

Inner Harbor Navigation Canal (IHNC) Basin

1% (100-yr) and 0.2% (500-yr) Surge and Wave Event Water Levels

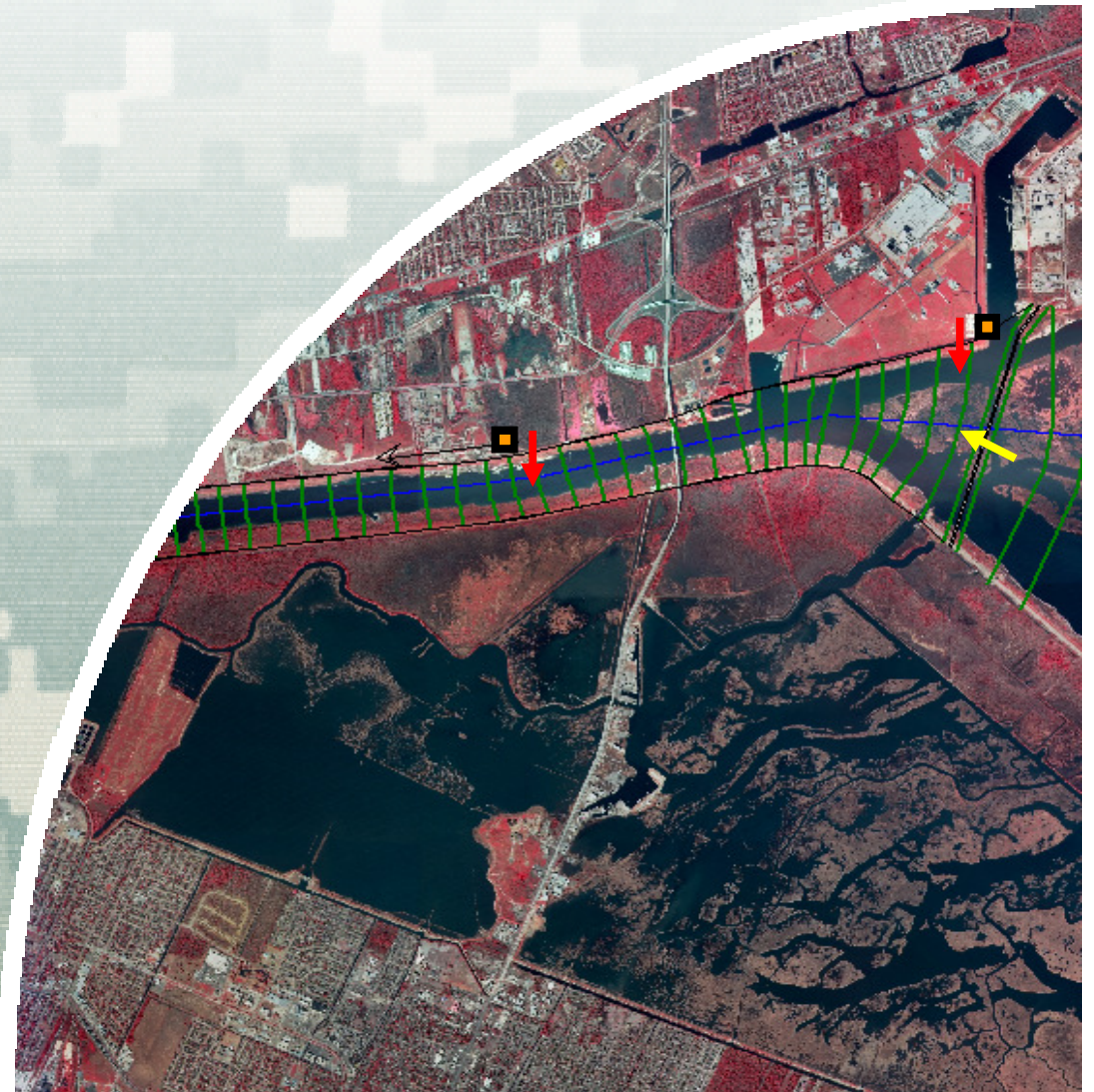
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US Army Corps of Engineers

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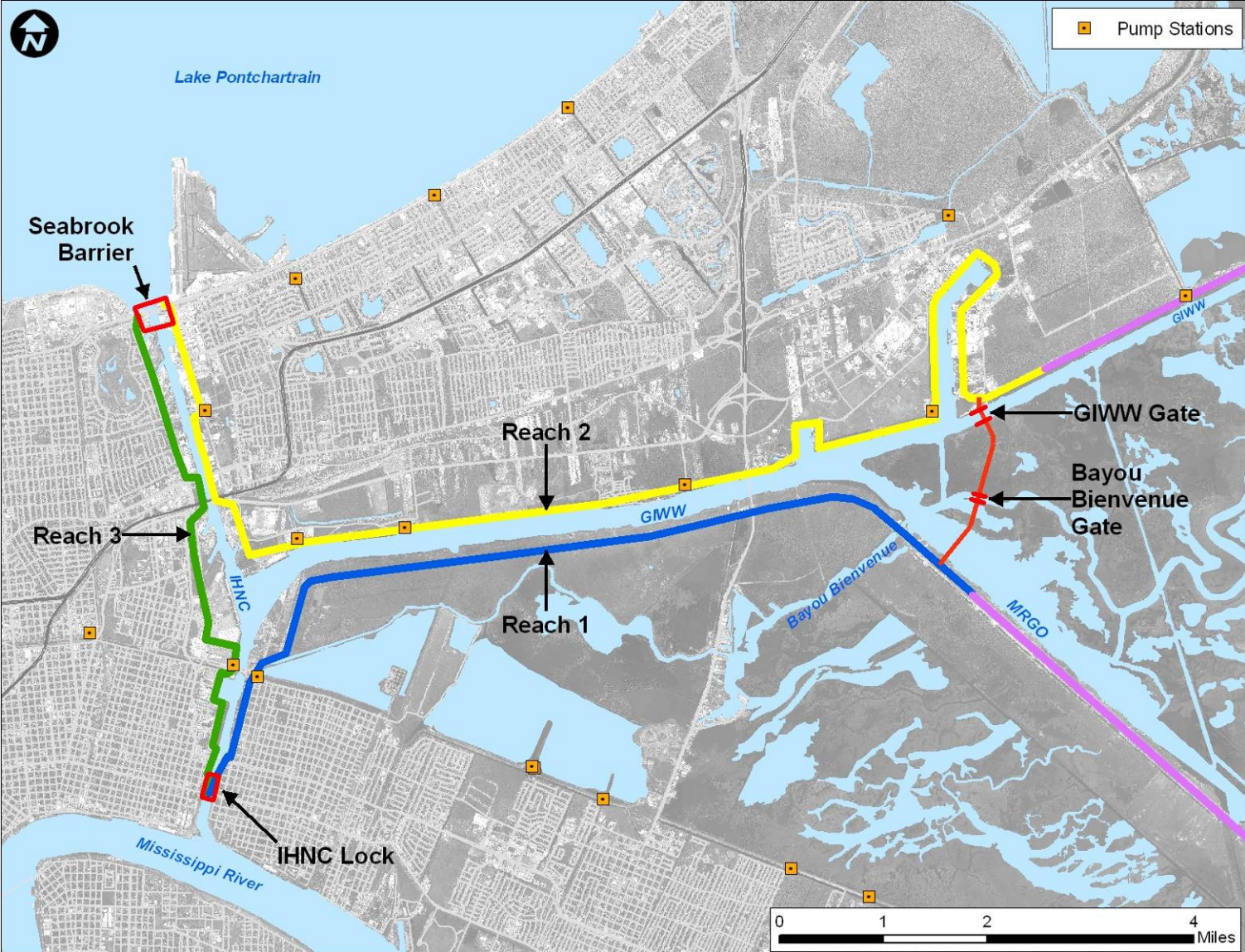


Overview

- The IHNC basin and its levees and floodwalls are part of the Hurricane & Storm Damage Risk Reduction System (HSDRRS) as a secondary line of defense.
- The IHNC Basin will serve as a retention basin during storm conditions.
- The retained volume from pumping, rain and overtopping during an event results in a stage increase.



IHNC Basin



IHNC Basin Stage

▶ Closure elevation

▶ Overtopping

▶ Rainfall

▶ Drainage Pump Stations

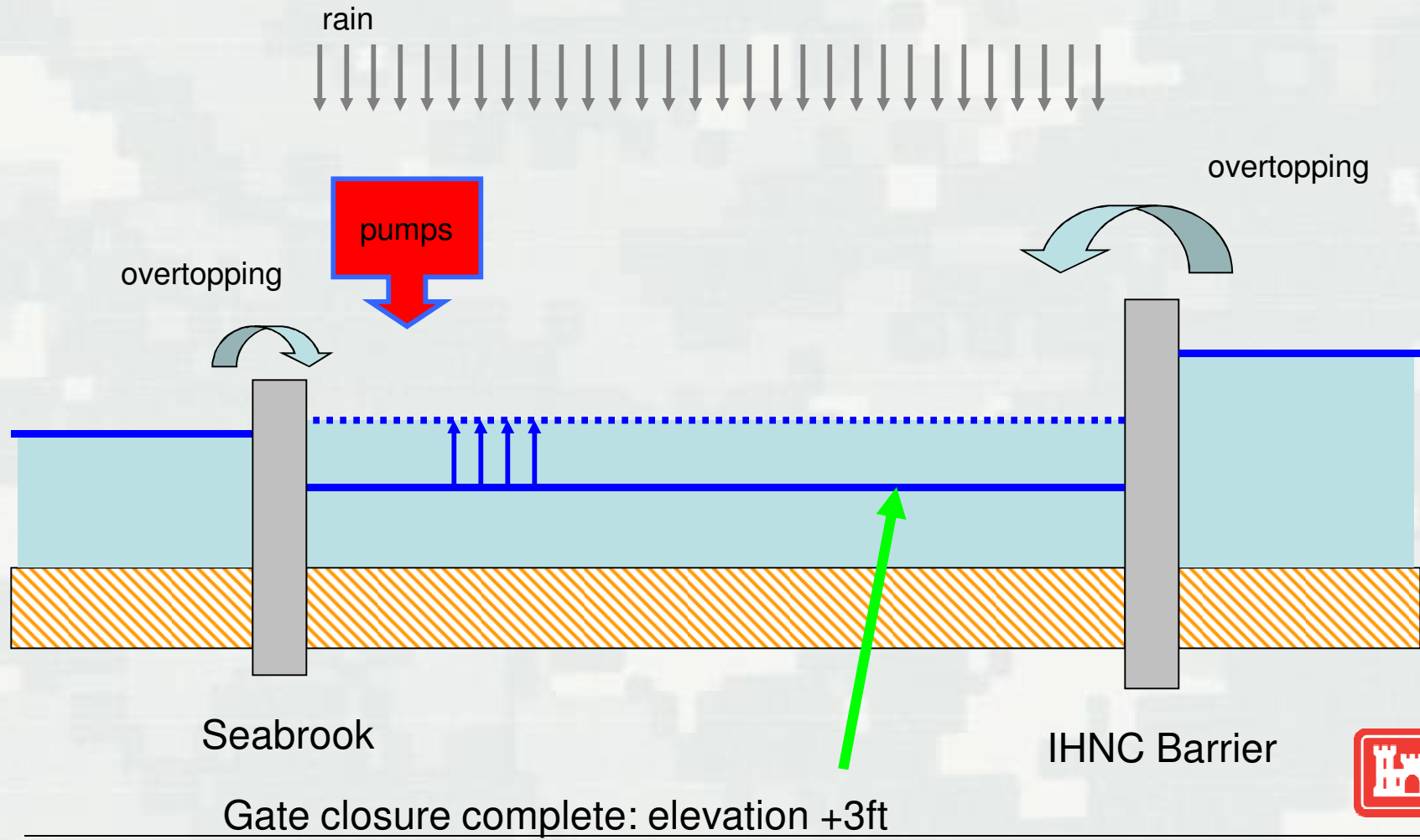
▶ Wind Setup

+

= Basin Stage



IHNC Basin



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IHNC Model

Rainfall:

- The 10% (10-yr) rainfall event is used in association with the 1% (100-yr) surge and wave event.

Pumping Capacity:

- 10% (10-yr) rainfall flow to pump stations taken from calculations from adjoining polders.
- Assumed maximum pump station discharge (this is a conservative approach since no reduction in discharge curves for pump efficiency decrease is applied).
- In 2057, 25% pump capacity increase is assumed.



IHNC Model

Rainfall Event and results

Event	Precipitation [ft]	2057 Pump Volume [ft ³ x Million]
10% (10-yr)	0.8	250



Overtopping

- Entire 152 storm suite from HSDRRS investigated
- All parameters are future conditions (2057)
 - ▶ Lake Borgne Surge Barrier height normalized is +24.5ft
 - ▶ Seabrook height normalized is +16ft
 - ▶ Relative Sea Level Rise is 1 ft
- Best estimate overtopping rates and volumes
- Most of the 152 storms result in no barrier overtopping; however, 15 do result in overtopping larger than anticipated 1% volume. 10 out of the 15 produce greater than 1% surge and wave conditions
 - ▶ The events exceeding the design capacity range from approx 600 to 10,000-year events



Overtopping and JPM-OS analysis

- Joint Probability Method with Optimal Sampling(JPM-OS)^[1] is used to determine the stage frequency relation based upon the maximum water levels per storm for a point.
- 152 interior IHNC stages translated to a 1% (100-yr) and 0.2% (500-yr) stage with JPM-OS method.

Event	Stage <u>excluding</u> wind setup [ft]
1% (100-yr)	7.4
0.2% (500-yr)	9.0

^[1] Resio et al., 2007, White Paper



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Wind Setup

- Due to strong winds the water surface can be pushed into one direction and tilt within the enclosed IHNC basin, resulting in an increase at one side and a decrease in stage on the other side
- 1% (100-yr) wind speed is 77mph and 0.2% (500-yr) wind speed is 88mph
- A maximum fetch of 7.5 miles (E/W)
 - ▶ Note: a set-down of equal magnitude is present at the other end of the basin

Event	Wind speed [mph]	Fetch [mi]	Wind setup [ft]
1% (100-yr)	77	7.5	0.5
0.2% (500-yr)	88	7.5	0.8



Stage frequency IHNC Basin

Still water level inside [ft]	100-yr 1%	500-yr 0.2%
▶ Closure elevation	+3.0	+3.0
▶ Overtopping	2.0	3.6
▶ Pumping (10 year rain event)	1.6	1.6
▶ Rainfall (10 year rain event)	0.8	0.8
▶ Wind Setup	0.5	0.8
Basin Stage	+7.9	+9.8



Conclusions

The final stages are rounded up to +8ft and +10ft for the 1% (100-yr) and 0.2% (500-yr).

Assumptions are conservative to account for the complexity of the system:

- ▶ For the wave overtopping calculations all waves are assumed to overtop the barrier perpendicular. (In reality, not all waves will be traveling directly at the barrier during the course of the storm).
- ▶ The barrier height is normalized to +24.5ft while higher portions are disregarded in this analysis.
- ▶ Most conservative 2057 pump volume (250 Million cubic feet) from the calculations is used.
- ▶ Most conservative rain volume used; it is assumed that all the rain will fall on the basin while gates are closed. (In reality, rain could fall prior to the closure and freely flow out).

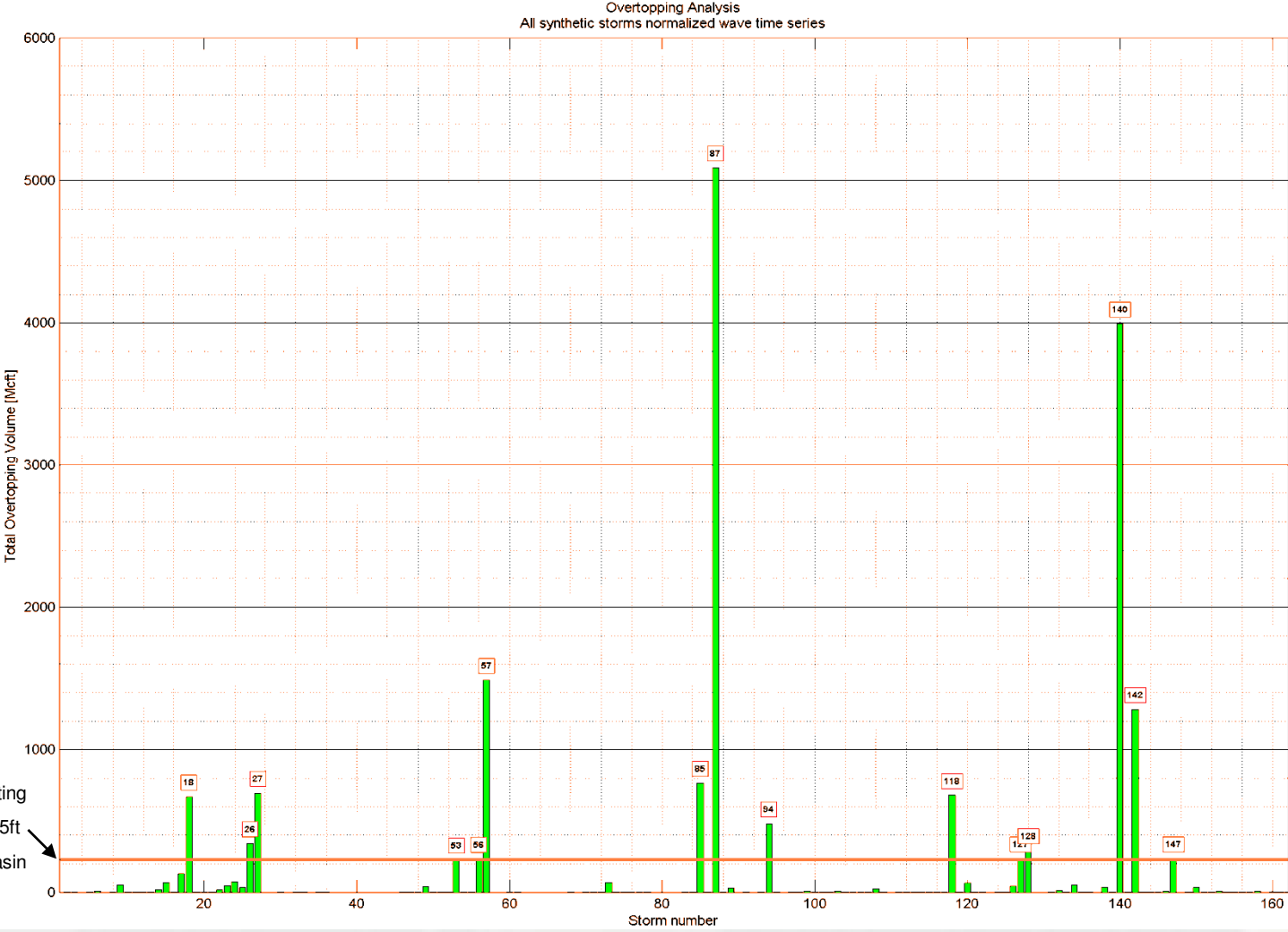


Backup



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Overtopping volume per storm

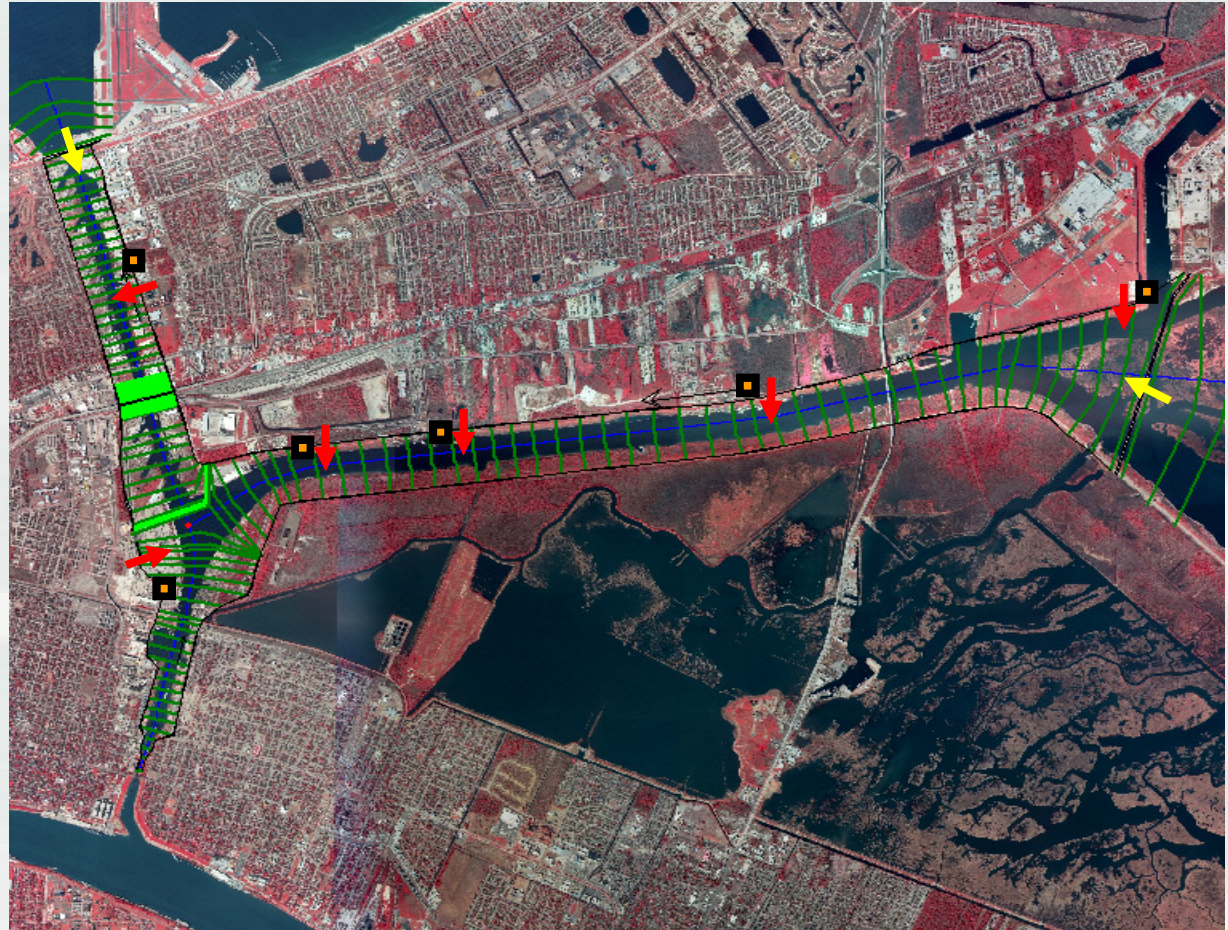


Volume resulting in approx. 1.5ft stage increase in basin



IHNC Model

- Pump stations
- Pump Discharge
- Overtopping



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IHNC Basin Stage

▶ Closure elevation Boundary condition

▶ Overtopping HSDRSS overtopping formulations
152 storms (ADCIRC and STWAVE)

▶ Rainfall HEC-RAS

▶ Drainage Pump Stations

▶ Wind Setup Brettschneider wind-setup
formulation +

Basin Stage

