



## Coastal Protection and Restoration Authority of Louisiana (CPRA)

### 2016/2017 Annual Inspection Report

for

### BLACK BAYOU CULVERTS HYDROLOGIC RESTORATION PROJECT (CS-29)

State Project Number CS-29  
Priority Project List 9

March 7, 2017  
Calcasieu and Cameron Parishes



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## **I. Introduction**

The Black Bayou Culverts Hydrologic Restoration Project (CS-29) encompasses a large project area and consists of one primary control structure located approximately ¼ mile south of the Gulf Intracoastal Waterway (GIWW) on LA State Highway 384 where it intersects Black Bayou in Calcasieu Parish. The project area is bordered to the north by the Gulf Intracoastal Waterway (GIWW), to the south by the Gulf of Mexico, to the east by Bayou Teche and the Vermilion River, and to the west by the Calcasieu River. Total project area is approximately 72,378 acres and is comprised primarily of freshwater marsh (See Appendix A).

The primary project feature is a 10 foot by 10 foot concrete box culvert equipped with flap gates and trash screens. LA Highway 384 was reconstructed over the structure complete with guard rails and signage. This structure provides additional drainage to the discharges provided by Calcasieu Locks, Schooner Bayou, and Catfish Point water control structures. It is intended to provide relief to the marsh impacted by high water levels

The Black Bayou Hydrologic Restoration Project was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended and approved on the ninth Priority Project List. The Black Bayou Culverts Hydrologic Restoration Project has a twenty year (20 year) project life, which began in January 2010.

## **II. Inspection Purpose and Procedures**

The purpose of the annual inspection of the Black Bayou Culverts Hydrologic Restoration Project (CS-29) 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, CPRA 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. The annual inspection report also contains a summary of maintenance projects, if any, 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.

An inspection of the Black Bayou Culverts Hydrologic Restoration Project (CS-29) was held on March 7, 2017 under clear skies and mild temperatures. In attendance were Jody White and Darrell Pontiff of CPRA, Dale Garber and Nick McCoy of NRCS, and the Contract Operator, Chris Simon and John Romagosa of Simon and Delany. The annual inspection began at 12:00pm at the culvert structure on Hwy 384.

The field inspection included a complete visual inspection of all features. Staff gauge readings where available were used to determine approximate elevations of water, rock armor, earthen embankments, steel bulkhead structures and other project features. Photographs were

taken at each project feature (see Appendix B) and Field Inspection notes were to record measurements and deficiencies (see Appendix D).

### **III. Project Description and History**

Prior to the construction of the GIWW, Black Bayou served as the natural drainage route for the western edge of the Mermentau Basin. The three million acre Mermentau River Basin is bounded by Bayou Cocodrie to the north, Bayou Teche and the Vermilion River to the east, the Calcasieu River to the west, and the Gulf of Mexico to the south. Chenier ridges divide the basin into two sub-basins: the Chenier sub-basin south of LA State Highway 82, and the Lakes (Grand Lake and White Lake) sub-basin north of Highway 82. Historically, the water in these sub-basins has been fresher in spring, becoming more brackish in summer and fall depending on rainfall. Marsh within the project area is presently described as being predominately Fresh Maidencane with areas of Fresh Bulltongue and Oligohaline Wiregrass (Visser et al. 2000). In their natural state, these inland marshes served as estuarine nurseries for *Penaeus aztecus* (white shrimp), *Callinectes sapidus* (blue crab), *Cynoscion nebulosus* (speckled trout), *Sciaenops ocellatus* (redfish), and *Brevoortia patronus* (menhaden) (Faulkner 2000).

Construction of the GIWW was completed in 1944, and in 1950 the Calcasieu Lock was placed in operation to prevent saltwater from entering the Mermentau Basin from Calcasieu Lake while allowing passage of vessels. While the lock structure has had a positive effect on the Lakes sub-basin wetlands by maintaining a barrier to saltwater intrusion via the GIWW, it has also contributed to the problem of excessively high water levels by restricting the outflow of floodwater (Faulkner 2000). The Mermentau Lakes sub-basin now functions more as a freshwater reservoir and less as the low-salinity estuary it once was (Louisiana Coastal Wetlands Conservation and Restoration Task Force 2002). LA State Highway 384 bisects and effectively dammed Black Bayou upstream of its confluence with the Calcasieu River; this further restricted floodwater relief of the Lakes sub-basin (Balkum 2002).

Construction of the Black Bayou Culverts Hydrologic Restoration Project was completed in January 2010 with a 20-year project life. The installation of ten 10 ft. by 10 ft. box culverts underneath Highway 384 is intended to restore the natural drainage outlet of Black Bayou. It is expected to decrease the depth and duration of flooding events which is assumed to be contributing to marsh degradation within the sub-basin (Balkum 2002).

The main project feature of the Black Bayou Culverts Hydrologic Restoration Project is the box culvert structure on Black Bayou at Hwy 384. The main structure components are as follows:

1. Ten (10) - 10 ft. x 10 ft. concrete box culverts equipped with aluminum flap gates on the West side and trash racks with a receiving slot for a sluice gate on the East side of the structure. The box culverts are supported by one hundred ten (110) – 12 in. butt diameter timber piles 50ft. in length (to elevation -60 ft.) and one hundred twenty eight

(128) – 4.5 in. (transitioned to 3.5 in. below the top 15ft.) diameter push piers to an elevation -70 ft.

2. At approximately 6 ft. from the headwall, a steel sheet pile cutoff wall on the West side of the structure to an elevation -35ft and steel sheet pile toe wall on the East side of the structure to an elevation -25ft was constructed with a tie-in concrete slab to the culvert structure.
3. Rock rip rap (R-700) channel lining was placed twenty-five (25) feet East and fifty (50) feet West of the structure. Rock rip rap (R-300) wingwall revetment was placed on either side of the structure.
4. A steel sheet pile bulkhead (approx. 550 lft.) with a galvanized steel pile cap was constructed on the southwest channel bank.

#### **IV. Summary of Past Operation and Maintenance Projects**

**General Maintenance:** Below is a summary of completed maintenance projects and operation tasks performed since January 2010, the construction completion date of the Black Bayou Culverts Hydrologic Restoration Project (CS-29).

**May-2010 Simon and Delany:** This maintenance project included providing a boom truck to lift Gate No. 2 for inspection on May 5, 2010. During a prior operation on April 15, 2010, this gate was not able to be pinned closed with the other nine gates. The gate was found to be in good condition. Bent eyelets had prevented from closing and once corrected it was pinned closed. With all gates closed, it was noted that water was still flowing at the structure. The costs associated with this event are as follows:

Provide Boom Truck and Crew: (Coordination handled by OCPR)	\$2,200.00
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<b>TOTAL COST:</b>	<b>\$2,000.00</b>
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**June-2010 Simon and Delany:** This maintenance project included providing a two man dive team to perform an underwater inspection of all ten gates on June 1, 2010. Undermining of the structure was confirmed between Gates No. 1 & 2, and at Gates No. 5 and No. 8. The costs associated with this event are as follows:

Provide two man dive team and perform inspection: (Coordination handled by OCPR)	\$1,850.00
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<b>TOTAL COST:</b>	<b>\$1,850.00</b>
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**June-2010 American Contractor and Technology, Inc (ACT):** This maintenance event included furnishing and placement of 240 supersize sand bags (approx. 1 CY per bag) in front of the flapgates on the lake side of the structure to reduce flow into the basin at high tide conditions as a result of undermining that has occurred. This work began on June 15, 2010 and was completed on June 23, 2010. Saltwater infiltration into the basin was reduced by this action. The costs associated with this event are as follows:

Construction Costs: Approximately \$99,081.91  
(Coordination handled by NRCS)

**TOTAL COST: \$99,081.91**

**June- 2010 NRCS Investigation Committee:** A committee was authorized by the NRCS State Conservationist to review and investigate the failures experienced at the structure. The committee began a design and construction review of the compiled records. A preliminary engineering report was prepared and a physical inspection was recommended.

**April- 2011 Healtheon:** This contract included construction of two earthen cofferdams on each side of the structure with clay fill. The intent was to dewater the interior to allow for a physical inspection and re-flood the site once complete. Work began on April 26, 2011 and was completed September 2, 2011. The physical inspection by the NRCS National Design Center Committee out of Fort Worth, TX occurred August 24-25, 2011.

**TOTAL COST: \$1,096,322.93**  
(Coordination handled by NRCS)

**June- 2015 Tarpan:**

Once funds were approved by the CWPPRA task force, a repair project was led by NRCS. Lonnie Harper and Associates were tasked with the design. The structure was repaired by constructing a steel sheet pile cutoff wall with wing walls on the west side of the structure and a steel sheet pile toe wall with wing walls on the east side of the structure. Existing timber piles were inspected for damage and flowable fill grout was pumped into the voids beneath the structure. The sheet pile was capped with a concrete tie-in slab to the structure sill (approximately 17ft from the structure headwall). For additional structural support, push piers were driven through the box culverts and fastened with stainless steel mounting plate assemblies. A concrete chamfer was installed over the mounting plates to form a smooth bottom surface. The trash racks were refurbished and slots were added to accept a sluice gate. The flap gates and frames were refurbished and coated with coal tar epoxy. The box culverts were cleaned and refurbished. Two 6 in. vents were installed near the west side in each box culvert. R-700 stone lined the channel bottom 50 feet on the west side and

25 feet from the sheet pile wall on the east side. R-300 stone was used as revetment on the wingwall embankments. The inlet and outlet channels were dredged. The work was completed July 7, 2016.

E&D	\$616,747
Construction	\$6,900,963.61
<b>TOTAL COST:</b>	<b>\$7,517,710.61</b>

**April 2017 Simon and Delany:** This maintenance event included parts and labor to replace the stainless steel nuts on the flapgate anchor rods with Teflon stop nuts to prevent the nuts from loosening and backing off the anchor rod.

<b>TOTAL COST:</b>	<b>\$1,625.00</b>
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**Structure Operations:**

April 15, 2010	9 of 10 gates pinned closed, Gate No. 2 could not be pinned (Joint effort between OCPR, NRCS and USACE)
May 5, 2010	Lifted Gate No. 2, found bent eyelets, pinned closed (performed by Simon and Delany)
May 12, 2016	Removed cofferdams, removed pins, all gates free flapping (performed by Tarpan under NRCS contract)
March 7, 2017	Lifted gates No. 4 & 5 with crane truck, removed board from support bracing on gate no. 5. Board was jammed under gate no. 4 preventing it from closing and gate no. 5 from opening. Board broke guide ring on gate no. 4. (performed by Simon and Delany with Crane Ceaux)

## **V. Inspection Results**

### **Concrete Box Culverts w/ Flap Gates**

The flapgates were performing as intended with the exception of Gates No. 4 & 5. The operations contractor assisted with an inspection of the two gates. The gates were lifted with a crane truck. A 2"x12"x12' board was removed from the support bracing of Gate No. 5. The board was wedged in the supports and extending out the north side where it was caught between gate no. 4 and the culvert facing. The south center guide ring on gate no. 4 was broken and removed. Both gates opened and closed properly after this operation.

It was noted that the nuts on the flapgate hinge anchor rods were loose and backing off of the threads. Each were inspected and tightened. The nuts will need to be replaced with lock nuts with a Teflon insert.

The trash screens on the east side of the structure were working as intended. There was floating vegetation and debris collecting at the trash screens.

(Photos: Appendix B, Photos 1-2,4-6 & 8)

#### **Steel Sheet Pile Bulkhead**

The steel sheet pile bulkhead was in good condition. (Photos: Appendix B, Photos 3&5)

#### **Rock Rip Rap Along Channel**

The visible rock rip rap was in good condition. (Photos: Appendix B, Photos 1&2)

## **VI. Conclusions and Recommendations**

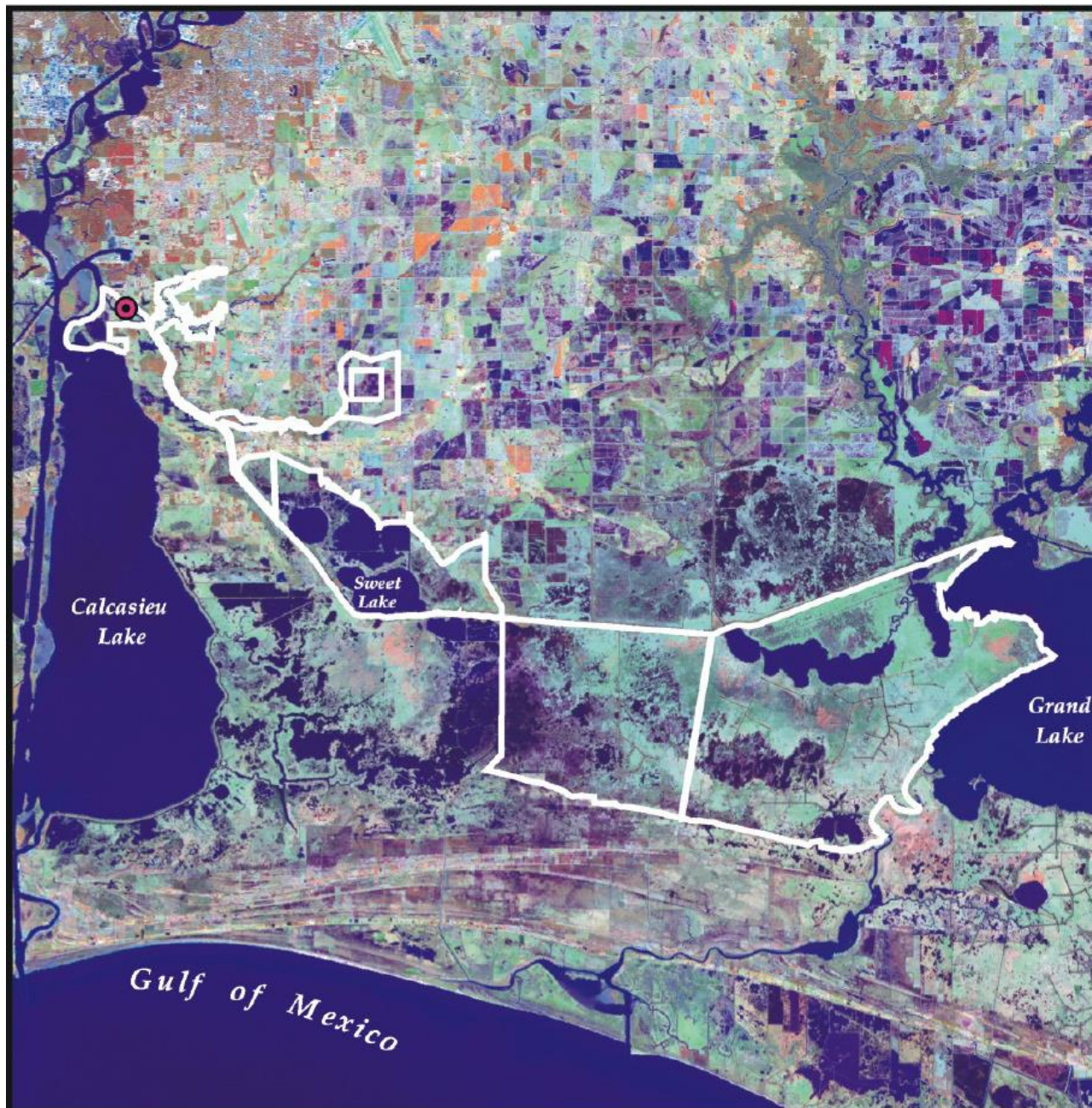
The Black Bayou Culverts Hydrologic Restoration Project construction was completed in January 2010; however, due to the issues described in the maintenance history, it has had little time in service. The structure was in service for roughly six months in 2010 and twelve months over 2016 & 2017 up to the date of this report. It is expected that the flap gates will remain free-flapping during normal rainfall years and closed periodically during drought years. Additional time in service will allow further evaluation of the effects on the marsh within the project area.

Use locking nuts on gates such as these where the continuous opening and closing of the gate can jar the nuts loose from their anchor rods.

Floating debris may prove to be a maintenance issue during wet years.

## **Appendix A**

### **Project Features Map**



## Black Bayou Culverts Hydrologic Restoration (CS-29)



**Culverts \***



**Project Boundary**

\* denotes proposed feature



Map Produced By:  
U.S. Department of the Interior  
U.S. Geological Survey  
National Wetlands Research Center  
Coastal Restoration Field Station

Background Imagery:  
2002 Thematic Mapper Imagery

Map Date: August 27, 2003  
Map ID: USGS-NWRC 2003-11-115  
Data accurate as of: April 4, 2003

## **Appendix B**

### **Photographs**



**Photo No. 1, West Side of Box Culvert Structure (Looking South) – Low Tide**



**Photo No. 2, West Side of Box Culvert Structure (Looking North) – High Tide**



**Photo No.3,** West Side of Box Culvert Structure, Steel Bulkhead & Warning Sign



**Photo No.4,** West Side of Box Culvert Structure, Crane Lifting Gate



**Photo No. 5,** West Side of Box Culvert Structure, Flap Gate, Rock Armoring, & Steel Bulkhead



**Photo No. 6,** Anchor Rods on Flapgates, Nuts Loosening and Backing Off of Anchor Rod



**Photo No.7,** East Side of Box Culvert Structure, Warning Sign



**Photo No. 8,** East Side of Box Culvert Structure (Looking South), Floating Debris

## **Appendix C**

### **Three Year Budget Projection**

**BLACK BAYOU CULVERTS H R/ CS-29 / PPL 9**  
**Three-Year Operations & Maintenance Budgets 07/01/2017 - 06/30/2020**

<u>Project Manager</u>	<u>O &amp; M Manager</u>	<u>Federal Sponsor</u>	<u>Prepared By</u>
Pat Landry	Jody White	NRCS	Darrell Pontiff

	2017/2018	2018/2019	2019/2020
<b>Maintenance Inspection</b>	\$ 7,269.00	\$ 7,487.00	\$ 7,712.00
<b>Structure Operation</b>	\$ 20,000.00	\$ 20,000.00	\$ 20,000.00
<b>State Administration</b>	\$5,000.00	\$ 5,000.00	\$ 5,000.00
<b>Federal Administration</b>		\$ -	\$ -

**Maintenance/Rehabilitation**

17/18 Description:

E&D	
Construction	
Construction Oversight	
Sub Total - Maint. And Rehab.	\$ -

18/19 Description:

E&D	\$ -
Construction	\$ -
Construction Oversight	\$ -
Sub Total - Maint. And Rehab.	\$ -

19/20 Description:

E&D	\$ -
Construction	\$ -
Construction Oversight	\$ -
Sub Total - Maint. And Rehab.	\$ -

	2017/2018	2018/2019	2019/2020
<b>Total O&amp;M Budgets</b>	<b>\$ 32,269.00</b>	<b>\$ 32,487.00</b>	<b>\$ 32,712.00</b>

<b>O &amp; M Budget (3 yr Total)</b>	<b>\$ 97,468.00</b>
<b>Existing O &amp; M Budget</b>	<b>\$ 1,388,674.00</b>
<b>Remaining O &amp; M Budget (Projected)</b>	<b>\$ 1,291,206.00</b>

## **Appendix D**

### **Field Inspection Form**

# MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: CS-29 Black Bayou Culverts Hydrologic Restoration

Date of Inspection: March 7, 2017

Time: 12:00pm

Structure No. \_\_\_\_ N/A

Inspector(s): Darrell Pontiff & Jody White, CPRA, Dale Garber & Nick McCoy, NRCS, Chris Simon and John Romagosa, Simon and Delany

### Structure Description: Conc. Box Culverts with Flapgates, Sheet Pile Wall

Water Level      Inside: 2.54      Outside: 2.52

Type of Inspection: Annual

Weather Conditions: Warm and Cloudy

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	good			3&5	
Flap Gates	good			1-2,4-6	Lifted Gates 4 & 5, removed a board lodged in bracing of Gate No. 5, prevented Gate No. 4 from closing & Gate no. 5 from opening
Conc. Box Culverts	good			1,2,4,6&8	Put back into operation May 2016 after repair contract.
Hardware	good			5,6	Nuts on anchor rod are loosening and backing off of the rod. Change to lock nuts.
Trash Guard	N/A			8	Floating debris is stacking up against trash guard while flap gates are open.
Signage	good			3&7	
Galv. Pile Caps					

What are the conditions of the existing levees?

Are there any noticeable breaches?

### Settlement of rock plugs and rock weirs?

Position of stoplogs at the time of the inspection?

Are there any signs of vandalism?

## **Appendix E**

### **Water Level Monitoring & Operations Plan**

## CS-29 BLACK BAYOU CULVERTS HYDROLOGIC RESTORATION

### WATER MANAGEMENT PLAN/OPERATIONAL SCHEDULE PROPOSED WATER CONTROL STRUCTURE IN THE BLACK BAYOU AREA CALCASIEU PARISH, LOUISIANA

With the construction of Louisiana Highway 384, the Black Bayou drainage path to the Calcasieu River was effectively blocked. In conjunction with the poor water relief offered by the Calcasieu Lock, the barrier created in Black Bayou has hindered the release of flood waters from the Mermentau Basin. Coupled with upstream drainage improvements, clearing of adjacent lands, subsidence, and relative sea level rise, the area is experiencing even longer periods of inundation from flood waters.

This project would re-open Black Bayou and alleviate some of the high water levels in the Mermentau Basin, as well as reduce water velocities through the Calcasieu Lock resulting in safer navigation. The removal of excess water in this area would allow an increase in emergent vegetation, while decreasing stresses on existing vegetation. The proposed flap gated structure would also maintain the deterrence of saltwater intrusion from the Calcasieu River.

Elevation observations in the marshes located near the project site revealed that the average mud line elevations were approximately +0.8 feet NAVD88. The top of the marsh plant root crown mass ranged in elevation from +0.9 feet NAVD88 to +1.2 feet NAVD88 (survey data as per On Target Surveying, Inc. and referenced in the 'Hydrologic Investigation of the Louisiana Chenier Plain' report dated October 2002). The applicant proposes to allow the structure to operate without human intervention, i.e. flap gates operating without restriction, unless the water level upstream of the structure reaches the previously stated average mud line elevation (+0.8 feet NAVD88). If this condition occurs, flow through the structure would be eliminated by manually locking closed the flap gates. A tide gauge referenced to the NAVD88 datum will be maintained upstream of the structure and the water surface elevation at this gauge will be used to determine the appropriate time for restriction of flow through the structure. The structure will remain closed until the water surface elevation at the gauge is +1.0 feet NAVD88; at which time the pins will be removed from the flap gates and the structure will be allowed to operate as designed.

#### STRUCTURE OPERATION SCHEDULE:

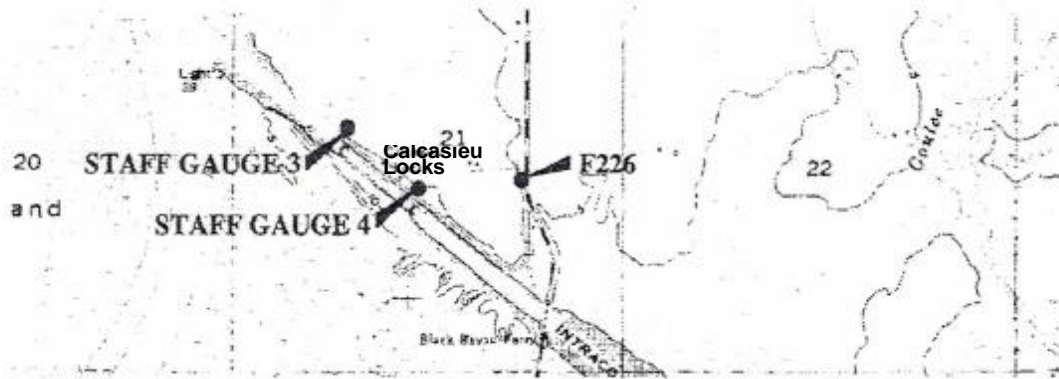
DATE	WATER LEVEL	STRUCTURE OPERATION
Jan. 1 – Dec. 31	above +0.8 ft*	Normal operation, i.e. unrestricted flap gates
Jan. 1 – Dec. 31	below +0.8 ft*	Structure closed, i.e. no flow through structure

\*In the event that the water level upstream of the structure drops below +0.8 ft NAVD88 the flap gates will be closed in order to eliminate flow through the structure. After such an event, the structure will remain closed until the water level increases to +1.0 ft NAVD88, at which time the flap gate restriction will be removed and the structure will operate as designed.

5/7/2004

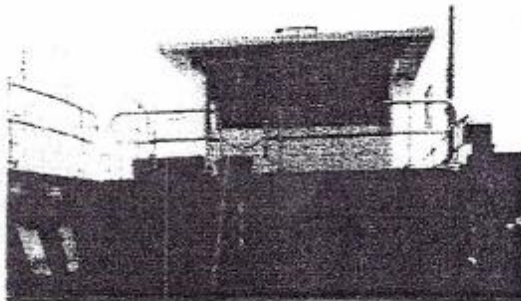
Note: The Calcasieu Lock East Gauge is used for water level monitoring within the project area. The Data Sheet to convert from the USACE gauge readings in MLG to the operation elevations in NAVD88 of the water management plan is included in this appendix.

**Calcasieu Locks Gauge Data Sheet (2005) in NAVD88**  
**Conversion from MLG to NAVD88 – Subtract 1.293ft**



**VICINITY MAP**

Reproduced from USC&GS "MOSS LAKE" Quadrangle



**WEST**  
**STAFF GAUGE 3**  
 (EXISTING)

**Adjusted NAD 83 (1992) Geodetic Position (RTK)**

Lat. 30°05'19.78129" N  
 Long. 93°17'41.39782" W

**Adjusted NAD 1983 Datum(1992)**

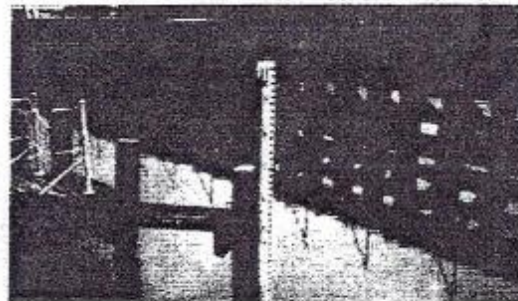
**LSZ (1702) Feet (RTK)**

N = 583,105.13  
 E = 2,660,539.46

**Elevation of 7.0 foot mark on**

**Gauge No. 3(NAVD 88) (Feet) (RTK)**

Elevation = + 5.707



**EAST**  
**STAFF GAUGE 4**  
 (EXISTING)

**Adjusted NAD 83 (1992) Geodetic Position (RTK)**

Lat. 30°05'12.32111" N  
 Long. 93°17'28.38764" W

**Adjusted NAD 1983 Datum(1992)**

**LSZ (1702) Feet (RTK)**

N = 582,332.08  
 E = 2,661,669.33

**Elevation of 6.0 foot mark on**

**Gauge No. 4 (NAVD 88) (Feet) (RTK)**

Elevation = + 4.707

**NGS Monument F226**  
 (SEE ATTACHED NGS DATA SHEET)

**Adjusted NAD 83 (1992) Geodetic Position (RTK)**

Lat. 30°05'11.62589" N  
 Long. 93°17'11.66667" W

**Adjusted NAD 1983 Datum(1992)**

**LSZ (1702) Feet (RTK)**

N = 582,236.79  
 E = 2,663,136.84

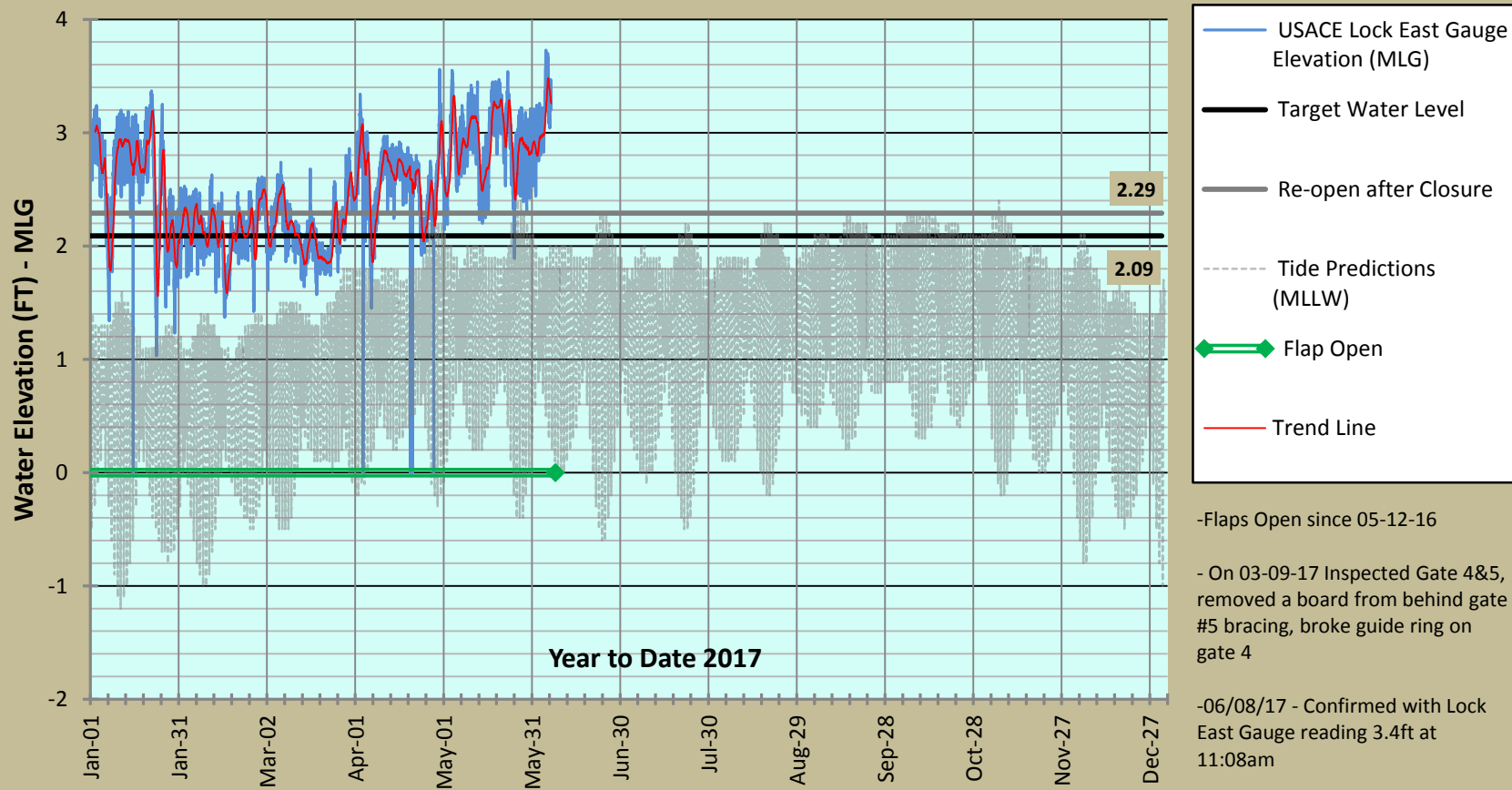
**Adjusted NAVD88 (Feet)(RTK)**

Elevation = +3.377

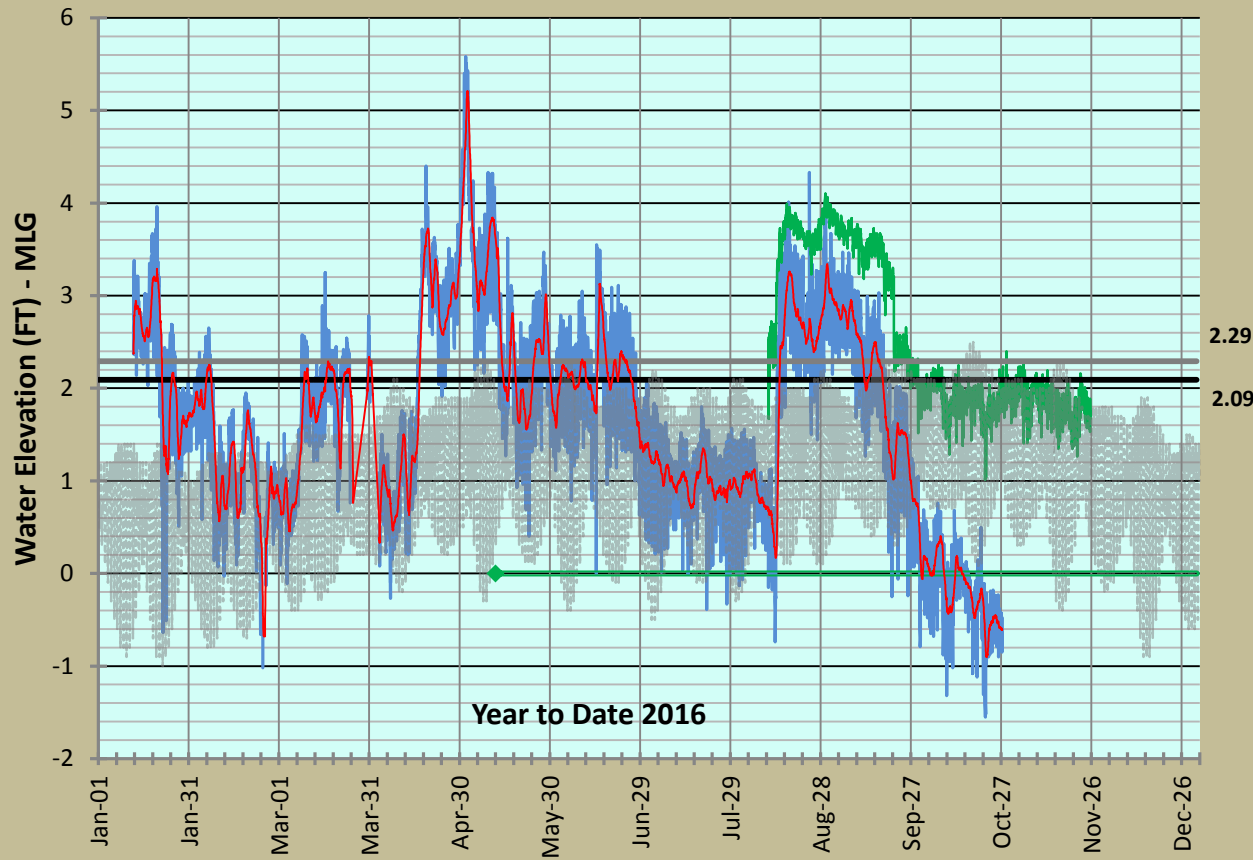


# Calcasieu Locks East - USACE Elevation - Stage FT (MLG)

## January 1, 2017 - December 31, 2017



## Calcasieu Locks East - USACE Elevation - Stage FT (MLG) January 1, 2016 - December 31, 2016



- USACE Lock East Gauge Elevation (MLG)
- CS-21 - Structure #1-NAVD88 Geoid 12a
- Target Water Level
- Re-open after Closure
- Tide Predictions (MLLW)
- ◆ Flaps Open
- Trend Line

\*\*\*Corps gauge isn't functioning properly - phone conversation with Kevin Galley on June 9th

-Checked with Lock:  
 -08-01-16 at 11:30am = 2.7ft  
 - 09-14-16 at 6:00am = 3.8ft  
 -10-11-16 at 10:20am = 2.7ft (must have major influence from lock and outside)  
 -10-27-16 Added CS-21 Data  
 -End of november and month of December, USACE data for 2016 was removed from website, only daily reading available