Mississippi Valley Division,
Regional Planning and Environment Division South

Morganza to the Gulf of Mexico, Louisiana, Hurricane and Storm Damage Risk Reduction Project

Appendix H – Induced Flooding Evaluation Inside the Levee System
December 2025

Contents

LIST OF FIGURES

SECTION 1

Inducements Evaluation Inside the Levee System

This appendix evaluates the potential impact and inducements the Proposed Action may have on the interior during low-frequency precipitation events and day to day conditions capturing seasonal events such as spring tides and cold fronts using hydrology and hydraulics (H&H) modeling. Potential impacts and inducements on the exterior resulting from the Proposed Action is included in Section 6.2 of the DSEIS. This appendix could be updated as MVN continues its induced flooding analysis and takings analysis. See Section 3.4 and Section 4.3 of the DSEIS for more information. See Appendix E for 2025 Hydrologic Engineering Center's River Analysis System (HEC-RAS) model results. The term "Water level" for this HEC-RAS-based interior modeling is based on water surface elevation (WSE) referenced to NAVD88 in this appendix.

This section evaluates whether the Proposed Action may induce flooding to the system's interior. For example, could rainfall potentially be impounded on the inside of the proposed levee system resulting in project-induced flooding?

To assess potential of interior induced flooding, the PDT evaluated five scenarios in a 2025 updated modeling using HEC-RAS version 6.6 model. See Appendix E – Hydrologic and Particle Tracking Modeling Reports for further detail on the model and assumptions.

The impacts on the local hydrology due to precipitation events and seasonal events are assessed in the following sections. The following event scenarios were analyzed for precipitation related inducements: 5-year, 10-year, and 25-year. For each of the analyzed intervals, the FWP and FWOP conditions were assessed and compared. These lesser interval events can help assess the likelihood of inducements due to more common precipitation events during a given year.

Typical cold front and spring tidal events were also evaluated using data including observed water levels and meteorological data from December and April 2023, respectively. The model used observed daily flows from the USGS gage Atchafalaya River at Simmesport, Louisiana (LA) (USGS 07381490), observed European Centre for Medium-Range Weather Forecast atmospheric reanalysis (ECMWF-ERA5) hourly winds, observed hourly precipitation from NOAA, and observed hourly water levels from the Coastwide Reference Monitoring System (CRMS) 0347 gage. The model report is included in Appendix E.

In the year 2035, the Proposed Action is expected to be complete and fully functional. 2035 therefore represents the transition from the "existing condition" to the "with-project condition" and is therefore a reasonable time point to evaluate the potential of project-induced flooding. The year 2085 represents the "future" year condition at the end of the 50-year period of analysis. The levee design elevations for year 2035 in the Proposed Action range from 7.5

feet to 21.5 feet varying by reach, while the levee design elevations for 2085 range from 11 feet to 26 feet varying by levee reach. This translates to a levee design elevation increase of approximately 3.5 feet to 4.5 feet from year 2035 to year 2085.

Simulations for FWP and FWOP for each of the five scenarios in the year 2035 are discussed in below.

1.1 INDUCEMENTS SUMMARY

When comparing the No Action to the Proposed Action project scenarios, the 2025 HEC-RAS model showed that precipitation-only events would not induce flooding on the levee interior for the 5%, 10% and 25% Annual Exceedance Probability (AEP) events in both the 2035 and 2085 conditions. Precipitation-only runs also showed a negligible to minimal difference in inundation duration when comparing the No Action and Proposed Action Alternatives in 2035 and 2085 conditions.

The April 2023 Spring Neap Tides and December 2023 Cold Front events showed an overall trend of either no significant difference or reductions in water levels of up to 0.5 foot throughout the interior of the MTG system as well as outside of the system. However, the Spring Neap Tides data did reveal isolated pockets along the Barrier reach that may experience increases in water levels of up to 1 foot in the 2035 condition both with and without Sea Level Change (SLC). The Spring Neap Tides data also resulted in a small pocket near Proposed Action levee Reach L potentially experiencing an increase in water levels of up to 0.3 feet on the outside of the system while the inside in the same area depicted a reduction of up to 0.55 feet in the 2085 condition including SLC. For the Spring Neap Tides 2085 condition without SLC small pockets along the Barrier Reach may experience up to 0.75 foot in increased water levels.

The December 2023 Cold Front event using the 2035 condition, both with and without SLC, resulted in an overall negligible difference in the interior water levels during precipitation events with a few small areas of reductions of up to 0.25 feet. The 2085 condition with SLC also depicts majority of the interior potentially experiencing no significant difference in water levels, except for a few small pockets that may experience reductions of up to 0.25 feet. Proposed Action levee Reach L potentially experiencing an increase in water levels of up to 0.40 feet on the outside of the system while the inside in the same area depicted no change in the 2085 condition including SLC.

1.2 INDUCEMENTS SCENARIOS EVALUATED

1.2.1 5-Year Event – Precipitation for FWP vs FWOP

This model scenario evaluates potential inundation due to precipitation and assumes that the hydrologic structures would be open. Appendix E includes further detail on the structures and modeling assumptions. For the 5-year event in the 2035 condition, very little difference in inundation water levels were found. The interior of the MTG System may potentially

experience either a negligible change in water levels or a reduction in water levels. See Figure H:1-1 below for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet. One small area to the southeast of Lockport may experience an increased water level of up to approximately 0.50 feet. Refer to Figure H:1-1 below for the 5-Year event in the 2035 condition and Figure H:1-2 for the 2085 condition.

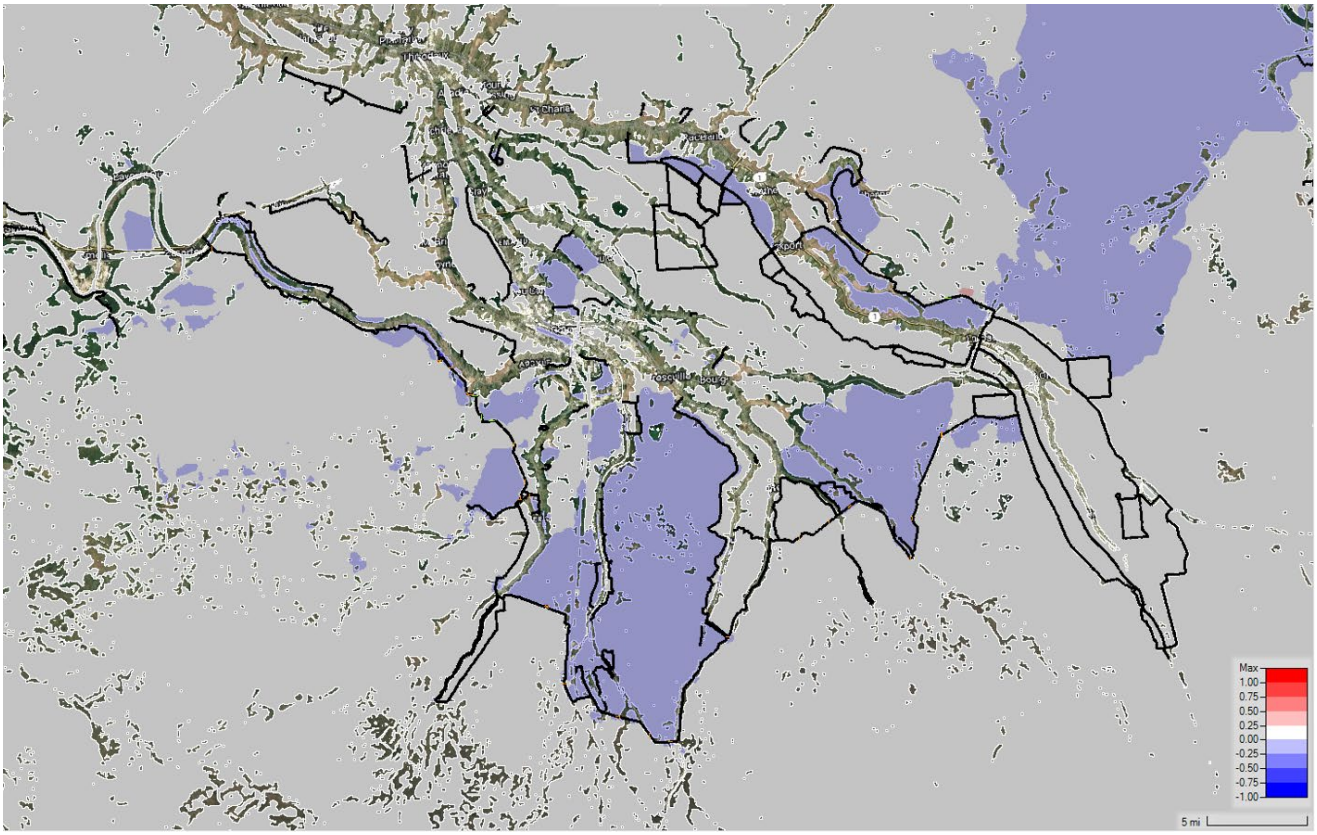

Figure H:1-1. 5-Year Event in the 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

.

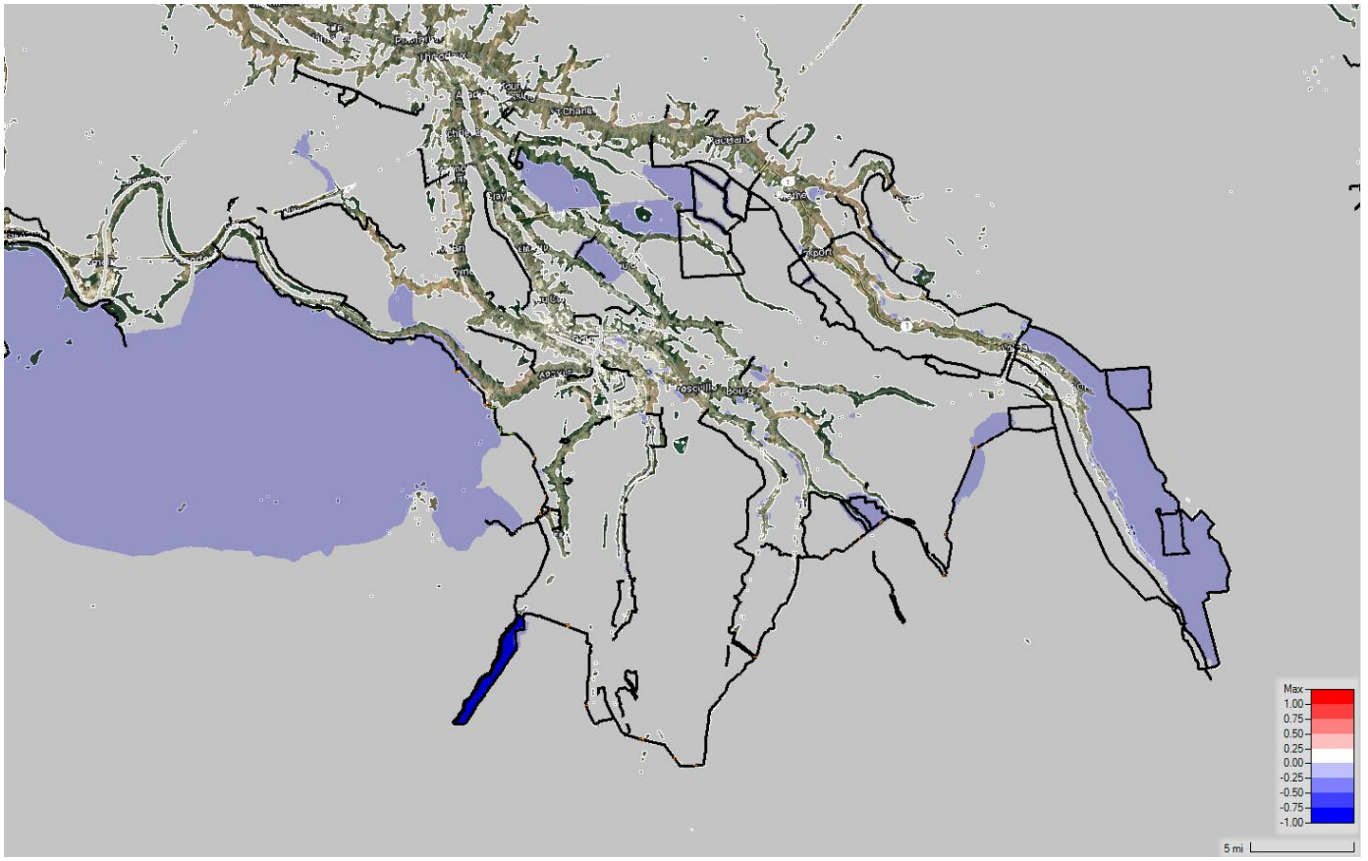

Figure H:1-2. 5-Year Event in the 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The 5-year event in the 2085 condition was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system due to precipitation. See Figure H:1-2 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 1.00 feet.

1.2.2 10-Year Event – Precipitation for FWP vs FWOP

This model scenario evaluates potential inundation due to precipitation and assumes that the hydrologic structures would be open. Appendix E includes further detail on the structures and modeling assumptions. Much of the interior of the MTG System may potentially experience either a negligible change in water levels or a reduction in water levels. See Figure H:1-2 below for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet.

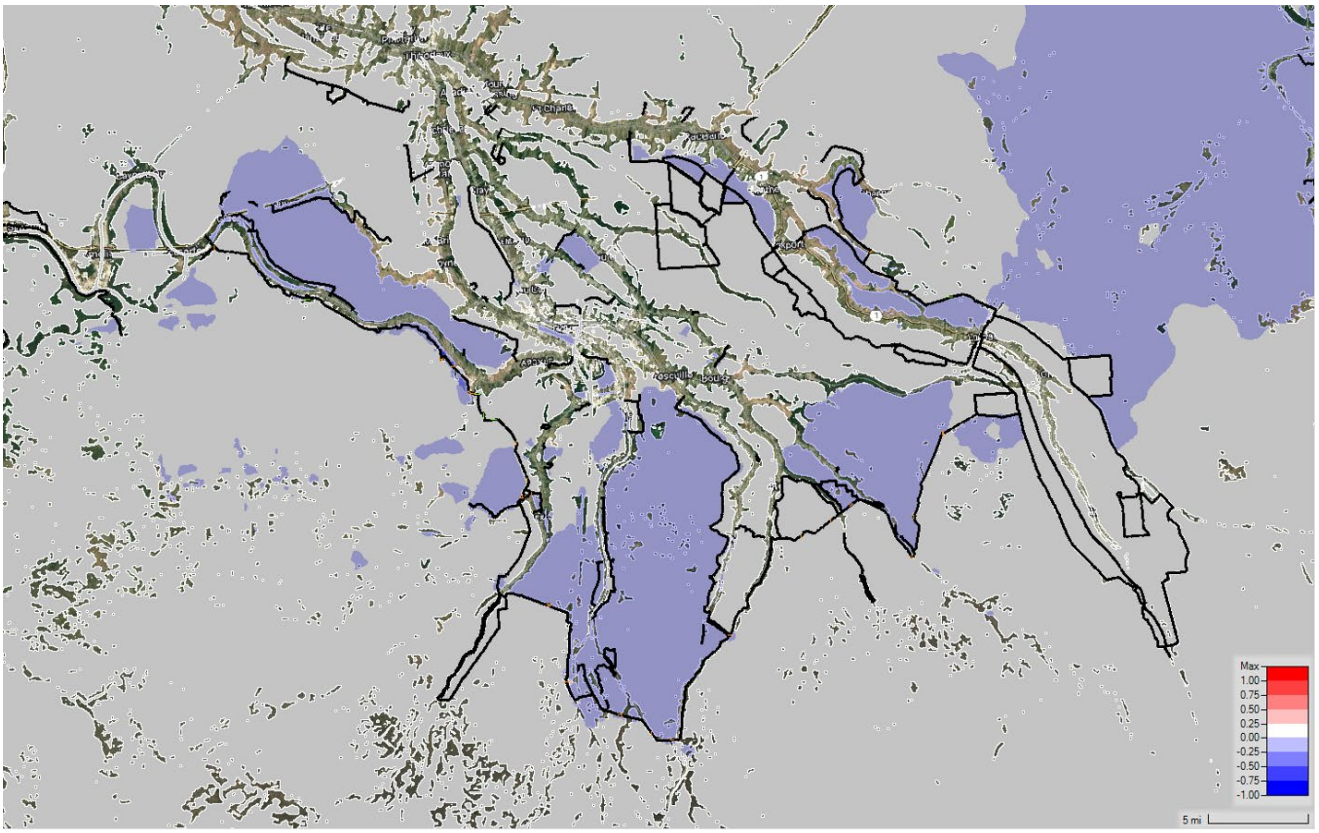

Figure H:1-3. 10-Year Event in the 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

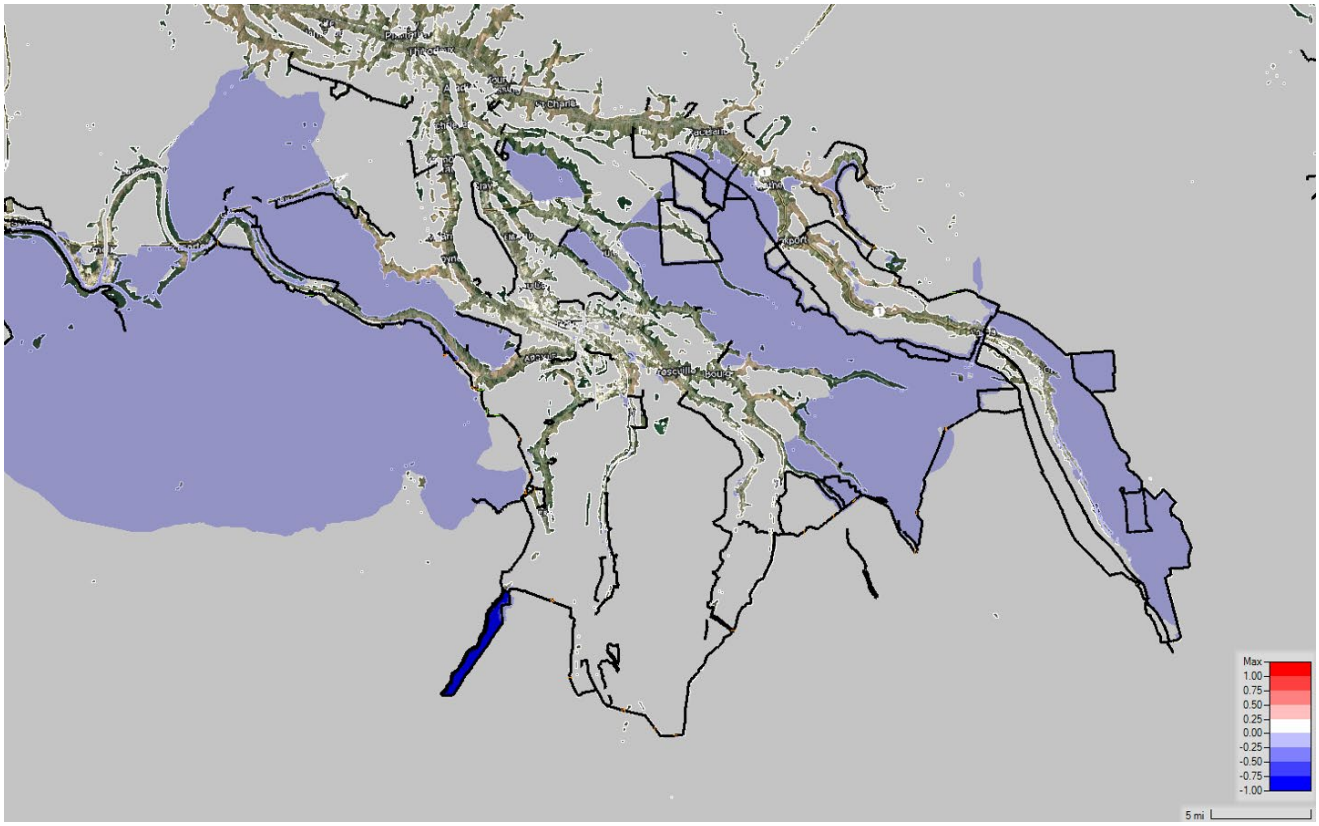

Figure H:1-4. 10-Year Event in the 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The 10-year event in the 2085 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system due to precipitation. See Figure H:1-4 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.75 feet.

1.2.3 25-Year Event – Precipitation for FWP vs FWOP

This model scenario evaluates potential inundation due to precipitation and assumes that the hydrologic structures would be open. Appendix E includes further detail on the structures and modeling assumptions. For the 25-year event in the 2035 conditions, very little difference in inundation water levels were found. Much of the interior of the MTG System may potentially experience either a negligible change in water levels or a reduction in water levels. See Figure H:1-5 below for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in

water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet.

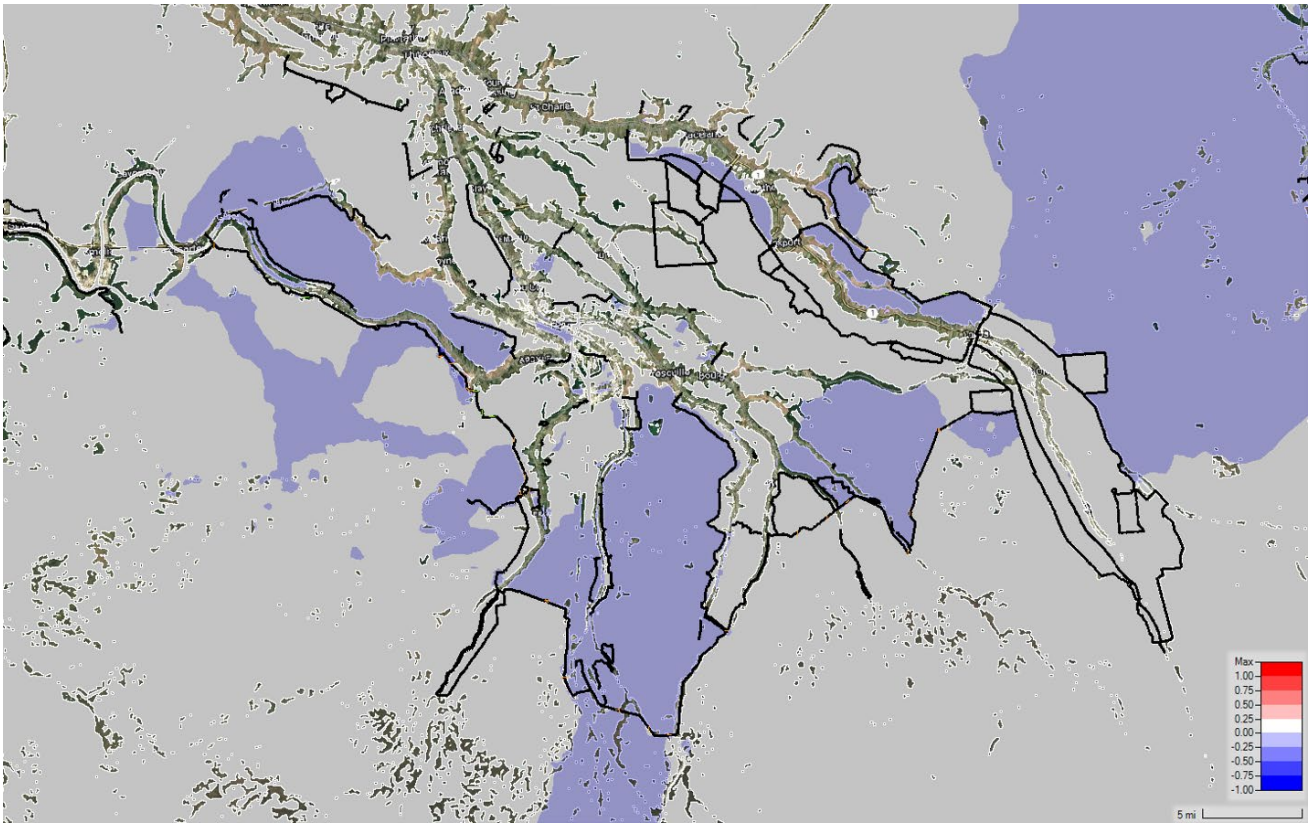

Figure H:1-5. 25-Year Event in the 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

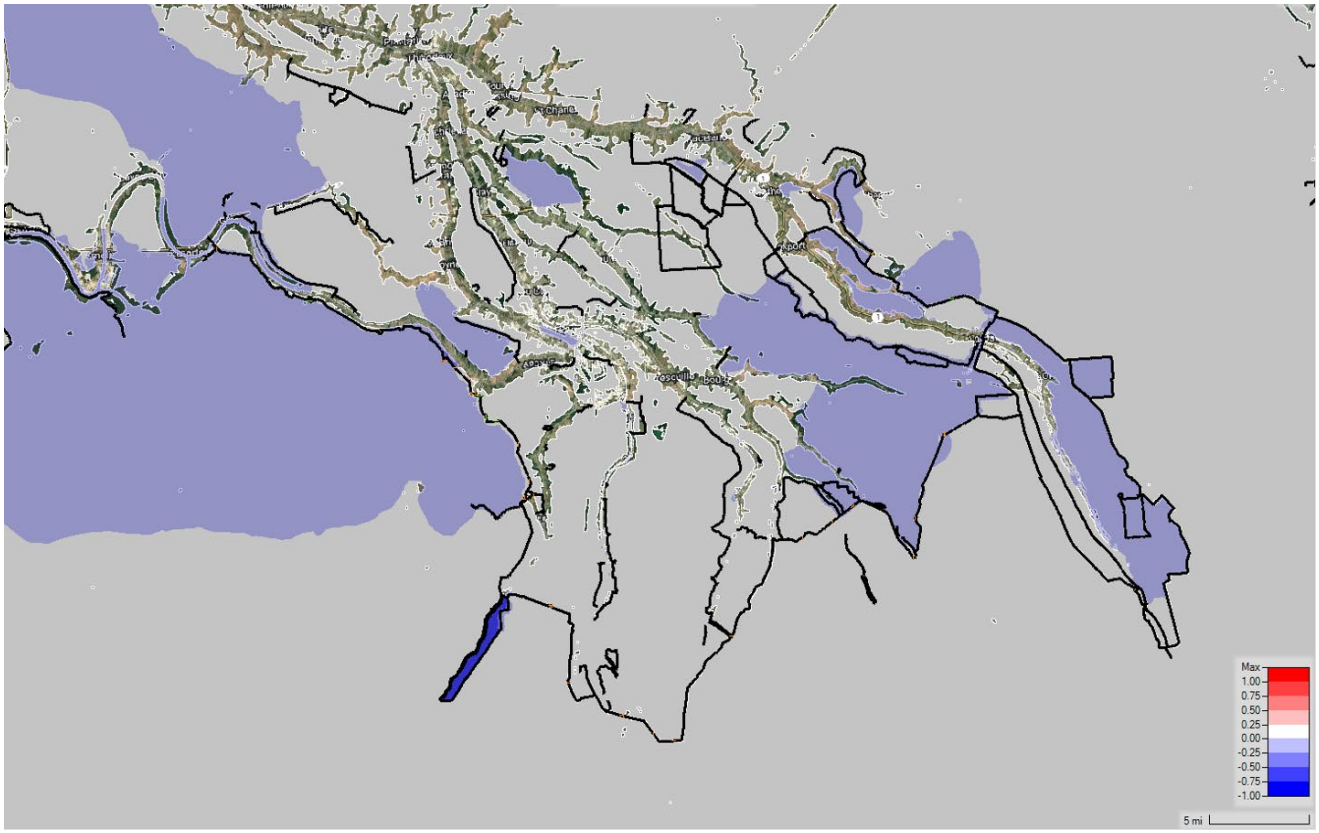

Figure H:1-6. 25-Year Event in the 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The 25-year event in the 2085 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system due to precipitation. See Figure H:1-6 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.75 feet.

1.2.4 April 2023 Spring Neap Tides for FWP vs FWOP

Spring tidal events are lunar-driven tidal events that typically have some of the highest lunar tidal amplitudes. These spring tidal events are indicative of changes in tidal exchanges and local hydrodynamics. The April 2023 Spring Neap tide event was evaluated using observed data from a recent event to analyze potential inducements inside of the MTG system.

The April 2023 Neap Tides event was run under both the 2035 and 2085 conditions while accounting for scenarios with and without SLC. This event evaluates potential inundation due to precipitation and tidal events and assumes that the hydrologic structures would be

open. Appendix E includes further detail on structures and modeling assumptions. For the 2035 condition with SLC, very little difference in inundation water levels were found. Much of the interior of the MTG System may potentially experience either a negligible change in water levels or a reduction in water levels. See Figure H:1-7 below for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet.

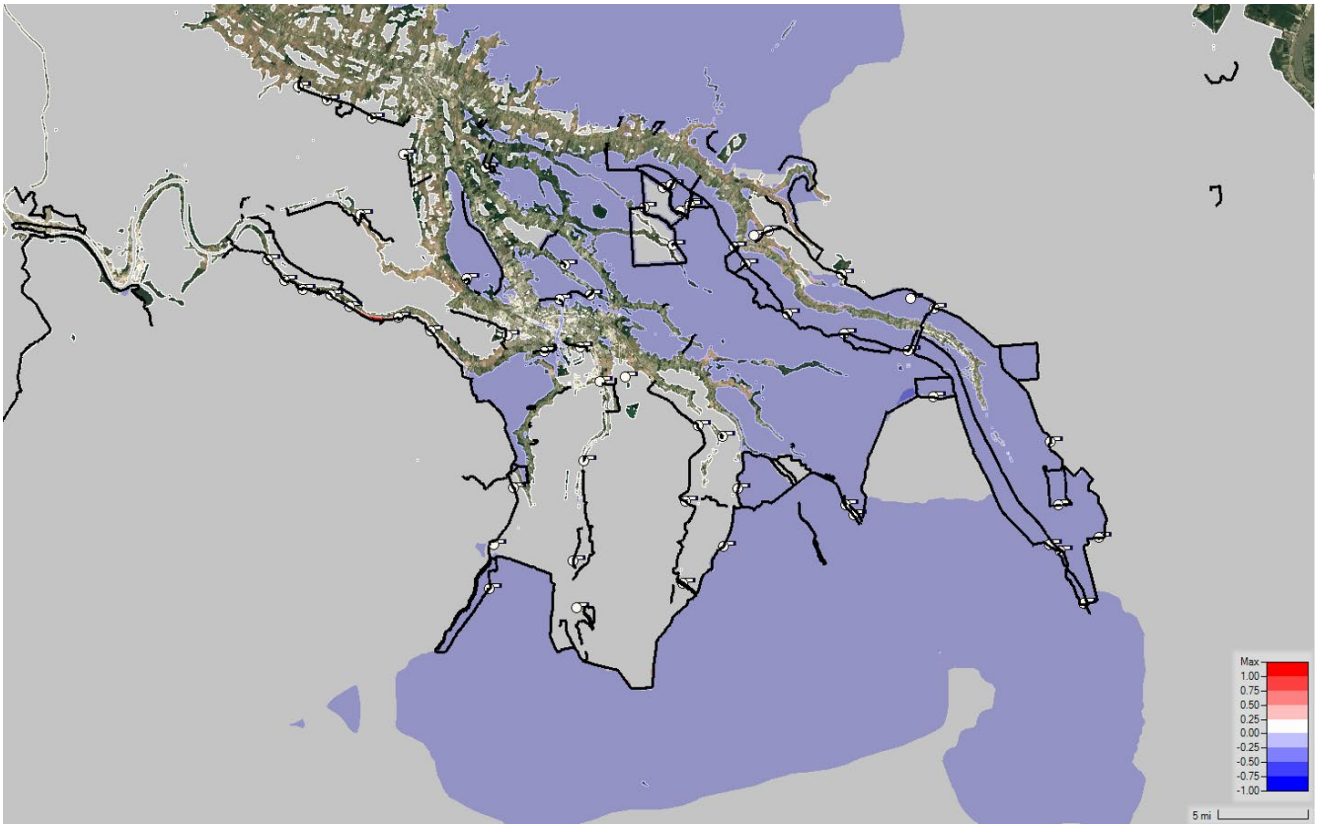

Figure H:1-7. April 2023 Spring Neap Tides with SLC, 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

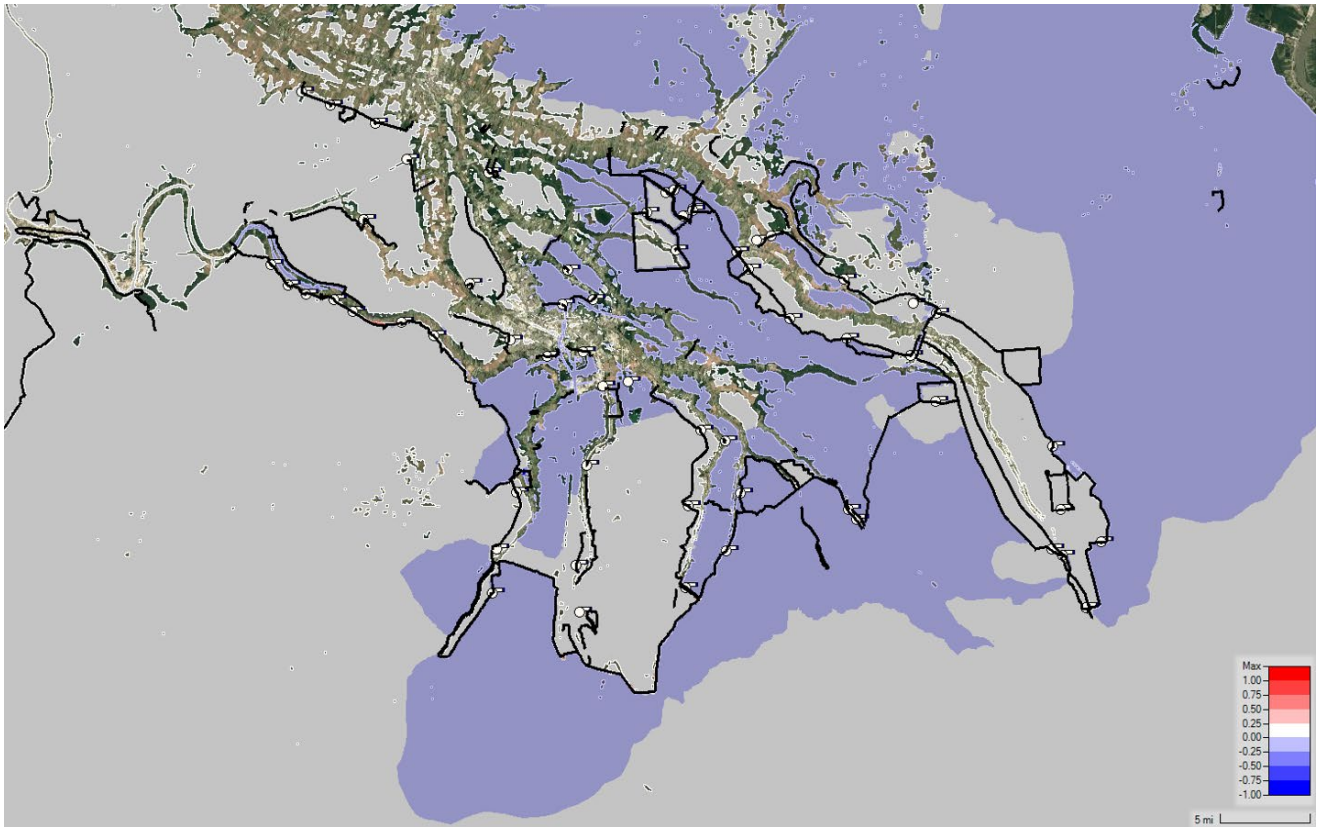

Figure H:1-8. April 2023 Spring Neap Tides without SLC, 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The April 2023 Neap Tide event without SLC in 2035 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system due to precipitation in combination with this tidal event. See Figure H:1-8 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet.

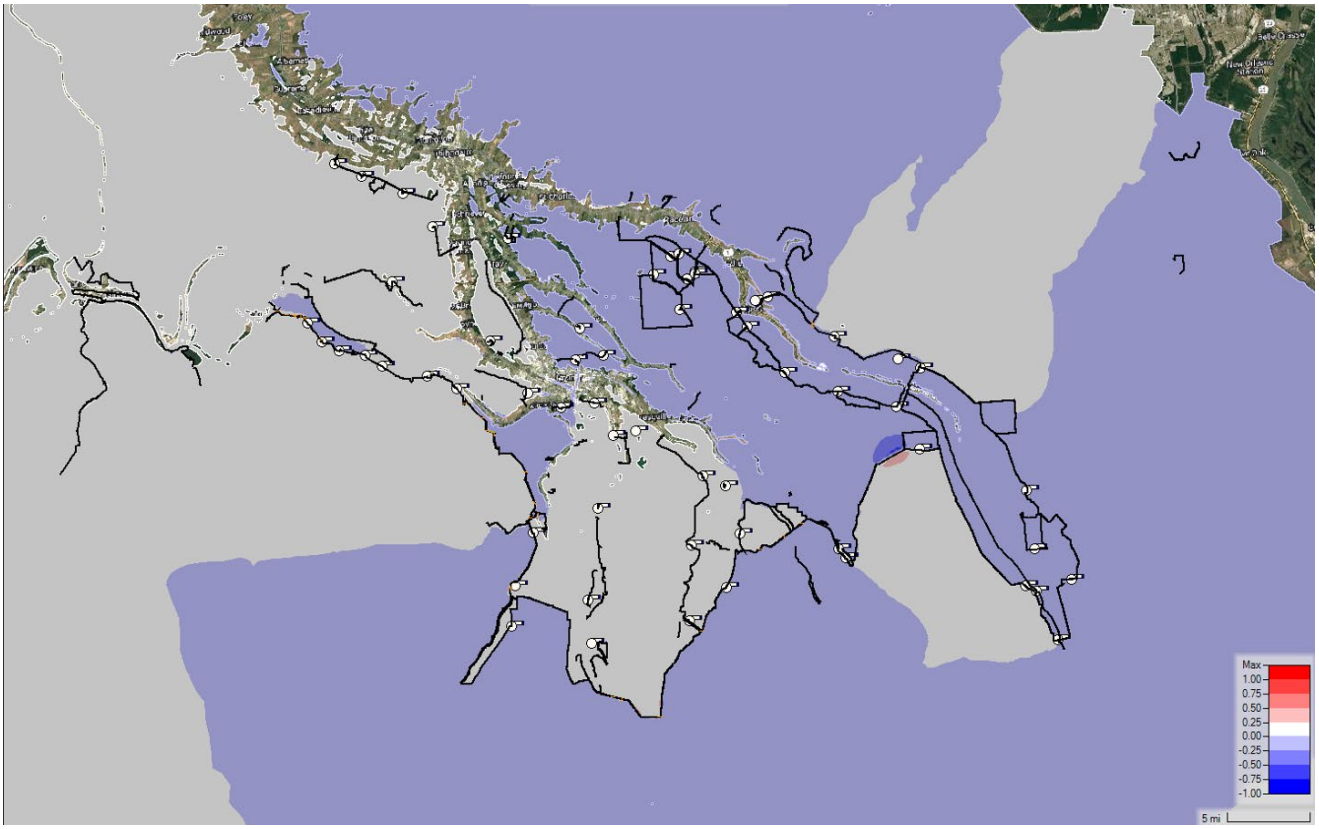

Figure H:1-9. April 2023 Spring Neap Tides with SLC, 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The April 2023 Neap Tide event with SLC, 2085 condition was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system due to precipitation. See Figure H:1-9 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet. One small area in the vicinity of Reach L and west of Cutoff, Louisiana indicates a potentially greater reduction in water levels of up to 0.55 feet.

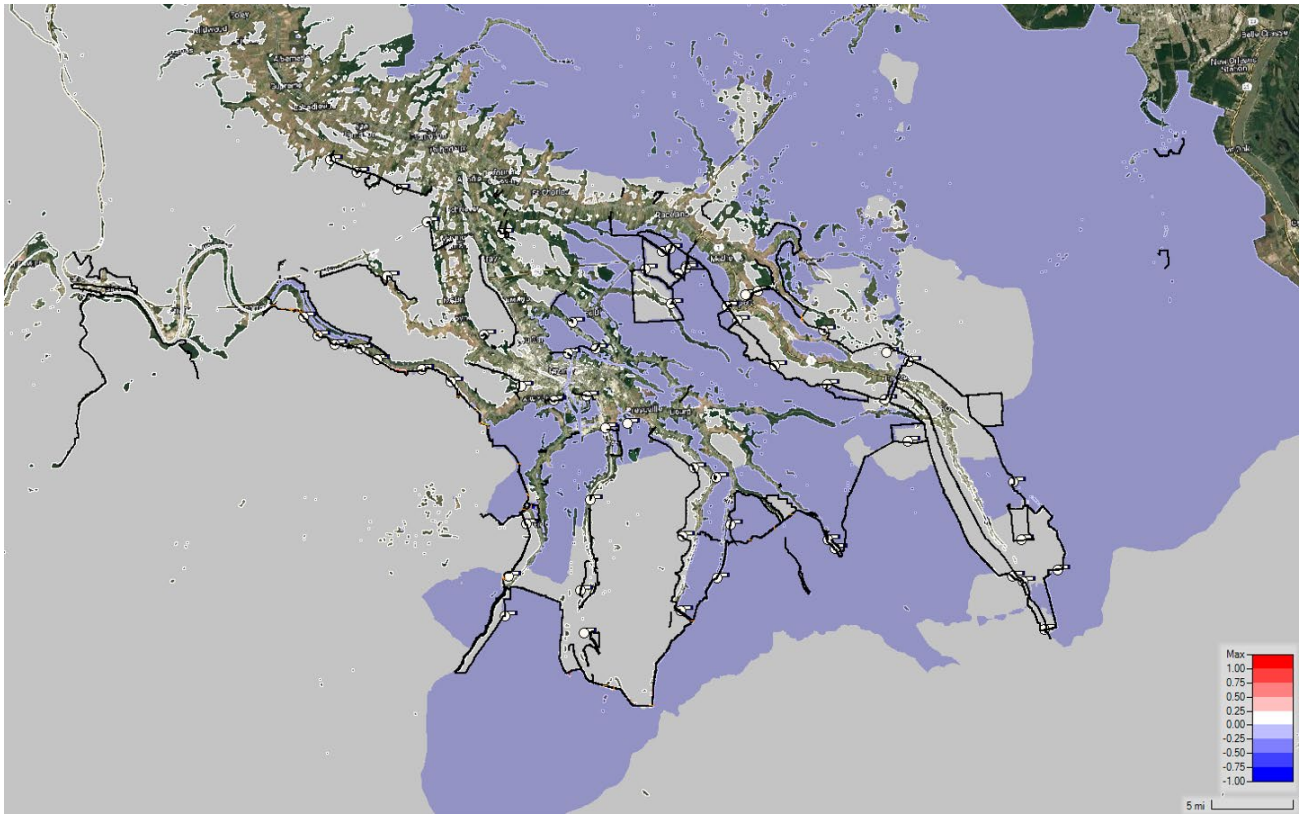

Figure H:1-10. April 2023 Spring Neap Tides without SLC, 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The April 2023 Neap Tide event without SLC in 2085 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system due to precipitation. See Figure H:1-10 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet.

1.2.5 December 2023 Cold Fronts for FWP vs FWOP

Cold front conditions were assessed, because these are regular, recurring meteorological events that cause dramatic exchange of water from bays to the continental shelf and can dramatically affect water surface elevations in coastal Louisiana.

The December 2023 cold front event was run for both the 2035 and 2085 conditions while accounting for scenarios both with and without SLC. This event evaluates potential inundation due to precipitation and tidal events and assumes that the hydrologic structures would be open. Appendix E includes further detail on the structures and modeling

assumptions. For the year 2035 condition with SLC, very little difference in inundation water levels were found. Much of the interior of the MTG System may potentially experience either a negligible change in water levels or a reduction in water levels. See Figure H:1-11 below for the resulting map of these findings. The scale used on the map is in feet (NAVD88). The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.75 feet

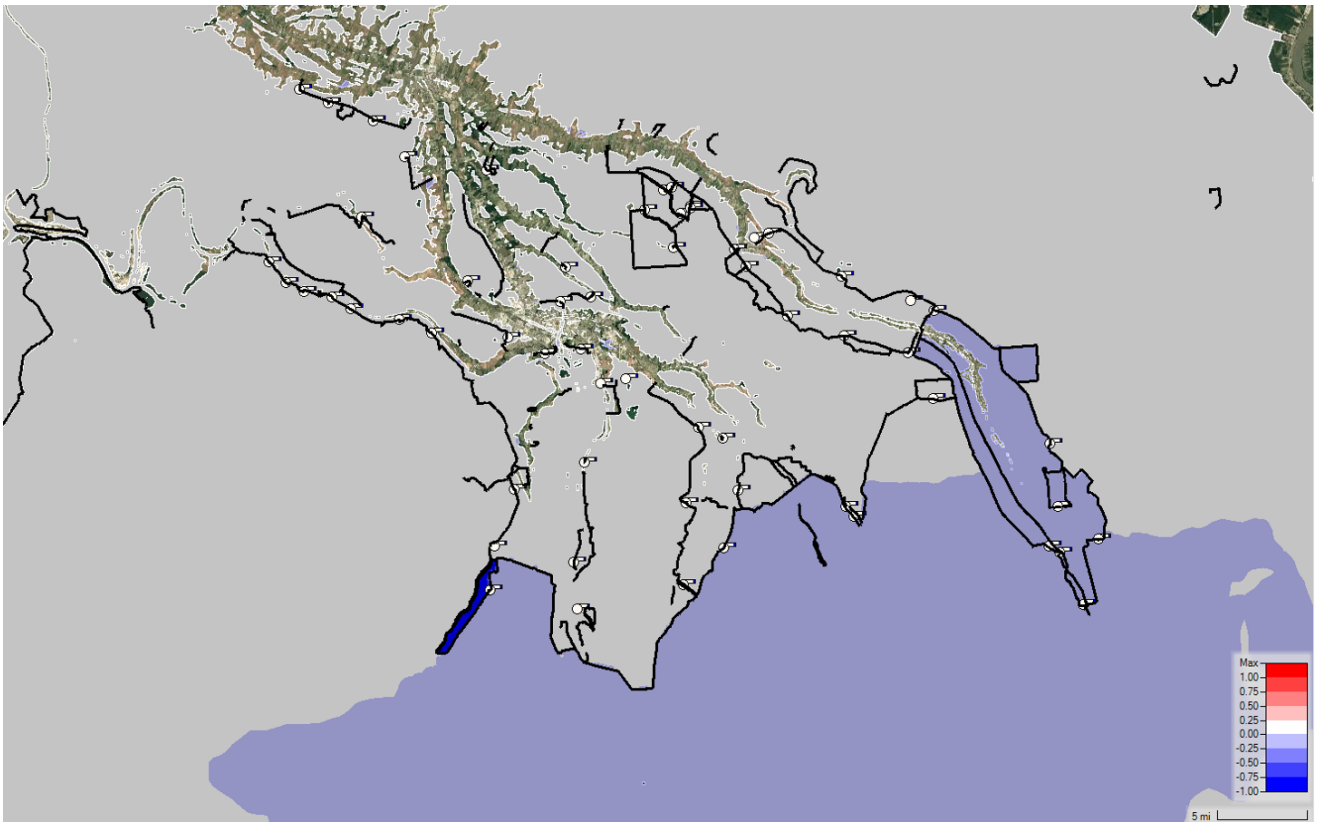

Figure H:1-11. December 2023 Cold Front Tidal Events with SLC, 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

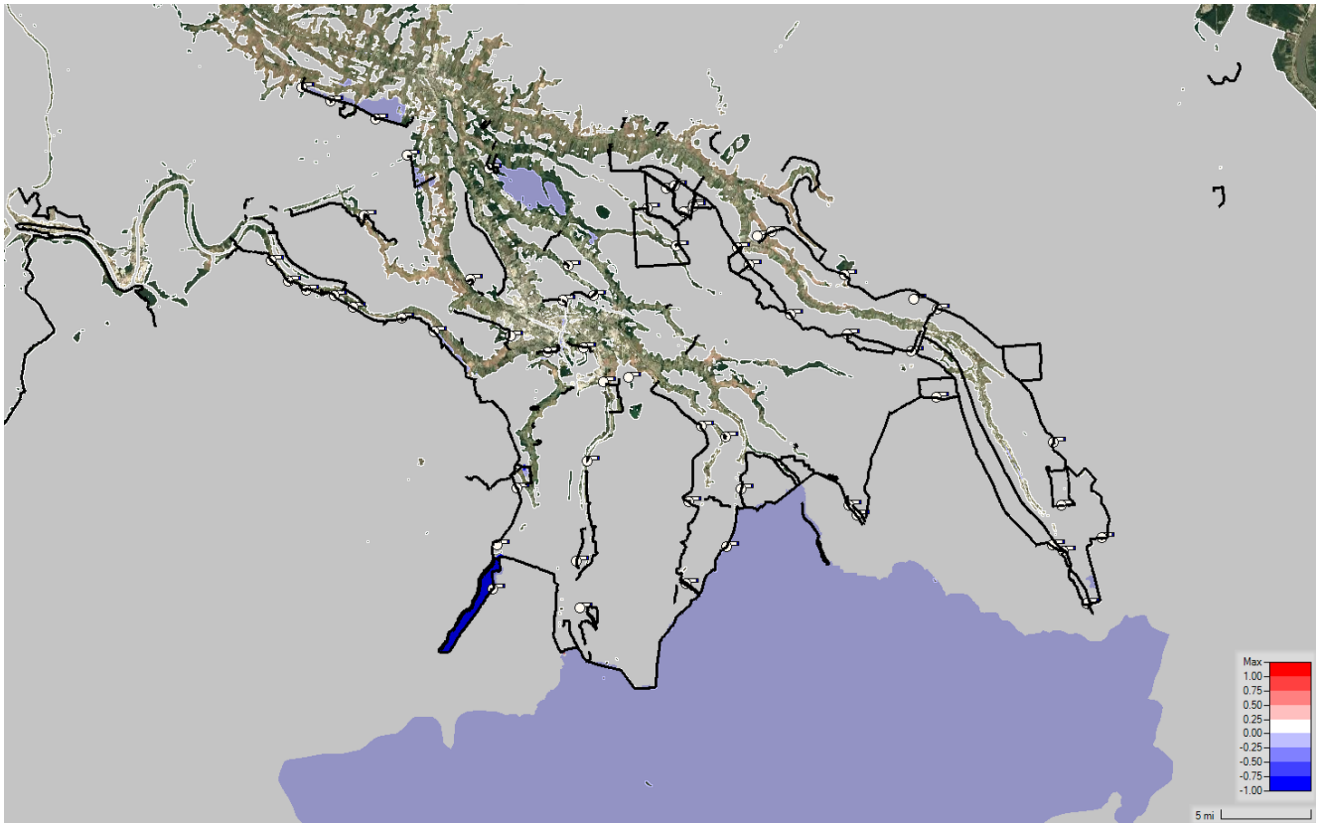

Figure H:1-12. December 2023 Cold Front Tidal Events without SLC, 2035 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

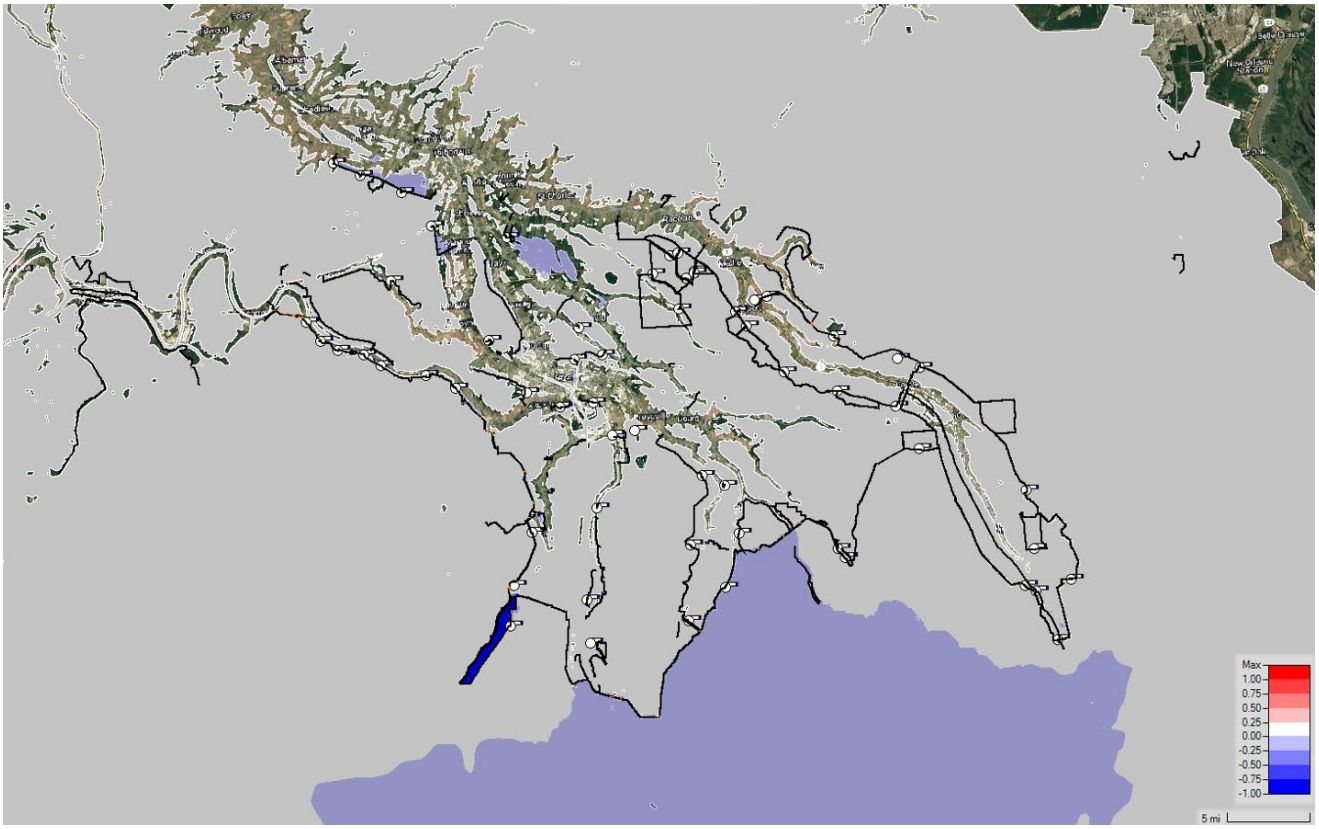

Figure H:1-13. December 2023 Cold Front Tidal Events without SLC, 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The December 2023 Cold Front Tide event with SLC in 2035 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system. See Figure H:1-12 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet. However, none of the blue areas in Figure H:1-12 represent any locations within the MTG system.

The December 2023 Cold Front Tide event without SLC in 2085 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system. See Figure H:1-13 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.75 feet.

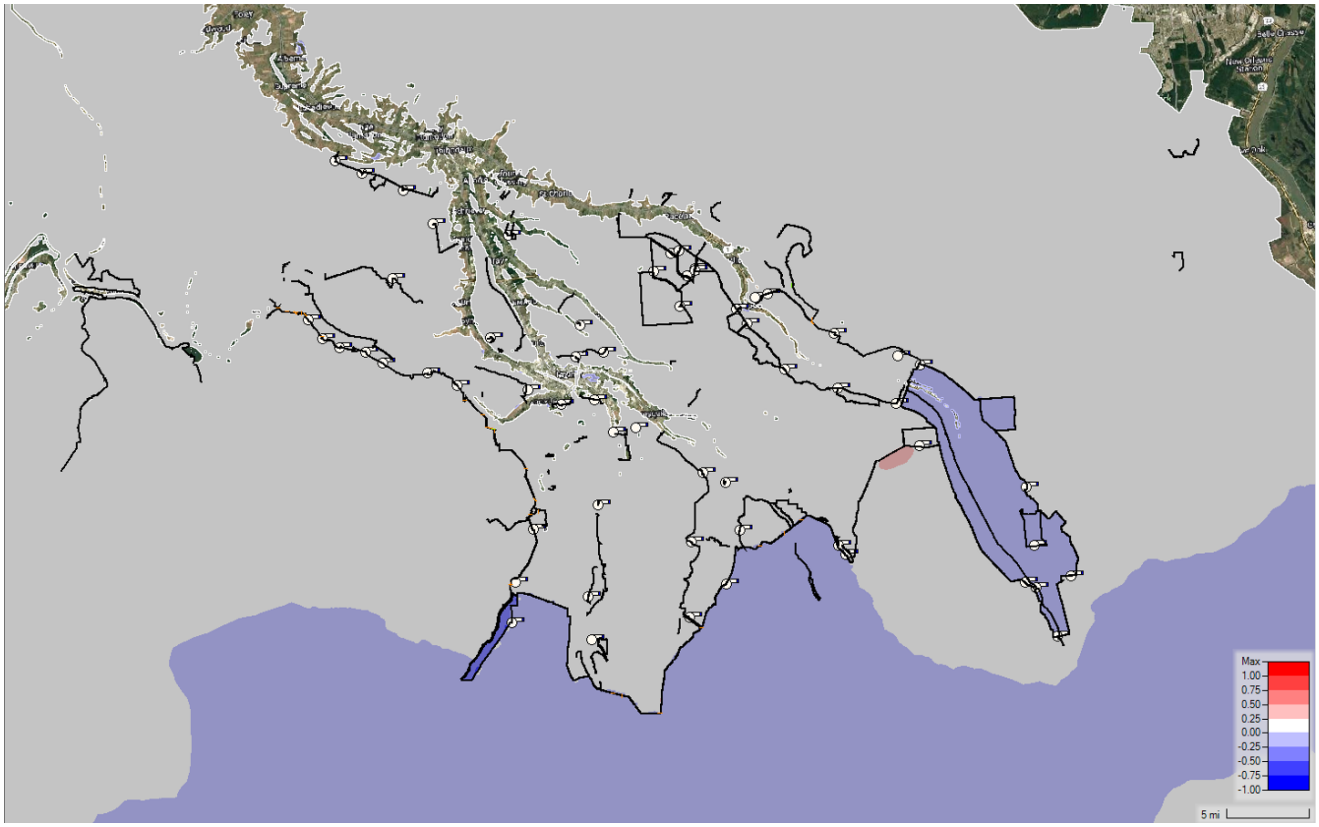

Figure H:1-14. December 2023 Cold Front Tidal Events with SLC, 2085 Condition Comparing FWP-FWOP (units in feet; gray is negligible change)

The December 2023 Cold Front Tide event with SLC in 2085 conditions was evaluated, but also showed little to no significant impact to the inundation water levels inside of the MTG system. See Figure H:1-14 for the resulting map of these findings. The scale used on the map is in feet. The gray areas on the map depict areas without any significant change in water level while the light blue areas depict areas that may experience a water level reduction of up to 0.25 feet. However, none of the light blue areas in Figure H:1-14 represent any locations within the MTG system.

SECTION 2

List of Acronyms and Abbreviations

AEP	Annual Exceedance Probability
CRMS	Coastwide Reference Monitoring System
CSTORM	Coastal Storm Modeling System
ECMWF	European Centre for Medium-Range Weather Forecast
EIS	Environmental Impact Statement
FWP	Future With Project
FWOP	Future Without Project
HEC-RAS	Hydrologic Engineering Center's River Analysis System
H&H	Hydrology and Hydraulics
L2L	Lockport to Larose
LA	Louisiana
LCN	Larose C North
LGM	Larose to Golden Meadow
MTG	Morganza to the Gulf
NAVD88	North American Vertical Datum of 1988
NFL	Non-Federal Levee
PDT	Project Delivery Team
SLC	Sea Level Change
SWL	Still Water Level
USGS	United States Geological Survey
WSE	Water Surface Elevation