

# Calcasieu Lock Ship Simulation



## Background

The original purpose of the Calcasieu Lock is to prevent saltwater intrusion from the west into the areas east of Calcasieu Lake.

A secondary purpose of the lock is to help drain the Mermentau Basin during heavy rain events. To accomplish this, the lock stays in the open position allowing freshwater to travel westward.

During these drainage periods, vessels have a hard time navigating eastward through the open lock.

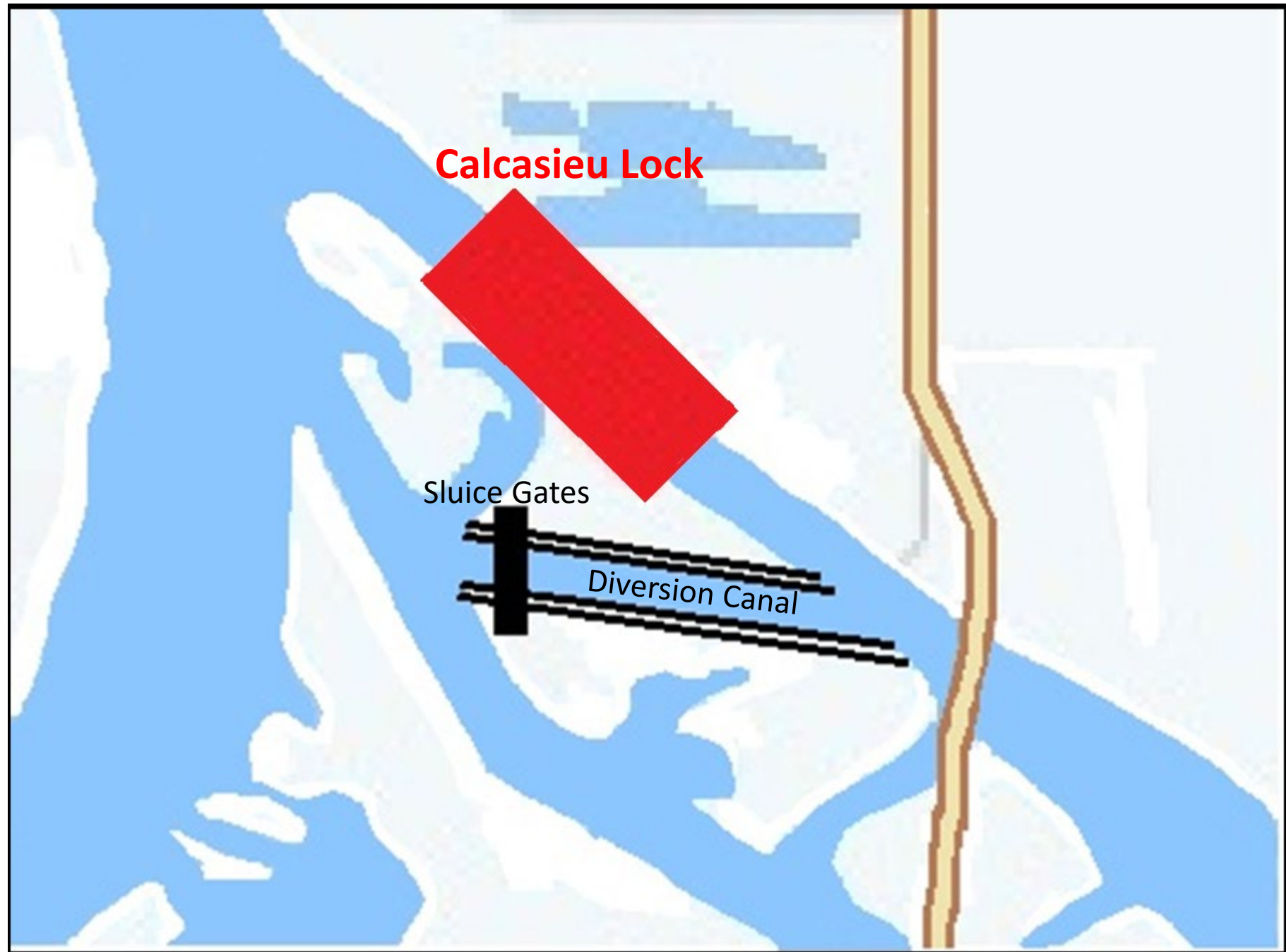




## Project Features

A diversion canal was proposed to divert flood waters during drainage events in lieu of using the lock. Sluice gates would be added to close off the canal during times of low water to prevent saltwater intrusion.

The Ship Simulation modeling was conducted to determine if, in fact, the canal would allow for safely navigating thru the Calcasieu Lock during drainage events.



## Modeling Assumptions

- (1) A design vessel had to be selected. The *Kin King* was chosen which is an integrated 6-pack barge with 1,200 HP pusher tow. The integrated unit is 655-ft long, 70-ft wide, and drafts 9.5-ft.
- (2) An environmental database was created for Calcasieu Lock which included current, wind, and bathymetric data.
- (3) The left graphic below identifies the west side “starting point”. The right graphic reflects the east side “starting point”.



# Modeling Runs

Included East and West runs

Did runs with Black Bayou open and closed

Ran each scenario with winds from the North and South

Ran both the 2 year and 10 year events

Plate(s) in Appendix A	Vessel	Black Bayou	Flow event	Transit Direction	East or West of Lock?	Wind Condition	Test Matrix Number	Total Runs
1	Loaded 6-pack	Culvert	2 yr	East	East	10 knots from N	7	4
2	Loaded 6-pack	Wall	2 yr	East	East	10 knots from N	1	4
3	Loaded 6-pack	Culvert	10 yr	East	East	10 knots from N	9	8
4	Loaded 6-pack	Wall	10 yr	East	East	10 knots from N	3	4
5, 7	Loaded 6-pack	Culvert	2 yr	West	East	10 knots from N	8	6
6, 7	Loaded 6-pack	Wall	2 yr	West	East	10 knots from N	2	11
8, 12	Loaded 6-pack	Culvert	10 yr	West	East	10 knots from N	10	8
9-12	Loaded 6-pack	Wall	10 yr	West	East	10 knots from N	4	17
13	Loaded 6-pack	Culvert	2 yr	East	West	10 knots from S	15	4
14	Loaded 6-pack	Wall	2 yr	East	West	10 knots from S	13	4
15	Loaded 6-pack	Culvert	10 yr	East	West	10 knots from S	11	4
16	Loaded 6-pack	Wall	10 yr	East	West	10 knots from S	5	6
17	Loaded 6-pack	Culvert	2 yr	West	West	10 knots from S	16	4
18	Loaded 6-pack	Wall	2 yr	West	West	10 knots from S	14	4
19	Loaded 6-pack	Culvert	10 yr	West	West	10 knots from S	12	4
20	Loaded 6-pack	Wall	10 yr	West	West	10 knots from S	6	6
21	Empty 6-pack	Wall	10 yr	East	East	10 knots from N	N/A	2
22	Empty 6-pack	Wall	10 yr	West	East	10 knots from N	N/A	2

# Results of Simulation

All eastbound transits on the east side of the lock could be compensated for and were mostly manageable.

The 10-year flood events with the proposed diversion channel for westbound traffic was **unanimously deemed unfeasible by the pilots**. Pilots felt the amount of pull from the diversion channel on slower moving westbound tows caused too much of a concern for navigation.

Several suggestions were made to modify the design/operation to help alleviate the severity of the crosscurrents from the diversion channel. The following 2 modifications were determined to have merit

- (1) Open Calcasieu Lock for westbound traffic.
- (2) Modify the diversion channel inlet to be slightly extended and rounded off to help alleviate the crosscurrents felt from the diversion channel

## 2<sup>nd</sup> Modeling Runs

Included runs with lock in open position for westbound transits

Included modified geometry for the inlet to the channel

Ran each scenario with winds from the North and South

Plate(s) in Appendix A	Alt.	Vessel	Flow event (MLLW)	Transit Direction	East or West of Lock?	Lock	Diversion Channel	Wind Conditio n	Test Matrix Number	Total Runs
23	1	Loaded 6-pack	10 yr, BB as wall	West	East	Open	Original	10 knots from N	1	4
24	1	Loaded 6-pack	10 yr, BB as wall	West	West	Open	Original	10 knots from S	2	4
25	2	Loaded 6-pack	10 yr, BB as wall	West	East	Closed	Modified	10 knots from N	3	8
26	2, 3	Loaded 6-pack	10 yr, BB as wall	East	East	Closed	Modified	10 knots from N	4	4
27	3	Loaded 6-pack	10 yr, BB as wall	West	East	Open	Modified	10 knots from N	5	8
28	3	Loaded 6-pack	10 yr, BB as wall	West	West	Open	Modified	10 knots from S	6	4

## Results of 2<sup>nd</sup> Simulation

All eastbound transits on the east side of the lock could be compensated for and were mostly manageable.

Westbound transits on the east side of the lock did NOT appreciably improve with modifications. Pilots said westbound was still not feasible.



## Path Forward

Yet to be determined. . .