



Coastal Protection and
Restoration Authority of Louisiana

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

2017 Annual Inspection Report

for

**GIWW Bank Restoration Project –
Segment 4 (TE-43)**

State Project Number TE-43
Priority Project List 10

July 13, 2017
Terrebonne Parish

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Table of Contents

I. Introduction.....	3
II. Inspection Purpose and Procedures	3
III. Project Description and History.....	4
IV. Summary of Past Operation and Maintenance Projects.....	4
V. Inspection Results	4
VI. Conclusions and Recommendations	7

Appendices

- Appendix A Project Features Map
- Appendix B Photographs
- Appendix C Three Year Budget Projections

I. Introduction

The GIWW Bank Restoration Project – Segment 4 (TE-43) is located in Terrebonne Parish, Louisiana, approximately 10 miles east of the Lower Atchafalaya River and approximately 10 miles southwest of Houma, La. Segment 4 is located along the south bank of the Gulf Intracoastal Waterway (GIWW), beginning at the mouth of Bayou Copasaw extending eastward to the southern end of Lake Hackberry.

Within the project area, increased Atchafalaya River flow and marine traffic through the GIWW has resulted in breaches in the shoreline bank and subsequent scouring of the interior marshes (Draft ER, Stead, 2004). The GIWW Bank Restoration of Critical Areas (TE-43) project intends to address this landloss by stabilizing the most severely degraded south bank of the GIWW and slow erosion along approximately 10,500 linear feet of the southern bank of the GIWW over the 20 year project life (Draft ER, Stead, 2004).

The project has a twenty (20) year project life, which began in April 2014. The principal project feature included the construction of a rock dike with a light-weight aggregate core. Due to very poor soil conditions, the rock dike was constructed in two (2) lifts with a 90 day waiting period to allow for initial consolidation of the soils.

II. Inspection Purpose and Procedures

The purpose of the annual inspection of the GIWW Bank Restoration of Critical Areas – Segment 4 (TE-43) project is to evaluate the constructed project features in order to identify any deficiencies. The inspection results are used to prepare a report detailing the condition of the project features and recommending any corrective actions considered necessary. Should it be determined that corrective actions are needed, the CPRA shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, construction, and contingencies, as well as an assessment of the urgency of such repairs. The annual inspection report also contains a summary of maintenance projects which were completed since completion of constructed project features and an estimated projected budget for the upcoming three (3) years for operation, maintenance, and rehabilitation. The three (3) year projected operation and maintenance budget is shown in Appendix C. A summary of past operation and maintenance projects completed since construction of the project is outlined in Section IV.

The annual inspection of GIWW Bank Restoration of Critical Areas – Segment 4 (TE-43) project took place on April 6, 2017, the same day as the Penchant Basin (TE-34) Project. In attendance were Brian Babin, Adam Ledet and Todd Hubbell with CPRA, and Doug Baker and Quin Kinler with the Natural Resource Conservation Service (NRCS). The attendees met at Bob's Bayou Black Marina in Bayou Black, La. The inspection began around 11:30 am at west end of Segment No.4 of the rock dike and ended at the east end at approximately 12:30 pm. The trip included a visual inspection of the rock dike, bankline, warning signs, navigational aids and settlement plates. The water level at

project site was +0.6' NAVD 88 (Geoid 12a) at 1:00 pm. Photographs of the inspection are located in Appendix B.

III. Project Description

The following completed, structural components jointly accepted by CPRA and NRCS will require operation, maintenance, repair, and/or rehabilitation throughout the twenty (20) year life of the project.

Segment 4 is a continuous 10,579 linear foot composite rock dike section with a light-weight aggregate core along the southern bank of the GIWW, east of the Bayou Copasaw. The rock dike was constructed to a +3.5' NAVD crest elevation with a 3' wide top width and 3:1 side slopes. The structure was constructed above a geotextile fabric material. The spoil material excavated for access was temporarily stock piled and used to fill the floatation channel upon completion of the dike structure. Other features include 2,262 linear feet of rock riprap apron on both ends of Segment 4 between the marsh and dike, nine (9) galvanized steel settlement plates, forty-six (46) timber warning signs and three (3) navigational aid lights at channel locations.

IV. Summary of Past Operation and Maintenance Projects

To date, there have been no maintenance events or project features that required routine maintenance. This section will be used to reference all past maintenance activities on future inspection reports.

V. Inspection Results

GIWW Bank Restoration of Critical Areas – Segment 4 (TE-43)

Since the rock dike along Segment No.4 is difficult to inspect visually and it is unclear of the extent of settlement that had occurred, CPRA contracted T. Baker Smith of Houma, La., through their IDIQ contract with CPRA, to perform a topographic survey of the structure. The scope of work was given to T. Baker Smith in December 2016 to begin work at a total cost of approximately \$45,000.

T. Baker Smith was contracted to survey nine (9) settlement plates, perform a profile survey along the centerline existing rock dike, and take survey transects at forty-four (44) locations along the rock dike. The locations of each transect matched the locations on the as-built drawings. All transects extend approximately 100' on the waterway side of the dike and 50' on the marsh side. As stated in T. Baker Smiths Survey Report dated April 4, 2017, the survey was based on two (2) Louisiana Coastal Zone Secondary Monuments (TE-43-SM-C and CRMSTE-SM-11). These monuments were used to transmit real time corrections to the rover unit, where the

horizontal and vertical positions were established on all data collected within the respective project areas.

TBS obtained mean low and mean high water levels by collecting daily water level elevations and comparing them to the water data gathered from the nearest CRMS continuous data collection station. TBS compiled this data to compute an average tidal data in NAVD 88. The mean water level was determined to be 1.2' NAVD 88, Geoid 12a.

TBS was also required to superimpose the newly collected elevation data onto the as-built survey drawings to make a comparison of what was constructed to the current conditions. Since the as-built survey data was collected in Geoid 99, all of the previously collected survey data had to be converted to the most recent geometric height (Geoid 12a). It was determined that the adjustment from the Geoid 99 to the current Geoid 12a was a factor of -1.5'. The final deliverables contained plan and profile drawings of the dike constructed in 2014 and the current configuration of the dike in 2017, all in Geoid 12a. The corrected design elevation in Geoid 12a is +2.0' NAVD.

A review of the elevation data and drawings of the TE-43 Segment No.4 revealed the following:

From Sta. 0+00 to 50+00, the rock dike settled from a minimum of 0.9' to a maximum of 2.0'. The settlement appeared to be somewhat uniform with an average settlement of 1.3'. The average elevation of the rock dike from 0+00 to 50+00 was approximately 0.7' NAVD (Geoid 12a).

The settlement continues to increase uniformly from 1.2' at Sta. 50+00 to 4.7' at Sta. 65+00 with depths increase west to east and an average settlement of 3.4'. The average elevation of the rock dike from 50+00 to 65+00 is approximately -1.4' NAVD 88 (Geoid 12a).

From Sta. 65+00 to 70+00, a very large increase in settlement was observed in the range of 11' with the worst case of settlement at Sta. 67+00. It is estimated that the crest elevation of the rock dike is near -9.0' NAVD (Geoid 12a).

Between Sta. 70+00 and 85+00, the settlement fluctuates from 1.9' at Sta. 70+00 to 4.7' at Sta. 75+00 and back up to 2.8' at Sta. 85+00. The average settlement between these stations was calculated to be 3.2'. The dike elevation ranges from 0.1' NAVD 88 to -2.7 NAVD 88 (Geoid 12a).

During construction, the contractor was unable to construct the rock dike to the design elevation between Sta. 85+50 and Sta. 88+25, and between Sta. 89+25 and Sta. 90+25. The dike settled approximately 12' at these two locations shortly after construction. Since construction, the structure has settled an additional 2'. These two areas have experienced the worst settlement of the entire length of the

rock structure. From Sta. 90+25 heading east, the settlement continues to decrease from 3.3' at Sta. 91+00 to 0.7' near the end of the project near Sta. 106+00. The average elevation for this reach was approximately 0.0' NAVD 88 (Geoid 12a)

TBS was also tasked with installing a total of seven (7) staff gauges at various locations along the south bank of the GIWW. The installation and survey techniques used followed the guidelines of CPRA's Contractor's guide to minimum standards. Below is a description of the staff gauge locations:

Two (2) staff gages were set at (TE-43) Bank Restoration of Critical Areas – Segment No. 4 at the far north and south ends of the project area. The staff gages were placed on existing pilings with the elevation of the gage set to NAVD88 (Geoid 12A).

Two (2) staff gages were set at (EB-10) GIWW Breach Closure Project – Segment No. 6 at the far north and south ends of the project area. The staff gage located at the north end was placed on an existing piling and set to NAVD88 Geoid 12A Elevation. The staff gage located at the south end was placed on a 4-inch by 4-inch post that was set by TBS with the elevation of the staff gage set to NAVD88 (Geoid 12A).

One (1) staff gage was set at (TE-34) Penchant Basin Natural Resource Plan – Increment 1 along the west bank of Bayou Penchant near the south end of the west project area. The staff gages were placed on existing pilings with the elevation of the gage set to NAVD88 (Geoid 12A).

Two (2) staff gages were set at (CIAP) GIWW Breach Closure Project – Segment No. 2B at the far northwest and southeast ends of the project area. The staff gages were placed on existing pilings with the elevation of the gage set to NAVD88 (Geoid 12A).

TBS's task order also required the survey of nine (9) existing settlement plates along Segment 4 of the bank restoration project. The settlement plate elevations ranged from 3.0' to 6.7' NAVD 88 (Geoid 12a) with an average elevation along the structure of 4.5' NAVD88 (Geoid 12a). Below are the settlement plate comparisons from the TBS's survey:

SP No.	Sta.	As-built Elev. (Geoid 99)	As-built Elev. (Geoid 12a)	2016 Elev. (Geoid 12a)	Settlement
SP 23	04+43	8.49'	6.99'	6.0'	0.99'
SP24	14+46	7.11'	5.61'	4.3'	1.31'
SP25	25+28	7.75'	6.25'	5.1'	1.15'
SP26	37+82	9.47'	7.97'	6.7'	1.27'
SP27	48+39	8.16'	6.66'	5.2'	1.46'

SP28	61+32	7.29'	5.79'	3.1'	2.69'
SP29	71+50	6.98'	5.48'	3.0'	2.48'
SP30	81+19	7.73'	6.23'	3.5'	2.73'
SP31	96+26	7.99'	6.49'	3.5'	2.99'

We did note that all of the warning signs along the length of the project were in good condition with the exception of two (2) signs on the western end of the project which had been pushed over or leaning partially into the water. These signs shall be replaced on the next maintenance cycle of the rock dike.

The complete survey report and drawings can be found at <https://cims.coastal.louisiana.gov/DocLibrary/DocumentSearch.aspx?Root=0&Folder=0> on the CPRA website under the CIMS icon.

VI. Conclusions and Recommendations

As in the case of previous inspections, it was difficult to visually inspect the rock dike due to a significant portion of the rock structure being submerged underwater. It had been decided by NRCS and CPRA that a topographic survey be conducted to evaluate the condition of the structure. T. Baker Smith was tasked by CPRA to conduct a topographic survey of the structure which was completed in March 2017.

As noted in Section V of this report, the topographic survey by T. Baker Smith revealed that the entire structure had experienced moderate to severe settlement, in the most extreme case over 10', due the poor soil conditions in the area. The only known or tested alternative to refurbish an existing rock structure is to cap it with additional rock riprap. The downfall to this method is that the additional weight placed on the structure may cause further settlement because of the underlying weak soils. At this time, we are not aware of any bankline protection system that could be placed on top of, or attached to, the rock structure as a retrofit. CPRA and NRCS are willing to consider other alternatives to enhance the protection of the bankline.

It appears that the main forces that have eroded the GIWW south bankline are wave action and the large volume of water that gets pushed into, and then gets withdrawn from, the bank each time a large vessel passes in the waterway. Based on the comparison of aerial photography pre-construction (2012) and post-construction (2015), it appears that 1) the floating vegetation behind the structure has increased due to the protection that the rock dike is providing, and 2) there is less "fracturing" and removal of the adjacent floatant marsh. Additionally, it may be possible that accretion can occur in the open water areas over time as the sediment from over-wash of the structure continues. Although we have seen significant settlement of the structure, the rock dike seems to be providing some protection along the south bank of the GIWW in the vicinity of the TE-43 project.

As for the warning signs and settlement plates, we recommend that the damaged timber pile and sign be replaced during the next maintenance event and additional segments of galvanized pipe be installed on settlement plates that have settled below an elevation that would make it difficult to access for future surveys.

References:

Stead, M.A. May 2004. Draft - Ecological Review of the GIWW Bank Restoration of Critical Areas in Terrebonne. Restoration Technology Section, Coastal Restoration Division, Louisiana Department of Natural Resources. Baton Rouge, La. 12 pp.

Appendix A
Project Features Map



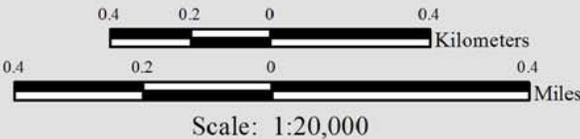
GIWW Bank Restoration of Critical Areas in Terrebonne (TE-43)



- Shoreline Protection
- Project Boundary



Source:
Coastal Protection and Restoration
Authority of Louisiana
Imagery:
2013 National Agriculture
Imagery Program



File Path: //RID2015040107/
Map Date: March 18, 2015

Appendix B
Photographs



Photo No.1 – view of rock dike tie-in along an oil field location canal at Sta. 0+00.



Photo No.2 – view of rock dike protection along the GIWW near Sta. 3+00.



Photo No.3 – view of rock dike and navigational aid structure near Sta. 3+00 along the GIWW.



Photo No.4 – view of rock dike along the GIWW looking eastward.



Photo No.5 – view of rock dike and warning sign leaning over near Sta. 05+00.



Photo No.6 – view of rock dike and warning sign leaning over near Sta. 05+00.



Photo No.7 – view of rock dike and downed warning sign over near Sta. 10+00.



Photo No.8 – view of rock dike and warning sign leaning over near Sta. 05+00.



Photo No.9 – view of rock dike and downed warning sign over near Sta. 10+00.

Appendix C

Three Year Budget Projection

**GIWW Critical Areas/ TE-43 / PPL 10 (2017-2020)
Three-Year Operations & Maintenance Budgets**

<u>Project Manager</u>	<u>O & M Manager</u>	<u>Federal Sponsor</u>	<u>Prepared By</u>
	<i>B.Babin</i>	NRCS	<i>B. Babin</i>

	2017/2018	2018/2019	2019/2020
<i>Maintenance Inspection</i>	\$ 13,006.00	\$ 13,394.00	\$ 13,799.00
<i>Structure Ops/ Nav Aid</i>	\$ -	\$ -	\$ -
<i>CPRA Administration</i>	\$ -		\$ -
<i>Maintenance/Rehabilitation</i>	\$ -	\$ -	\$ -

17/18 Description:

<i>E&D</i>	
<i>Construction</i>	
<i>Construction Oversight</i>	
<i>Sub Total - Maint. And Rehab.</i>	\$ -

18/19 Description:

<i>Surveying</i>	
<i>Construction</i>	\$ -
<i>Construction Oversight</i>	\$ -
<i>Sub Total - Maint. And Rehab.</i>	\$ -

19/20 Description:

<i>E&D</i>	\$ -
<i>Construction</i>	\$ -
<i>Construction Oversight</i>	\$ -
<i>Sub Total - Maint. And Rehab.</i>	\$ -

	2017/2018	2018/2019	2019/2020
<u>Annual O&M Budgets</u>	\$ 13,006.00	\$ 13,394.00	\$ 13,799.00

<u>2017 - 2020 O &M Budget (3 yr Total)</u>	\$ 40,199
<u>Unexpended O & M Funds</u>	\$ 904,389
<u>Remaining O & M Budget (Projected)</u>	\$ 864,190

OPERATIONS & MAINTENANCE BUDGET WORKSHEET

Project: TE-43 GIWW Critical Areas Bank Restoration

FY 17/18 –

Administration		\$ 13,006
Operation/Navigational Aid:		\$ 0
Maintenance:		\$ 0
E&D:	\$ 0	
Construction:	\$ 0	
Construction Oversight:	\$ 0	

Operation and Maintenance Assumptions:

O&M Inspection and Report

CPRA Direct Costs

Inspection:

CPRA Engineer 3 – 12 hrs@ \$68/hr.:	\$ 816
CPRA Engineer 6 – 12 hrs @ \$78/hr.	\$ 936
CPRA Scientist 4 – 10 hrs @ \$56/hr.	\$ 560
	\$ 2,312

Report:

CPRA Engineer 6 – 30 hrs. @ \$78/hr.	\$ 2,340
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Total Direct CPRA Costs: **\$ 4,652**

CPRA Indirect Costs

Inspection:

CPRA Engineer 3 – 12 hrs@ \$127/hr.:	\$ 1,524
CPRA Engineer 6 – 12 hrs @ \$145/hr.	\$ 1,740
CPRA Scientist 4 – 10 hrs @ \$104/hr.	\$ 1,040
	\$ 4,304

Report:

CPRA Engineer 6 – 30 hrs. @ \$145/hr.	\$ 4,350
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Total Indirect CPRA Costs: **\$ 8,354**

FY 18/19 –

Administration		\$	0
O&M Inspection & Report		\$	13,397
Operation/Navigational Aid:		\$	0
Maintenance:		\$	
E&D:	\$		0
Construction:	\$		0
Construction Oversight:	\$		0

Operation and Maintenance Assumptions:

O&M Inspection and Report – 3% Inflation

CPRA Direct Costs

Total Direct CPRA Costs: \$4,652 x 3% Inflation = **\$4792**

CPRA Indirect Costs

Total Indirect CPRA Costs: \$8,354 x 3% Inflation = **\$8,605**

FY 19/20 –

Administration		\$	0
O&M Inspection & Report		\$	13,799
Operation/Navigational Aid:		\$	0
Maintenance:		\$	
E&D:	\$		0
Construction:	\$		0
Construction Oversight:	\$		0

Operation and Maintenance Assumptions:

O&M Inspection and Report – 3% Inflation

CPRA Direct Costs

Total Direct CPRA Costs: \$4,792 x 3% Inflation = **\$4,936**

CPRA Indirect Costs

Total Indirect CPRA Costs: \$8,605 x 3% Inflation = **\$8,863**

2017-2020 Accounting

Expenditures (LaGov):	\$ 60,665
Total Expenditures:	\$ 60,665
Current O&M Funding (LANA Report):	\$ 965,054
Current Unexpended O&M Funds:	\$ 904,389