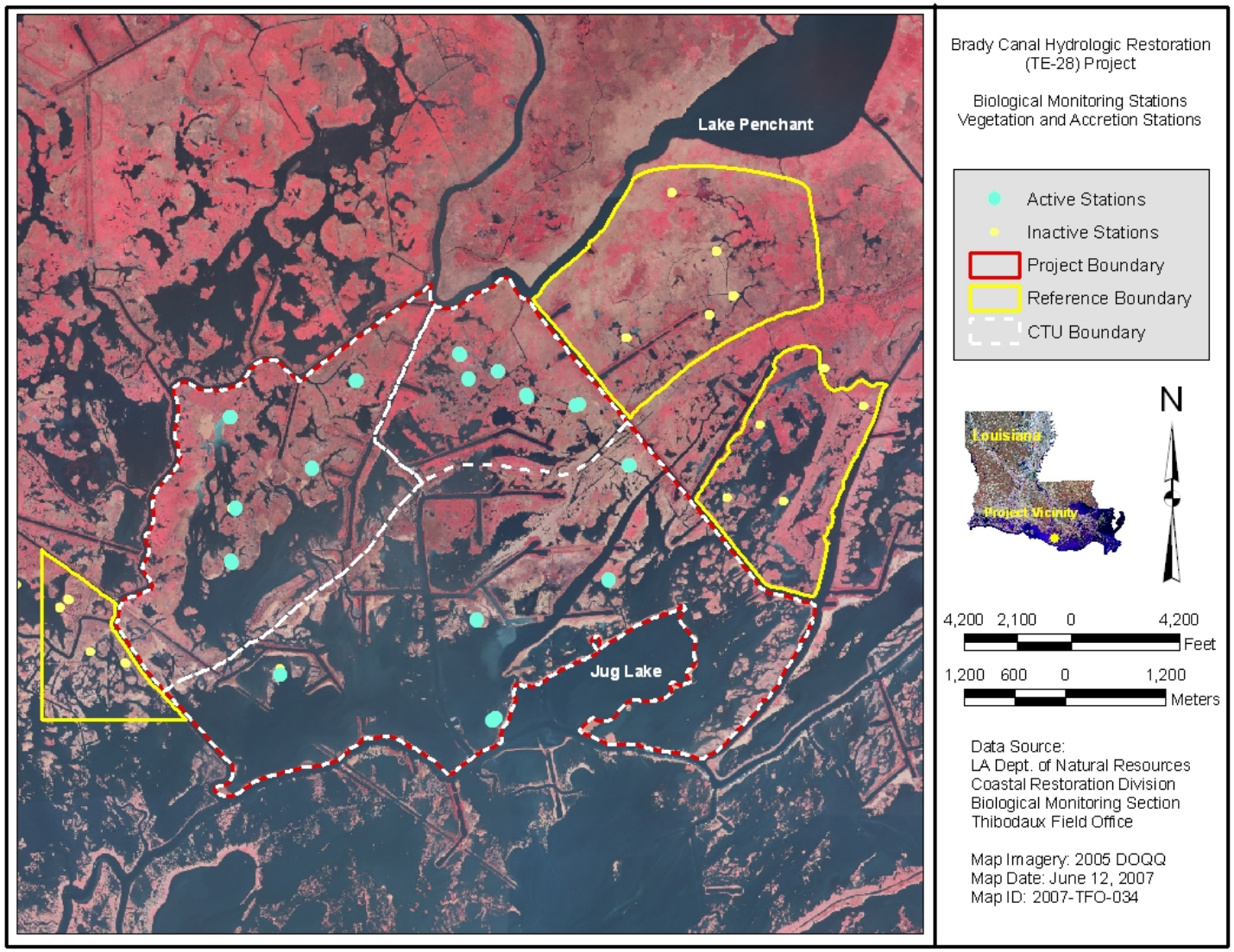

Figure 6. Location of active and inactive emergent vegetation and accretion stations in the Brady Canal Hydrological Restoration (TE-28) Project. Stations were inactivated in April 2004 due to the CRMS-*Wetlands* project.

The continuous recorder at station TE28-219R was deactivated in February 2002 because data showed that this thick marsh mat did not exhibit vertical movement during high water events like the marsh mat at station TE28-218, nor did it move vertically with normal water level changes (Folse and Babin 2007). Marsh mat movement data were collected from 1998 to 2000 (pre-construction) and 2000-2006 (post-construction) and will continue to be collected utilizing the recorder located in CTU #2.

Submerged Aquatic Vegetation (SAV)

The frequency of occurrence of SAV was compared between project and reference areas. Within the project (by CTU) and reference areas, five ponds were sampled during the fall (October or November) in 1996 and 1999 (pre-construction) and in 2002 (post-construction). Sampling that was to take place in 2006, 2012, and 2015 (post-construction) will not occur due to the CRMS-*Wetlands* project (Folse 2003). Methods described in Nyman and Chabreck (1996) were used to determine the frequency of occurrence of SAV. The presence/absence of SAV is determined at a minimum of 20 random points within each pond sampled. Frequency of occurrence is determined for each pond from the number of points at which SAV occurred and the total number of points sampled. The species was noted as present when SAV occurred at a point sampled. Results from SAV sampling in 1996, 1999, and 2002 are located in Folse and Babin (2007).

c. CRMS- *Wetlands*

In 2003, the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Task Force adopted the Coastwide Reference Monitoring System (CRMS)-*Wetlands* program to evaluate the effectiveness of each constructed restoration project. CRMS-*Wetlands* provides a network or "pool" of reference sites that can be used to not only evaluate the effectiveness of individual projects but also hydrologic basins and entire coastal ecosystems. Each 1-km^2 CRMS-*Wetlands* site is monitored consistently according to a "Standard Operating Procedures" document with the following parameters collected at each site: hourly hydrographic (includes salinity, water level, and water temperature), monthly soil porewater salinity, semi-annual surface elevation and sediment accretion, annual emergent vegetation, land:water ratio estimated from aerial photography taken every three to four years, and soil properties collected once at each CRMS site.

CRMS-*Wetlands* is currently in the implementation stage (i.e., securing landrights, site characterizations, and site construction) and not all sites are fully operational. However, data collection has begun at over half of the sites and data will be used to help support project-specific monitoring as soon as it becomes available. The Brady Canal Hydrologic Restoration (TE-28) Project does not have any CRMS-*Wetlands* monitoring sites within its project or reference boundaries. However, there are several sites surrounding the project (figure 7). Data collected from these surrounding CRMS-

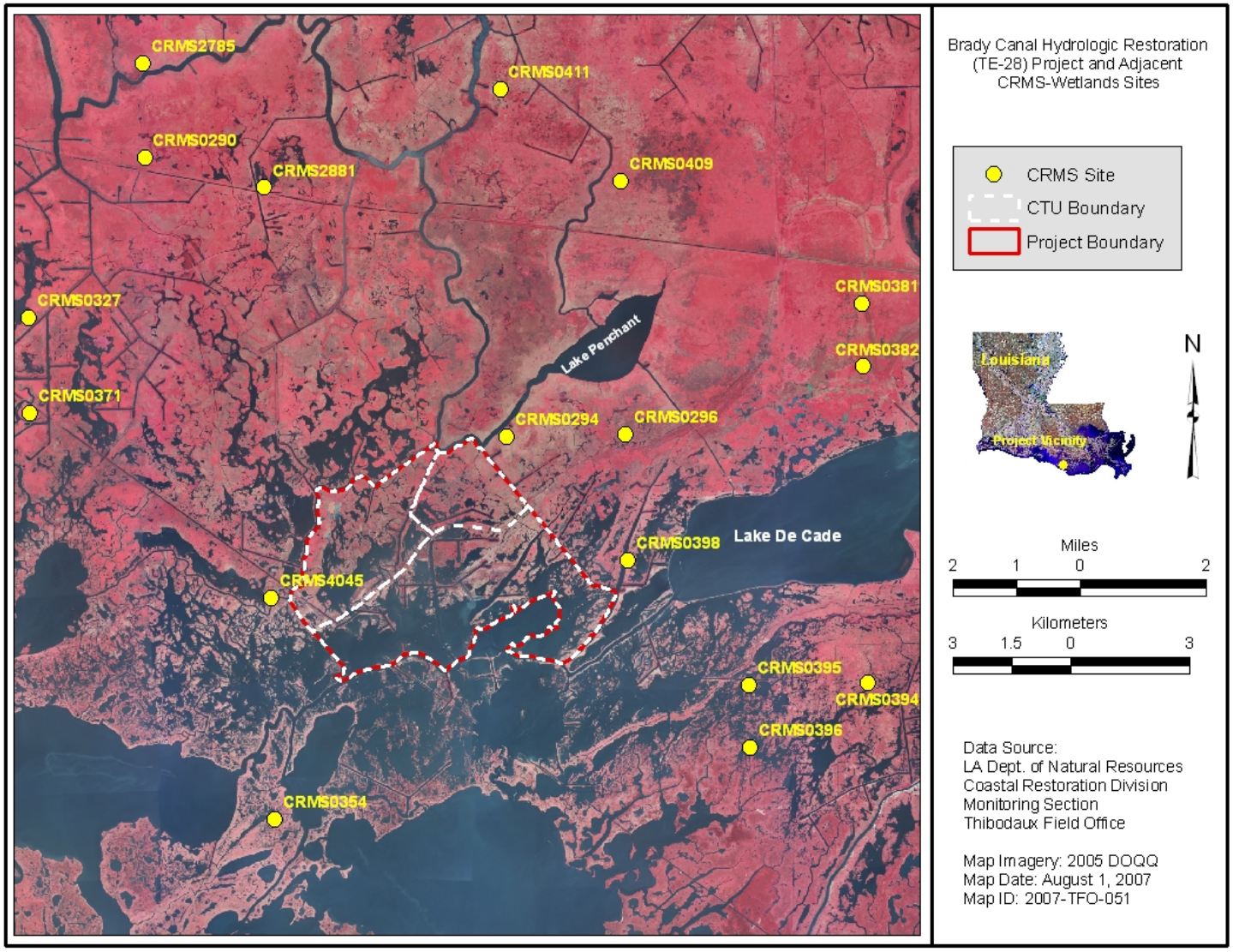

Figure 7. CRMS-*Wetlands* sites in the vicinity of the Brady Canal Hydrologic Restoration (TE-28) Project.

Wetlands sites along with future project-specific data collection efforts will provide a broader evaluation of project effectiveness.

d. Preliminary Monitoring Results and Discussion

A comprehensive analysis of monitoring variables except habitat mapping is presented in the 2004 Operations, Maintenance, and Monitoring Report (Folse and Babin 2007). Habitat mapping data is presented in the 2005 Operations, Maintenance, and Monitoring Report (Babin and Folse 2007). The reports can be obtained through LDNR's web site. The 2005 Operations, Maintenance, and Monitoring Report provides information concerning the habitat mapping analysis from 1998 and 2002 along with the presentation of the water level and salinity data collected in 2004.

Due to the inactivation of reference sites in 2004, the following results and discussions focus on the status and trends of the data that has been collected within the project area since data collection began in 1996. Comparative analysis between project and reference and pre- and post-construction can be obtained from the reports mentioned above.

Salinity and Water Level

Mean weekly salinity data collected at stations TE28-01, -02, -03, and -07R will be discussed, as the other reference area stations were deactivated in 2004 due to the implementation of CRMS-*Wetlands*. Most of the spiking on the weekly mean water level and salinity graphs can be explained by tropical storm or hurricane activity. Table 1 corresponds with the graphs and provides the dates of weather events affecting continuous recorder readings in the project area.

Table 1. Dates of tropical events affecting weekly mean water level and salinity at the Brady Canal Hydrologic Restoration (TE-28) Project stations.

Landfall Date	Tropical Weather Event
07/18/1997	Hurricane Danny
09/03/1998	Hurricane Earl
09/28/1998	Hurricane Georges
06/11/2001	Tropical Storm Hermine
08/06/2001	Tropical Storm Allison
08/06/2001	Tropical Storm Barry
07/12/2002	Tropical Storm Bertha
09/14/2002	Tropical Storm Hanna
09/26/2002	Hurricane Isidore
10/03/2002	Hurricane Lili
06/30/2003	Tropical Storm Bill
09/16/2004	Hurricane Ivan
10/10/2004	Tropical Storm Matthew
07/05/2005	Hurricane Cindy
07/10/2005	Hurricane Dennis
08/29/2005	Hurricane Katrina
09/24/2005	Hurricane Rita

Because the salinity in the project area typically has characteristics of an oligohaline (0.5-5 ppt) environment and the reference area is freshwater (<0.5 ppt), the most interesting trends in the data collected during 2005 and 2006 were observed due to Hurricane Rita's landfall on the Louisiana-Texas border on September 24, 2005 (Table 2).

Table 2. Mean Salinity at the Brady Canal Hydrologic Restoration (TE-28) Project stations.

Station	Sample Size	Average	Minimum	Maximum	Standard Deviation
TE28-01	65033	1.5497	0.03	17.16	2.23469
TE28-02	56280	1.13751	0.01	17.67	1.56466
TE28-03	72464	1.57849	0.01	22.83	2.40701
TE28-07R	75296	0.44036	0.07	21.23	1.04944

Hurricane Katrina had little effect on the mean weekly salinity and water level as its landfall occurred to the east of the project area and the orientation of the winds were such that water from the Gulf of Mexico was not pushed north into the project area.

Station TE28-07R is the northernmost station as well as the only active reference area station. The overall salinity is lower than at stations -01 and -03, with more pronounced spiking of salinity than at station -02. Hurricane Rita caused the smallest rise in salinity of all stations at 7.76 ppt the week of September 21, 2007, lasting for the shortest duration, only above 5 ppt for about one week. Spikes in March, April, and October were smaller in size and length of time than at stations -01 and -03.

Station TE28-02 is located second with regard to the north to south orientation of the four stations. The overall salinity is typically lower and the spikes more moderate than at stations -01 and -03. However, Hurricane Rita caused the salinity to rise to a weekly mean of 13.84 ppt the week of September 25, 2005, at this station, the highest value of the four stations. Salinity readings fell to 5.4 ppt in mid January, over three months time after rising above the gradient classified as oligohaline. No spikes were noted in March, April, or October 2006, unlike the three other stations. The retention of the saltwater may indicate a lack of water exchange in the area after Hurricane Lili altered the flow dynamics of the area around the continuous recorder. Monthly data collection trips confirm that the hydrologic connection between CTU #2 and CTU #3 has been altered as a result of Hurricane Lili. Data presented in the marsh mat movement section of this report illustrate that the marsh in this area moved vertically with rising water levels. Visual confirmation during data collection visits to the project confirms horizontal movement/displacement of large areas of floating marsh due to wind speed and direction. The marsh settled in existing channels after the water level receded, thus altering the hydrology of the area. Comparing the 1998 and 2002 habitat mapping (Folse and Babin 2007) shows that these changes occurred as a result of high water levels and winds. These marsh mats were in the same post-Hurricane Lili location as observed during a field trip by LDNR/CRD in May 2006.

TE28-01 is the third station in order from north to south of four stations discussed. The salinity readings for this station spiked at a weekly mean of 11.55 ppt on September 28, 2005, and did not fall below 5 ppt until mid-January, approximately three months later. Salinity readings spiked above 5 ppt again in late March and early April 2006 and were above 5 ppt in October 2006.

TE28-03 is the southernmost of the four stations. Hurricane Rita-induced salinity measurements spiked at a weekly mean of 11.69 ppt the week of September 21, 2005, and did not fall below 5 ppt until the week of December 2005. Spikes in the salinity data were seen in March, April, and October 2006.

Mean weekly water level/elevation for the four stations ranges from approximately 0 to 3 ft NAVD88. TE28-02 is missing data from June 1, 2005, to April 12, 2006, due to an unnoticed broken resting pin in the stilling well containing the continuous recorder. Figures 8-11 present salinity and water level data through weekly mean. The four stations presented have nearly complete data sets from 1996 to 2006. No statistical analyses were run because there are no longer reference area sondes for comparison with each CTU. Folse and Babin (2007) provide a statistical analysis of data pertaining to project effectiveness. Spikes in weekly mean water level at the time of Hurricane Rita indicate saltwater pushing in from the south. Salinity measured after Hurricane Rita exemplifies retention of salt water in the project area.

Monthly discrete readings were averaged by day and by CTU. The monthly discrete data presented in Figure 12 graphically illustrates the discrete readings, which mimic the spiking seen in the continuous recorder (hourly readings). This shows that the salinity throughout the project closely resembles the data collected at the continuous recorder stations.

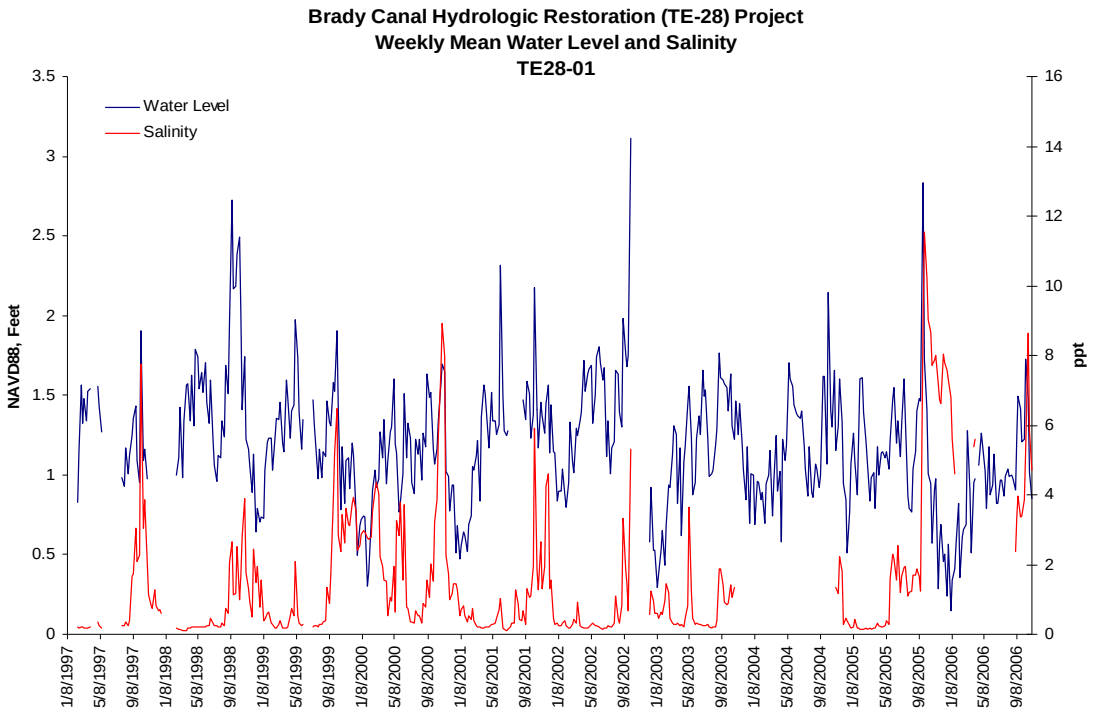

Figure 8. Weekly mean water level and salinity at the Brady Canal Hydrologic Restoration (TE-28) Project station TE28-01.

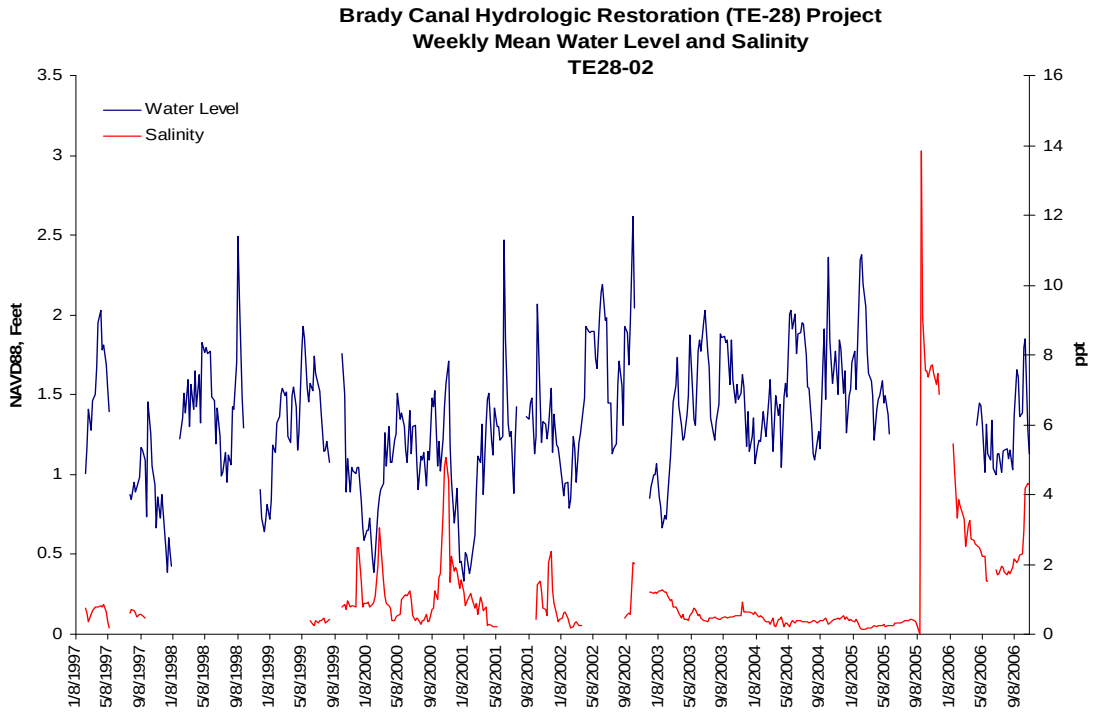

Figure 9. Weekly mean water level and salinity at the Brady Canal Hydrologic Restoration (TE-28) Project station TE28-02.

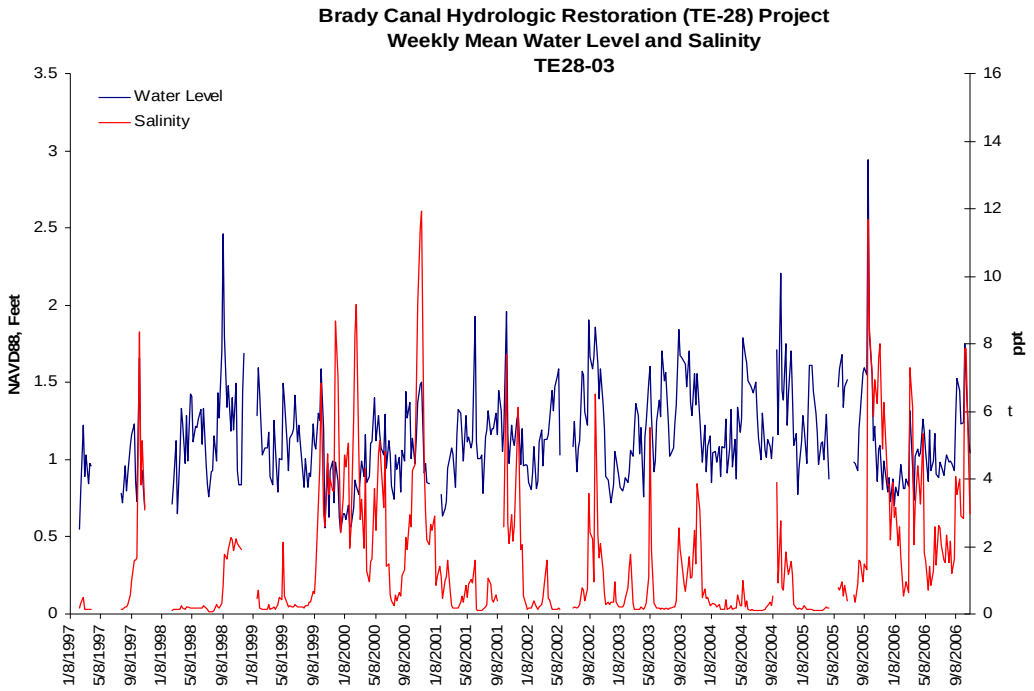

Figure 10. Weekly mean water level and salinity at the Brady Canal Hydrologic Restoration (TE-28) Project station TE28-03.

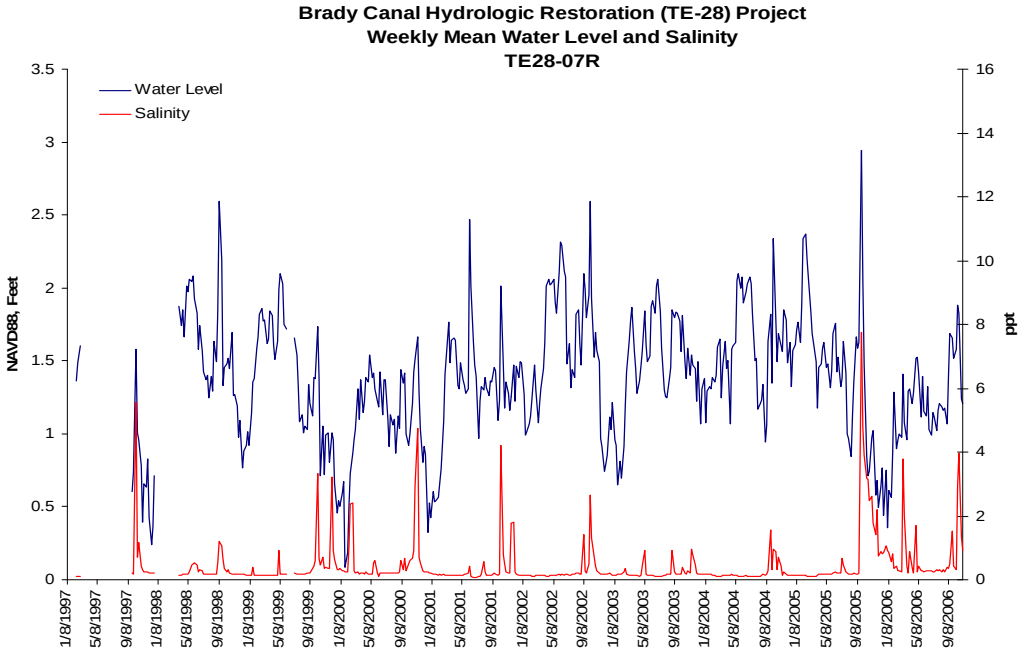

Figure 11. Weekly mean water level and salinity at the Brady Canal Hydrologic Restoration (TE-28) Project station TE28-07R.

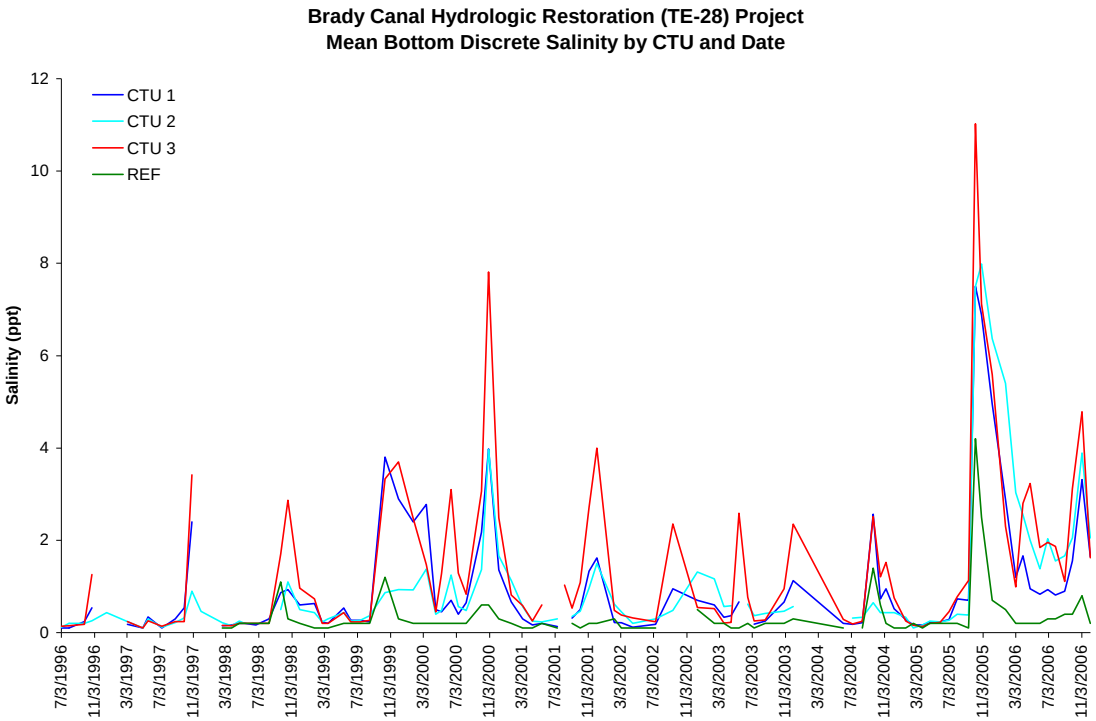

Figure 12. Mean daily bottom salinity readings by date at the Brady Canal Hydrologic Restoration (TE-28) Project.

Marsh Mat Movement

Hourly water level, marsh surface, and salinity data are collected using a continuous recorder that is suspended below the marsh mat in the fluid ooze layer which is above the firm substrate layer. Water level data are converted to ft, NAVD88 using data from an hourly continuous recorder in the adjacent marsh channel, TE28-02. Figure 13 presents the water surface and marsh mat surface fluctuations at station TE28-218.

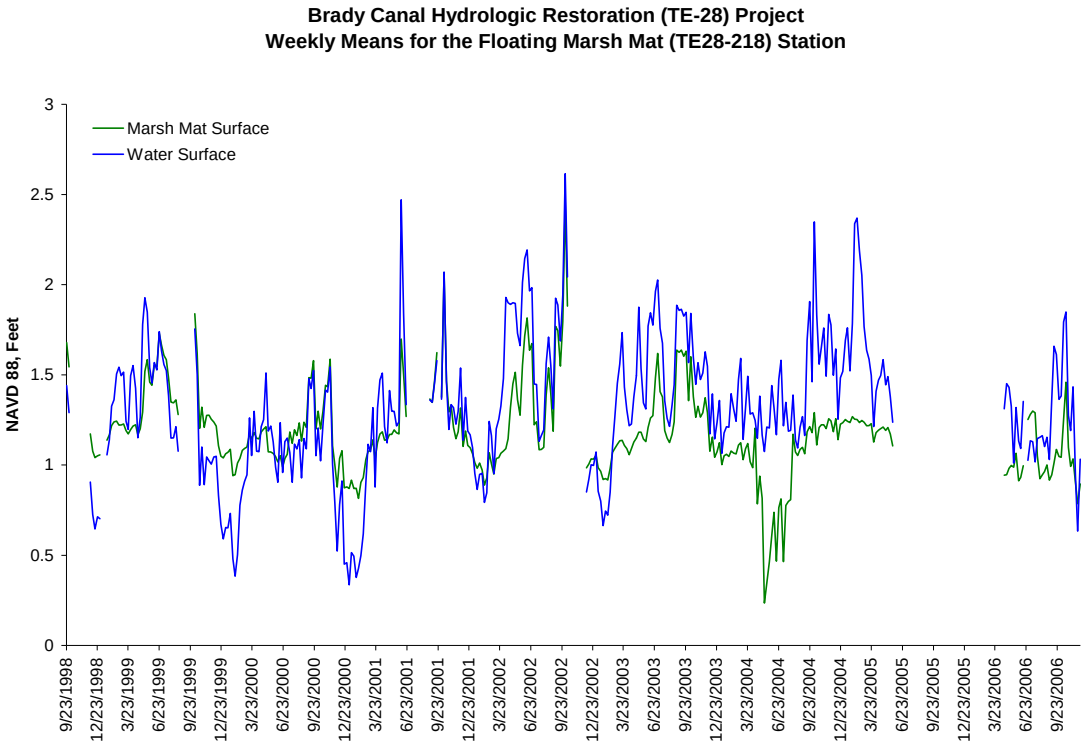

Figure 13. Weekly mean water elevation and marsh surface (NAVD88, Ft) at the Brady Canal Hydrologic Restoration (TE-28) Project station TE28-218.

Accretion

Rate of vertical accretion is determined through the measurement in millimeters of depth of a feldspar layer in a cryogenic core sample of marsh. Liquid nitrogen is used to freeze the sample cores around copper tubing and collected in triplicate at each of the five representative stations within each CTU using techniques described in Cahoon et al. (1996). Figure 14 shows the rate of accretion for CTUs 1, 2, and 3 as well as an average rate of accretion for all CTUs per sample year. During 1997/1998, the average accretion across all CTUs was 27.79 mm per year. In 2000/2001 average vertical accretion measured 16.1mm per year and in 2006 the average rate of accretion was measured at 12.92 mm per year. In comparison, historical data shows an 18 mm per year gain of sediment in the Bayou Decade area in 1992, an annualized gain of 34.6 mm per year from July 1991 to January 1993 in the Jug Lake area, and also an annualized gain of 9.9 mm per year from January 1993 to July 1994 in the vicinity of Jug Lake (Reed et al. 1995). Accretion throughout the project area is a result of deposited plant material versus deposition of mineral sediment, particularly in CTU #1 and CTU #2. Floating marshes do not contain much mineral sediment and rely on the production of plant biomass to sustain the thickness of the marsh mat. Data collection shows that the measured accretion is due primarily to the deposition of degraded plant matter.

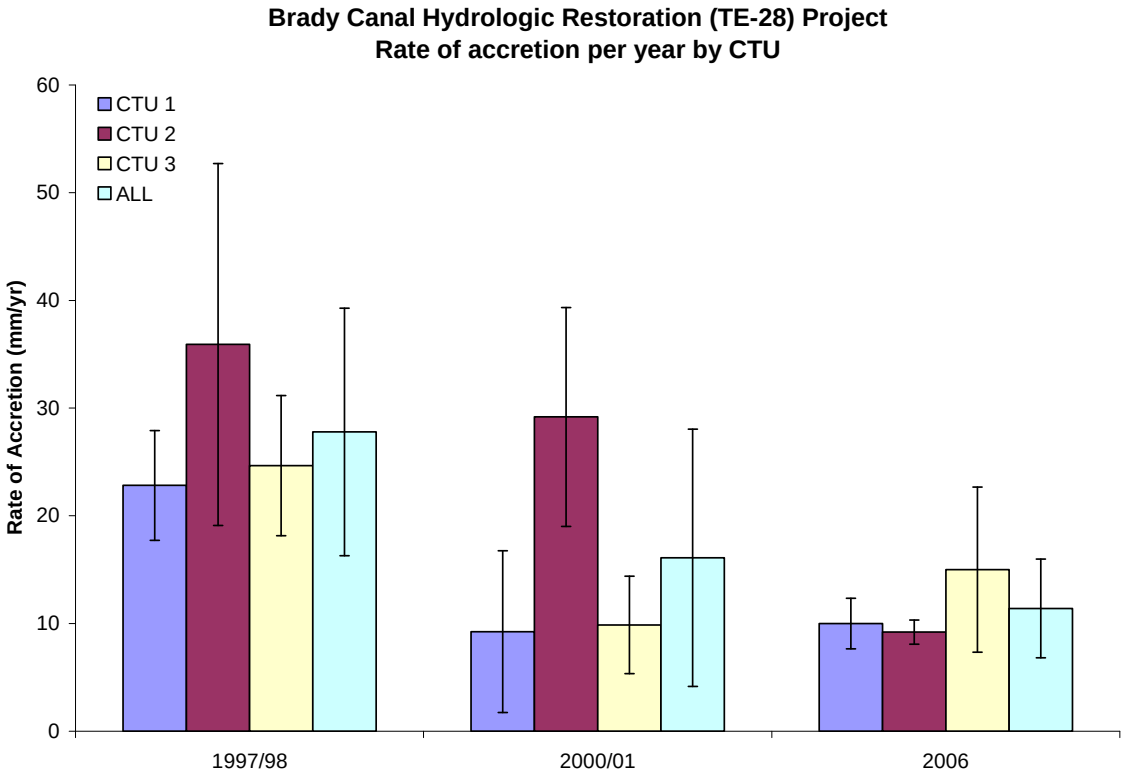

Figure 14. Rate of vertical accretion in millimeters per year at the Brady Canal Hydrologic Restoration (TE-28) Project in three CTUs and mean accretion rate for all CTUs per year.

Emergent Vegetation

Species richness and relative abundance were evaluated in the project area using the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974). Five sites are chosen within each CTU and replicate samples are collected at each site. Figure 15 is an illustration of the species richness and relative abundance of species in CTUs 1, 2, and 3 through the years. The total cover of other species in CTU #3 in 2006 is influenced by a high total cover value for *Bacopa monnieri* (14.16 % total cover) and *Setaria Beauv.* (13.84 % total cover). The total cover of *Baccharis halimifolia* in CTUs 1 and 2 in 2006 is 14.69 and 15.91 % total cover. Visual inspection of CTU #1 and CTU #2 by LADNR/CRD personnel reflects the data presented with respect to *Baccharis halimifolia*. There was no *Baccharis halimifolia* present in CTUs 1 and 2 in 1999 or 2002. There has been no increase in *Baccharis halimifolia* in CTU #3. In CTU #2 there were five species with relatively low cover in 1999 and 2002 that do not appear in 2006. These include *Ludwigia L.* and *L. leptocarpa* in 1999 and *Ludwigia leptocarpa* and *L. peploides* in 2002 and *Rynchospora colorata, Salvinia minima,* and *Bidens laevis*. In CTU #3, species that appear for the first time in the data in 2006 comprise 23.37 % of the total cover.

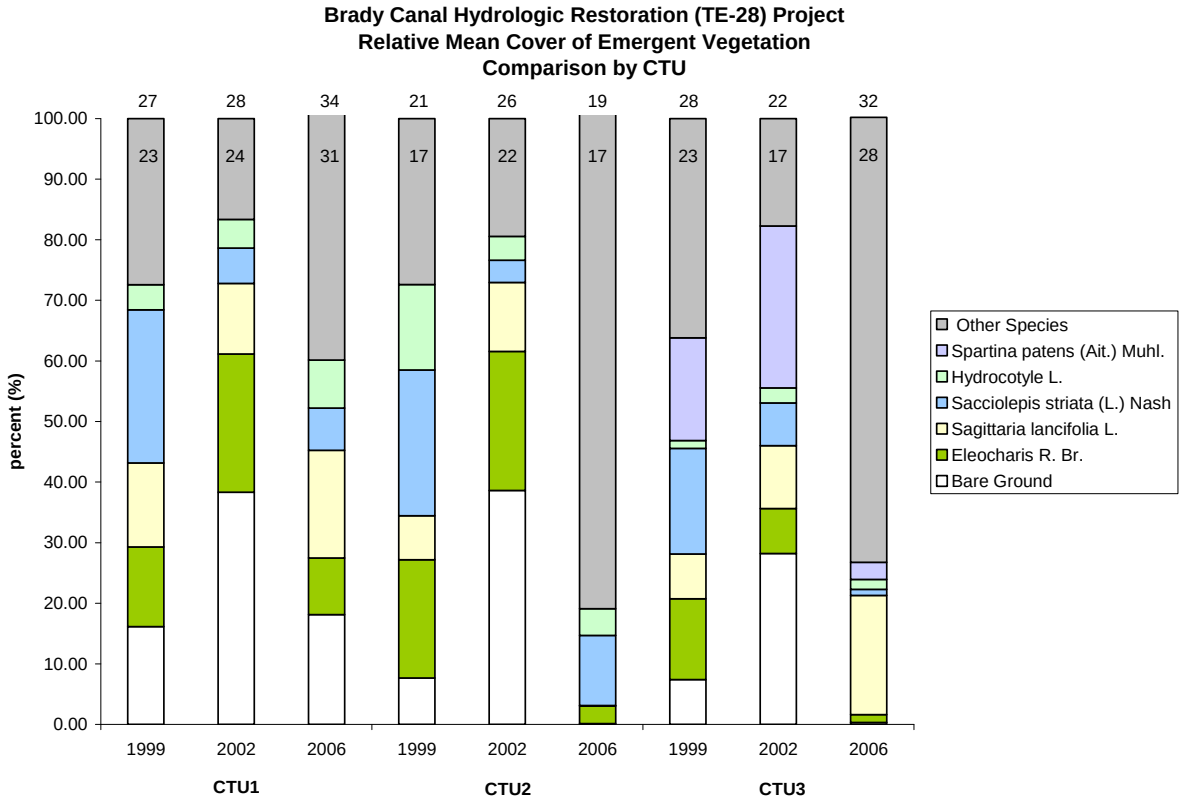

Figure 15. Relative mean cover of emergent vegetation compared by CTU over 3 sampling years at the Brady Canal Hydrologic Restoration (TE-28) Project. The numbers above the bars represent the total number of species identified.

V. Conclusions

a. Project Effectiveness

A comprehensive analysis of the monitoring data was completed in the 2004 Operations, Maintenance, and Monitoring Report (Folse and Babin 2007) and in the 2005 Operations, Maintenance, and Monitoring Report (Babin and Folse 2007). A detailed analysis was not performed in this report due to the elimination of monitoring stations and variables in the reference areas in 2004 as a result of the implementation of the CRMS-*Wetlands* project.

b. Recommended Improvements

As a result of the 2007 annual inspection, only programmatic levels of recommended improvements were identified that will require corrective actions in the 2007/2008 maintenance cycle. Recommended improvements include the repair of five (5) breaches along Carencro Bayou and Brady Canal (Figure 3). A detailed cost breakdown of maintenance repairs associated with breach closures is shown in Appendix B.

In the past, breach repairs of overflow banks and earthen embankment tie-ins have been classified in the Operations, Maintenance, and Monitoring report as emergency/immediate maintenance concerns. However, due to the frequent reoccurrence of breaches in the overflow banks and earthen embankments adjacent to existing water control structures, corrective actions have become problematic and shall be considered routine maintenance.

Channel depths adjacent to the water control structures should be measured to determine if the structures are raising the elevation of the channel bottoms and affecting hydrology. Levees, channel liners, weirs, and their adjacent channels should be surveyed to determine if they are functioning correctly. Discussion with the federal sponsors of this project to determine the time frame for these surveys is recommended.

Monitoring personnel should attend field trips quarterly with a contractor to note changes occurring in the project area. This will also provide monitoring personnel a chance to see any changes that may be occurring that the regular data collection efforts may not be showing.

c. Lessons Learned

It is well documented from past inspections and maintenance events that the earthen overflow banks on the northern boundary of the project (Little Carencro Bayou, Carencro Bayou, and Brady Canal) and the earthen embankment tie-ins to the weir structures along Jug Lake are areas of frequent erosion breaching. During high water events, these areas of the earthen embankments appear to have eroded more quickly and required continued maintenance and repairs. It is recommended that future designs of overflow banks and embankment tie-ins incorporate a rock revetment component to protect the banks from over-washing and effects of scouring adjacent to water control structures, reducing erosion.

Hydrologic restoration projects should include investigative measures to determine if changes within the project area have affected the function and purpose of the project features, i.e., water control structures. Often times, channels may change as a result of the construction of a water control structure or the placement of levees or other features that alter the hydrology of a system. Consequently, procedures should be prepared in advance of project implementation to investigate changes within the project that may influence hydrology.

The reference stations for this project were deactivated before the CRMS-*Wetlands* stations were actually collecting data. These gaps in the data make statistical analyses and comparisons difficult. Therefore, stations should not be deactivated before the replacement stations are equipped to provide data.

The resting pin that supports the bottom of the continuous recorder was broken June 1, 2005, and not discovered until April 12, 2006, at TE28-02. Consequently, the data for

TE28-02 and TE28-218 was discarded for this time frame. The continuous recorder setup will be examined more frequently to prevent future loss of data.

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Appendix A

Inspection Photographs

Photo 1 – (Structure 6) – fixed crest weir with barge bay along the north bank of Bayou Decade.

Photo 2 – (Structure 6) – northeast bank tie-in of structure 6.

Photo 3 – (Structure 6) – southwest bank tie-in of structure 6.

Photo 4 – (Structure 6) – location of missing timber piling and damage to guardrail on bulkhead.

Photo 5 – (Structure 6) – damaged timber pile cluster on the southwest side of structure 6.

Photo 6 – (Structure 7) – rock channel plug located along the north bank of Bayou Decade.

Photo 7 – (Structure 7) – rock channel plug located on the north bank of Bayou Decade.

Photo 8 – (Structure 10) – south bank of rock lined channel along Voss Canal.

Photo 9 – (Structure 10) – rock lined channel located along Voss Canal.

Photo 10 – (Structure 14) – southern tie-in of variable crest weir structure along Carencro Bayou.

Photo 11 – (Structure 14) – northern tie-in of variable crest weir along Carencro Bayou.

Photo 12 – (Structure 20) – rock lined channel located on the southwest side of Jug Lake.

Photo 13 – (Structure 21) – earthen embankment tie-in on the north side of the structure.

Photo 14 – (Structure 23) – variable crest weir located along the northeast bank of Jug Lake.

Photo 15 – (Structure 24) – fixed crest weir structure along the east bank of Jug Lake.

Photo 16 – (Breach Repair 1 through 4) - rock dike constructed in 2003 to close large openings in the bank.

Photo 17 – (Breach Repair 1 through 4) – rock dike constructed in 2003 to close large openings in the bank.

Photo 18 – (Breach Repair 5 and 6) – Levee refurbishment along Turtle Bayou completed in 2003.

Photo 19 – (Breach Repair 5 and 6) – Levee refurbishment along Turtle Bayou completed in 2003.

Photo 20 – (Breach Repair 7) – rock dike along location canal off of Superior Canal completed in 2003.

Photo 21 – Breach repair located along Breach 7 completed in 2006 by Apache Corporation.

Photo 22 – (Breach Repair 8) – levee refurbishment along Superior Canal completed in 2003.

Photo 23 - (Breach Repair 9) – levee refurbishment along Superior Canal completed in 2003.

Photo 24 – (Breach Repair 9) – levee refurbishment along Superior Canal completed in 2003.

Photo 25 – Breach repair made by Apache Corporation in 2006 along the east bank of Jug Lake.

Photo 26 – Breach repair located along Carencro Bayou adjacent to power lines near camp sites.

Photo 27 – Breach repair completed in 2006 by Apache Corporation along Carencro Bayou.

Photo 28 – Breach repair completed in 2006 by Apache Corporation along Carencro Bayou.

Photo 29 – Breach repair completed in 2006 by Apache Corporation along Carencro Bayou.

Photo 30 – Breach repair completed in 2006 by Apache Corporation along Carencro Bayou.

Photo 31 – Breach repair completed in 2006 by Apache Corporation along Brady Canal near the Bayou Penchant and the Apache Camp.

Photo 32 – Low area along the east bank of Jug Lake southwest of structure 24.

Photo 33 – Low area along the east bank of Jug Lake southwest of structure 24.

Photo 34 – Low area along the north bank of Bayou Decade north east of structure 6.

Photo 35 – Newly discovered breach along Carencro Bayou caused by uprooted tree.

Photo 36 – Newly discovered breach along Carencro Bayou uprooted tree.

Photo 37 – Newly discovered breach along the south bank of Brady Canal on the northern boundary of the project.

Appendix B

Three Year Budget Projections

Brady Canal/ TE-28 / PPL 3

Three-Year Operations & Maintenance Budgets 07/01/2007 - 06/30/10

Project Manager	O & M Manager	Federal Sponsor	Prepared By
	Brian Babin	*NRCS*	*Brian Babin*

	2007/2008	2008/2009	2009/2010
Maintenance Inspection	$ 5,407.00	$ 5,569.00	$ 5,736.00
Structure Operation	$ 16,000.00	$ 16,000.00	$ 16,000.00
Administration	$8,000.00	$ 8,000.00	$ 8,000.00
Maintenance/Rehabilitation			

07/08 Description: Routine Breach Repair and Navigational Aid inspection and maintenance

E&D	$0.00		
Construction	$32,500.00		
Construction Oversight	$2,000.00		
Sub Total - Maint. And Rehab.	$ 34,500.00		

08/09 Description: Routine Breach Repairs and Navigational Aid inspection and maintenance

E&D		$ -	
Construction		$ 32,500.00	
Construction Oversight		$ 2,000.00	
	Sub Total - Maint. And Rehab.	$ 34,500.00	

09/10 Description: Routine Breach Repairs and Navigational Aid Inspection and Maintenance

E&D			$ -
Construction			$ 32,500.00
Construction Oversight			$ 2,000.00
		Sub Total - Maint. And Rehab.	$ 34,500.00

	2007/2008	2008/2009	2009/2010
Annual O&M Budgets	**$ 63,907.00**	**$ 64,069.00**	**$ 64,236.00**

O &M Budget (3 yr Total)	**$192,212.00**
Unexpended O & M Funds	**$417,820.00**
Remaining O & M Budget (Projected)	**$225,608.00**

OPERATIONS & MAINTENANCE BUDGET WORKSHEET

Project: TE-28 Brady Canal Hydrologic Restoration

FY 07/08 –

Administration		$ 8,000*
O&M Inspection & Report		$ 5,407
Operation:		$ 16,000**
Maintenance:		$ 34,500
E&D:	$ 0	
Construction:	$ 32,500***	
Construction Oversight:	$ 2,000	

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually for a total of $8,000 per operation. (2)($8,000) = $16,000**. LDNR Administration: $3,000*

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

Routine Breach Repairs by Landowners:

Mobilization:	$ 7,500
Breach Repairs:	$15,000
(1000 linear ft. @ $15/ ft.)	
Contingency (20%)	$ 5,000
	$27,500***
Construction Oversight:	$ 2,000
(Burlington Resources)	
LDNR Administration:	$ 3,500*
NRCS Administration:	$ 1,500*
Overall Project Cost:	**$34,500**

FY 08/09 –

Administration		$ 8,000*
O&M Inspection & Report		$ 5,569
Operation:		$ 16,000
Maintenance:		$ 34,500
E&D:	$ 0	
Construction:	$ 32,500***	
Construction Oversight:	$ 2,000	

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually for a total of $8,000 per operation. (2)($8,000) = $16,000, Administration: $3,000*
Routine Breach Repairs: 32,500***, Construction Oversight: $2,000 (See Fy07/08)
LDNR Admin: $3,500*, NRCS Admin: $1,500* (See FY 07/08)
Navigational Aid inspection, maintenance and repairs: $5,000***

It is anticipated that miscellaneous earthen breaches and navigation lights will have to be repaired during the fiscal year. The cost above is based on in-kind service credits to the landowner for repair of breaches. Cost breakdown shown in FY 06/07.

FY 09/10 –

Administration		$ 8,000*
O&M Inspection & Report		$ 5,736
Operation:		$ 16,000
Maintenance:		$ 34,500
E&D:	$ 0	
Construction:	$ 32,500***	
Construction Oversight:	$ 2,000	

Operation and Maintenance Assumptions:

Structure Operations: 3 – structures are operated twice annually for a total of $8,000 per operation. (2)($8,000) = $16,000, Administration: $3,000*
Routine Breach Repairs: 32,500***, Construction Oversight: $2,000 (See Fy07/08)
LDNR Admin: $3,500*, NRCS Admin: $1,500* (See FY 07/08)
Navigational Aid inspection, maintenance and repairs: $5,000***

It is anticipated that miscellaneous earthen breaches and navigation lights will have to be repaired during the fiscal year. The cost above is based on in-kind service credits to the landowner for repair of breaches. Cost breakdown shown in FY 06/07.

Appendix C

Field Inspection Notes

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 6

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Fixed Crest Weir w/ Barge Bay

Water Level: N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy and Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Fair	pipe rail slightly bent		18 thur 22	**Observations:**
Earthen Wingwalls	Good				Structure No.6 appeared to be in good condition with slight damage to the timber piles protecting the steel bulkhead and timber navigational aid structure (dolphin)
Stop Logs Bays timbers, locks hoist etc.					Slight erosion was noted on the west side of the steel sheet pile wall at the earthen embankment tie-in.
Handrails Grating Hardware etc.					Two (2) of the batter piles on the timber dolphin on the southwest side of the strucrture suppporting the navitgation lights were split down the middle due to marine barge traffic hitting the structure. The center piling on this dolphin is in good condition.
Timber Piles	Good	Timber Piling west side of barge bay missing			There is no evidence that the structure will fail in the near future. LDNR will continue to monitor the damaged piling.
Timber Wales					All signs and navigation lights appeared to be in good condition. Automatic Power, Inc. was awarded a contract to inspect and maintain the nav lights beginning in Jan 2007.
Galv. Pile Caps	Fair	several caps missing			
Cables	Fair	loose on the southwest dolphin			
Signage /Supports	Good				**Structure Description:** 244 linear ft. steel sheetpile fixed crest weir structure with a 70 ft. wide barge bay crossing an oilfield canal on the north side of Bayou Decade west of Jug Lake. The mudline of the 70 ft. wide barge bay is set at an elevation of -0.5 ft. The fixed crest section is set at elevation +0.5 ft. NAVD. The steel sheetpile sections tie into the existing earthen embankment which is constructed to an elevation of +4.0 ft. NAVD. on each side of the structure. Two (2) batter dolphin piles with navigational aids are located on each side of the structure. Navigational aids include solar powered navigation lights with battery backup and aluminum warning signs attached to batter piles.
Rock Embankment					
Eathern Embankment					
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 7

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Rock Plug

Water Level : N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A			23 & 24	**Observation:**
Earthen Wingwalls	N/A				Other than storm debris littering the structure, the rock plug was in very good condition with not noticeable settlement or erosion.
Stop Logs Bays timbers, locks hoist etc.	N/A				Signs and supports are also in good condition.
Handrails Grating Hardware etc.	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Cables	N/A				
Signage /Supports	Good				
Rock Embankment	Very Good				**Structure Description:** 415 linear ft. rock riprap plug (approximately 6,000 tons of riprap installed) across as oil field access canal on the north side of Bayou Decade wet of Site 6. The top of the riprap plug is was constructed to an elevation of +4.0' NAVD which corresponds to the earthen embankment on each side to the structure. Aluminum warning signs are located in front of the structure along Bayou Decade.
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 10

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Rock Armored Channel Lining

Water Level: N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy/ Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A			25 & 26	The rock lined channel section appeared to be in good condition with no settlement of the weir section on each side. Earthen tie also looked to be in good condition.
Earthen Wingwalls	N/A				It is unclear, from a visual inspection, whether the section below the water surface is settling or not. A profile survey may be required in the future to assess this portion of the structure.
Stop Logs Bays timbers, locks hoist etc.	N/A				
Handrails Grating Hardware etc.	N/A				
Timber Piles	Good				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Cables	N/A				
Signage /Supports	N/A				
Rock Embankment	Good				**Structure Description:** 275 ft. x 45 ft. wide rock riprap channel liner three (3) feet minimum thickness lining the opening of a interior channel located on the west end of Bay Long intersecting Voss Canal. Aluminum warning signs attached to timber piles are located on both sides of the structure.
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 14

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Fixed Crest Weir w/ Adjustable Stoplogs

Approx. Water Level:

Type of Inspection: Annual

Weather Conditions: P. Cloudy/ Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	None	minor paint chipping	30 & 31	Minor erosion was noted on the earthen bank tie-ins on both sides of the structure. No breaching around the structure was occurring. The structure itself was in good condition with minor flaking of paint on the handrails of the structure.
Earthen Wingwalls	Fair				The interior marsh adjacent to structure was very shallow at the time of the Inspection.
Stop Logs Bays timbers, locks hoist etc.	Good				Structure Operatons were completed in March 2007 by T. Baker Smith. 9 stop logs were removed to a crest elevation of -5.57'.
Handrails Grating Hardware etc.	Good				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	Good				
Cables	N/A				
Signage /Supports	Good				**Structure Description:** 82 linear ft. steel pile fixed crest weir with a six (6) ft. wide variable crest weir structure. This structure consist of 36 ft. fixed crest weir structure (18 ft. on each side of the stop log bay) set at an elevation of 1.0 ft. BML. The six (6) ft. wide variable crest section contains 10 - 4" x 6" stop logs, steel channel guides, locking channels and locks, steel grating walkways, handrails, etc. Aluminum warning signs are located adjacent to structure.
Rock Embankment	N/A				
Eathern Embankment	significant cut banks				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 20

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Rock Armored Channel Liner

Water Level: N/A

Type of Inspection: Annual

Weather Conditions: P. Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A	None	N/A	16	
Earthen Wingwalls	N/A				**Observation:** The rock rip rap lined channel appeared to be in good conditon with no signs of damage or displacement of rock. From water elevation of 0.54' NAVD determined from measurements at Structure No. 21, we detemined that the lined channel was at an approximate elevation of -7.7' NAVD. We are uncertain of the average elevation and a profile may be required in the future to determine the extent of settlement.
Stop Logs Bays timbers, locks hoist etc.	N/A				
Handrails Grating Hardware etc.	N/A				All signs and supports were also in good condition.
Timber Piles	Good				
Timber Wales	N/A				
Galv. Pile Caps	Good				
Cables	N/A				
Signage /Supports	Good				**Structure Description:** 180 ft. x 48 ft. wide loose rock riprap channel lining placed 3 ft. minimum thickness, lining the opening of the canal at the northwest corner of Jug Lake connecting the interior marsh. Aluminum waring signs supported by timber piles are located on both sides of the structure.
Rock Embankment	Good				
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 21

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Fixed Crest Weir w/ Adjustable Stoplogs

Approx. Water Level :

Type of Inspection: Annual

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	Paint chipping	None	15	
Earthen Wingwalls	Fair				**Observation:** The variable crest weir structure was in good condition. The earthen wingwalls noted on previous inspection as experiencing significant erosion were refurbished with material from the lake by Apache Corporation using in-kind service credits.
Stop Logs Bays timbers, locks hoist etc.	Good				Water level at the time of the inspection was calcutated to be approximately 0.54' NAVD determined from hex bolt on structure.
Handrails Grating Hardware etc.	Good	paint chipping			Stop logs were removed in March 2007 by T. Baker Smith. A total of 17 logs were removed from the three (3) bay structure to the natural channel bottom.
Timber Piles	Good				Note: Only one photo available. Others did not come out.
Timber Wales	Good				
Galv. Pile Caps	Good				
Cables					
Signage /Supports	Good				**Structure Description:** 100 linear ft. steel sheet pile fixed crest weir with three (3) - 6 ft. wide variable crest sections. Each variable crest sections contains 10 stop logs each measuring 4" x 6" timbers. The variable crest sections can be adjusted from 1.0 ft. BML to 5.0 ft. BML. The sheet pile structure ties into a 15 ft. wide earthen embankment section on each side of the structure. Aluminum warning signs attached to round timber piles are located on each side in front of the structure.
Rock Embankment	N/A				
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 23

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Fixed Crest Weir w/ Adjustable Stoplogs

Approx. Water Level : N/A

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	Paint chipping	None	14	
					Observation:
Earthen Wingwalls	Fair	repaired	N/A		The variable crest weir was in good condition with not apparent damage. the earthen wingwall tie-ins were recently repaired by Apache Corporation and are in good condition.
Stop Logs Bays timbers, locks hoist etc.	Good				The variable crest section was operated in March 2007 by T. Baker Smith at which time a total of 20 logs were removed from two (2) bays.
Handrails Grating Hardware etc.	Good				All signs and supports were also in good condition.
Timber Piles	Good				
					Several of the photos taken did not come out.
Timber Wales	Good				
Galv. Pile Caps	Good				
Cables					
Signage /Supports	Good				**Structure Description:** 100 linear ft. steel sheet pile fixed crest weir with two (2) - 6 ft. wide variable crest sections. Each variable crest sections contains 10 stop logs each measuring 4" x 6" timbers. The variable crest sections can be adjusted from 1.0 ft. BML to 5.0 ft. BML. The sheet pile structure ties into a 15 ft. wide earthen embankment section on each side of the structure. Aluminum warning signs attached to round timber piles are located on each side in front of the structure.
Rock Embankment	N/A				
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration**

Date of Inspection: February 14, 2007

Structure No. Site 24

Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Fixed Crest Weir

Water Level:

Type of Inspection: Annual

Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	Good	Paint chipping		13	
Earthen Wingwalls	Fair	recently repaired			The fixed crest wier was in good condition with no apparent damage. The earthen wingwalls were recently repaired by Apache Corporation under In-kind service agreement with LDNR.
Stop Logs Bays timbers, locks hoist etc.	N/A				All signs and supports were also in good condition.
Handrails Grating Hardware etc.	Good				
Timber Piles	Good				
Timber Wales	N/A				
Galv. Pile Caps	Good				
Cables	N/A				
Signage /Supports	Good				
Rock Embankment	N/A				**Structure Description:** 140 ft. steel pile fixed crest weir located adjacent to the southeast corner of Jug Lake. The structure consists of a fixed crest steel sheet pile weir with 60' section set at +4.0'. elev., 30' section set at +1.5' elev., and 50' section set at -03' elev. On either side of the structure is a 15 linear ft. wide earthen wingwall sections construction to +4.0'. NAVD88 to tie into the existing earthen embankments. Aluminum warning signs are set at either side of the 50 linear ft. sections of sheet piling and are supported by timber piles.
Eathern Embankment	N/A				
Rock Armored Earthen Embankment	N/A				

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: **TE-28 Brady Canal Hydrologic Restoration** Date of Inspection: February 14, 2007

Structure No. Inspector(s): B. Babin, S. Triche, W. Blanchard, B. McElroy, T. Allen

Structure Description: Earthen Embankments Water Level Inside: N/A Outside: N/A

Type of Inspection: Annual Weather Conditions: Partly Cloudy / Cool

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Earthen					Breach 8 - levee refurbishment along Superior Canal appeared to be in good condition
Embankment	Good	slight cut bank	N/A	6 & 7	with a slight cut bank noticed along the front face to the embankment. Levee width
					and elevation was good and vegetation was thick and plentiful. The repaired section
					of levee completed in 2003 appreared to have settled some from elevation differences
					in the refurbished section and the adjacent levee not repaired.
Earten					Breach 9 - a visual inspection of the levee refurbishment along Superior Canal revealed
Embankment	Good	slight cut bank	N/A	3	that the earten embankment was in good condition with adequate width and elevation
					A slight cut bank was noted along the face of the levee. Vegetation was plentiful.
				4 & 5	Breach 7 - rock channel plug in good condition with no settlement. Photo No. 5
					shows a small breach across canal from Breach 7 repaired by Apache.
Earthen					Breach 5 & 6 - We did notice cut banks along the entire length of the breach repair
Embankment	Good	slight cut bank	N/A	1 & 2	completed in 2003. Embankment remains in good condition
					Breach 1 through 4 - rock dike along north bank of Bayou Decade between Turtle
Armored	Good			8 & 9	Bayou and Jug Lake is in same condition as previous inspection. I appears that
Embankment					some rocks along the length of the structure was displaced during the storms.
					The rock dike is low but appears to be protecting the northern bank as intended.
					Newley discovered low areas and breaches
					Three low areas where potential breaches may occur was identified along the east
				10, 11 & 12	bank of Jug Lake. These areas are very low and may require routine maintenance
					in the coming year. We will continue to monitor these locations.
					Below are the coordinates of breaches discovered along Bayou Carencro, Brady
					Canal and Little Carencro Bayou:
					UTM (Meters)
				33, 34,35,	Breach 1 - 694,235 N 3,254,371 E
				36,37,	Breach 2 - 694,422 N 3,254,769 E
					Breach 3 - 695,025 N 3,254,790 E
					Breach 4 - 695,776 N 3,254,844 E
					Breach 5 - 695,955 N 3,254,982 E
				27 & 28, 29	Maintenance work performed by Apache along Carencro Bayou in Oct 2006
				32, 38	