US Army Corps
of Engineers®
New Orleans District

Engineering Documentation Report

Mississippi River &Tributaries

Morganza to the Gulf of Mexico, LA
(MTG) Project

Hurricane and Storm Damage Risk
Reduction

P2# 323234

December 2021

Engineering Documentation Report

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1. Purpose/Overview

The primary purpose of this Engineering Documentation Report (EDR) is to document the incorporation of the adaptive design criteria and other design refinements described in this report in the Mississippi River and Tributaries (MR&T), Morganza to the Gulf of Mexico, Louisiana (MTG) Project as directed in Engineer Regulation (ER) 1110-2-1150 (dated 31 Aug 99) based on the current MTG design. Another purpose of the EDR is to approve the increased non-Federal sponsors (NFS(s)) construction cost share, as proposed by the Coastal Protection and Restoration Authority Board of Louisiana (CPRAB) in a letter of intent, dated 27 March 2019 (and updated 17 November 2021), supporting the option that limits Federal participation to initial construction, as defined in this report (see Section 10).

The 2013 MTG Project Final Post Authorization Change Report (PACR), as approved by the Chief of Engineers Report dated 8 July 2013, recommended site adaptation of the post-Katrina design criteria to reduce project cost without significantly increasing risk to be considered during the next phase of implementation, preconstruction, engineering and design (PED). While further progressing the design through the PED phase, the New Orleans District (CEMVN) prepared a technical report to determine if and how the current Total Project Cost (TPC) could be reduced below the $10.3 billion project TPC that is authorized in the Water Resources Reform and Development Act (WRRDA) of 2014 (as documented in the 2013 PACR) via site adaptive design criteria, among other measures. The CEMVN developed the April 2019 Adaptive Criteria Assessment Report (ACAR), which, based on the current design at the time, demonstrated that the MTG Project's TPC could be reduced by incorporating adaptive criteria, taking into account the existing condition of the project site and also by limiting the Federal participation to initial construction of the project to the authorized 1 percent annual exceedance probability (AEP)/100-year level of risk reduction (LORR). The ACAR was subsequently submitted to the Mississippi Valley Division (CEMVD), Headquarters (HQ) U.S. Army Corps of Engineers (USACE), the Director of Civil Works (DCW), and the Assistant Secretary of the Army (Civil Works) (ASA(CW)). The 13 August 2019 DCW memo stated "The ACAR is a technical report and does not represent a decision document suitable for budgetary decisions; however, additional analysis in the PED phase, including an economic analysis, will produce a document that can be used to support such decisions as the project is considered for construction." The 13 December 2019 ASA(CW) memo stated "I fully support the project delivery approach recommended in the ACAR, which is aligned with the Administration's commitment to infrastructure in America while also minimizing residual risk associated with this important project. I encourage the Corps to move forward with development of the economic update and continue to seek potential cost reduction measures while ensuring project costs and benefits are evaluated in a manner consistent with law and policy." It is therefore concluded the consideration and application of site adaptive criteria during PED phase, as recommended in the 2013 PACR, Report of the Chief of Engineers, the endorsement Memo from the ASA(CW), and the current design for the MTG Project is consistent with the authorized 1 percent AEP/100-yr LORR project. This EDR recommends approval of the current design based on the ACAR, inclusive of the recommended reduction in the Federal TPC for construction, and current design standards.

2. Pertinent Data

2.1. Pertinent Data

A tabular summary of essential data on the Project is listed below.

Project Cost	$ 6,522,378,000 (FY 22 Price Level)
Benefit-to-Cost Ratio	6.19 at 2.25% Discount Rate
Physical Features	Levees, floodwalls, floodgates, a lock complex (excluding any additional sill depth required for the Houma Navigation Canal Deepening project.—see Section 10.1), road and railroad gates, fronting protection for existing pump stations, environmental control structures, hurricane and storm damage risk reduction structures on navigable waterways (commensurate with the term "navigation structures" used in the ACAR) , other necessary structures, and mitigation measures to compensate for unavoidable environmental impacts to wetlands with monitoring and adaptive management
Project Purpose	Hurricane and Storm Damage Risk Reduction
Controlling Elevations	See Table 7-2 for the hydraulic design elevations per levee reach.

All elevations throughout this document are referenced as North American Vertical Datum of 1988 (NAVD88) epoch 2004.65.

2.2. Prior Reports

The table below provides a list of the prior reports and where they can be found, that will be used as references in this report.

Table 2-1 Relevant Reports

Year	Report Tile
2013	Mississippi River and Tributaries, Morganza to the Gulf of Mexico, Louisiana Final Post Authorization Change Report - https://www.mvn.usace.army.mil/About/Projects/Morganza-to-the-Gulf/
2013	Issue Evaluation Study, Design Criteria Site-Adaptation Report for the Proposed Morganza to the Gulf Levee System - Available upon request.
2019	Morganza to the Gulf, Adaptative Criteria Assessment Report (A technical report whose tenets are subject to approval by this EDR) - Appendix D

3. Status of Project Authorization

In accordance with the 2002, 2003 and 2013 reports of the Chief of Engineers, the MTG Project is authorized as a feature of the MR&T.

The MTG Project was initially authorized for Federal construction by Section 1001(24) of the Water Resources Development Act (WRDA) of 2007, Public Law 110-114, in accordance with the Reports of the Chief of Engineers dated 23 August 2002 and 22 July 2003, at a total cost of $886.7 million as follows:

> *"(24) MORGANZA TO THE GULF OF MEXICO, LOUISIANA.—*
>
> *(A) IN GENERAL.—The project for hurricane and storm damage reduction, Morganza to the Gulf of Mexico, Louisiana: Reports of the Chief of Engineers dated August 23, 2002, and July 22, 2003, at a total cost of $886,700,000, with an estimated Federal cost of $576,355,000 and an estimated non-Federal cost of $310,345,000.*
> *(B) OPERATION AND MAINTENANCE.—The operation, maintenance, repair, rehabilitation, and replacement of the Houma Navigation Canal lock complex and the Gulf Intracoastal Waterway floodgate features of the project described in subparagraph (A) that provide for inland waterway transportation shall be a Federal responsibility in accordance with section 102 of the Water Resources Development Act of 1986 (33 U.S.C. 2212)."*

The project was redesigned in the 2013 PACR, both to address the limitations of Section 902 of the WRDA of 1986, as amended, and to meet updated post-Hurricane Katrina design guidelines. The MTG Project was subsequently re-authorized by Section 7002(3)5 of the WRRDA of 2014, Public Law (PL) 113-121, in accordance with the Report of the Chief of Engineers dated 8 July 2013, at an updated total cost of $10,265,100,000 as follows:

> *SEC. 7002. AUTHORIZATION OF FINAL FEASIBILITY STUDIES. The following final feasibility studies for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plan, and subject to the conditions, described in the respective reports designated in this section:*
>
> (3) HURRICANE AND STORM DAMAGE RISK REDUCTION.---

State	***Name***	***Date of Report of Chief of Engineers***	***Estimated Initial Costs and Estimated Renourishment Costs***
5. LA	*Morganza to the Gulf*	*July 8, 2013*	*Federal: 6,695,400,000* *Non-Federal: 3,604,600,000* *Total: $10,300,000,000*

The need for this EDR is to document the refinements, that include inclusion of the adaptive design criteria, to the MTG Project that make up the current design (see Section 7 for more information). In addition, the EDR is needed to incorporate the increased NFSs construction cost share, as proposed by the NFSs, to limit Federal participation to initial construction, as defined in this report (see Section 10). The EDR is required as the most recent decision document in support of the MTG Project Partnership Agreement (PPA).

4. Project Agreements

Listed below is the NFS(s) and the agreements that have been executed or that are scheduled to be executed for MTG Project.

4.1. Non-Federal Sponsor for the Project Partnership Agreement

For purposes of the Project Partnership Agreement (PPA), the non-Federal sponsors are the State of Louisiana, as represented by CPRAB, and the Terrebonne Levee and Conservation District (TLCD). The CPRAB is named as the "single state entity" for flood risk reduction and hurricane storm damage risk reduction projects in an area referenced as Southeast Louisiana (which is inclusive of Terrebonne and Lafourche parishes) pursuant to a policy determination of HQUSACE, as set forth in CECW-MVD Memorandum to Commander, Mississippi Valley Division, dated 30 August 2010, SUBJECT: Coastal Protection and Restoration Authority (CPRA) As Single State Entity Serving as NFS.

4.2. Design Agreements

A Design Agreement for the MTG Project between the NFS(s) (at the time, the NFS(s) was the Louisiana Department of Transportation and Development [LADOTD]) and the Department of the Army was executed on 22 May 2002 and subsequently amended on 24 March 2005 (signed by Department of Army and the LADOTD) and 10 January 2011 (signed by LADOTD and CPRA which changed the NFS(s) to CPRA (now known under state law as CPRAB)).

4.3 In Kind Memorandum of Understanding

An In Kind Memorandum of Understanding (MOU) between the CPRAB and the TLCD, as the non-Federal Interests named in the MOU , and the Department of the Army was executed effective 4 December 2019 to preserve the potential for the NFS(s) to receive credit for future in kind construction performed by the non-Federal Interests (for those items of work described in the In Kind MOU) for which the construction contract notice to proceed is issued after the effective date of the MOU but prior to the effective date of the execution of the PPA. Design work performed in association with the items of in-kind work described in the MOU for which the construction was initiated pursuant to the terms of the MOU would also be eligible to be considered for credit under the terms of the MOU, even if such design work was commenced prior to the effective date of the MOU.

4.4 Project Partnership Agreement

The HQUSACE is currently assisting CEMVN in drafting language for a PPA and will utilize the Model Project Partnership Agreement for Construction of Specifically Authorized Coastal Storm Risk Management Projects (Without Periodic Nourishment) as the basis for the formation of the agreement. This PPA will describe the implementation of the project in accordance with the recommendations of the ACAR, as approved by this EDR. As addressed in this EDR (based on the recommendations of the ACAR), the PPA will be modified from the model to propose an alternative cost share with the Federal investment limited to the initial construction (defined in Section 10). The PPA is scheduled to be executed in 2021.

5. Previous Actions

The MTG Project studies listed, following in chronological order, along with pertinent actions, were managed under the project management policy.

Table 5-1 MTG Project Pertinent Documents and Actions

1992	Reconnaissance study authorized by resolution adopted April 1992 by the Committee of Public Works and Transportation of the U.S. House of Representatives. In August, Hurricane Andrew caused extensive flooding in Terrebonne and Lafourche parishes.
1994	USACE completed the Morganza to the Gulf reconnaissance report (USACE, 1994).
2002	The Morganza to the Gulf feasibility study and PEIS were completed in March 2002. The PED Agreement for the overall project was signed in May 2002. In August 2002, the USACE issued a Chief of Engineers report.
2003	In July 2003, the USACE issued a supplemental Chief of Engineers report (USACE, 2003), which made changes to the non-Federal sponsor's in-kind services.
2005	The PED Amendment 1 executed in March 2005 combined the two PED efforts into one and allowed the non-Federal sponsor to advance funds on the combined PED effort. In August and September, Hurricanes Katrina and Rita impacted the study area
2007	WRDA 2007 authorized the Morganza to the Gulf of Mexico, Louisiana project for hurricane and storm damage risk reduction at a total cost of $886.7 million.
2011	The PED Amendment 2 executed in January 2011 increased the funding ceiling and changed the name of the non-Federal sponsor from Louisiana Department of Transportation and Development (DOTD) to the Coastal Protection and Restoration Authority Board of Louisiana.
2013	A PACR was completed and recommended an increase in the TPC to $10.3 billion and recommended that USACE take future action to pursue adaptive criteria to reduce costs. The PACR was approved by the Chief of Engineers on 8 July 2013. An Issue Evaluation Study, Design Criteria Site-Adaptation for the Proposed MTG Levee System (RMC Report) was completed later in July 2013 to further recommend and provide detail for the adaptive criteria.
2014	The WRRDA 2014 authorized MTG Project at $10.3 billion in accordance with the Chief of Engineers Report dated 8 July 2013.
2018	In a 14 November 2018 meeting with Rep. Graves, CPRAB, Stakeholders, HQUSACE, CEMVD and CEMVN, CEMVN was directed to perform an assessment in collaboration with local stakeholders to explore adaptive criteria and other cost saving measures for MTG Project.
2019	The ACAR was completed to provide further detail and preliminary costs to implement the adaptive criteria along with proposing a non-traditional cost share that limits Federal investment to the initial construction. Recommendations in the ACAR await approval by this EDR.

2019	ASA(CW) provides a memo in support of the ACAR dated 13 December 2019.
2020	The USACE receives additional funding to further progress the design and develop an Economic Update and plans and specifications for the Humble Canal Floodgate Preload contract. Funds were also used to complete Humble Canal Floodgate Preload EA 583 and this report.
2021	Walla Walla Cost Engineering Mandatory Center of Expertise certifies the estimated TPC for MTG Project (FY21 Project First Cost of $6B, updated to $6.5 billion in FY22).

6. Project Description

The MTG Project includes a total of 98 miles of earthen levees, floodwalls, floodgates, 22 hurricane and storm damage risk reduction structures on navigable waterways (includes 2 at the Gulf Intracoastal Waterway (GIWW) and "Bubba Dove" at Houma Navigation Canal), 10 roadway/railroad gates, 23 environmental structures, fronting protection for existing pump stations, and the HNC Lock Complex (excluding any deepening of the HNC sill depth beyond the 18 feet required for the MTG project), and other necessary structures, and mitigation measures to compensate for unavoidable environmental impacts to wetlands with monitoring and adaptive management in accordance with the authorized alignment, as authorized by WRRDA 2014. The current project features are the same as described in the 2013 PACR, as authorized by WRRDA 2014. While no new structures or alignments have been added, the current design has refined the design of some of these features and is reported in Appendix A—Engineering Inputs. Figure 6-1 displays the current MTG Project alignment.

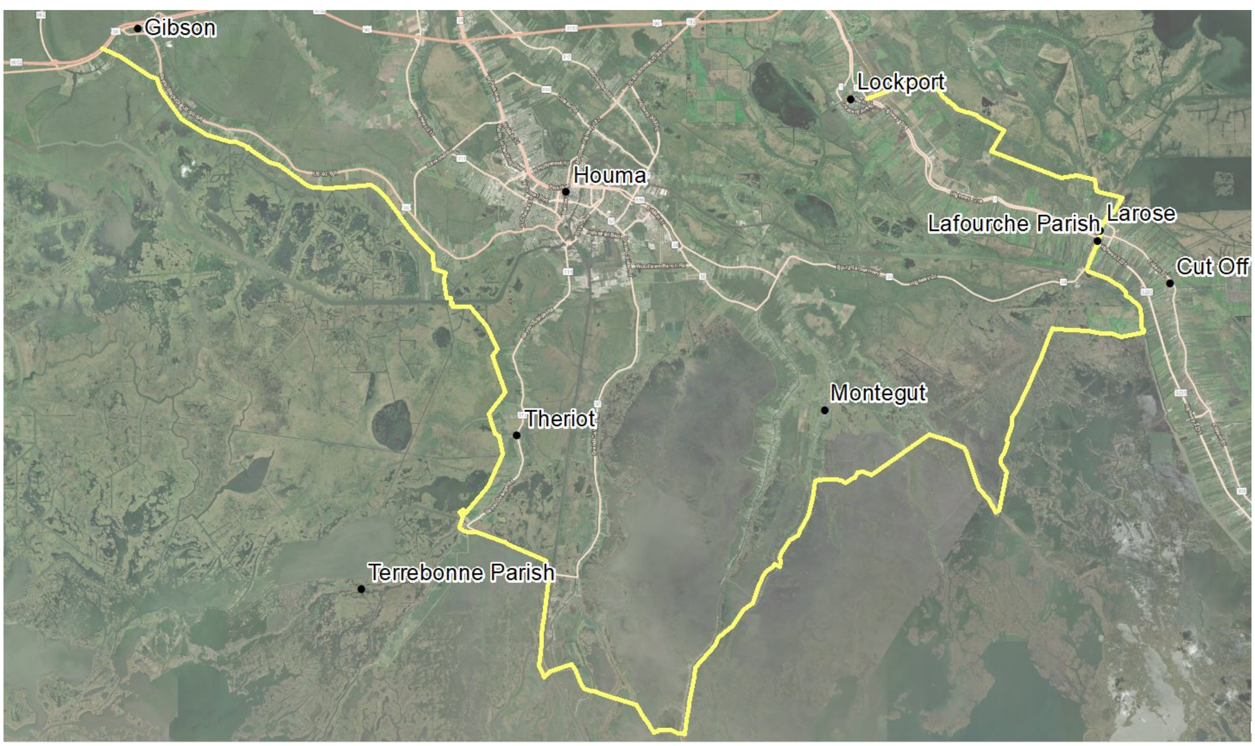

Figure 6-1 Morganza to the Gulf Levee Alignment

7. Current Engineering Studies, Investigations and Design

7.1. Evolution of Design

As re-authorized by Congress in WRRDA 2014, the estimated cost of the project was approximately $10.3 billion, resulting in over $9 billion of cost increase as compared to the original $886.7 million project authorized in 2007. In addition to the adoption of the CEMVN Hurricane Storm Damage and Risk Reduction System (HSDRRS) criteria, the cost increase for the re-authorized project is predominantly attributable to adjustment of levee and structure heights based on updated hydraulic modeling, which utilized new hydraulic modeling methodologies as well as updated geometry (bathymetry and Light Detection and Ranging (LIDAR)) to compute new 1 percent hydraulic elevation requirements. Recognizing the large cost increase, Section 10.5 of the PACR recommended implementation of site adaptations of the HSDRRS criteria without significantly increasing risk such as reducing factors of safety, changing levee overtopping rates and elimination of structural superiority requirements.

In 2013 the Risk Management Center (RMC) and CEMVN further analyzed the site adaptation recommendations by completing the Issue Evaluation Study for Design Criteria Site-Adaptation Report for the Proposed MTG Levee System (RMC Report). The preliminary findings of this report are mentioned in the MTG Chief's Report (paragraph 7), dated 8 July 2013, which states, "While the estimated project costs in the district's report are the best available and compliant with current post-Katrina design criteria, the USACE Risk Management Center (RMC) and the CEMVN jointly evaluated the proposed MTG Project to assess whether the post-Katrina design criteria, specifically in the areas of global stability, overtopping, and structural superiority, could be site adapted to reduce project cost without significantly increasing risk. Based on the results of this effort, site adaptations of the criteria were identified for consideration during the next phase of implementation, preconstruction, engineering and design." Part of the RMC Report included performing a Sensitivity Analysis on one reach (J-2) of the proposed MTG Project alignment to investigate potential cost savings that could be applied to all reaches.

Under the "Major Findings and Understandings" section on page 73 of the RMC Report, the three primary design parameters recommended for adjustment include increasing the allowable overtopping rate to 0.5 cfs/ft (0.1 cfs/ft required for HSDRRS criteria), lowering the allowable factor of safety for global stability from 1.5 to 1.3, and eliminating structural superiority. Specifically, the recommendations are quoted as follows:

> *"1. Reduce the Factor of Safety (FoS) for end of construction global stability from 1.5 to 1.3. The risk assessment team concluded that there is inconsequential change in post-project residual risk for a levee 800 ft wide (associated with global stability FoS = 1.5) versus a 600 ft wide (associated with a global stability FoS = 1.3). This reduction in end of construction factor of safety does increase the likelihood of slope stability failures during construction, which is often unacceptable in an urban environment. However, for the non-urban setting of this project, slope stability failures during*

construction can be mitigated during construction at relatively low costs and are unlikely to cause loss of life or significant property damage.

2. Change the Design Overtopping Rate for well-maintained grass-covered levee slopes from 0.1 to 0.5 cfs/ft. This change could result in reduction of levee and structure elevations by several feet. Based on tests conducted to assess USACE HSDRRs designs, the grass cover on clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft.

3. Elimination of the structural superiority requirement. Reducing top elevations of structures to match adjacent levee heights would lead to significantly shorter structures, i.e., reducing structure elevations by 2 ft in addition to the reductions in elevation resulting in the change in design overtopping rate." (Note, As defined in the HSDRRS Design Guidelines on page 5-2 under Section 5.1.3, structural superiority is 2 feet added to structure elevations above the required design grade of adjacent levee alignments. Intent of structural superiority is to provide additional elevation for difficult to construct features such as sector gates, utility crossing, etc., in an effort to minimize the need for future adjustment should design grades increase due to greater than expected subsidence or sea level rise. In addition, structure superiority lowers the potential for overtopping at critical infrastructure)."

Beginning in November 2018, CEMVN was tasked to investigate further the "site adaptations of the criteria (that) were identified for consideration during the next phase of implementation, preconstruction, engineering, and design" from the PACR and the 2013 Chief's Report. Using the RMC report criteria along with detailed information from local stakeholders, the team evaluated any potential cost savings for the project. This refined design was applied to the proposed MTG Project alignment to determine an updated method of project implementation and updated cost. In addition, the levee material quantities and costs were updated to consider the levees constructed by local interests, based upon certain assumptions, the validity of which assumptions were to be evaluated in the future. Aside from the 2013 recommended re-evaluation of design changes and other site adaptations, the team evaluated a proposal from the NFS(s) to limit the Federal investment to complete initial construction of the authorized 1 percent AEP to start realizing benefits, with the NFS(s) assuming responsibility to continue the 1 percent AEP through the 50-year period of analysis. The results of this analysis were codified into a technical report called the ACAR, dated 16 April 2019. The review of the CEMVN recommendations in the ACAR obtained support for implementation of the recommendations at all levels with USACE and by the office of the ASA(CW). Although the ACAR was a 4-6-month assessment and limited in scope, the team was able to gain more certainty in the applicability of the site adaptations through the incorporation of the specific design criteria first mentioned in the 2013 PACR, further developed in the RMC Report and, later the ACAR. Ultimately the ACAR was reviewed, and the approach and methodology described therein received formal memorandum support of R. D. James, ASA (CW) 13 December 2019, James C. Dalton, DCW 13 August 2019, and Richard G. Kaiser, Major General Commanding CEMVD 6 May 2019. The support received within

USACE and from the office of the ASA (CW) has led to the preparation of this EDR and its recommendation to approve the recommendations of the ACAR, including the site adaptations and the change in construction cost share responsibility proposed by the NFS(s).

Prior to receiving final HQUSACE approval, the ACAR was directed to be reviewed an additional time in early 2020 by the CEMVD Levee Safety Center in coordination with the RMC. The CEMVN facilitated this review in which reviewers were provided access to the CEMVN ProjectWise database such that all data and documentation developed for the ACAR effort, by CEMVN and the NFS(s), could be evaluated. Written comments were developed, formally submitted, and responded to in a formal memorandum dated 17 August 2020 signed by Jean S. Vossen, CEMVN Chief, Engineering Division. Upon successful comment resolution and implementation within the ACAR document, formal HQUSACE approval to proceed to an Economic Update was provided on 28 August 2020 by Phoebe A. Purcell, Deputy Dam and Levee Safety Office, CECW-EC.

7.2. Current Design and Changes

The descriptions included in this section focus on the changes or updated design of the project based upon the project team further progressing details of design of the project. If items are not covered in this section, it means that further design has not occurred on that element, and the design in the 2013 PACR will still be used. It is beyond the scope of this EDR to progress to the detailed design of each element. Further design will be reserved until such time as further design funds are appropriated. Those changes that are presently proposed in this EDR are described in the sections below.

7.2.1. Assumptions on Future Without Project Conditions

Using non-Federal funding, the various non-Federal entities commenced independent construction of elements of the recommended project alignment, the initial construction commencing in advance of the Congressional authorization of the project and continuing after Congressional authorization without first having executed an agreement for construction with the Government. Most of this construction took place prior to the effective date (4 December 2019) of the MOU between the Government and the CPRAB and TLCD, the non-Federal Interests (NFIs) named in the MOU. None of the construction by non-Federal entities that were initiated prior to the execution of the MOU are eligible to be considered for any in kind credit. To date, non-Federal entities have independently constructed approximately 47 miles on the authorized levee alignment to an elevation of 12 feet (NAVD88) (existing elevations range from 10 to 11.5 feet due to settlement which is less than half of the design height), as well as a total of 23 structures in the alignment consisting of barge floodgates, environmental structures, and fronting protection for existing pump stations. For the current economic analysis, the team assumed that constructed features were part of the without project conditions. No sunk costs are associated with those features; however, the on-ground conditions were included in the Engineering design to reduce the amount of fill for quantity takeoffs.

Existing levees and other raised feature (roads, spoil banks, etc.) alignments were included in the updated hydrologic & hydraulic (H&H) modeling for the without project conditions. The elevations of the raised features are based on the approximate 2017 era surveys or LIDAR data, which is generally representative of 2020 conditions, shown in Figure 7-1. The figure shows portions of the alignment completed; however, it also shows that it is not a closed system that, therefore, would not yield benefits. These constructed features resulted in less quantities needed for segments that are partially constructed.

Figure 7-1 Without-Project Levees and Raised Feature Alignments

7.2.2. Assumptions on Future With-Project Conditions for H&H and Engineering Design

The CEMVN developed new hydraulic levee sections based on updated hydraulic models that capitalize on new modeling methods and techniques developed since completion of the PACR and in accordance with the changes that are recommended by the site adaptive criteria. Table 7-1 summarizes these changes/improvements in the hydraulic modeling, which resulted in the lower hydraulic design elevations.

Table 7-1. Summary of Changes in the Hydraulic Modeling from PACR

Design Parameter	Design Change	Notes
Coupled ADCIRC + SWAN model storm surge characteristics	New storm surge characteristics from the updated coupled model were used to develop stage frequency curves, fragility curves, levee design elevations, and structure design elevations.	Stage frequency curves, fragility curves, levee designs and structure design elevations are lower than the elevations presented in the PACR. The extreme return events stillwater elevations are lower and the more frequent return events are higher.
Overtopping equations	Van der Meer overtopping equations changed to EurOtop overtopping equations for use in computing levee design elevations.	Implementation of the EurOtop equation resulted in a change in levee height of approximately 0.50 feet lower than van der Meer. The ½ foot variation is within the uncertainty band of the model (+/- 0.50 feet) and could vary based on the use of a different surge model result output point.
Overtopping threshold rate	Overtopping threshold rate increased from 0.1cfs/ft to 0.5cfs/ft	Overtopping threshold rate of 0.5cfs/ft approved from the post PACR RMC site adaptation report was used for levee designs and corresponding structure design elevations which resulted in lower design elevations.
Removal of wave berm design option	A berm factor was not incorporated in the levee design equations.	In the PACR levee elevations for a few construction reaches were determined with and without-wave berms. In this update wave berms were not used which would result in higher elevations than levees designed with-wave berms.

Table 7-2 summarizes the new hydraulic design elevation results from the plan recommended by CEMVN based on the site adaptive criteria, compared to the PACR results illustrating the elevation differences (lower) which directly corresponds to lower costs in the design of alignment features.

Table 7-2 Summary of the New Hydraulic Design Elevations (feet NAVD88) based on the site adaptive criteria

Hydraulic Reach*	**Current Design 1 Percent Design Elevations**		**PACR 1 Percent Design Elevations****	
	(NAVD88 epoch 2004.65)			
	2035***	**2085**	**2035**	**2085**
A	-	-	15.5	20.5
A-North of GIWW	10.0	16.5	15.5	20.5
A-South of GIWW	11.0	16.5	-	-
B	13.0	18.5	17.5	20.5
E2	17.5	21.0	21.5	23.5
E1	17.0	20.0	21.5	23.5
F2	16.0	19.0	22.0	23.5
F1	15.5	18.5	22.0	23.5
G1	17.0	19.5	22.5	24.0
G2	17.5	20.5	22.5	24.0
G3	18.0	20.5	22.5	24.0
H1	17.0	20.0	24.0	26.5
H2	18.0	22.0	24.0	26.5
H3	20.0	24.0	24.0	26.5
I1	20.0	24.0	24.0	26.5
I2	21.0	25.0	24.0	26.5
I3	20.0	24.5	24.0	26.5
J2	21.5	25.0	24.0	26.5
J1	20.5	24.0	24.0	26.5
J3	20.0	23.5	24.0	26.5
K	20.5	26.0	22.5	25.5
L	20.5	24.5	22.5	25.5
Larose C-North	-	-	18.0	20.5
C-North	8.5	16.5	-	-
GIWW	8.5	15.5	-	-
Lockport to Larose	-	-	10.5	15.0
Lockport to Larose-A	9.5	13.0	-	-
Lockport to Larose-B	7.5	11.0	-	-
Barrier	10.5	17.0	15.5	20.0

*Hydraulic reaches were subdivided into segments. The PACR A is also referred to as A-North of GIWW and A-South of GIWW. The PACR Larose C-North is C-North and GIWW and PACR Lockport to Larose is Lockport to Larose A and B.

**The PACR levees were designed with wave berms; the design in this report does not include wave berms.
***Does not include 2 feet of overbuild.

7.2.3. Structures

Structural engineers developed quantities for the structural features based on prorated quantities developed for structures during the PACR. For the 56 ft barge gate structures, previously assumed to be sector gates in the PACR, a limited design approach was followed using existing designs from the NFS(s) constructed within the last 10 years. In summary, reductions in quantities from the PACR were realized for the foundations, structural concrete, and structural steel for all structures including floodgates, roadway gates and corresponding floodwalls due to the overall reduction in design heights with the updated design. Further detail can be found in Appendix A—Engineering Input.

7.2.4. Real Estate

A Real Estate Plan (REP) was prepared and approved in 2013 as an appendix to the PACR. The REP presented the lands, easements, and rights of way (LER) and costs for the PACR in accordance with ER 405-1-12. Previously, a REP was prepared in support of the final feasibility report, which was approved in 2002. For the purposes of this report, real estate costs were reevaluated based on current land values. Changes in Lands, easements, rights-of-way, relocations and disposal areas (LERRD) requirements and assumptions are noted in this section. All other information as presented in the approved REP for the PACR remains the same. The CEMVN Real Estate has determined that no amendment to the approved REP is necessary or required.

7.2.4.1. Levee Alignment/ Project Features

There are a total of approximately 98 miles of earthen levee, floodwalls, floodgates, 22 hurricane and storm damage risk reduction structures on navigable waterways (including the Bubba Dove Floodgate that is part of the HNC Lock complex), 10 roadway/railroad gates, 23 environmental control structures, fronting protection for pump stations, and the HNC Lock Complex, (excluding any deepening of the HNC sill depth beyond the 18 feet required for the MTG project), and other necessary structures, and mitigation measures to compensate for unavoidable environmental impacts to wetlands with monitoring and adaptive management in accordance with the authorized alignment, as authorized by WRRDA 2014.

After new hydraulic design elevation analysis resulted in a reduction in the levee footprint (refer to Appendix A-Engineering Input), the number of acres required for levee construction was reduced. For this report, it is estimated that 4,128 acres of perpetual flood risk reduction levee easements would be acquired for the levee footprint. This was reduced from 5,985 acres as presented in the REP for the PACR.

In addition, 2,626 acres of temporary work area easements would be acquired for borrow, 50 acres of temporary work area easements would be acquired for staging areas, and 298 acres of temporary work area easements would be acquired for staging for marsh creation at the HNC Lock. Temporary access easements would be acquired over 14.25 acres. These acreages are consistent with information presented in the approved REP for the PACR.

The approved REP also presented that an estimated 4,746 acres would be acquired in fee (excluding minerals) for project mitigation requirements. This information has not changed for the purposes of this report.

The existing levee and structures lie within the authorized project footprint. For this project, new structural design based on new hydraulic design elevations indicates that the project footprint is wider than existing features. The CEMVN Real Estate was not able to confirm whether the NFI acquired the approved estates required for this project prior to construction of the existing levees and structures. If the necessary real estate interests have not been acquired at the time of the determination of credit eligibility, the NFS(s) would be required to acquire the LERRDs for the project in accordance with the USACE requirements for LERRDs acquisition. For the purposes of this report and to provide the most conservative and all-encompassing estimate, all of the LERRDs required for the project based on the new structure design were included in the revised cost estimate, despite the fact that only LERRDs acquired by the NFS(s) after the effective date of the 2019 MOU (either as the NFI under the terms of the MOU or as the NFS under the terms of the PPA) are eligible to be considered for a credit.

In October 2019, certain NFI expressed written intent to begin construction of certain features of the project, including, but not limited to, the NFI funded HNC Lock Complex, scheduled to begin construction in 2021. Effective 4 December 2019, a MOU was executed between the Department of the Army, as the Federal sponsor, and the CPRAB and the TLCD, as the named NFIs in the MOU. The MOU defines the proposed in kind work ("in kind contributions") to be performed by the NFIs, advises the NFIs of the risks of performing the work prior to execution of the PPA, and outlines the necessary requirements in order for the work to be eligible for credit towards the Non-Federal contribution of funds for the project. Among those requirements, the NFIs must comply with the applicable provisions of the Uniform Relocations Assistance and Real Property Acquisitions Policy Act of 1970 (PL 91-646) and the Uniform Regulations contained in 49 Code of Federal Regulations (CFR) Part 24 in acquiring LERRDs required for construction and subsequent operations and maintenance of the proposed work. To date, a PPA has not been executed for the project. Therefore, it is assumed for the purposes of this report that the NFS(s) may be able to request credit for LERRDs provided for the project that were acquired after the effective date of the MOU.

It is estimated that a total of 580 landowners will be impacted by the levee alignment and project construction features. Estimated real estate costs for LER required construction, operation and maintenance of the project are $46,902,000 in Fiscal Year (FY) 2022 Price Levels (PL). This is an increase from $32,287,000 as presented in the approved REP. Although there was a decrease in the acreage amounts described above, there was an increase in land values from the time of the PACR. There was also an estimated increase in PL 91-646 assistance payments due to increase in land values, and an increase in estimated administrative costs for acquisition.

7.2.4.2. Relocations

Based on local stakeholder input, relocations identified in the PACR have predominantly not been completed in compliance with criteria for reaches constructed to date by non-Federal entities. Approximately 47 miles of the PACR alignment (98 miles in total) have been independently constructed by non-Federal entities to elevation 12 feet (NAVD88). Due to time and scope limitations, the Project Delivery Team (PDT) was unable to review the entire alignment to determine which utility relocations have been performed in compliance with USACE criteria. Ultimately the PDT retained the quantities deduced in the PACR and updated the cost to 2020 dollars using prevailing cost rates and data.

7.2.4.3. Future Borrow

Material for future levee lifts will be hauled in from remote locations that have not yet been identified. A temporary work area easement (borrow) will be acquired over these potential borrow pits, from an estimated 325 landowners.

In the approved REP for the PACR, a separate real estate chart of accounts was prepared for lands required for borrow material for future levee lifts. For this report, a separate real estate cost estimate for lands required for future borrow was prepared. The estimated real estate cost for future borrow is $28,182,000 in FY 22 PL. This is an increase from $17,424,000 in the approved REP, due to an increase in land values from the time of the PACR, and an increase in estimated administrative costs for acquisition.

7.2.4.4. Induced Flooding

It was noted in the approved REP for the PACR that construction of the system has the potential to raise water levels in areas immediately outside the levees by several feet during storm events. Hydrologic modeling estimated that the Future Without Project conditions could potentially increase the level of flooding to approximately 1,010 structures (876 residential and 134 non-residential).

At the time of the PACR, the PDT assumed, for the purpose of the PACR, the worst-case scenario (most expensive option), a 100 percent buyout of all structures in the impacted areas. For this report, the estimated cost for acquisition of structures is $378,037,000 in FY 22 PL. This is an increase from the $305,115,300 in the approved REP. This is due to an increase in land values from the time of the original PACR. Prior to construction, the requisite surveys and factual determinations will be performed in order to support a physical takings analysis in order to determine the extent of induced flooding as a result of the project and whether that induced flooding will rise to the level of a taking. Acquisition of the impacted structures would take place prior to initiation of construction of each reach. A determination of the appropriate action for the induced flooding will be determined concurrently with the design and physical takings determination, but for purposes of this report it is assumed that a mandatory buyout of the structures impacted by any induced flooding will be required.

Owners/ tenants who are displaced as a result of an involuntary acquisition via a mandatory buyout are entitled to receive benefits in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970 (PL 91-646) and the Uniform Regulations contained in 49 CFR Part 24. (Note that PL 91-646 benefits are not available to the owner for voluntary flood-proofing measures, should such measures be deemed appropriate, as opposed to an involuntary mandatory buyout.) The estimate of acquisition costs for residential structures includes the depreciated value of the improvement, the value of the land, moving costs, differential housing payment, payment of last resort and administrative costs. The estimated cost of acquisition for the non-residential structures includes the depreciated value of the improvements, land value, moving costs, reestablishment costs, necessary and reasonable incidental costs, and administrative cost. An estimated average uniform relocations assistance cost was applied for all structures to be acquired.

7.2.4.5. Real Estate Costs

As a result of the analysis prepared for this report, the total estimated cost for real estate is as follows:

Table 7-3 2013 PACR Real Estate Costs and Current Design Real Estate Costs

Feature	2013 PACR Approved Costs	Revised Costs in FY 22 PL
Levee Alignment/Project Features	$ 32,287,000	$ 46,902,000
Future Borrow	17,424,000	28,182,000
Induced Flooding Buyouts	305,115,300	378,037,000
TOTAL REAL ESTATE COSTS	**$354,826,300**	**$453,121,000**

7.2.4.5.1. Real Estate Cost Estimate Assumptions

Real estate cost estimates for each separate work item have been prepared by USACE and are based on the following assumptions and limiting conditions: (a) Acreages for the reduced levee footprint were provided by Engineering Division; (b) All other acreages were taken from the REP prepared for the PACR; (c) Inspection of the properties was made by aerial photography.

7.2.5. Environmental

The Environmental costs include the development of the new Supplemental Environmental Impact Statement (SEIS) for the MTG Project, excluding the work to be performed for the Federal Humble Canal Initial Preload Levee Contract, which will be addressed in Draft Environmental Assessment (EA) #583.

The original PACR environmental mitigation costs included two account codes. One code was a cost for environmental control structures to maintain tidal flows through the proposed systems. Refined designs of the 23 environmental control structures based on information provided by the NFS(s) along with reduced levee elevations, lowered costs of environmental control structures by an average of approximately 40 percent.

The second account code was for direct impacts associated with levee construction. Due to the uncertainty with the effects of final levee heights being proposed under the final design associated with the site adaptive criteria; the original mitigation costs presented in the PACR for direct impacts were carried through this effort ($427 million which correlates to $464 million in FY 22 PL). This cost represents a conservative estimate for addressing direct impacts and expected that, with smaller levee footprints, direct mitigation impacts will be reduced. Construction footprint cost of the levee was reduced by 30 percent and is reflected in the 06 Account Code and acquitted to a reduction in total project costs.

In summary, the updated 06 Account Code has reduced from $941 million to $789 million in FY 22 PL, primarily based on the reduction of cost of the environmental control structures. It is important to note that indirect impacts could increase based on the recommended site adaptive criteria. Mitigation for additional indirect impacts as well as borrow sources not covered in the PACR preliminary indirect impacts analysis would be addressed during detailed design and in supplemental National Environmental Policy Act (NEPA) documents. Prior construction efforts (and the associated mitigation costs therefor) for hurricane storm surge risk reduction that have been completed by the independent actions of TLCD and other non-Federal entities without a prior agreement with USACE for such construction would be treated as the Future Without Project condition in supplemental NEPA documents. Current contingency, included in the TPC Summary (see Appendix C-Cost Certification), includes the risk for needing additional compensatory mitigation which is estimated to be $90 million FY 22 PL.

8. Cost Estimate

Based on the information above, cost engineering developed new unit costs for the revised levee quantities and worked with structural engineers to develop quantities for the new structure design based on revised hydraulic design elevation requirements and the assumption that many of the flood gates will be barge gates. The overbuild was added by the Geotechnical and Civil Branch when developing the geometry and calculating the quantities. See Appendix A—Engineering Input, for more detail.

An updated Current Working Estimate (CWE) was prepared to take a “snapshot” of the cost of the current design of the MTG Project incorporating all the information obtained from the NFS(s) and the design refinements developed to date that include the site adaptations. The CWE includes contingency based on risk using Cost and Schedule Risk Analysis (CSRA). The CWE and CSRA was certified by the Walla Walla Civil Works Cost Engineering and Agency Technical Review Mandatory Center of Expertise (MCX) on 16 April 2021 (and certification was updated 29 October 2021 with FY 22 PL). The certified CWE (Table 8-1) includes an estimated first cost (FY22 PL) of $6,522,378,000 that include the “sunk cost” which are the costs expended under the Design Agreements. The fully funded costs which is the cost of each feature, escalated to the mid-point of construction will be used in the PPA and is also included below. The basis of design for the project, along with explanation of design refinements, can be found in Appendix A—Engineering Input.

Table 8-1 Current Working Estimate

Work Breakdown Structure No. & Civil Works Feature Description	Total Costs		Total Costs Fully Funded	
Effective Price Levels	**Fiscal Year 2022**		**Fiscal Year 2022**	
02 Utility/ Facility Relocations	$	297,471,000	$	351,347,000
05 Locks	$	424,122,000	$	427,359,000
06 Fish & Wildlife Facilities	$	463,888,000	$	670,345,000
06 Fish & Wildlife Facilities	$	325,600,000	$	441,720,000
11 Levees & Floodwalls (1st Levee Lift)	$	1,305,337,000	$	1,740,297,000
11 Levees & Floodwalls (2nd Levee Lift)	$	574,021,000	$	1,185,424,000
11 Levees & Floodwalls (3rd Levee Lift)	$	393,937,000	$	1,544,960,000
11 Levees & Floodwalls (Fronting Protection)	$	71,737,000	$	98,378,000
11 Levees & Floodwalls (T-Wall)	$	229,874,000	$	389,964,000
15 Floodway Control & Diversion Structures	$	551,246,000	$	744,714,000
15 Floodway Control & Diversion Structures (Barge Gates)	$	365,237,000	$	502,010,000
Construction Totals	**$**	**5,002,470,000**	**$**	**8,096,518,000**
01 Lands and Damages	$	453,121,000	$	669,343,000
30 Planning, Engineering, & Design	$	618,358,000	$	843,472,000
31 Construction Management	$	387,811,000	$	538,906,000
Sunk Cost	$	60,618,000	$	60,618,000
Project Cost Totals	**$**	**6,522,378,000**	**$**	**10,208,857,000**

9. Economic Analysis

Applying the site adaptive criteria caused changes in both the cost and benefits to the MTG Project which are detailed below. More detailed economic analysis can be found in Appendix B—Economics which also includes the Level 3 Economic Reevaluation Report, approved 14 December 2021.

9.1. Economic Benefit Methodology

Reduction of physical damages to structures, contents, and vehicles and emergency cost reduction were recalculated for this report. Avoidance of structure-raising costs, water supply benefits, and safe harbor benefits were all scaled from previous values to current values using the change in benefits to the recalculated categories. This scaling accounts for both changes in price level and interest rate as well as changes in the with-project and without-project hydraulic conditions.

9.1.1. Benefit Categories

Inundation reduction benefits were considered under both existing and future conditions. Projections of the future development expected to take place in the study area during the period of analysis were included as part of the future condition analysis in the PACR but were not included in this economic analysis due to development in many of those areas being actualized and consequently included in the current inventory as the existing condition. For purposes of this evaluation, the team recalculated reduction of physical damages and emergency cost reduction, but scaled avoidance of structure-raising costs, agricultural benefits, water supply benefits, and safe harbor benefits.

Physical flood damage reduction benefits include the decrease in potential damages to residential and commercial structures, their contents, and the privately owned vehicles associated with these structures.

Only structure-raising costs were considered. The avoidance of structure-raising costs for all residential and non-residential structures that would otherwise incur repetitive flooding is considered a benefit attributable to the 1 percent AEP alternative. The benefits captured for this category at the time of the PACR were scaled for this economic analysis.

The National Economic Development (NED) benefits from agricultural are defined as the increase in the value of the agricultural output of the area and the decrease in the cost of maintaining a given level of output attributable to a project alternative. These benefits include reductions in production costs and in associated costs, the reduction in damage costs from floods, erosion, sedimentation, inadequate drainage, or inadequate water supply, the value of increased production of crops, and the economic efficiency of increasing the production of crops in the project area.

The NED benefits from municipal water supply are defined as the willingness of a community to pay for an increase in the value of goods and services attributable to the water supply. In most cases, the marginal cost of supplying water is used to calculate the willingness of the consumers to pay for the additional water supply. However, because the marginal cost was not determined in this study, the water supply benefits were measured by comparing the reduction in the cost of treating water for municipal usage during periods of high salinity that is attributable to the 1 percent AEP alternative.

No NED benefits from navigation or ecosystem restoration are quantified for this project. The benefits from a hurricane and storm damage risk reduction plan result from the reduction of actual or potential damages due to inundation. Physical inundation reduction damages include damages to residential and commercial structures, losses to the contents in those structures, and damages to privately owned automobiles. Inundation reduction benefits on both existing and future conditions were considered.

9.1.2. Without-Project for Total BCR

This condition includes no construction of the Federal project. Existing local levees that were captured in the H&H stage modeling are also included in the economic modeling.

9.2. Economic Analysis Results

Table 9-1 Cost Breakdown at 2.25 and 7 Percent Discount Rate

FY 22 (Oct 2021) Price Levels	Total Project	
	2.25%	7%
Sunk Cost*	$89,000,000	$89,000,000
First Costs (Remaining Cost)	$6,462,000,000	$6,462,000,000
Equivalent Annual Costs	$231,000,000	$595,000,000
Equivalent Annual Benefits	$1,427,000,000	$1,065,000,000
Net Benefits	$1,197,000,000	$471,000,000
Benefit-to-Cost Ratio	6.19	1.79

*Sunk cost is converted to present value cost. Table 2-1 shows the historic sunk cost in a nominal price level.

9.2.1. Uncertainty Surrounding Results

The uncertainty surrounding each of the economic and engineering variables was also entered into the Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) model. Either a normal probability distribution, with a mean value and a standard deviation, or a triangular probability distribution, with a most likely, a maximum and a minimum value, was entered into the model to quantify the uncertainty associated with the key economic variables. A normal probability distribution was entered into the model to quantify the uncertainty surrounding the ground elevations. The number of years that stages were recorded at a given gage was entered for each study area reach to quantify the hydrologic uncertainty or error surrounding the stage-probability relationships. The uncertainty associated with the levee performance was quantified using the levee features section of the model, which related the elevation of exterior storm surges to the probability of levee failure.

Attachment A—Engineering Input documents the current design of the project based on PACR, the ACAR and incorporating further design that includes site adaptive criteria. The objective herein is to furnish the cost engineering review team members with a basis, rationale, and quantity/cost traceability required to certify the current micro-computer aided cost engineering system (MCAES) MII cost estimate and associated risk register/Crystal Ball output for contingency. Given the significant number of unknowns that have been eliminated due to the construction work that was independently completed by non-Federal entities to date, the project contingency calculated via the Crystal Ball analysis is lower than is typical for similar levee alignment projects (24 percent vs 25 percent). Because the non-Federal entities who engaged in the independent construction have shared extensive engineering information in the area, parameters, such as location of borrow sites, geotechnical data, and structures (floodgates, fronting protection, and environmental control structures), provided significant actualized data that amplifies cost estimate confidence and resulted in an overall lower contingency amount via the Crystal Ball analysis.

However, as is the case for all civil works construction efforts, additional data collection, re-design, and corresponding updated cost estimates shall be required to verify the findings throughout PED, as detailed plans and specifications for construction contracts are developed. The PDT collaboratively developed a risk register and CEMVN Cost Engineering developed a formal Crystal Ball analysis to produce a contingency intended to mitigate the risk associated with TPC.

9.2.2. Regional Economic Development

In addition to NED benefits, Regional Economic Development (RED) effects of completing the system and maintaining the channels for navigation purposes were examined. The RED account addresses the impacts that the USACE expenditures associated with the construction of a coastal storm risk management system will have on the levels of income, output, and employment throughout the region.

This RED analysis employs input-output economic analysis, which measures the interdependence among industries and workers in an economy. This analysis uses a matrix representation of a regional economy to predict the effect that changes in one industry will have on other industries. The greater the interdependence among industry sectors, the larger the multiplier effect on the economy. Changes to government spending drive the input-output model to project new levels of sales (output), value added Gross Regional Product (GRP), employment, and income for each industry.

The construction of the MTG system would yield significant increases in employment and gross regional product, not only to the parishes of Terrebonne and Lafourche, but to metro New Orleans and beyond. The 1 percent AEP site adaptive criteria alternative would support a total of 76,950 full-time equivalent jobs, $5.2 billion in labor income, $5.7 billion in the gross regional product, and $9.9 billion in economic output in the local impact area. More broadly, these expenditures support 109,640 full-time equivalent jobs, $7.6 billion in labor income, $9.5 billion in the gross regional product, and $16.4 billion in economic output in the nation.

9.3. Residual Risk and Floodplain Management Reporting

9.3.1. Residual Risk

Residual risk is any flood risk to either existing or future development that remains in the floodplain after the implementation of the 1 percent AEP. This section discusses the changes in risk from the PACR. The MTG Project study area is one of the fastest growing coastal areas. The project area includes several communities within Terrebonne Parish, which has the most developable land in the study area. According to the 2020 U.S. Census, this parish had a combined total of approximately 235,000 residents. Based on a residential and non-residential structure inventory, the project area contains a total of 68,800 structures. At the time of the PACR, projections were made of the future residential and non-residential development to take place in the MTG Project study area under without-project conditions. Much of the undeveloped land within the study area reaches where this development was projected has already been developed at the time of this report, so no additional projection of future development was included in this report. The total depreciated replacement value for residential, nonresidential, and autos is $15,876,000,000.

In the PACR, without-project equivalent annual damages were estimated at $1,134,000,000 at a 3.75 percent discount rate brought to a 2022 price level. Based on updated H&H, the without-project equivalent annual damages have increased by $417,000,000 (2022 price level) since the PACR.

In the PACR, residual damage with the project in place was assumed to be $170,000,000 at 3.75 percent discount rate brought to a 2022 price level. Based on the site adaptive criteria, the updated current storm surge modeling, and the future sea level rise rates, the residual damages are projected to be $124,000,000 at the 2.25 percent discount rate (2022) price levels annually based on 1 percent AEP alternative.

9.3.2. Wave Overtopping and Breaching Risk

The risk for hurricane storm surge damages comes from two scenarios: structural/levee-based breach failures or from overtopping of the system. The levee system may have reaches with either structural deficiency that is known or structural integrity that is unknown (a common occurrence for older levee systems). Levee systems with structural integrity issues may, however, provide some flood risk reduction benefits by impeding flood conveyance to some degree. For these levee reaches, the USACE relies on modeling of breaches along the levee reaches. Although it is not possible to predict the exact location of a levee breach, the USACE developed single point fragility curves for each levee reach to evaluate the overall system performance related to breach scenarios.

The second scenario resulting in storm surge damages is from overtopping. This scenario can be from wave overtopping or weir overflow. Wave overtopping occurs largely when the still water level is lower than the top of levee elevation. Weir overflow occurs when the still water level is higher than the top of levee elevation.

Weir overflow and flow through breaches is occurring as the annual chance exceedance event decreases. Breaching would not occur until well above the 100-year flood in both 2035 and 2085. See Tables 28 and 29 in Appendix B-Economics for an overview of performance by reach.

9.3.3. Life Safety Risk

As described in the 2013 PACR, the use of a post-Katrina engineering design criteria and standards were applied to reduce the potential loss of life and property from coastal storms; however, levees alone cannot completely reduce risk and prevent loss of life. The key to preventing loss of life is effective evacuation planning and execution.

As a condition of the PPA, the NFS(s) shall implement a floodplain management plan. In addition to building above the 100-year floodplain and high-risk areas, the sponsor will update the management plan and highlight the changes in risk associated with the constructed Federal project.

All coastal parishes exercise aggressive evacuation plans, which are mandatory by state law and coordinated by the State of Louisiana according to the state's emergency operations plan that is put into effect 72 hours prior to expected landfall of tropical storms. The community is inherently prepared for hurricanes as a consequence of a water-based culture (fishing, hunting, oil industry, etc.). Many of those in the oil industry that work on offshore platforms receive early forecasts. Parish officials have taken an active role in communicating the need to evacuate to the public regardless of the presence of levees. Post-Hurricane Katrina, willingness to evacuate has greatly increased, which is typical after major hurricanes; however, if sufficient time passes without another major hurricane event, willingness to evacuate may decline. Information of more recent events, such as Hurricane Ida, will be incorporated during the design. It is important that local planning officials understand that evacuation planning is the key primary means to save lives. This project is mainly to reduce the flooding of homes, utilities, hospitals, and emergency response facilities as a result of hurricane storm surge, all of which reduces the public health and safety risks. The project also reduces the flooding and erosion of transportation routes, which keeps them open for maximum evacuation effectiveness, as well as enabling immediate post-storm access by emergency responders, repair crews and other critical services. Public health and safety risks are expected to be reduced with the Federal action. Quantitative benefits are not claimed; however, because the evacuation planning and response are the best means to assure the health and safety of the population, including the loss of life.

10. Cost Allocation and Cost Sharing

The following sections describe Federal and non-Federal division of project responsibilities, work in kind credit and NFS(s) financing.

10.1. Federal and Non-Federal Cost Sharing

As noted in the ACAR, the CPRAB, as the NFS(s), has proposed that the Federal investment be limited to 65 percent of the cost of the Cost Shared Work for the MTG Project (estimated to be complete in 2035, pending funding allocation), as set forth below. Under its proposal, after the Cost Shared Work is complete, the NFS(s) will bear the full responsibility and cost of continuing the construction of the 1 percent AEP through 2085, referenced herein as Non-Cost Shared Work. The CPRAB expressed intent to carry out this larger role of responsibility for project delivery in its 27 March 2019 Letter of Intent (a copy of which is included in the ACAR Appendix), stating that "CPRAB is willing to accept a larger role of responsibility in delivering the project. The CPRAB understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with the NFI being responsible for the costs of performing all future work required including lifts for the project though 2085". Letters of Intent submitted by NFSs show support for the project described in the EDR and accompany this report. The CPRAB provided an updated Letter of Intent dated 17 November 2021. TLCD also provided a Letter of Intent dated __ December 2021.

For purposes of this report, the term “Cost Shared Work” means the initial design and construction of the project undertaken pursuant to the cost-sharing provisions of the PPA to be executed by the Federal and NFS(s), to provide a 100-year LORR. The initial construction is deemed as the completion of the project features to close the full levee system and start realizing benefits. The NFS(s) will provide 35 percent of the Cost Shared Work as cash and/or in kind work. Fully funded (escalated to the mid-point of construction) initial construction and design costs are estimated (rounded to the nearest 100,000) to be $4,896,200,000 in FY 22 PL (includes $60,618,000 in “sunk costs” spent to date on studies and design), with the Federal share estimated to be $3,182,530,000 and the NFS(s) share estimated to be $1,713,670,000.

The above costs do not include the cost to deepen the HNC Lock sill beyond -18 feet. Deepening of the HNC lock sill beyond -18 feet was recognized as a non-Federal cost in the 2013 PACR and will be excluded from the MTG Cost Shared Work. The current estimated fully funded cost of the deepening of the HNC sill below -18 feet is $10,610,000. However, as a matter separate from the Cost-Shared Work for the MTG project, the State of Louisiana may execute an In-Kind MOU with the Government for deepening of the sill depth of the HNC Lock beyond -18 feet prior to initiation of the HNC lock construction in order to preserve potential credit eligibility for the costs of the deepening of the HNC Lock sill beyond -18 feet , such credit to be applied toward the non-Federal share of the construction costs for the Houma Navigation Canal project, which was conditionally authorized in Section 403 of the Water Resources Development Act of 2020.

The term “Non-Cost Shared Work” means design and construction of all future levee lifts, demolition and/or reconstruction of structure alterations of floodgates, road and railroad gates, the lock complex, fronting protection, and floodwalls, and any other modifications to the project following completion of Cost Shared Work, or functional portion thereof, through calendar year 2085 that are necessary to maintain the 100-year level of risk reduction for the MTG Project. The fully funded costs of the Non-Cost Shared Work are projected to be $5,302,100,000 in FY 22 PL with the Federal share estimated to be $0 and the NFS(s)’ share estimated to be $5,302,100,000. After applying cost share ratios and rounding, the total project cost reflected in the PPA is $10,208,910,000.

10.2. Federal Responsibilities

The Federal government, subject to the performance by the NFS(s) of its below-described non-Federal responsibilities, as further to be set forth in the PPA, will be responsible for planning, engineering, design, and construction of the Cost Shared Work for the project in accordance with the applicable provisions of PL 99-662 (WRDA of 1986). The Government, subject to the availability of funds and using those funds provided by the NFS(s), shall expeditiously construct the project, applying those procedures usually applied to Federal projects, pursuant to Federal laws, regulations, and policies. In accordance with WRDA 2007, Section 1001(24), the Government shall operate, maintain, repair, rehabilitate, and replace the HNC Lock complex and the GIWW floodgate features of the project that provide for inland waterways transportation, at no cost to the NFS(s).

10.3. Non-Federal Responsibilities

Federal implementation of the Cost Shared Work for the 1 percent AEP project shall be subject to the NFS(s) agreeing to comply with applicable Federal laws and policies, including but not limited to the following:

a. Provide 35 percent of construction costs for Cost Shared Work, which is defined for purposes of this EDR as the initial design and construction of the Federal MTG undertaken pursuant to provide a 100-year LORR, as further specified below:

1. Provide, during design, 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project.

2. Provide all real property interests, including placement area improvements, and perform all relocations determined by the Federal government to be required for the project. For real property interests acquired prior to 4 December 2019, if the Government determines that additional interests in such real property interests are required for the Cost Shared Work, the costs for acquiring such additional interests would be creditable pursuant to the provisions of the PPA to be executed by the Government and the NFS(s);

3. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35 percent of construction costs;

4. Provide in kind contributions for the Cost Shared Work as a part of its 35 percent cost share that are identified as being integral to the project by the CEMVD and that have been or will be provided in accordance with the terms and provisions of the MOU dated effective 4 December 2019 and of the PPA that will be executed by the Government and the NFS(s), as specified hereafter:

a) Obtain all applicable licenses and permits necessary for such in kind work,
b) Notify the Government within 30 calendar days of completion of functional portions of the work,
c) Provide the Government with a copy of as-built drawings for the work, and,
d) Commence the operation and maintenance of such work, as functional portions of the in kind work are completed.

The value of in kind contributions shall be equivalent to the costs, documented to the satisfaction of the Government, that are incurred for construction work initiated after

December 4, 2019 to provide in-kind contributions for the Cost Shared Work, and may include engineering and design and supervision and administration associated with that construction, but shall not include any costs associated with betterments, as determined by the Government. Appropriate documentation includes invoices and certification of specific payments to contractors, suppliers, and employees.

b. Following completion of the Cost Shared Work, or functional portion thereof, as determined by the Government, provide and be responsible, at full non-Federal expense, for all of the Non-Cost Shared Work, which is defined for purposes of this EDR as the design and construction of all future levee lifts, demolition and/or reconstruction of structure alterations of floodgates, road and railroad gates, the lock complex, fronting protection, and floodwalls, and any other modifications to the project following completion of Cost Shared Work, or functional portion thereof, through calendar year 2085) that are necessary to maintain the 100-year LORR for the project;

c. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of coastal storm risk reduction the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

d. Inform affected interests, at least yearly, of the extent of risk reduction afforded by the project; participate in and comply with applicable Federal floodplain management and flood insurance programs; prepare a floodplain management plan for the project to be implemented not later than one year after completion of construction of the project; and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with the project;

e. Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof, including the Cost Shared Work and the Non-Cost Shared Work, at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal government, except that the Federal government shall be responsible for operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) of the HNC Lock complex and the GIWW floodgate features of the project that provide for inland waterways transportation;

f. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the NFS(s) and other non-Federal governmental entities now or hereafter own or control for access to the project, including, but not limited to property associated with the Cost-Shared Work and the Non-Cost Shared Work to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose, subject to conditions as further specified below:

1. The Government shall provide written notification to the NFS(s) of any deficiencies that are identified during such inspections, and the NFS(s) shall undertake the necessary corrective actions; and

2. The Government may consider the NFS(s) failure to undertake, or to correct deficiencies in, the Non-Cost Shared Work in assessing the NFS(s) eligibility for assistance under 33 USC 701n (commonly referred to as PL 84-99) and its implementing regulations.;

g. Hold and save the Federal government free from all damages arising from design, construction, OMRR&R of the project, except for damages due to the fault or negligence of the Federal government or its contractors.

h. Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (U.S.C.) 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation and maintenance of the project;

i. Agree, as between the Federal government and the NFS(s), to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;

j. Agree, as between the Federal government and the NFS(s), that the NFS(s) shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that will not cause HTRW liability to arise under applicable law; and

k. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended, (42 U.S.C. 4630 and 4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

11. Environmental Documentation

The MTG Project completed a Programmatic Environmental Impact Statement (PEIS) to conclude the NEPA process in 2013 and the Record of Decision was signed on 9

December 2013. Through the process of refining the design during the PED Phase, the project team identified that some assumptions made in the PEIS would be implemented differently for the project. Therefore, the project team has initiated a SEIS that can progress with more available funding. Once more funding is available, the SEIS is estimated to take 2 years to complete. Initial coordination and feedback from agencies have occurred. The MTG Project received New Start Construction Funding in the Fiscal Year 2021 Work Plan to construct the Humble Canal Floodgate Preload contract which showed a slightly different footprint from the Humble Canal Floodgate footprint in the PEIS. The team has initiated an EA to analyze those differences that completed public review on 25 September 2021. Completion of the SEIS is needed before commencing construction on other features of the project that are not adequately covered by other environmental documents (with the exception of the Humble Canal Floodgate Preload, that will be covered by the aforementioned EA).

12. Recommendation

It is recommended that the refinements included in this report serve to update the details for implementation of the MTG Project, as well as the alteration of the Federal and non-Federal obligations and cost share for the construction of the said project. It is within the Division Engineer's authority to further optimize and utilize adaptive criteria as recommended in the authorizing documents, within the requirements in ER 1105-2-100, Planning Guidance Notebook, Appendix G, Amendment #1, 30 June 2004, paragraph G-13 and ER 1110-2-1150. The Division Engineer has the authority to approve the proposal to alter the Federal and NFS(s)' obligations and cost share responsibilities for the construction of the MTG Project in accordance with the proposal by the NFS(s) to increase obligations and costs for construction.

13. Review and Approval

This document underwent a District Quality Control Review. The approval authority for this report is the Division Engineer, CEMVD.

Diana M Holland

Diana M. Holland
Major General, USA
Division Engineer/Commanding

15 Dec 2021
Date

Appendix A—Engineering Input

USACE

New Orleans District (CEMVN)

Morganza to the Gulf (MTG)

CEMVN Engineering Division Input to the 2021 Engineering Documentation Report

October 2021

Prepared By

USACE, New Orleans District, Engineering Division
New Orleans, Louisiana

In Coordination with

Terrebonne Levee and Conservation District (TLCD)
Coastal Restoration and Protection Authority Board of Louisiana(CPRAB)
North Lafourche Levee District (NLLD)
South Lafourche Levee District (SLLD)

Questions or Comments Contact:
Chief, CEMVN Engineering Division

Contents

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List of Acronyms
ACB - Articulated Concrete Block
ACA – Adaptive Criteria Assessment
AEP – Annual Exceedance Probability
CEMVN – USACE New Orleans District
CPRAB – Coastal Protection and Restoration Authority Board of Louisiana
CPT – Cone Penetrometer Test
CSU - Colorado State University
E&D – Engineering and Design
FOS – Factor of Safety
FPEIS - Final Programmatic MTG EIS
GIWW – Gulf Intercoastal Waterway
HNC – Houma Navigation Canal
HPTRM - High Performance Turf Reinforcement Mat
HSDRRS – Hurricane and Storm Damage Risk Reduction System
HQUSACE- Headquarter USACE
LAMP -Levee Analysis Mapping Process
LORR – Level of Risk Reduction
LSP – Levee Safety Program
LWL - Low Water Level
MTG – Morganza to the Gulf
NAVD – North American Vertical Datum
NLLD – North Lafourche Levee District
NFS – non-Federal Sponsor
OMRR&R - Operation, Maintenance, Repair, Rehabilitation and Replacement
PACR – Post Authorization Change Report
PED – Preconstruction Engineering and Design
PDT - Project Delivery Team
RMC – Risk Management Center
S&A – Supervision and Administration
SLLD – South Lafourche Levee District
SWL - Still Water Level
TLCD – Terrebonne Levee and Conservation District
TOW - Top of Wall
TPC - Total Project Cost
TRM – Turf Reinforcement Mat
USFWS – US Fish & Wildlife Service
WIFIA - Water Infrastructure Finance and Innovation Act
WOS - Wave Overtopping Simulator
WRDA – Water Resources Development Act
WRRDA – Water Resources Reform and Development Act

1.0 INTRODUCTION & BACKGROUND

The Morganza to the Gulf (MTG) hurricane and storm damage risk reduction project is predominantly situated in Terrebonne Parish and partially in Lafourche Parish. It consists of a southern Louisiana levee alignment approximately 98 miles long, including associated navigation, roadway, pump station fronting protection, and environmental structures. MTG was authorized by the Water Resources Development Act (WRDA) of 2007 at a cost of $886,700,000. However, due to the implementation of the Hurricane and Storm Damage Risk Reduction System (HSDRRS) design criteria following the devastating impacts of Hurricane Katrina on the New Orleans metropolitan area, the MTG project was redesigned based on updated hydraulic modeling and to the new HSDRRS design criteria. Resulting costs exceeded the 20 percent cost increase limit specified in WRDA 1986, Section 902.

Subsequently, a Post Authorization Change Report (PACR) was completed in 2013 seeking Congressional re-authorization of the MTG construction and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The PACR was successfully completed and subsequently served as the basis for the Congressional re-authorization of the MTG project in the Water Resources Reform and Development Act (WRRDA) of 2014, at an estimated cost of $10.3B. Major changes to the project features included increasing the total levee length from 72 miles to 98 miles, increasing levee/structure elevations and levee widths, increasing the number of floodgates and environmental control structures from 9 to 19 and 12 to 23, respectively, increasing the sill depth and floodgate width for the Houma Navigation Canal (HNC) lock complex, and including costs for mitigation to address potential indirect impacts. Additionally, one of the two Gulf Intercoastal Waterway (GIWW) sector gates near Houma was eliminated. However, due to the resulting significant increase in project cost, MTG has only received limited Federally funding to date for construction and is unlikely to receive significant funding by OMB for construction at the PACR cost level moving forward.

Prior to the authorization of the project by WRDA 2007 and continuing after its re-authorization in WRRDA 2014, Terrebonne Levee and Conservation District (TLCD) and other non-Federal entities independently constructed elements on the authorized MTG alignment and features utilizing local funding.To date, TLCD has designed and constructed approximately 47 miles on the authorized levee alignment to an elevation of 12 feet (NAVD88, epoch 2004.65) (existing elevations range from 10.0 to 11.5 feet due to settlement) as well as a total of 23 structures in the alignment consisting of barge floodgates, environmental structures, and pump station fronting protection. Agreements were not in place prior to construction and the TLCD is not eligible for in-kind credit for the work that was performed prior to the signing on an in-kind Memorandum of Understanding (MOU) effective December 4, 2019. In-kind construction that was initiated pursuant to the in-kind MOU its effective date, or that is constructed under the anticipated Project Partnership Agreement, may be eligible to be considered for credit. The HNC Lock Complex is also set to begin construction in 2021.

In 2013 the Risk Management Center (RMC) and the U.S. Army Corps of Engineers (USACE) New Orleans District (CEMVN) completed the Issue Evaluation Study for Design Criteria Site-Adaptation Report for the Proposed MTG Levee System. The preliminary findings of this Report, are referenced in the 08 July 2013 Chief of Engineers Report, that recommends adaptive criteria for the project “to reduce project cost without significantly increasing risk.” In March 2019, in coordination with TLCD, North Lafourche Levee District (NLLD), South Lafourche Levee District (SLLD) and Coastal Protection and Restoration Authority Board of Louisiana (CPRAB), an Adaptive Criteria Assessment Report (ACAR) was completed for the MTG project. The primary objective of the ACAR effort was to capitalize on the Non-Federal Sponsor (NFS) investment to date (considering actual cost data and available borrow locations as well as improved foundation strengths) to optimize designs, resulting in a lower cost of constructing the remaining alignment to a fundable level. This ACAR resulted from a tasker from a 14 Nov 2018 meeting with Rep. Graves, CPRAB, Stakeholders, HQUSACE, CEMVD, and CEMVN, where CEMVN was directed by HQUSACE to perform an assessment in collaboration with local stakeholders. Adaptive criteria would be utilized in conjunction with actual material costs for local constructed components, where appropriate. The effort took 6 months (from the 14 Nov 2018 meeting) to produce a technical report with potential cost-saving findings while retaining the 1% AEP or 100-year, consistent with the PACR. Note the ACAR was a limited investigation into potential cost savings and due to the limited time, scope, and funding, did not include economic analysis or any discussion on project credits, benefits, specific cost-sharing, or OMRR&R costs. The ACAR was completed in 2019, and the tenets have been supported by CEMVD, HQUSACE, and the Assistant Secretary of the Army—Civil Works (ASA(CW)). In Fiscal Year 2020, reprogramming actions were received in the amount of $1.25M in investigation funds to perform an Economic Update and development of plans and specifications for the Humble Canal preload contract. All of the aforementioned actions have lead to the current design, that is described in this report.

A step forward toward progressing the design of MTG and providing documentation for the Engineering Documentation Report (EDR) is to obtain a certified cost estimate. Hence, CEMVN has developed formal MII cost estimates with updated quantities, design, and cost data for the 2035 and 2085 project horizons. This report serves as the technical explanation for the current design that is described in the present EDR and the change in costs from the 2013 PACR to the current design utilizing adaptive criteria. The newly developed MII estimates and corresponding risk register and Crystal Ball output have been developed by CEMVN and submitted to the USACE Cost Center of Expertise for review and cost estimate certification.

2.0 REFERENCES

a. U.S. Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries (Chief of Engineers Report), August 2002.

b. U.S. Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries Supplemental Report (Chief of Engineers Report), July 2003.

c. U.S. Army Corps of Engineers, New Orleans District Engineering Division, Hurricane and Storm Damage Risk Reduction System Design Guidelines (Interim), October 2007 (Includes 12 June 2008 Revisions).

d. U.S. Army Corps of Engineers, Louisiana Coastal Protection and Restoration (LACPR) Final Technical Report, August 2009.

e. U.S. Army Corps of Engineers, New Orleans District Engineering Division, Hurricane and Storm Damage Risk Reduction System Design Guidelines, New Orleans District Engineering Division, February 2011.

f. U.S. Army Corps of Engineers, Post Authorization Change Report, Morganza to the Gulf of Mexico Project, LA, May 2013.

g. U.S. Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries (Chief of Engineers Report), July 8, 2013.

h. U.S. Army Corps of Engineers, Risk Management Center, Issue Evaluation Study, Design Criteria Site-Adaptation Report for the Proposed Morganza to the Gulf Levee System, July 24, 2013, which includes as an Appendix the Morganza to the Gulf Sensitivity Analysis from October 2012.

i. Morganza to the Gulf Cost Assessment, November 2018.

j. Adaptive Criteria Assessment Report (ACAR) transmittal to CEMVD inclusive of review comments and transmittal correspondence between CEMVN, CEMVD, and HQ, CEMVN, May 2020.

Reports cited are incorporated by reference.

3.0 SYSTEM DESCRIPTION

The authorized MR&T MTG project is designed to provide hurricane and storm damage risk reduction benefits to a 1% AEP (or 100-year) (otherwise known as 1% or 100-year LORR) while ensuring navigational passage and tidal exchange. MTG is located in the state of Louisiana, about 60 miles southwest of New Orleans, and includes Terrebonne Parish and the portion of Lafourche Parish between the eastern boundary of Terrebonne Parish and Bayou Lafourche. The study area extends south to the saline marshes bordering the Gulf of Mexico and encompasses approximately 1,900 square miles. The GIWW and the HNC are major waterways in the area. The GIWW passes through Houma in an east-west direction. The HNC extends due south from Houma to the Gulf of Mexico. Bayou Lafourche runs along the northeastern boundary of the project/study area. Figure 3-1 illustrates the currently authorized MTG levee alignment (in red) relative to New Orleans and other towns/landmarks as well as water bodies in the Southeast Louisiana vicinity. The authorized MTG levee alignment primarily follows existing hydrologic barriers, such as natural ridges, roads, and existing local levees.

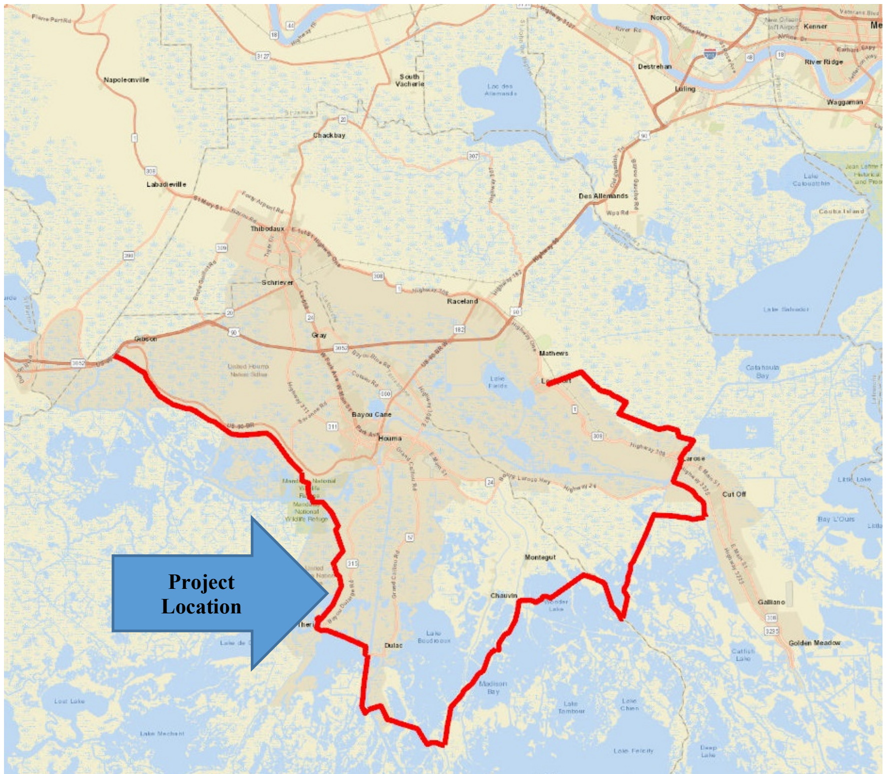


Figure 3-1 Vicinity Map

Figure 3-2 illustrates the status of construction as of January 2021. Green highlighted alignments have been constructed by local stakeholders to an elevation of 12.0 feet (with corresponding settlement throughout the alignment that has resulted in current elevations ranging from 10.0 to 11.5 feet). Yellow highlighted reaches are currently under construction by local stakeholder. Red highlighted reaches have no construction activities to date.

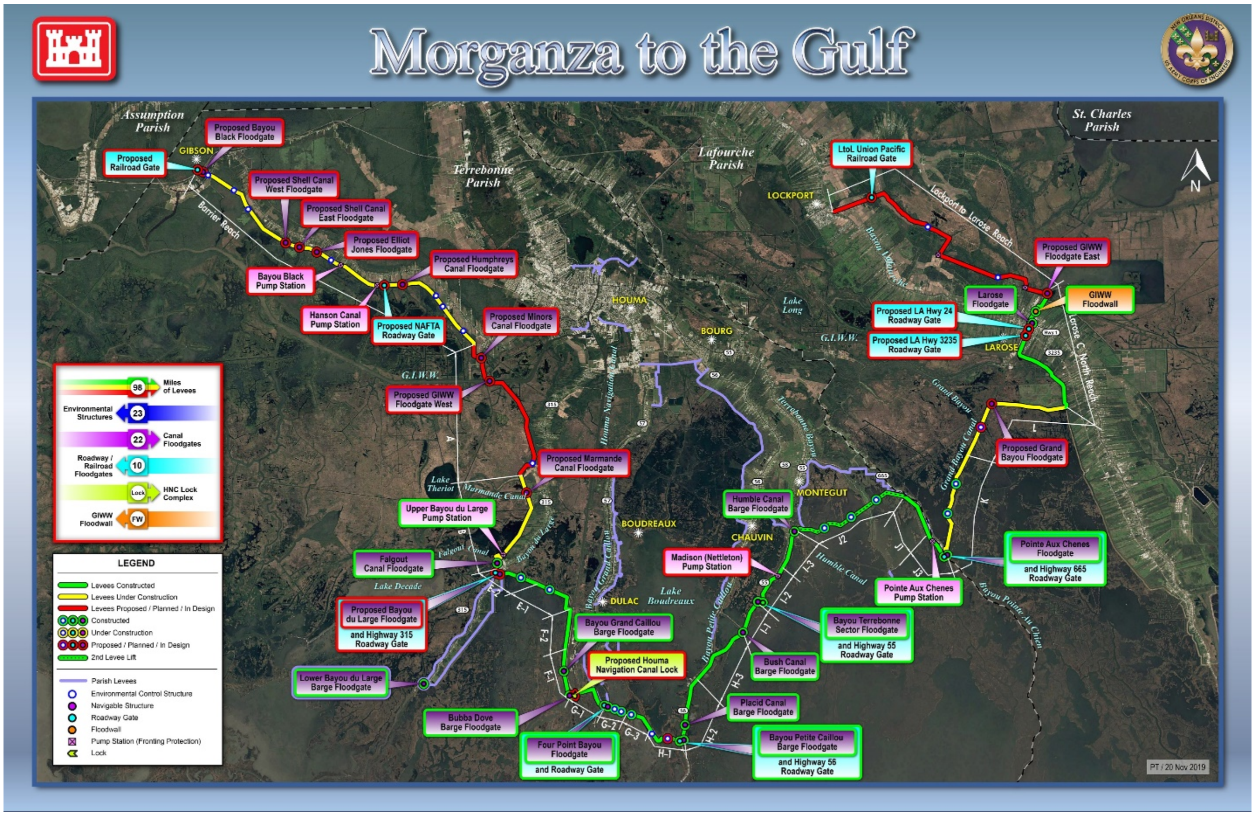


Figure 3-2 – MTG Levee Alignment (See Appendix A for larger version)

There are a total of approximately 98 miles of earthen levee, 22 hurricane and storm damage risk reduction structures on navigable waterways (includes 1 at GIWW and 2 "Bubba Dove" at HNC), 10 roadway/railroad gates, 23 environmental structures, fronting protection for pump stations, and the HNC Lock Complex in the currently authorized alignment. To date, approximately 47 miles of earthen levee have been constructed by local interests to an elevation of 12 feet (**NAVD88 epoch 2004.65 – all elevations throughout this document are referenced to this datum**). Due to settlement, existing elevations range from 10.0 to 11.5 feet throughout local stakeholder constructed alignments (based on stakeholder provided data). The locally-funded HNC Lock Complex is scheduled to begin construction in 2021.

4.0 SUMMARY OF PAST REPORTS/ANALYSIS

4.1 PACR

The PACR report for MTG was completed in 2013. The 2013 PACR estimated cost of the project was approximately $10.3B (w/contingencies), resulting in over $9B of cost increase as compared to the originally authorized project. In addition to the adoption of the HSDRRS criteria, the cost increase is predominantly attributable to updated hydraulic modeling, which utilized state-of-the art hydraulic modeling methodologies as well as updated geometry (bathymetry and LIDAR) to compute new 1% hydraulic elevation requirements. MTG was subsequently re-authorized, however, the project has not been funded for construction to date and is unlikely to be funded for construction at the PACR cost level moving forward.

4.2 RMC HISTORICAL EFFORTS

In 2013 the Risk Management Center (RMC) and CEMVN completed the Issue Evaluation Study for Design Criteria Site-Adaptation Report for the Proposed MTG Levee System. The preliminary findings of this Report, are referenced in the 08 July 2013 Chief of Engineers Report, (paragraph 7), and states, "While the estimated project costs in the district's report are the best available and compliant with current post-Katrina design criteria, the U.S. Army Corps of Engineers Risk Management Center and the New Orleans District jointly evaluated the proposed MTG project to assess whether the post-Katrina design criteria, specifically in the areas of global stability, overtopping, and structural superiority, could be site adapted to reduce project cost without significantly increasing risk. Based on the results of this effort, site adaptations of the criteria were identified for consideration during the next phase of implementation, preconstruction, engineering and design." Part of that report (in an Appendix) included performing a Sensitivity Analysis (conducted in 2012) on one reach (J-2) of the proposed MTG alignment to investigate potential cost savings. The RMC report served as the original basis for the MTG ACAR.

Under the "Major Findings and Understandings" section on page 73 of the RMC Issue Evaluation Study, the three primary design parameters recommended for adjustment include increasing the allowable overtopping rate to 0.5 cfs/ft (0.1 cfs/ft required for HSDRRS criteria), lowering the allowable factor of safety for global stability from 1.5 to 1.3, and eliminating structural superiority. Specifically, the recommendations are quoted as follows:

"1. Reduce the Factor of Safety (FoS) for end of construction global stability from 1.5 to 1.3. The risk assessment team concluded that there is inconsequential change in post-project residual risk for a levee 800 ft wide (associated with global stability FoS = 1.5) versus a 600 ft wide (associated with a global stability FoS = 1.3). This reduction in end of construction factor of safety does increase the likelihood of slope stability failures during construction, which is often unacceptable in an urban environment. However, for the non-urban setting of this project, slope stability failures during construction can be mitigated during construction at relatively low costs and are unlikely to cause loss of life or significant property damage.

2. Change the Design Overtopping Rate for well-maintained grass-covered levee slopes from 0.1 to 0.5 cfs/ft. This change could result in reduction of levee and structure elevations by several feet. Based on tests conducted to assess USACE HSDRRS designs, the grass cover on clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft.

3. Elimination of the structural superiority requirement. Reducing top elevations of structures to match adjacent levee heights would lead to significantly shorter structures, i.e., reducing structure elevations by 2 ft in addition to the reductions in elevation resulting in the change in design overtopping rate." (Note, As defined in the HSDRRS Design Guidelines on page 5-2 under Section 5.1.3, structural superiority is 2 feet added to structure elevations above the required design grade of adjacent levee alignments. Intent of structural superiority is to provide additional elevation for difficult to construct features such as sector gates, utility crossing, etc., in an effort to minimize the need for future adjustment should design grades increase due to greater than expected subsidence or sea level rise. In addition, structure superiority lowers the potential for overtopping at critical infrastructure)."

4.3 ADAPTIVE CRITERIA ASSESSMENT REPORT (ACAR)

Beginning in November 2018, CEMVN was tasked to investigate further the "site adaptations of the criteria (that) were identified for consideration during the next phase of implementation, preconstruction, engineering, and design" from the 8 July 2013 Chiefs Report. Using the RMC report criteria along with detailed information from local stakeholders, the team would evaluate any potential cost savings for the project. This refined design approach was applied to the proposed MTG alignment to determine an updated cost. In addition, the levee material quantities and costs were updated to consider the levees constructed by local interests. Another cost savings component is based upon the Non-Federal Sponsor proposal to limit the federal investment for a 1% AEP to the year 2035 project horizon, where the local stakeholders would be responsible, at 100 percent non-Federal cost, to construct levee lifts, demolition and/or reconstruction of structure alterations of floodgates to achieve hydraulic design levels, and any other modifications to the Project following completion of Federal/non-Federal Sponsor Cost Shared Work (to attain the 1% AEP to the year 2035 project horizon), or functional portion thereof, through the end of the project period of analysis (currently estimated to extend to the calendar year 2085) as necessary to maintain the 100-year level of risk reduction for the Project. This 4-6-month assessment was limited in scope, but the team was able to gain more certainty in the applicability of the "site adaptations." Investigation Funds were received in Fiscal Year 2020 to further develop the design and to update the costs and benefits. **This report documents the current design and the basis of quantities and costs for the newly developed CEMVN-ED MII cost estimates and input to economic analysis in the EDR.** MTG received "Construction New Start" funds from the Fiscal Year 2021 Work Plan for the Army Civil Works program on 19 January 2021 to commence construction of the project.

5.0 APPROACH

Primarily, efforts are focused on the effect of the site adaptations on the levee cross-section and footprint to update assumptions that will constitute the current design of the project. The design of the MTG project has evolved since completion of the PACR. The design described in this report is a "snapshot" of the current design, further developing the tenets of the ACAR and other updates based on new information. When approaching the focus of design update, it was noted that the levee construction constitutes approximately 50% of the Total Project Cost (TPC). Reductions or changes in levee quantities generate a corresponding "ripple" effect to other projects' costs. Parameters such as mitigation and real estate will also see cost savings as the levee sections and footprints are reduced. As costs of construction features are reduced, cost for Supervision and Administration (S&A), Engineering and Design (E&D), and contingency are likewise reduced as these parameters are typically a percentage of construction costs.

In summary, cost saving measures implemented consist of:

- Updated hydraulic modeling that capitalizes in advancement of modeling technologies since completion of the PACR
- Lower design elevation requirements developed while maintaining a 1% LORR and 0.5 cft/ft overtopping rate with 2 feet of overbuild for settlement

- Levee global stability Factor of Safety (FoS) of 1.3 instead of 1.5
- Geotechnical analysis to investigate foundation strength gains through soil consolidation of the existing levees
- New Cone Penetrometer Test (CPT) data (Increased strength gains enable levees to be constructed higher with minimal increase in footprint size, thereby saving cost in material placement for the 47 miles of locally constructed levee.)
- Tailoring haul distances to align with stakeholder input on actual pits used to date
- Tailoring haul distances to align with potential stakeholder identified pit locations which they have identified since PACR completion
- Subtracting quantities of levee material placed to date from revised design sections
- Re-assessing structures to develop new quantities based on revised hydraulic design elevations and conversion of the PACR sector gates to barge gates (except for two GIWW gates which shall remain sector gates)
- Obtaining updated costs for fabricated steel tailored to barge gates for current hydraulic elevations
- Eliminating structural superiority requirements

6.0 ENGINEERING DISCIPLINE INPUT

6.1 HYDRAULICS

CEMVN developed new hydraulic levee sections based on updated hydraulic models that capitalize on new modeling methods and techniques developed since completion of the 2013 PACR as well as the 2019 ACAR. The following table summarizes changes/improvements in the hydraulic modeling resulting in the lower hydraulic design elevations from the 2013 PACR.

Design Parameter	Design Updates	Notes
Coupled ADCIRC + SWAN model storm surge characteristics	New storm surge characteristics from the updated coupled model were used to develop stage frequency curves, fragility curves, levee design elevations, and structure design elevations.	Stage frequency curves, fragility curves, levee designs and structure design elevations are lower than the elevations presented in the PACR. The extreme return events stillwater elevations are lower and the more frequent return events are higher.
Overtopping equations	Van der Meer overtopping equations changed to EurOtop overtopping equations for use in computing levee design elevations.	Implementation of the EurOtop equation resulted in a change in levee height of approximately 0.50 feet lower than van der Meer. The ½ foot variation is within the uncertainty band of the model (+/-0.50 feet) and could vary based on the use of a different surge model result output point.
Overtopping threshold rate	Overtopping threshold rate increased from 0.1cfs/ft to 0.5cfs/ft	Overtopping threshold rate of 0.5cfs/ft approved from the post PACR RMC site adaptation report was used for levee designs

		and corresponding structure design elevations which resulted in lower design elevations.
Removal of wave berm design option	A berm factor was not incorporated in the levee design equations.	In the PACR, levee elevations for a few construction reaches were determined with and without wave berms. In this update wave berms were not used, resulting in higher elevations but smaller footprints than levees designed with- wave berms.

In addition to the updates noted in the table above, the existing conditions hydraulic modeling was updated using the 2017 Coastal Protection and Restoration Authority's (CPRA) 2017 Master Plan ADCIRC mesh. The 2017 CPRA ADCIRC mesh was developed to represent base conditions for the 2017 State Master Plan. The 2017 Master Plan ADCIRC mesh is a heavily validated and verified ADCIRC mesh which performs well for hindcasts of Katrina, Rita, Gustav, Ike, and Isaac.

Appendix D provides the methodology, detailed explanations, figures, and corresponding tabular results for the hydraulic engineering re-analysis performed for the updated design. Structural elevations are the same for the without wave berm conditions and are therefore not tabulated separately. The table below summarizes the new hydraulic design elevation results compared to the 2013 PACR results illustrating the elevation differences (lower), which directly corresponds to lower costs in the design of alignment features.

Hydraulic Reach*	Current Design 1% Design Elevations		PACR 1% Design Elevations**	
	(NAVD88 epoch 2004.65)			
	2035***	2085	2035	2085
A	-	-	15.5	20.5
A-North of GIWW	10.0	16.5	15.5	20.5
A-South of GIWW	11.0	16.5	-	-
B	13.0	18.5	17.5	20.5
E2	17.5	21.0	21.5	23.5
E1	17.0	20.0	21.5	23.5
F2	16.0	19.0	22.0	23.5
F1	15.5	18.5	22.0	23.5
G1	17.0	19.5	22.5	24.0
G2	17.5	20.5	22.5	24.0
G3	18.0	20.5	22.5	24.0
H1	17.0	20.0	24.0	26.5
H2	18.0	22.0	24.0	26.5
H3	20.0	24.0	24.0	26.5
I1	20.0	24.0	24.0	26.5
I2	21.0	25.0	24.0	26.5
I3	20.0	24.5	24.0	26.5
J2	21.5	25.0	24.0	26.5
J1	20.5	24.0	24.0	26.5
J3	20.0	23.5	24.0	26.5

K****	20.5	26.0	22.5	25.5
L	20.5	24.5	22.5	25.5
Larose C-North	-	-	18.0	20.5
C-North	8.5	16.5	-	-
GIWW	8.5	15.5	-	-
Lockport to LaRose	-	-	10.5	15.0
Lockport to LaRose-A	9.5	13.0	-	-
Lockport to LaRose-B	7.5	11.0	-	-
Barrier	10.5	17.0	15.5	20.0

*Hydraulic reaches were subdivided into segments as shown on reach map. PACR A is also referred to as A-North of GIWW and A-South of GIWW. PACR Larose C-North is C-North and GIWW and PACR Lockport to Larose is Lockport to Larose A and B.

**PACR levees were designed with wave berms; current design has no wave berms.
*** Does not include 2.0 feet of overbuild.
**** R**each K elevation is a ½ higher than in the PACR report. The slight variation may be due to higher stages on the exterior than in the PACR models, removal of wave berm or some other unknown anomaly**

6.2 GEOTECHNICAL

With CEMVN hydraulic analysis complete, CEMVN geotechnical engineers developed new design sections for Reaches J2, B, Barrier Reach, and Reach F for the 1% LORR. The analysis was completed on four representative design sections. Additionally, a section developed by CPRAB for Reach E was evaluated. Section 6.2.4 includes further discussion on the design sections completed. The geotechnical engineers then performed an assessment of how to apply the design sections to the remaining reaches (i.e., which sections best fit the remaining un-designed reaches). Civil Engineers subsequently developed quantities throughout the alignment by using the newly designed sections and geotechnical engineering guidance to match analyzed cross-sections to similar reaches. See Appendix C for the tabular calculation of new levee quantities.

As stated above, CEMVN reviewed design sections developed by CPRAB for Reach E. TLCD furnished levee section data, including construction plans and specifications for various MTG levee reaches constructed to date. Additionally, the TLCD provided geotechnical reports, boring/CPT logs, and soil parameters for each design Reach. Reaches E and G were constructed with geotextile fabric reinforcement. Otherwise, TLCD only utilized fabric adjacent to structures in the remaining reaches. The CPRAB design section has been applied to Reaches E and G only.

6.2.1 NEW CPT DATA POINTS

MTG soil data obtained by CEMVN was collected before the TLCD began levee construction. Since the first stage of levee construction for some of the levee reaches have already been constructed, consolidation and strength gain of foundation soils have taken place. CEMVN and the CPRAB performed theoretical foundation strength gain calculations. The TLCD collected 10 new CPT data points during the ACAR to assess validity of the strength gains assumed in CPRAB and CEMVN geotechnical analyses. Two CPTs per reach were collected adjacent to existing soil borings or CPTs performed for previous CEMVN studies/investigations prior to levee construction in reaches J2, H, F, E, and Larose C North. The CPT data validated the methodology used to estimate the strength increase in foundation soils. The CPTs are considered representative of subsurface conditions at the CPT locations on the date completed.

6.2.2 GEOTECHNICAL DESIGN METHODOLOGY AND ASSUMPTIONS

TLCD has either completed construction or has begun construction on reaches B, E, F, G, H, J, K, and L to initial elevations of approximately 12 feet. Subsequent settlement of these reaches range from 0.5 feet to 1.5 feet over approximately two years. Because large amounts of settlement were observed and predicted during the first two years after levee construction, strength gain of foundation soils was incorporated into the design of future material placement on the existing reaches. Only gains in strength occurring during the initial two years after levee construction were considered. Geotechnical engineers developed the initial effective overburden for a reach with no levee present and then determined the levee section from the TLCD's P&S that was likely constructed. Using Rocscience's Settle3D software, geotechnical engineers modeled this section to determine the induced stress with depth resulting from the constructed section at a time stage of two years. All design and construction data provided by the TLCD can be found in the MVN Projectwise system at the following address: pw:\\PWINT-CPC.EIS.DS.USACE.ARMY.MIL:CEMVN01\Documents\Civil Works\M2G - Morganza to the Gulf\Work By Sponsors\Structures\.

The geotechnical engineers found that cohesive soils in southeastern Louisiana typically have an undrained shear strength to vertical effective stress ratio equal to approximately 0.22. Therefore, the engineers multiplied the induced change in stress at approximately two years by the correlation factor of 0.22 to estimate the increase in shear strength gain at the centerline and toe of the existing levee.

Geotechnical engineers then applied these strength gain values to slope stability using the 2016 version of GeoStudio's Slope/W program to perform slope stability analyses using the Spencer's Method for Still Water Level (SWL), Low Water Level (LWL), and Top of Wall (TOW) water loadings. The required global stability factor of safety is 1.3 for SWL and LWL. Geotechnical engineers assumed that additional shear strength gains in the soft clay soils encountered throughout the project would improve the global stability factor of safety during levee construction to the 2nd stage. A global stability FOS of 1.2 was utilized to capture foundation strength gains of soft soils during initial levee construction in our geotechnical analyses for all reaches analyzed. Additionally, for levee reaches where the first lift has already been constructed, foundation strength gains will continue to increase. Only strength gains from two years of consolidation are accounted for in our analyses. However, additional strength gain will be realized before construction to the 2nd levee lift. Typically, foundation strength gains are not considered for levee enlargement of existing levees. However, the timing between levee lifts, the large size of the typical enlargement, and additional foundation consolidation and strength gains justify this approach. Therefore, the factor of safety was designed to 1.2 for this assessment. After construction of these lifts, a field investigation program will be developed to document and verify foundation strength gains have occurred, and a FOS of 1.3 was obtained.

The cross-section for cost estimation for Reach E was provided to USACE by CPRAB. CEMVN openly shared design methodologies with CPRAB to ensure consistency in design and engineering analyses.

In addition to slope stability analyses, geotechnical engineers analyzed reaches J2, F, B, and the Barrier Reach for settlement using Settle3D. Each reach was designed with a two-foot overbuild to account for settlement after construction. With this two-foot overbuild, each of the levee crowns analyzed remained above the 1% design elevation for at least seven years.

Geotechnical engineers considered a levee cross-section with and without a wave berm as designed by hydraulic engineers. After preliminary analyses, the "without wave berm" case was decided to be the smaller, more cost-effective levee section required for stability. The large wave berm developed by hydraulic engineers was not necessary for stability, particularly for the low water case. Therefore, quantity calculations made in the current analyses were performed for the "without wave berm" case.

6.2.3 SEEPAGE

Seepage analyses were not performed. Nevertheless, based on geotechnical engineering experience, the difference in cross-section between the currently proposed cross-section and the cross-sections previously developed for the PACR do not significantly impact seepage performance under a flood load due to a reduced levee crown height for the current analysis and the similar foundation conditions. In the PACR, seepage analyses were analyzed for the foundation of reach F and reach I and indicated satisfactory seepage FOS for SWL and Top of Levee (TOL). Reach F is believed to be the most vulnerable to seepage due to the presence of near surface sands and will represent a worst-case seepage condition for the western portion of the project. Reach I represents a typical eastern reach in regards to seepage. Additionally, borrow pits constructed to provide side cast material for future levee construction will be designed to be far enough away from the levee to ensure an adequate seepage FOS.

6.2.4 CONSTRUCTION METHODOLOGY ASSUMPTIONS

Since USACE was not involved during initial non-Federal levee construction along the MTG alignment, geotechnical engineers assumed quality control testing such as soil classification, moisture content, organic content, and sand content were performed to ensure proper embankment material was used for construction. Embankment materials should be classified in accordance with ASTM D 2487 as CL or CH with less than 35% sand content. Geotechnical engineers assume typical embankment construction methods, including clearing, grubbing, and proper drainage, were performed. CEMVN understands that the first lift primarily served to preload the foundation of the levees and that minimal compaction effort took place (i.e., three passes of a dozer). As such, soil properties included in the analyses assumed semi-compacted levee fill with a unit weight of 110 pcf and cohesion of 400 psf. To account for settlement of foundation soils, geotechnical engineers designed each levee Reach with a two-foot overbuild of the levee crown. Per information provided by the TLCD, the first lifts of reaches E and G were constructed with geotextile reinforcement. All other levee reaches constructed to date do not have geotextile reinforcement fabric in the section.

Levee cross-sections were designed and analyzed for slope stability and settlement for reaches J-2, B, F, E, and the Barrier Reach. The 1% design elevation for MTG levees varies across reaches from elevation (EL) 7.5 to EL 21.5 for 2035 and EL 11 to 26 for 2085. The reaches that the geotechnical engineers analyzed represent good coverage with respect to varying levee crown elevations as they apply to engineering analyses. Therefore, appropriate levee cross-sections that CEMVN analyzed were applied to MTG Reaches that were not analyzed. Projection of design sections were assumed as follows: Reach J2 was projected to reaches H2, H3, I1, I2, I3, J1, K, and L; reach B was projected to reach A; reach E was projected to reach G; the Barrier Reach was projected to the Lockport to Larose Reach, and reach F was not projected onto any other reach.

In summary, the geotechnical engineers provided civil engineers (1) four new design sections, (2) CPRAB's reach E design section, and (3) instructions on how to apply the new design sections to the remaining reaches throughout the alignment. Design sections developed utilizing the adaptive criteria for the without wave berm condition are illustrated in Figures 6-1 thru 6-5.

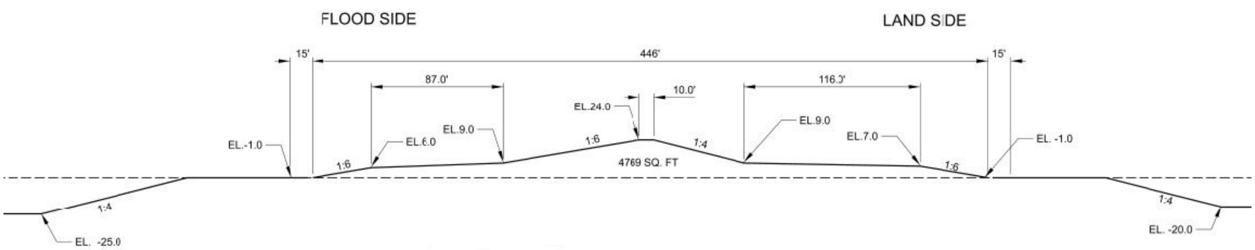


Figure 6-1 - Typical Section Reach J-2 – Not to Scale (NTS)

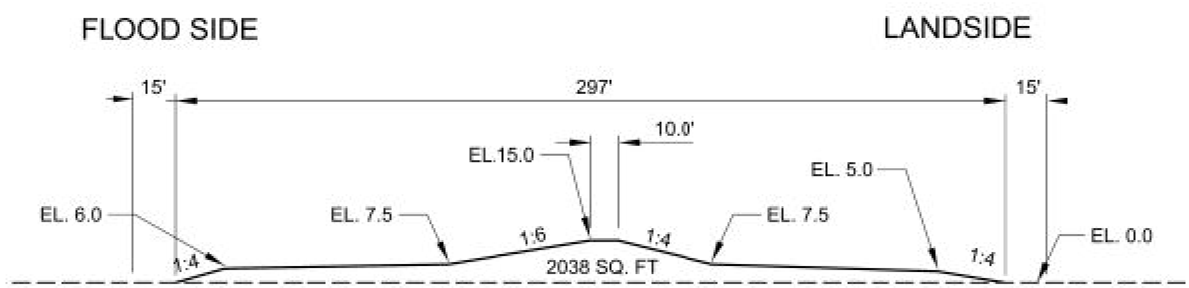


Figure 6-2 - Typical Section Reach B – NTS

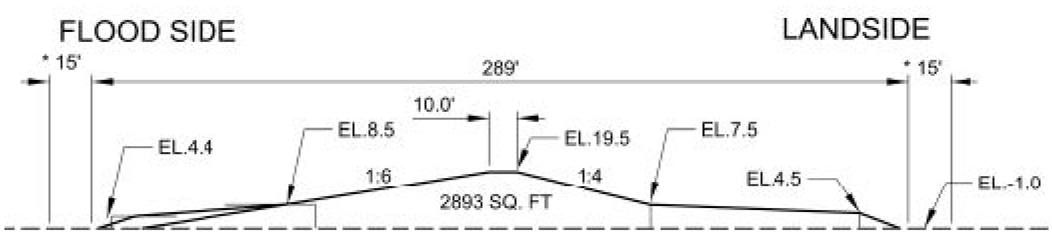


Figure 6-3 - Typical Section Reach E (CPRAB) – Not to Scale (NTS)

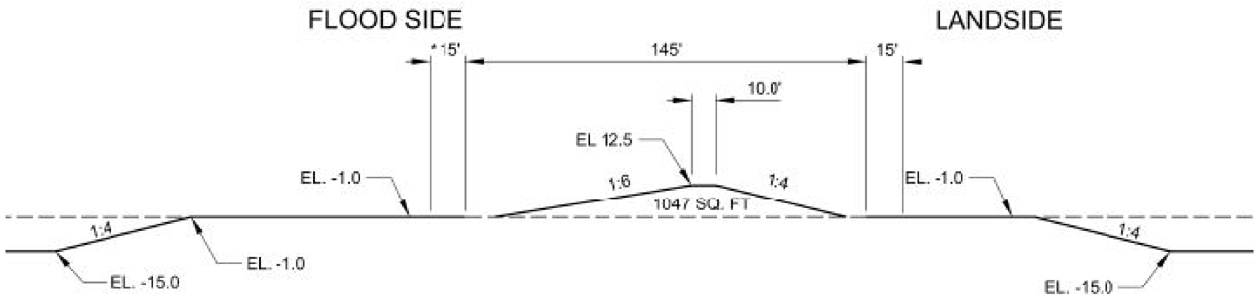


Figure 6-4 - Typical Section Barrier Reach – NTS

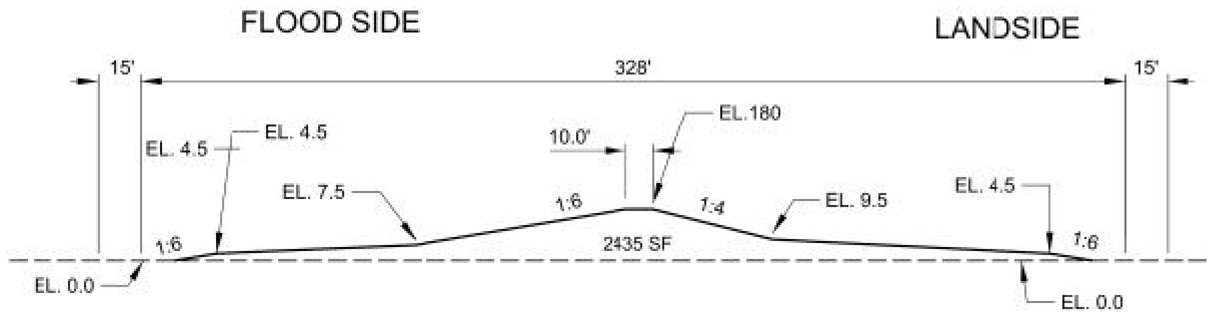


Figure 6-5 - Typical Section Reach F– NTS

6.3 CIVIL ENGINEERING

With geotechnical engineering design sections complete, civil engineers developed cross-sectional areas multiplied by reach lengths to develop neat-line embankment quantities. Quantities of borrow placed to date were provided by local stakeholders. Since quantity of borrow was provided (versus quantity of embankment), local furnished quantities were reduced by 20% to account for compaction during material placement. New design section quantities less the stakeholder quantities placed to date provided cost engineers with the quantities needed (by reach) to attain the 1% AEP LORR. See Appendix C for a tabular listing of quantity dimensions and quantity calculations.

For levee reaches for which construction of the first lift has not begun, the difference in design section quantities was increased by 20% to account for lateral spread. For levee reaches for which initial construction to approximate EL 12 has been completed, the difference in design section quantities was increased by 35% to account for lateral spread and foundation settlement that has occurred since construction. Civil engineers also developed levee area acreage for computing clearing/grubbing and fertilizing/seeding/mulching costs.

6.4 COST

Cost engineers developed new unit costs for the revised levee quantities and worked with structural engineers to develop new structure quantities based on revised hydraulic design elevation requirements and conversion of most of the flood gates from sector gates to barge gates. All future levee construction is assumed to be built following typical CEMVN levee construction techniques using truck-hauled embankment, with the exception of Reach K, which requires barge delivery for the majority of the length.

The embankment construction unit cost ($/CY) for the revised levee design sections was based on an average 7-mile one-way truck haul distance. The haul distance was provided by TLCD based on the haul distances they have been experiencing for the alignments constructed to date. This appears to be reasonable based on a review of mileage arcs on the local stakeholder furnished borrow map, which is provided in Appendix B. The unit cost for levee embankment includes basic assumptions for borrow pit development (i.e., pit management, excavation, on-site processing/moisture control), loading, truck hauling, spreading, compacting, testing, and truck wash racks. The cost for truck wash racks was removed from the Barrier Reach, Reach A, Reach B, and the Lockport to Larose Reach, where it is assumed the levee is directly accessible without transiting on highways. The overall levee construction cost also includes parameters such as mobilization/demobilization, levee clearing, embankment construction, and fertilizing, seeding, and mulching.

In addition to revised quantities resulting from updated hydraulic design elevations and conversion of sector gates to barge gates, costs for structures included new fabricated steel prices furnished by the local stakeholders based on actual construction data (bid schedules) for constructed features. A reduction in quantities was realized for foundations, structural concrete, and structural steel for most structures including floodgates, roadway gates, and corresponding floodwalls. The cost development assumes unrestricted solicitations as the contracting method.

6.4.1 RELOCATIONS

Based on local stakeholder input, relocations identified in the PACR have predominantly not been completed in compliance with USACE criteria for reaches constructed to date. Approximately 47 miles of the PACR alignment (98 miles in total) have been constructed to elevation 12. Due to time and scope limitations, the PDT was unable to go through the entire alignment to determine which utility relocations have been performed in compliance with USACE criteria. Ultimately the PDT retained the quantities developed for the PACR and updated the cost to 2020 dollars using prevailing cost rates and data. The PACR quantities assumed that no utility relocations have occurred on the footprint that has been constructed by the NFS, though it is likely that some relocations have occurred in 47 miles of levee alignment that has been constructed on. Therefore, it was decided to take a conservative approach and assume that all utililites would need to relocated.

6.4.2 S&A, E&D, AND CONTINGENCY

As new costs for all alignment parameters were completed, Cost Engineering then applied the same PACR percentages for S&A and E&D to the TPC. No reduction in these percentages can be justified; however, the overall cost of these parameters is reduced based on an overall reduction of alignment features cost. Overall project contingency is based on the risk register, and corresponding Crystal Ball output, which has been submitted with the MII estimates for review as part of the cost certification.

6.5 STRUCTURES

Hydraulic engineers furnished structural engineers with new hydraulic design elevations for the structures. Predominantly, structural engineers pro-rated quantities developed for structures during the 2013 PACR. For the 56 ft barge gate structures, previously assumed to be sector gates in the PACR, a limited design approach was followed, utilizing existing designs from local stakeholders constructed within the last 10 years. In summary, reductions were realized for the foundations, structural concrete, and structural steel for all structures, including floodgates, roadway gates, and corresponding floodwalls. The revised quantities were provided to cost engineering for input to the MII estimates using prevailing cost data and rates, resulting in the new costs for structures. Details of the structural design approach for the current design can be found in Appendix E.

7.0 RISK

This report documents changes from the project described in the PACR. Another objective is to furnish the cost engineering review team members with a basis, rational, and quantity/cost traceability required to certify the current MII cost estimate and associated risk register/crystal ball output for contingency. As is the case for all Civil Works construction efforts, additional data collection, re-design, and corresponding updated cost estimates shall be required to verify the findings throughout PED as detailed plans and specifications for construction contracts are developed. The PDT collaboratively developed a risk register, and MVN Cost Engineering developed a formal Crystal Ball analysis to produce a contingency intended to mitigate the risk associated with TPC.

Local stakeholder efforts to construct approximately 47 miles of levee have significantly reduced the uncertainty in future risk during PED and the corresponding cost estimate and contingency. The MTG alignment has an extensive amount of subsurface, survey, and levee construction data that has been collected by local interests and leveraged as part of this study – considerably more than most new studies, especially those under “3x3x3” constraints. Moreover, required levee construction heights, a significant source of uncertainty in most new studies in southeast Louisiana, are much clearer today due to the consolidation settlement that has already occurred since the previous levee construction. Lastly, the successful construction of levees has given clarity and confidence that the assumed design criteria and construction methods will be effectively implemented during future phases of the MTG project.

8.0 QUALITY REVIEWS

Quality reviews were completed for the current effort as well as the ACAR under a vertical team review. The ACAR was reviewed through the USACE vertical chain of command up to HQ. The approach defined in the ACAR was applied and refined in the current design.

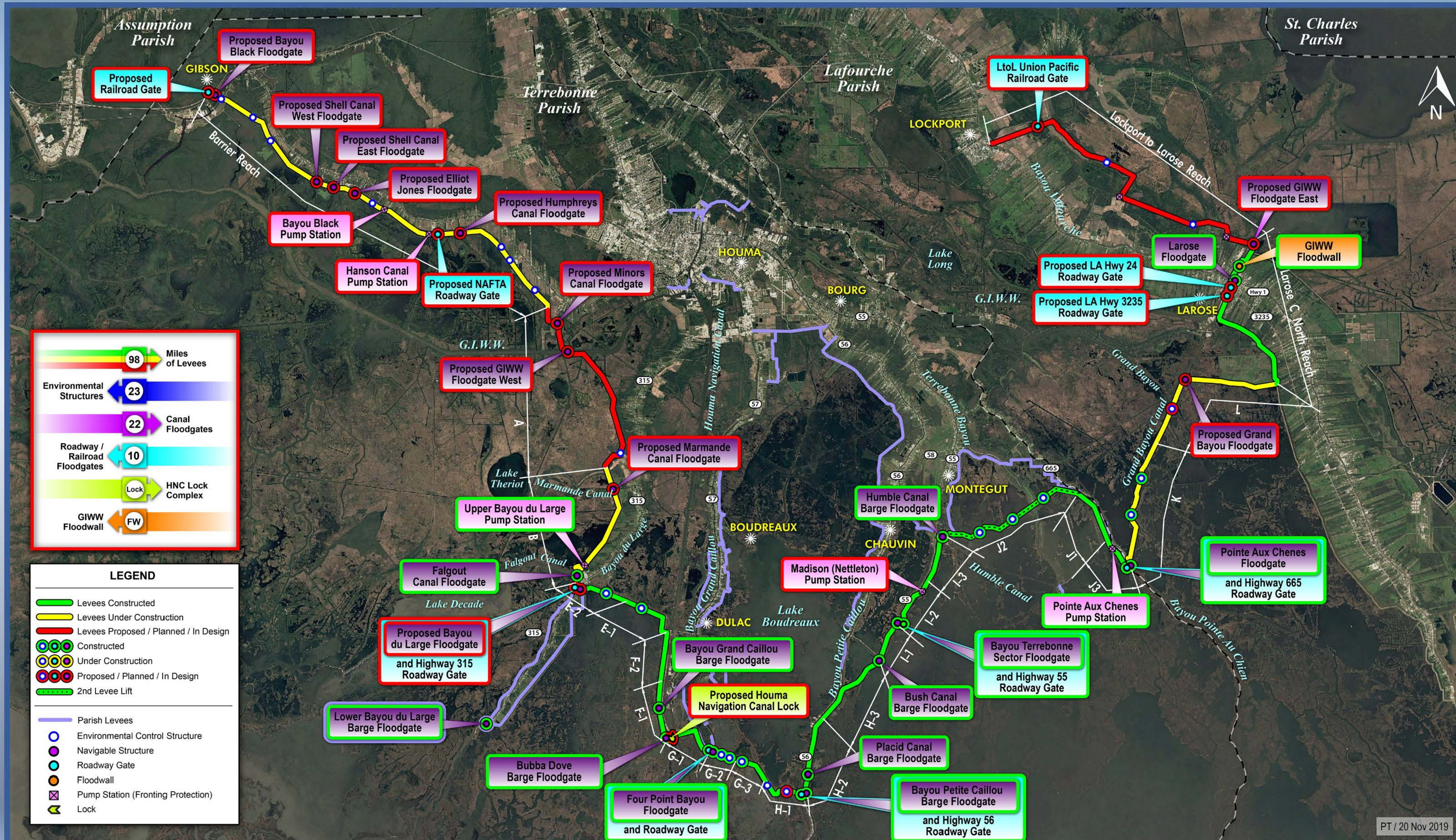
9.0 CONCLUSION

The results of the 2021 engineering review of costs have confirmed the recommendations from 2019 ACAR of utilization of "adaptive criteria" representes a valid approach and, thus, those recommendations have been incorporated in the current design as recommended in this report and in the Engineering Documentation Report. The current design resulted in a TPC of approximately $6B, and the 2035 cost to achieve a "closed" 1% AEP system is approximately $3.6B. The exact cost figures are included in the MII outputs, which have been provided to the Cost Center of Expertise for certification as part of the update to the current design in support of this EDR.

Appendix A

Project Map

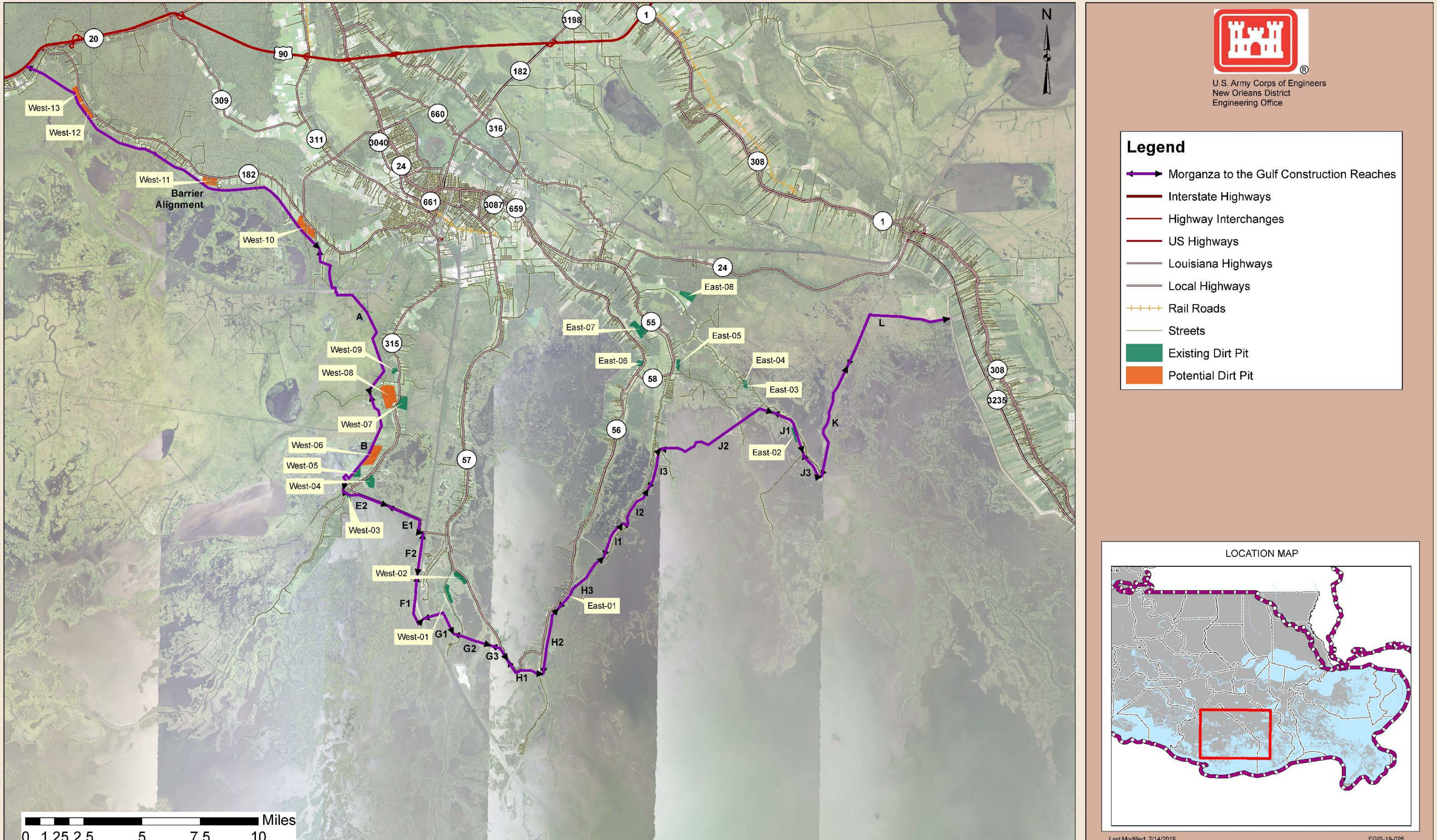
Morganza to the Gulf



Appendix B

Borrow Map

Morganza to Gulf Borrow Pits Map



Appendix C

Levee Quantities & List of Structures by Reach

APPENDIX C
MORGANZA TO THE GULF
LEVEE QUANTITIES AND LIST OF STRUCTURES BY REACH
1% Design, 2035

Dec 2020 EDHH - Hydraulic Reachs	ACAR Project/Reach	Projected reach	Total Reach Length (FT)	X-sectional area (SF)	NFS Embankment Placed	update Dec 2020 lift (CY)	Levee (AC)
A-North of GIWW		B					
A-South of GIWW	Reach A	B	43,184	2,038		4,400,450	324
B	Reach B		26,786	2,038		2,729,493	201
E2	Reach E		22,966	2,893	746,355	2,314,452	168
E1							
F2	Reach F (Lower)		22,583	2,435	1,226,042	1,094,323	186
F1	Reach F (Upper)			0			
G1	Reach G-2A	E	24,388	2,893	887,212	2,329,988	179
G2	Reach G-2B	E		0			
G3	Reach G-2C	E		0			
	Reach G-1	E		0			
H1	Reach H-3	J2	41,366	4,113	1,360,239	6,670,595	452
H2	Reach H-2	J2		0			
H3	Reach H-1	J2		0			
I1	Reach I	J2	30,168	4,769	290,186	6,801,809	330
I2		J2					
I3		J2					
J2	Reach J-3		49,357	4,769	2,992,195	7,729,713	539
J1	Reach J-1	J2		0			
J3	Reach J-2	J2		0			
K	Reach K	J2	26,961	4,769	0	5,714,534	294
L	Reach L	J2	31,143	4,769	291,867	6,250,691	
C-North	Larose C North Reach		36,960			0	
GIWW						0	
Lockport-A	Lockport to Larose R	BARRIER	77,531	1,047		3,607,776	311
Lockport-B		BARRIER					
Barrier	Barrier		83,081	1,047		4,349,290	335
						53,993,115	3319

APPENDIX C
MORGANZA TO THE GULF
LEVEE QUANTITIES AND LIST OF STRUCTURES BY REACH
2050 1% Design

Project/Reach	Total Reach Length (FT)	Cross sectional area (SF)	Volume (CY)	Adjusted Volume (CY)	Section width (FT)	Levee Area (AC)
Barrier Reach	83,081	402	1,236,984	1,484,381	235.00	448
Reach A	43,184	770	1,231,544	1,477,852	375.00	372
Reach B	26,786	770	763,897	916,676	375.00	231
Reach E	22,966	729	620,082	837,111	330.00	174
Reach F (Lower) Reach F (Upper)	22,583	855	715,128	965,423	399.00	207
Reach G-2A Reach G-2B Reach G-2C Reach G-1	24,388	729	658,476	888,943	330.00	185
Reach H-3 Reach H-2 Reach H-1	41,366	1,124	1,722,051	2,324,769	495.00	470
Reach I	30,168	1,124	1,255,883	1,695,442	495.00	343
Reach J-3 Reach J-1 Reach J-2	49,357	1,124	2,054,714	2,773,863	495.00	561
Reach K	26,961	1,124	1,122,376	1,346,852	520.00	322
Reach L	31,143	1,124	1,296,472	1,750,237	495.00	354
Larose C North Reach	36,960	848	1,160,818	1,392,981	235.00	199
Lockport to Larose Reach	77,531	402	1,154,350	1,385,221	235.00	418
				19,239,750		4,283

Notes:

1. Adjusted difference includes 20% increase in quantity to account for lateral spread in reaches in which NFS has yet to complete any alignment.
2. Adjusted difference includes 35% increase in quanity to account for lateral spread and settlement during construction in which NFS has completed alignment.
3. Section Width-Assumed 15' VFZ each side plus additional 25' on landside for construction easement/access for all reaches without NFS completed alignment
4. On reaches where NFS has completed alignment, assumed 15' each side for disturbed areas

APPENDIX C
MORGANZA TO THE GULF
LEVEE QUANTITIES AND LIST OF STRUCTURES BY REACH
IN SUPPORT OF THE 2021 ECONOMIC ANALYSIS
2070 1% Design

Project/Reach	Total Reach Length (FT)	Cross sectional area (SF)	Volume (CY)	Adjusted Volume (CY)	Section width (FT)	Levee Area (AC)
Barrier Reach	83,081	456	1,403,146	1,683,775	255.00	486
Reach A	43,184	643	1,028,419	1,234,103	388.00	385
Reach B	26,786	643	637,904	765,484	388.00	239
Reach E	22,966	450	382,767	516,735	303.00	160
Reach F (Lower) Reach F (Upper)	22,583	551	460,860	622,162	407.00	211
Reach G-2A Reach G-2B Reach G-2C Reach G-1	24,388	450	406,467	548,730	303.00	170
Reach H-3 Reach H-2 Reach H-1	41,366	698	1,069,388	1,443,673	501.00	476
Reach I	30,168	698	779,899	1,052,863	501.00	347
Reach J-3 Reach J-1 Reach J-2	49,357	698	1,275,970	1,722,559	501.00	568
Reach K	26,961	698	696,992	836,390	526.00	326
Reach L	31,143	698	805,104	1,086,891	501.00	358
Larose C North Reach	36,960	900	1,232,000	1,478,400	255.00	216
Lockport to Larose Reach	77,531	456	1,309,412	1,571,295	255.00	454
				14,563,060		4,394

Notes:

1. Adjusted difference includes 20% increase in quantity to account for lateral spread in reaches in which NFS has yet to complete any alignment.
2. Adjusted difference includes 35% increase in quanity to account for lateral spread and settlement during construction in which NFS has completed alignment.
3. Section Width-Assumed 15' VFZ each side plus additional 25' on landside for construction easement/access for all reaches without NFS completed alignment
4. On reaches where NFS has completed alignment, assumed 15' each side for disturbed areas

APPENDIX C
MORGANZA TO THE GULF
LEVEE QUANTITIES AND LIST OF STRUCTURES BY REACH
2070 1% Design

Structure	Constructed (Y/N)
Barrier Reach	
Bayou Black Floodgate	N
Environmental Control Structure	N
Environmental Control Structure	N
Environmental Control Structure	N
Shell Canal West Floodgate-Stoplog	N
Shell Canal East Floodgate	N
Elliot Jones Floodgate-Stoplog	N
Environmental Control Structure	N
Bayou Black Pump Station FP	N
Hanson Canal Pump Station FP	N
NAFTA Roadway Gate	N
Humphreys Canal Floodgate-Stoplog	N
Environmental Control Structure	N
Environmental Control Structure	N
Environmental Control Structure	N
Reach A	
Minors Canal Floodgate	N
GIWW Floodgate West	N
Environmental Control Structure	N
Reach B	
Marmande Canal Floodgate-Stoplog	N
Upper Bayou du Large Pump Station	Y
Falgout Canal Floodgate	Y
Reach E	
Bayou du Large Floodgate	N
Highway 315 Roadway Gate	N
Environmental Control Structure	Y
Environmental Control Structure	Y
Reach F	
Grand Caillou Barge Floodgate	Y
Houma Navigation Canal Lock	Y
Bubba Dove Barge Floodgate	Y

APPENDIX C
MORGANZA TO THE GULF
LEVEE QUANTITIES AND LIST OF STRUCTURES BY REACH IN SUPPORT OF THE 2021 ECONOMIC ANALYSIS
2070 1% Design

Reach G	
Four Point Bayou Floodgate	Y
Four Point Bayou Roadwaygate	Y
Environmental Control Structure	Y
Environmental Control Structure	Y
Environmental Control Structure	Y
Reach H	
Environmental Control Structure	N
Environmental Control Structure	N
Bayou Petite Caillou Barge Floodgate	Y
Hwy 56 Roadway Gate	Y
Placid Canal Barge Gate	Y
Reach I	
Bush Canal Barge Gate	Y
Bayou Terrebonne Floodgate	Y
Hwy 55 Roadway Gate	Y
Madison (Nettleton) Pump Station FP	N
Humble Canal Barge Gate	Y
Reach J	
Environmental Control Structure	Y
Environmental Control Structure	Y
Environmental Control Structure	Y
Pointe Aux Chenes Pump Station FP	Y
Pointe Aux Chenes Floodgate	Y
Hwy 665 Roadway Gate	Y
Reach K	
Environmental Control Structure	Y
Environmental Control Structure	Y
Reach L	
Environmental Control Structure	N
Grand Bayou Floodgate	N

APPENDIX C
MORGANZA TO THE GULF
LEVEE QUANTITIES AND LIST OF STRUCTURES BY REACH
2070 1% Design

Larose C North Reach	
LA Hwy 3235 Roadway Gate	Y
LA Hwy 24 Roadway Gate	Y
GIWW Floodwall	N
Gulf South PPL Fldwl	Y
Enbridge/Am Midstream PPL Fldwl	Y
Williams PPL Fldwl	Y
Larose Floodgate	Y
GiWW Floodgate East	N
Lockport to Larose Reach	
LtoL - Union Pacific RR gate	N
Environmental Control Structure	N
Environmental Control Structure	N

Appendix D

Hydraulics Input

1 Introduction

1.1 Study Area

The study area is about 60 miles southwest of New Orleans, Louisiana and includes most of Terrebonne Parish and the portion of Lafourche Parish between the eastern boundary of Terrebonne Parish and Bayou Lafourche. The authorized Morganza to the Gulf of Mexico project (MTG) was intended to function as a 1% annual exceedance probability (100-year) coastal storm damage risk reduction system. In addition to flood risk reduction, the structural features of the authorized project were designed to provide tidal exchange, environmental benefits, and navigational passage. Reference Figure 1 for a map showing the post authorization change Morganza to the Gulf levee alignment.

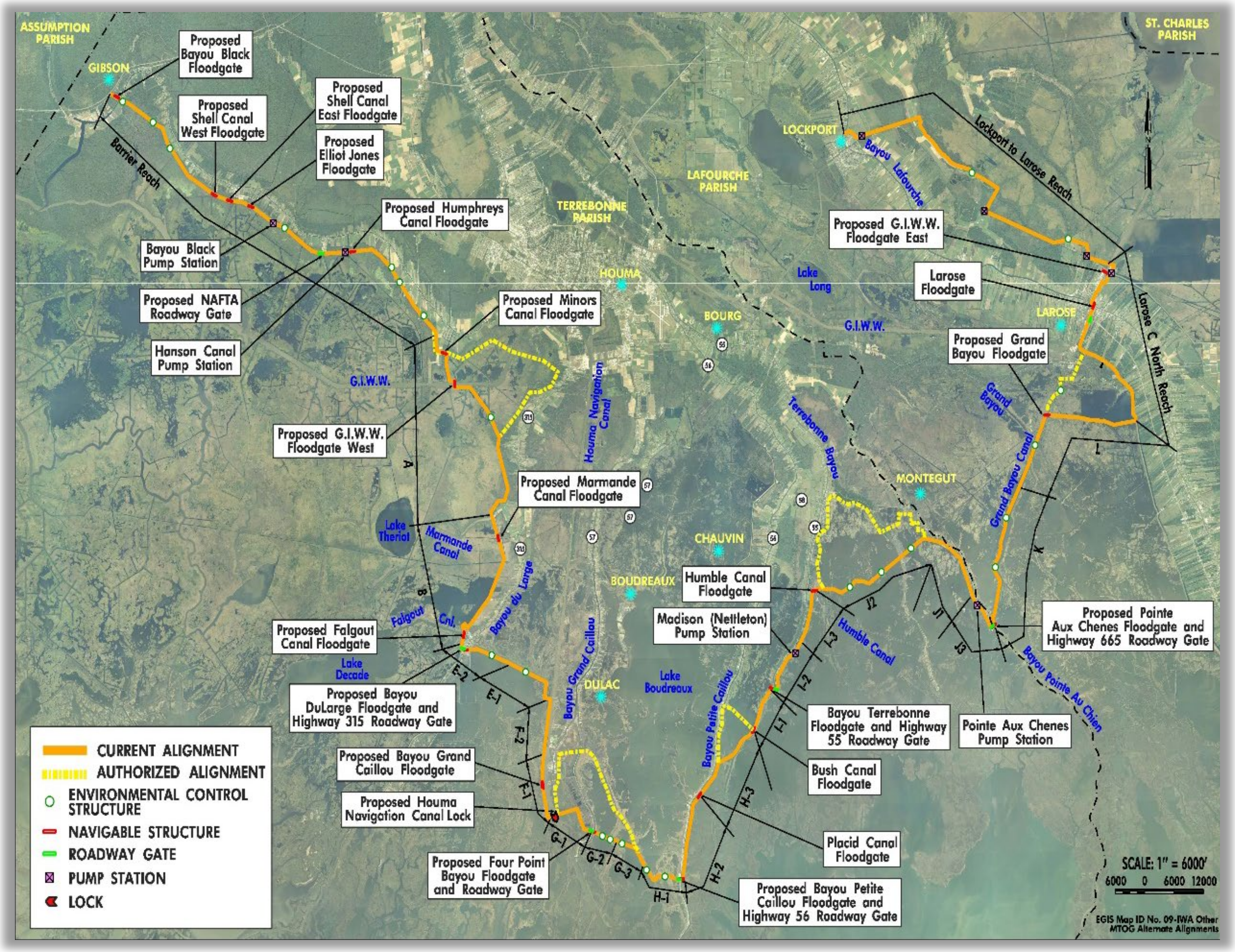


Figure 1-Morganza to the Gulf proposed levee alignment and reach names

2. Hydraulics

This section contains the methodology and results of the hydraulic investigations completed for the economic analysis including new ADCIRC modeling used to

establish interior and exterior frequency curves, levee designs and fragility curves.
All elevations are referenced to NAVD88 epoch 2004.65.

2.1 Storm Surge Assessment Methodology

The storm surge assessment task was used to determine stage frequency from hurricane storm surges impacting the Morganza to Gulf (MTG) project vicinity. The hydraulic modeling output provided stage-frequency for the 10-, 20-, 50-, 100-, 200-, 500- and 1000-year return periods.

ADCIRC + SWAN was used to model hurricane storm surges. It is a system of computer programs for solving time dependent, free surface circulation and transport problems. Version 53.04 was used for the analysis. The program utilizes the finite element method in space allowing the use of highly flexible, unstructured grids covering large domains as pictured in Figure 2, Typical ADCIRC applications include prediction of storm surge and flooding. See http://adcirc.org/ and for more http://swanmodel.sourceforge.net/download/download.htm information.

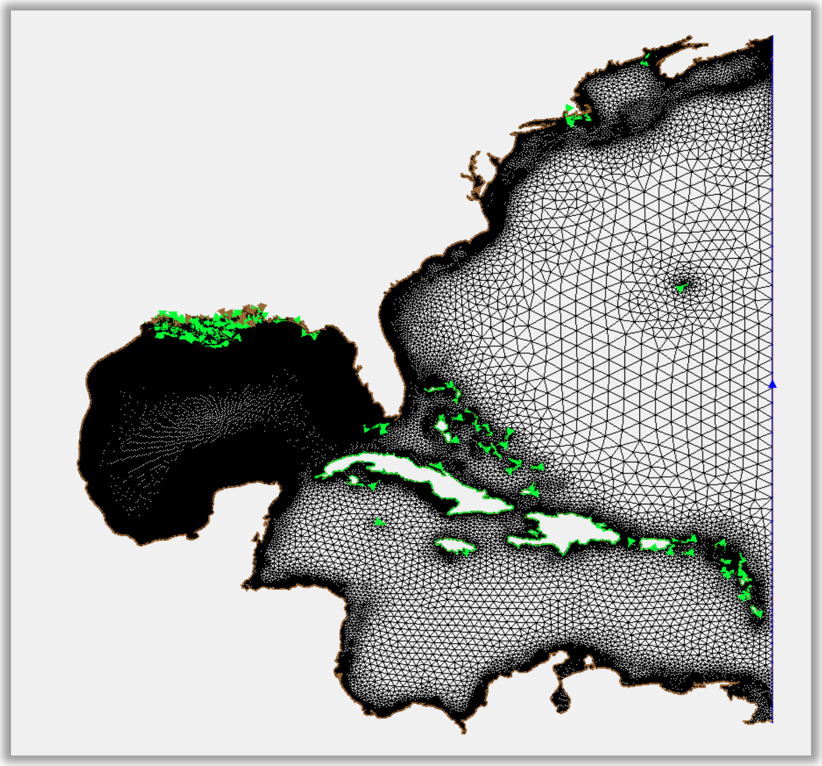


Figure 2-CPRA 2017 ADCIRC mesh

Matlab version R2017a was used to post process the ADCIRC data and run a water level statistics code produced by the U.S. Army Engineer Research and Development Center (ERDC).

2.1.1 With-and Without-Project Conditions

The existing conditions hydraulic modeling was completed using the 2017 Coastal Protection and Restoration Authority's (CPRA) 2017 Master Plan ADCIRC mesh. The mesh was developed to represent base conditions for the 2017 State Master Plan. The mesh is heavily validated and verified ADCIRC mesh which performs well for hindcasts of Katrina, Rita, Gustav, Ike, Isaac. More information concerning the mesh can be found online here:

http://coastal.la.gov/wp-content/uploads/2017/04/Attachment-C3-25.1_FINAL_04.05.2017.pdf

http://coastal.la.gov/our-plan/2012-coastal-masterplan/cmp-appendices/

Figure 3 displays the levee and other raised feature (roads, spoil banks, etc.) alignments in the MTG without coupled model mesh. The elevations of the raised features are based on ~2017 era surveys or lidar data, which is generally representative of 2020 conditions. Figure 4 displays the modified "With-Project" coupled model mesh. The MTG and Larose to Golden Meadow levee elevations were set to non-overtopping conditions.

Figure 3-Without-project levees and raised feature alignments

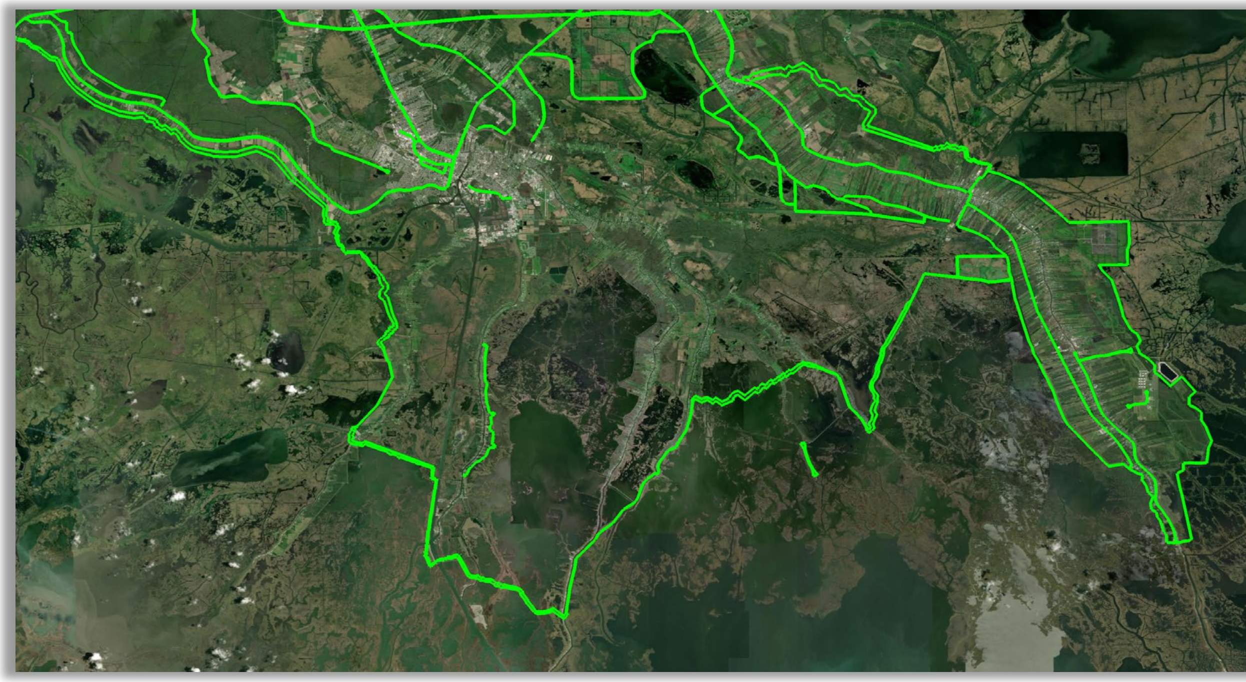


Figure 4- With-project levees and raised feature alignments

2.1.2 Synthetic Storms

Fifty-one (51) synthetic storms were selected with water level return intervals from 10 year to 500 year. The associated surge values were required for levee designs (100-year) and frequency curves for use in the HEC-FDA model (10- to 500- yr). The suite of storms was modeled for with-and without-project for existing and future conditions, which brings the total number of coupled ADCIRC SWAN model simulations to 204. The storms cover a range of hypothetical tracks and intensities as pictured in Figure 5 and Figure 6. Most of the storm tracks in the suite are west of overtop of the project area. These storms will likely show the largest surges along the exterior of the proposed levee but may not fully capture the flood inducements behind them which is outside of the scope of the project. Storms to the east of the project area could push water higher in the interior but will not contribute to increase stages on the exterior. For this analysis the storms on the west provided a more conservative estimate of the exterior stages required to develop levee design elevations and stages in the with project analysis. Additional storms from the full suite will be examined in PED.

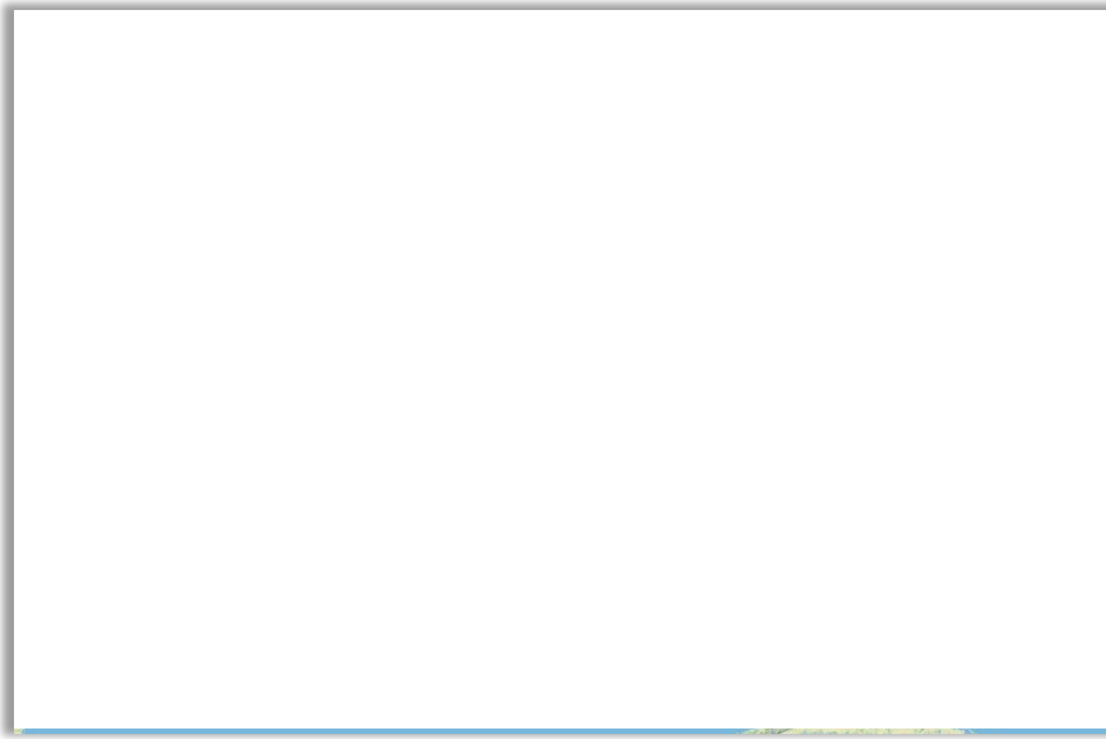


Figure 5-Synthetic storm tracks

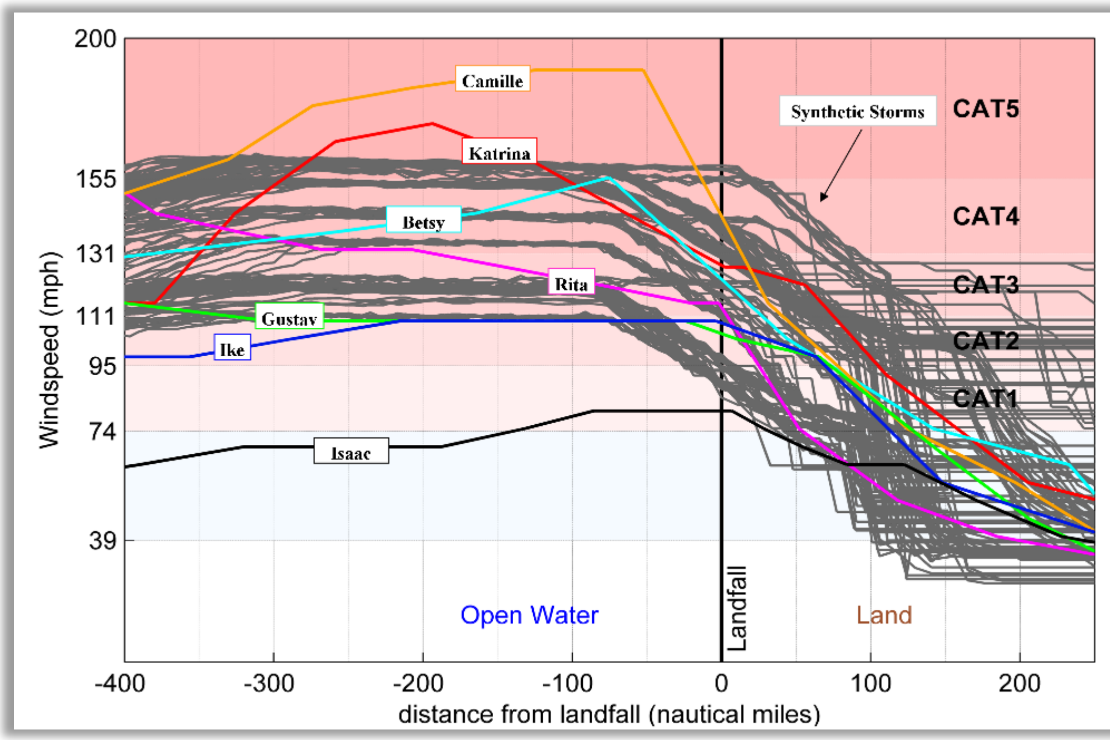


Figure 6-Synthetic and actual storm intensities

With-and Without-Project Results

The 51 synthetic storms were simulated with the couples ADCIRC +SWAN model for with-and without-project conditions. The coupled model computes maximum storm surge (water surface elevations, wave heights (Hs) and peak wave period (Ts) in the coupled model at node in the model mesh. Figure 7 displays the maximum water surface elevations for without-project conditions for synthetic storm 009. The simulation shows extreme flooding in the study area. Figure 8 displays the maximum water surface elevations for with-project conditions for synthetic storm 009. The simulation including the non-overtopping levee shows a vast reduction in flooding in the interior (protected side) and a significant increase in flooding on the exterior (flood side). Figure 9 displays the difference in maximum water surface elevations between with-and without-project. The difference plot shows the increase or stacking of water on the exterior is greater than 5ft for areas close to the levee, but tapers down further away from the levee. The return period of this storm surge in this area is roughly a 0.1% (1000-year).The difference plot for all synthetic storms shows similar patterns of exterior stacking and interior reductions of peak water surface elevations.

A regression analysis was performed to determine stage frequency for with-and without-project. Regression is needed to produce statistical results with a limited sub-suite of storms. It is computationally intensive to re-run the entire suite, so a sub-suite was used to perform a regression analysis. The maximum water surface results of all 51 synthetic storms for without-project are compared to with-project maximum water surfaces at all locations in the study area. The regression algorithm is completed at each node in the coupled model providing a continuous water level surface. The regression analysis allows prediction of the changes to the without-project stage-frequency due to the project based on results of all storms. Figure 10 displays the regression results at a location on the outside of the MTG levee. The regression analysis allows a generalized prediction of with-project stage frequency for both interior and exterior locations. Regression analysis includes extra error and uncertainty into the estimates. For this reason, all stage and wave frequency data should be reviewed and possibly recomputed during the Preconstruction Engineering and Design (PED) phase of the project. Figure 10 shows an increase of the with-project stage-frequency on the exterior due to the stacking of water that occurs on the levee exterior. The regression analysis uses a linear regression approach, providing a general trend of expected changes to stage-frequency. Figure 11 to 24 display the maximum storm surge for with-and without-project for the 10-, 20-, 50-, 100-, 200-, 500- and 1000-yr storm surge events for years 2020 and 2070. The bottom figure in each plot shows the maximum difference. Results of the ADCIRC model were used to develop levee and hydraulic structure design elevations and stage frequency curves. Stillwater elevations for year 2085 were linearly extrapolated from the nonlinear 2070 values derived from the ADCIRC model; stillwater elevations for the base year 2035 were interpolated from the results of the 2020 and 2070 model results. Stillwater values for returns lower than the 10-year were also extrapolated; values for the 25-year were interpolated as required for the HEC-FDA model stage frequency curves. Reference Sections 2.2 and 2.3 for more information on levee and hydraulic structure design elevation methodology and frequency curve development.

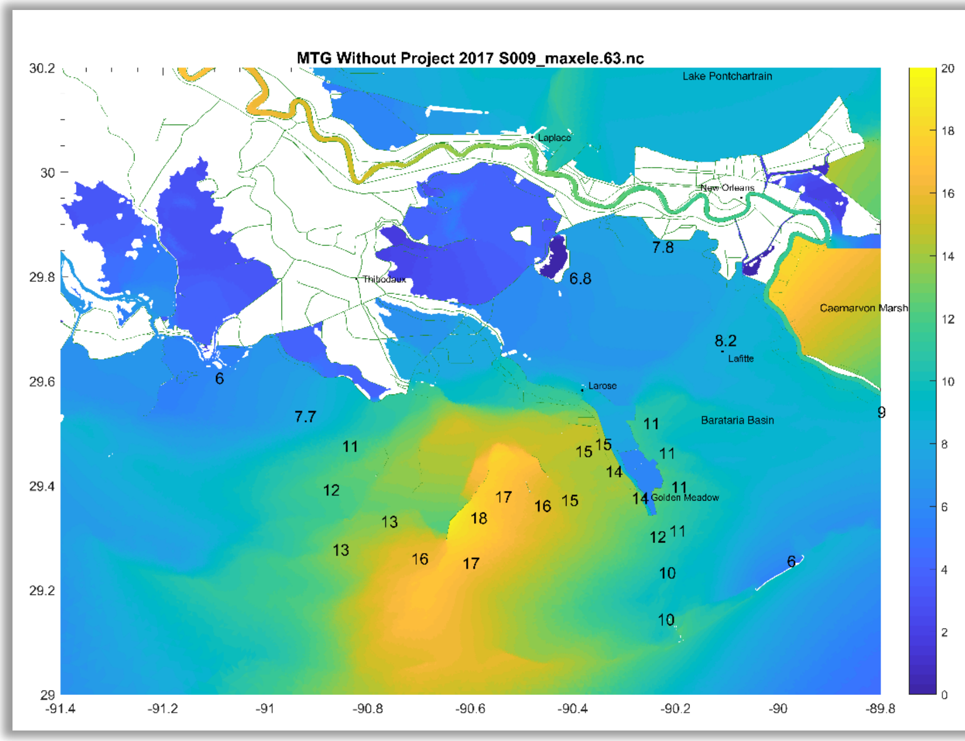


Figure 7-Without-project maximum water surface elevation synthetic storm 009

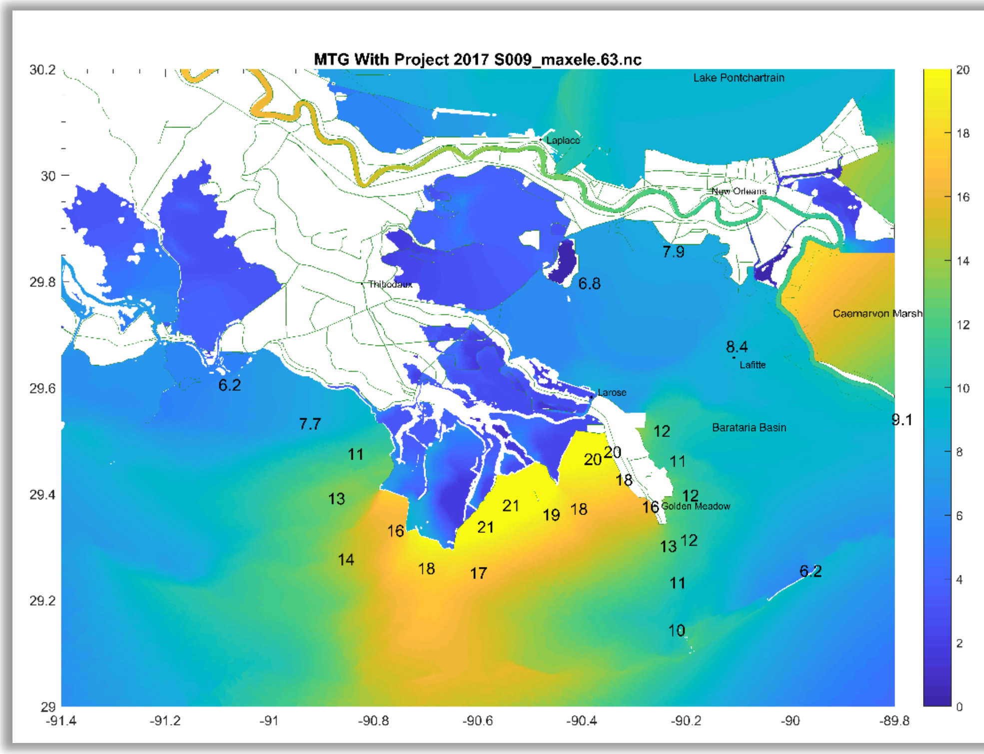


Figure 8-With-project maximum water surface elevation synthetic storm 009

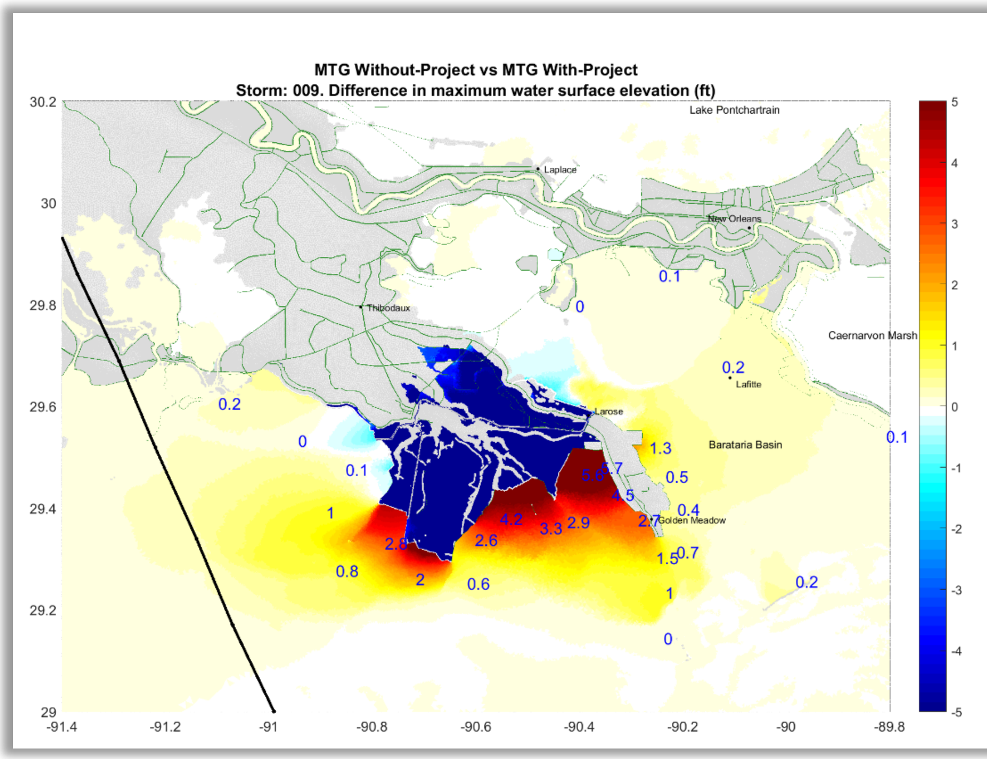


Figure 9-Difference in maximum water surface elevation for synthetic storm 009

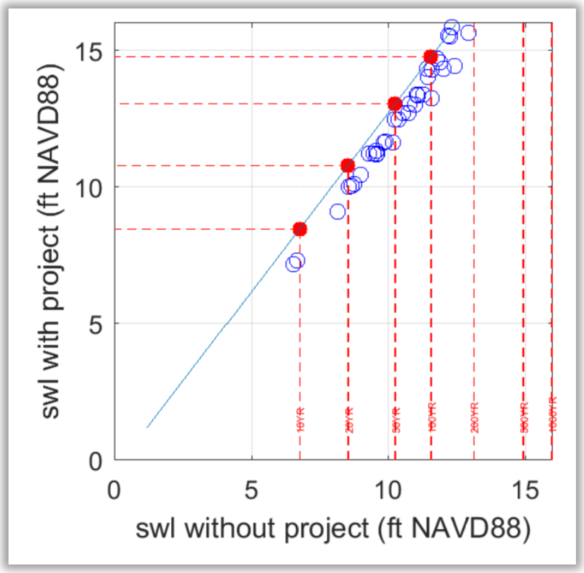


Figure 10 - Regression plot at a location outside of the MTG levee (NAVD88 epoch 2004.65)

2.1.4. Assumptions and Limitations

- Interior water level statistics were computed with the latest joint probability method-optimum sampling (JPM-OS) code from ERDC. The code was applied as-is with no modification or verification.
- The without-project interior stage frequency data does not include the effects of rainfall, wave overtopping, pumping, or levee breaching.
- The coupled ADCIRC + SWAN modeling includes a smaller subset of 51 synthetic storms. **During the PED phase design elevations should be reviewed and based on a more thorough analysis.**
- The statistical results are based on regression analysis, which introduces some uncertainty into the modeling. The data was examined for residual errors to minimize uncertainty within the model results. Lowliers and highliers were removed from the results.

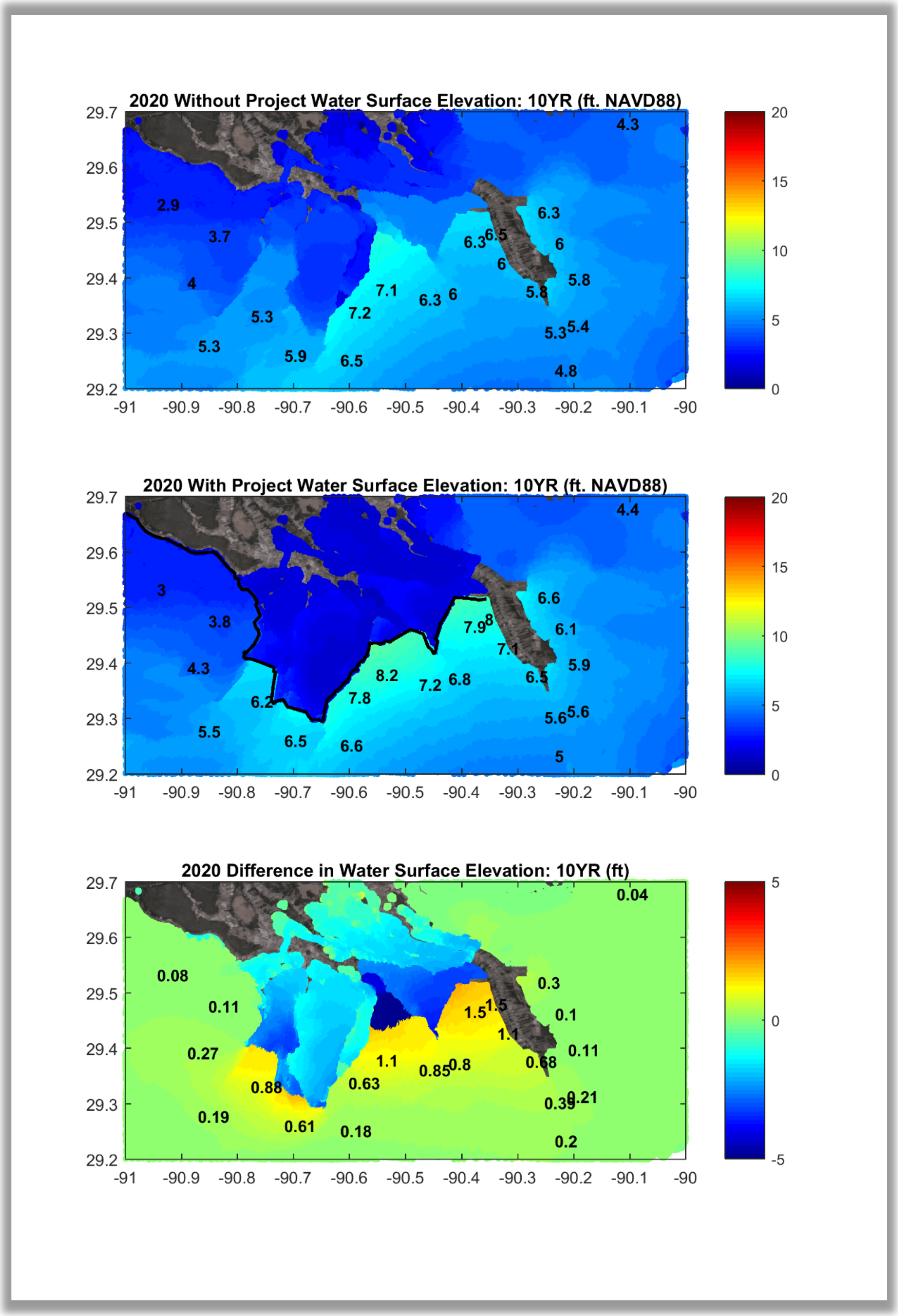


Figure 11-2020 with-and without-project maximum 10-year stillwater elevations and maximum difference between with-and without-project

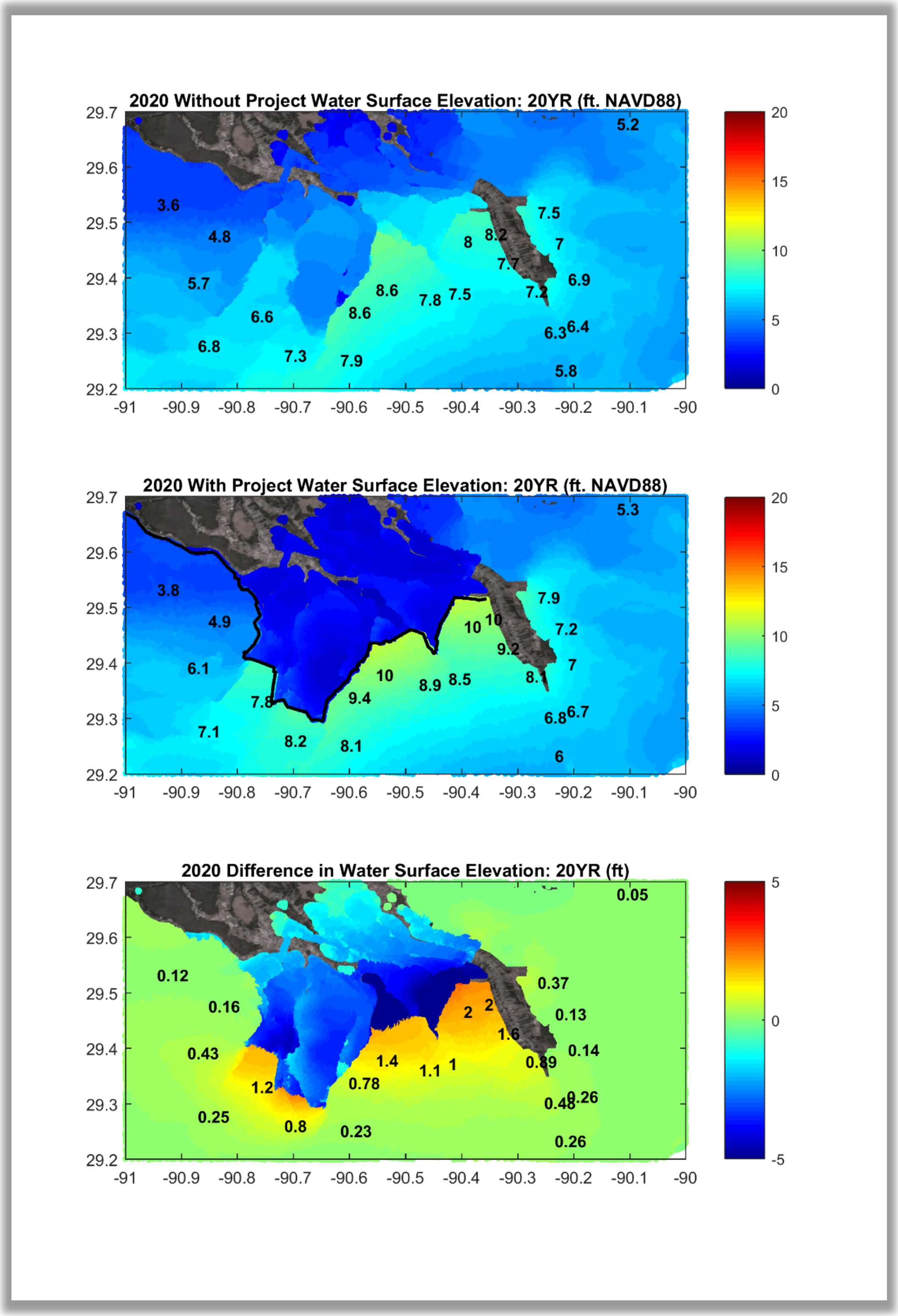


Figure 12-2020 with-and without-project maximum 20-year stillwater elevations and maximum difference between with-and without-project

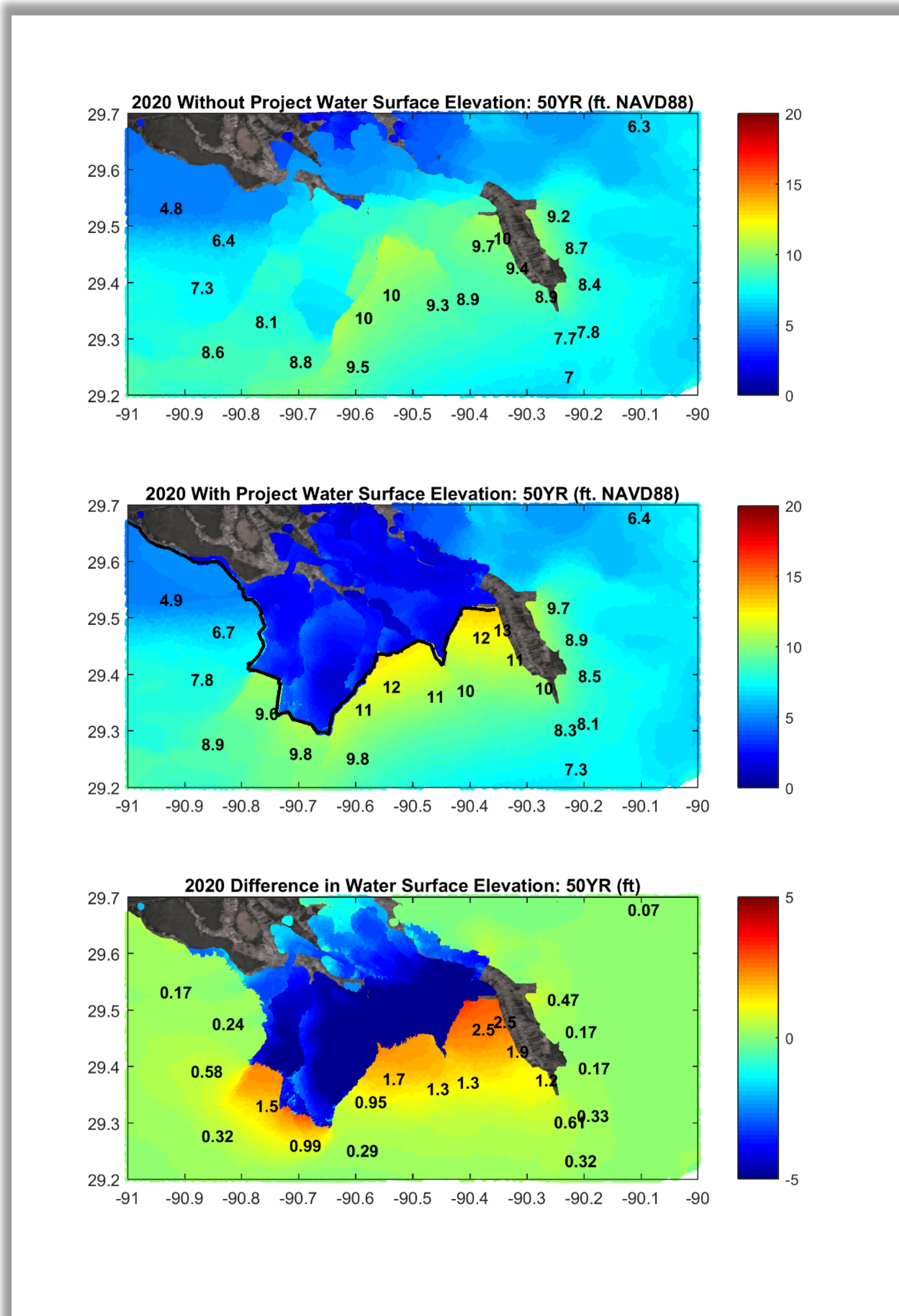


Figure 13-2020 with-and without-project maximum 50-year stillwater elevations and maximum difference between with-and without-project

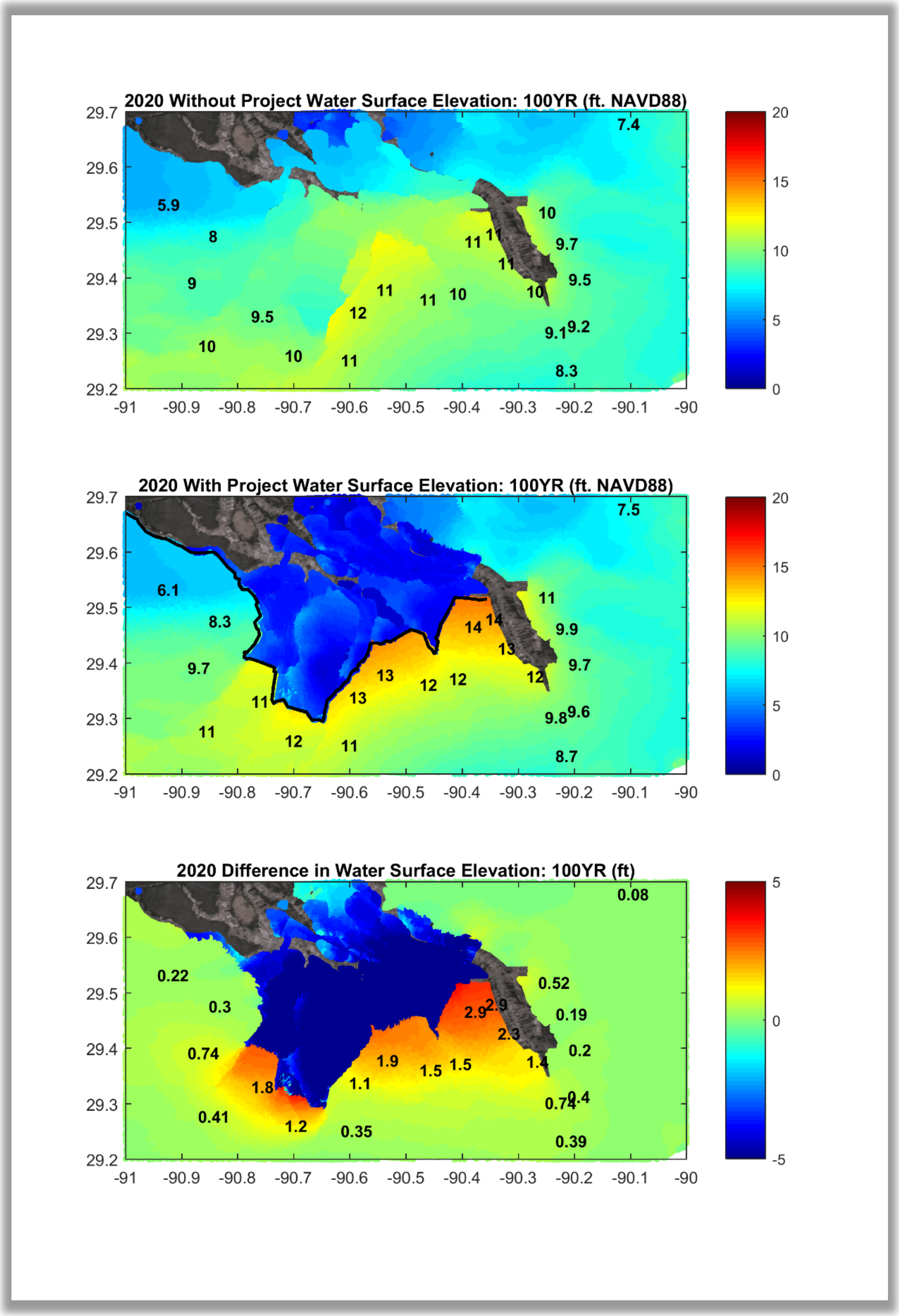


Figure 14-2020 with-and without-project maximum 100-year stillwater elevations and maximum difference between with-and without-project

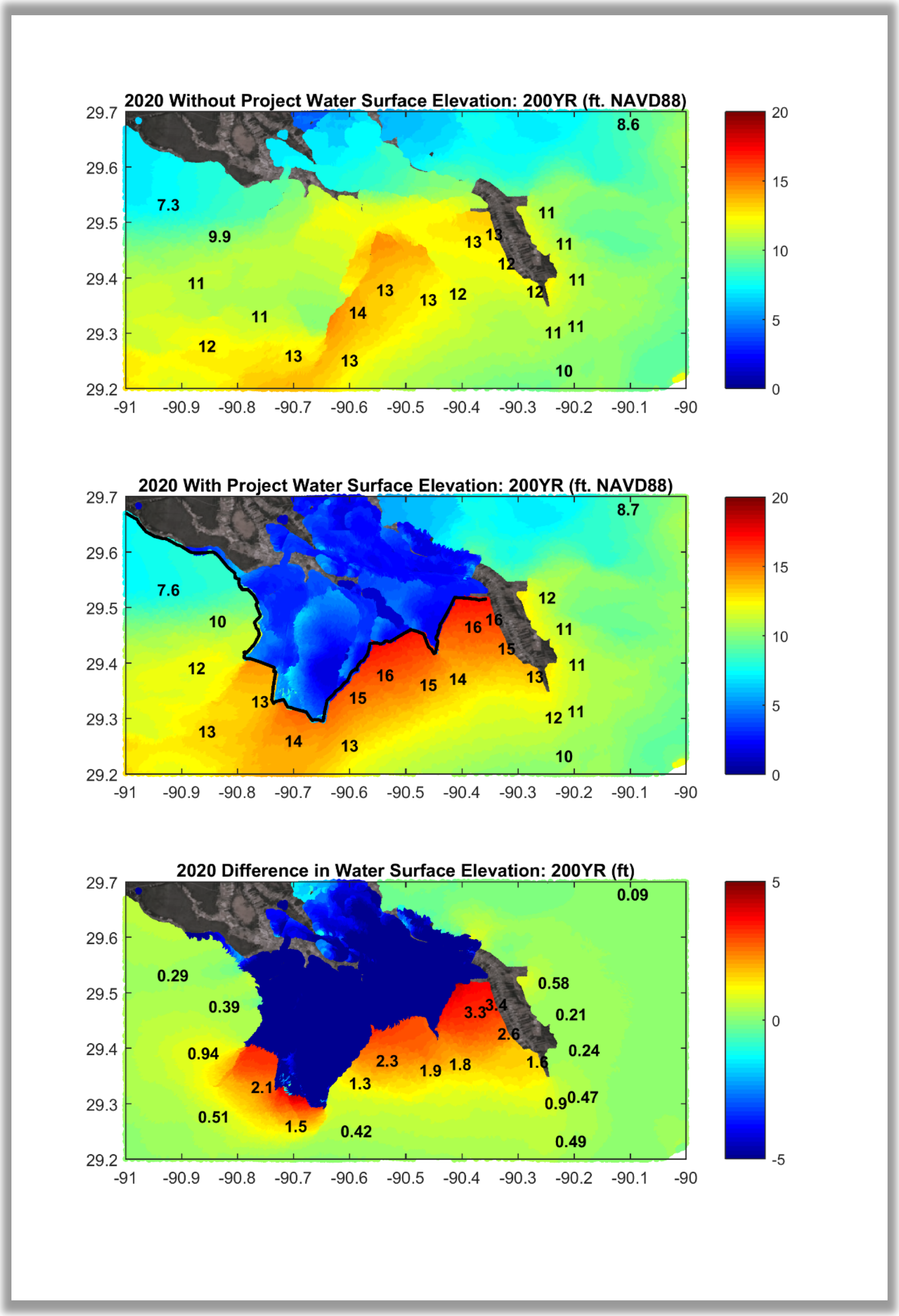


Figure 15-2020 with-and without-project maximum 200-year stillwater elevations and maximum difference between with-and without-project

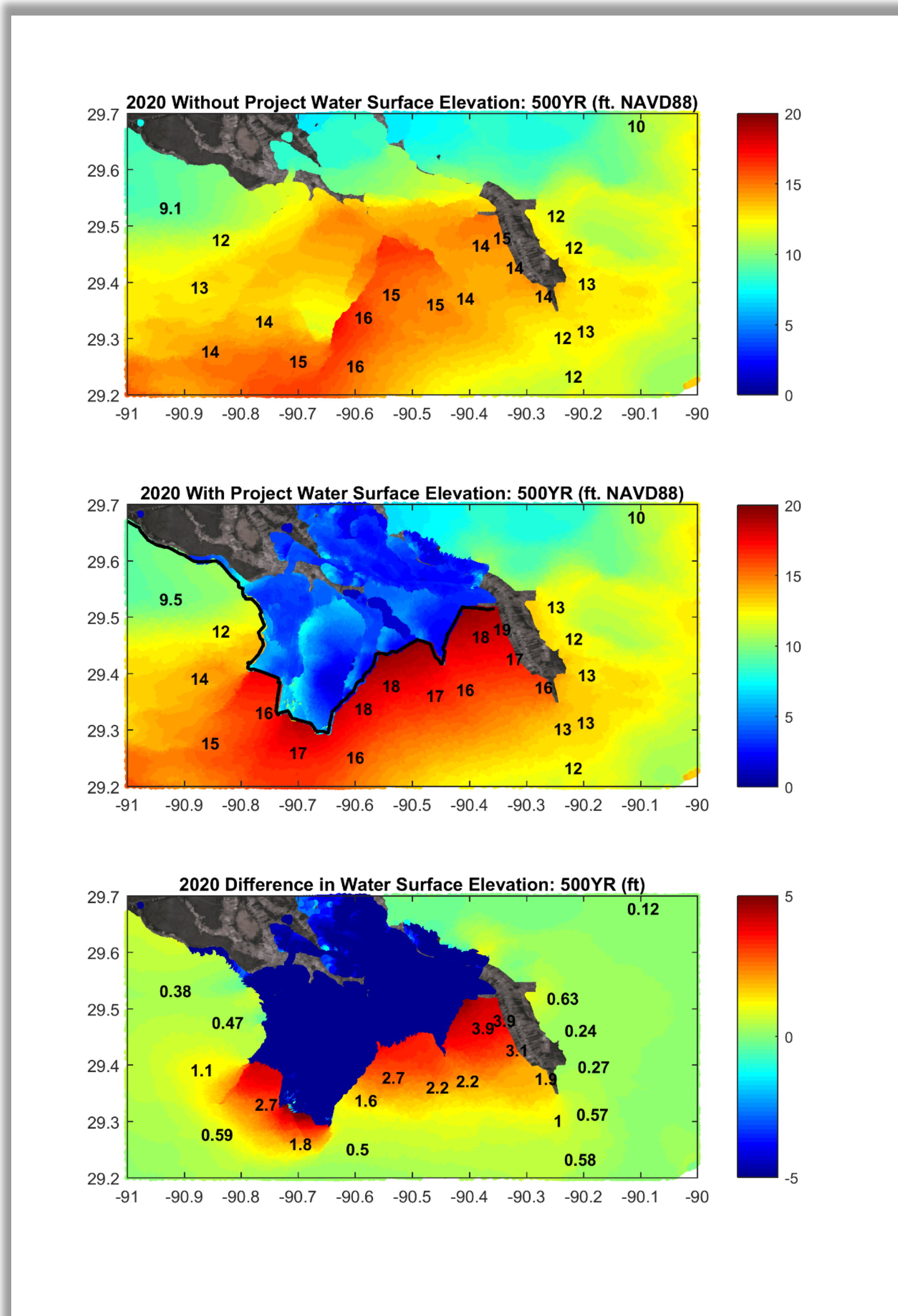


Figure 16-2020 with-and without-project maximum 500-year stillwater elevations and maximum difference between with-and without-project

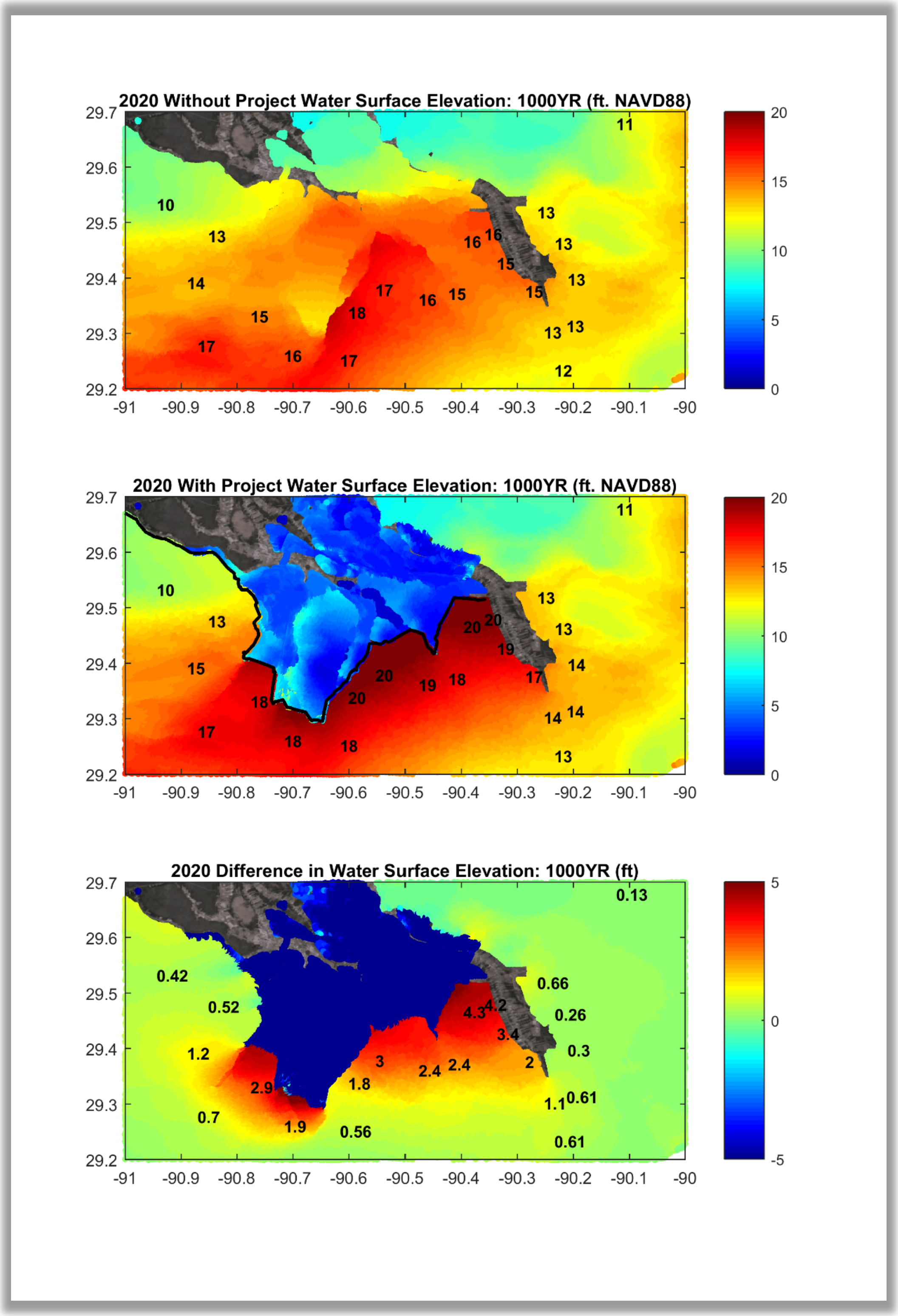


Figure 17-2020 with-and without-project maximum 1000-year stillwater elevations and maximum difference between with-and without-project

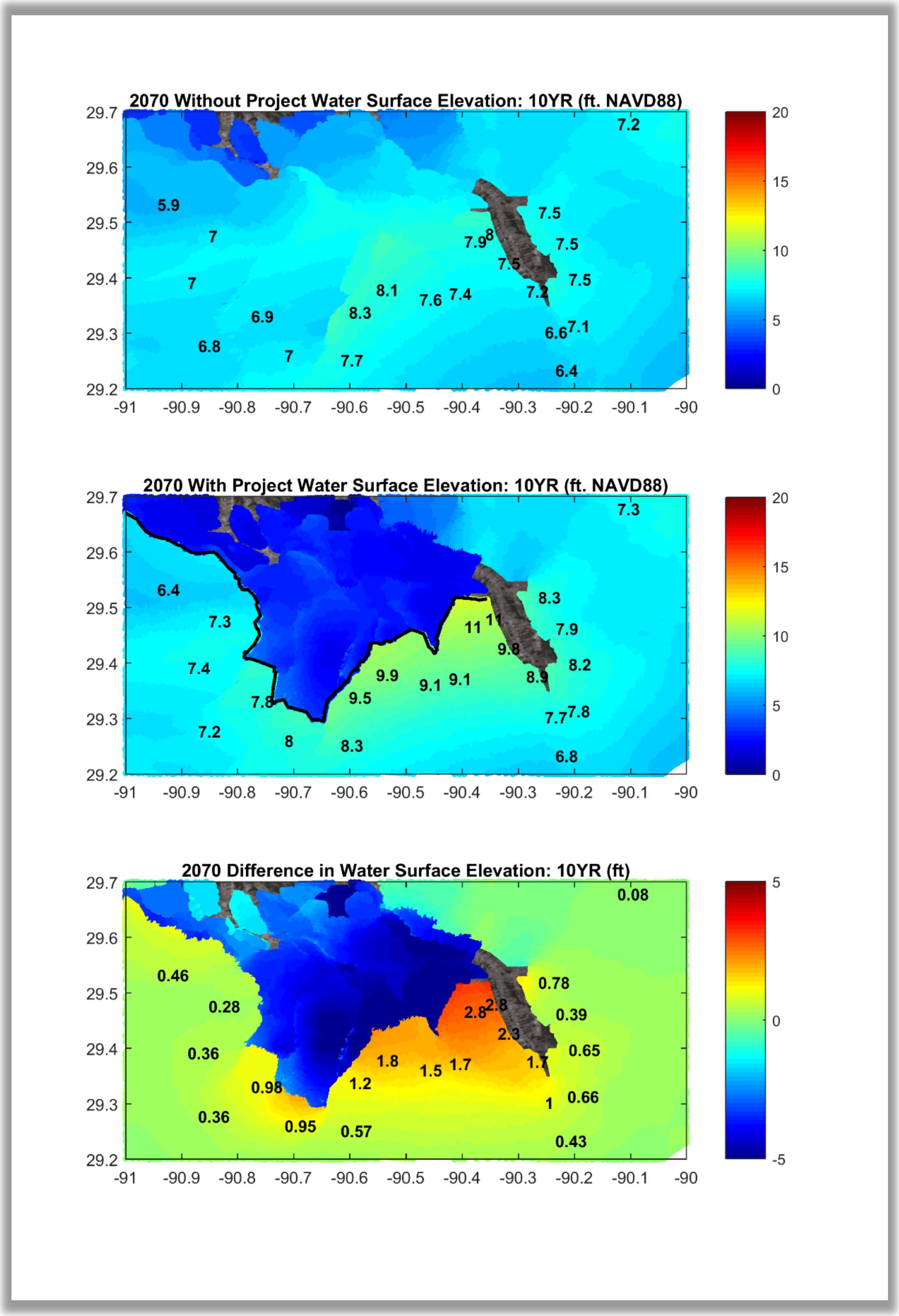


Figure 18-2070 with-and without-project maximum 10-year stillwater elevations and maximum difference between with-and without-project

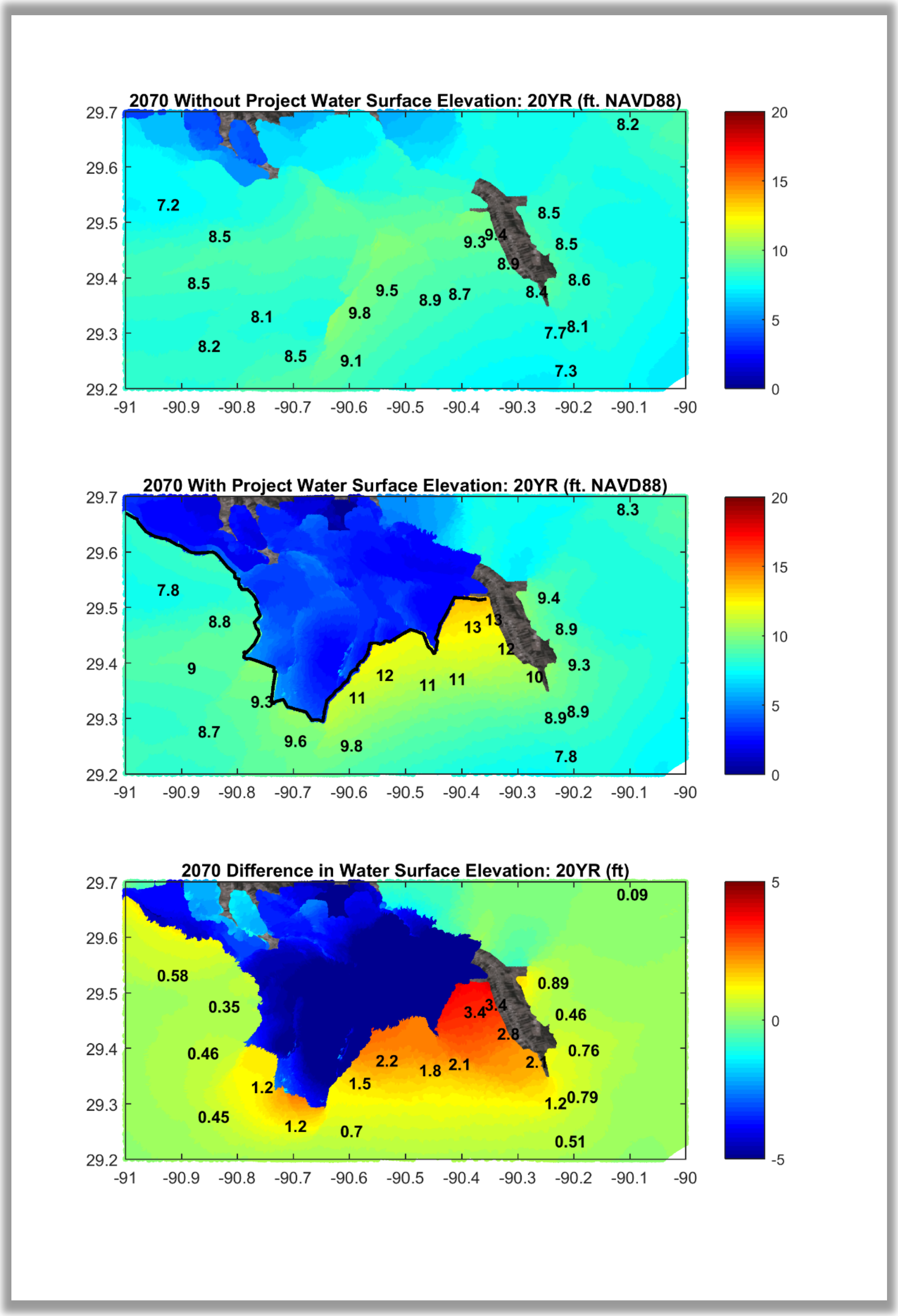


Figure 19-2070 with-and without-project maximum 20-year stillwater elevations and maximum difference between with-and without-project

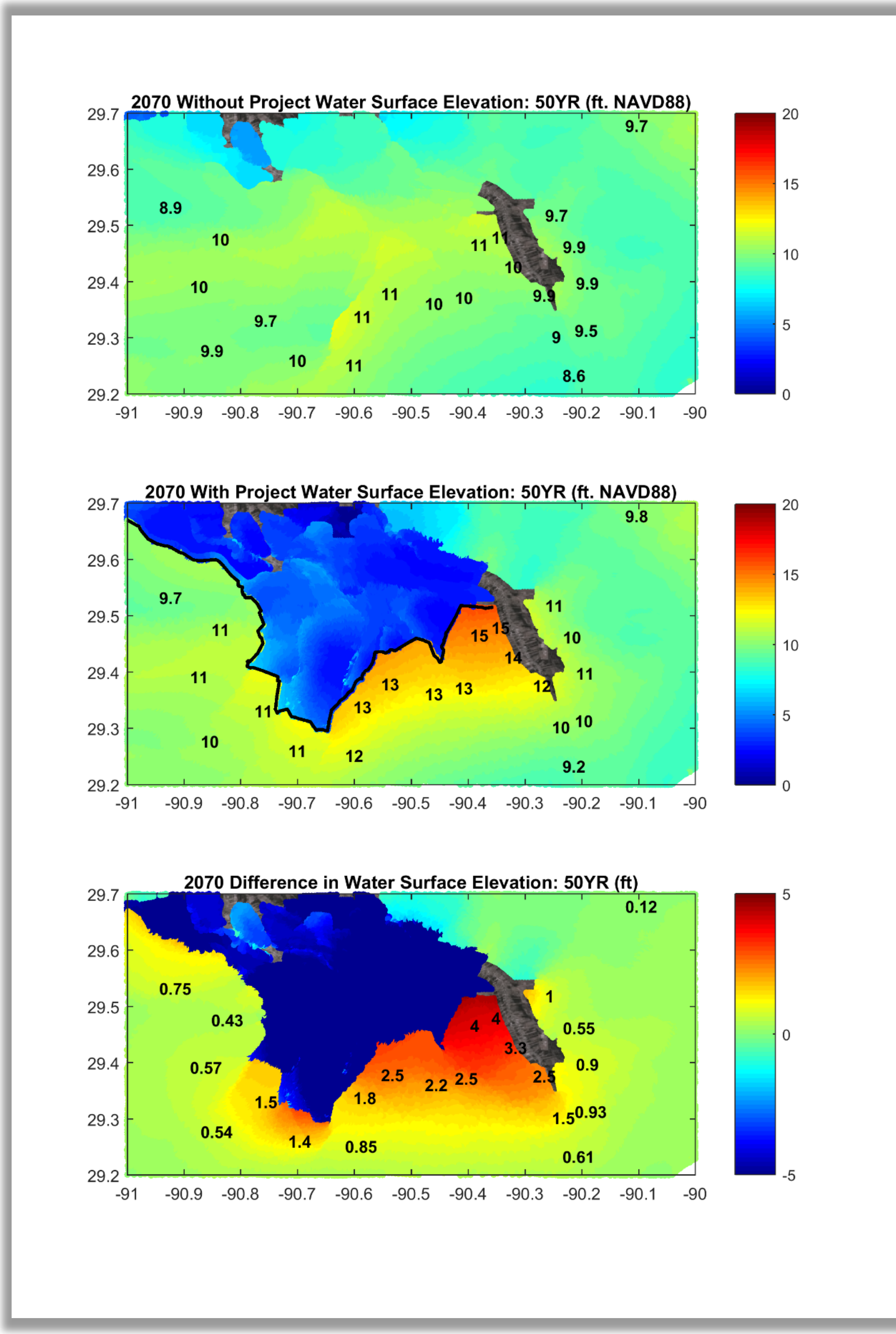


Figure 20-2070 with-and without-project maximum 50-year stillwater elevations and maximum difference between with-and without-project

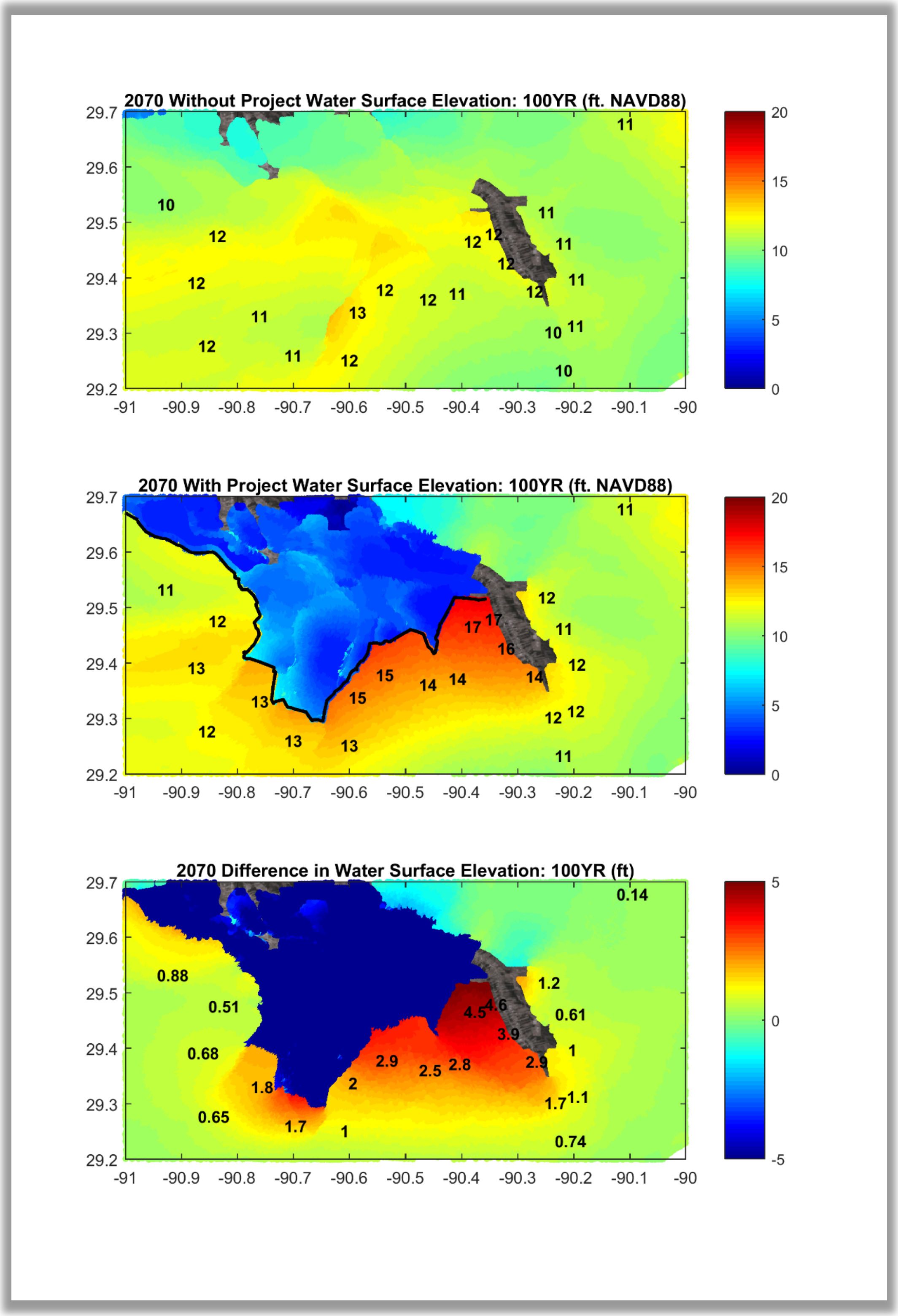


Figure 21-2070 with-and without-project maximum 100-year stillwater elevations and maximum difference between with-and without-project

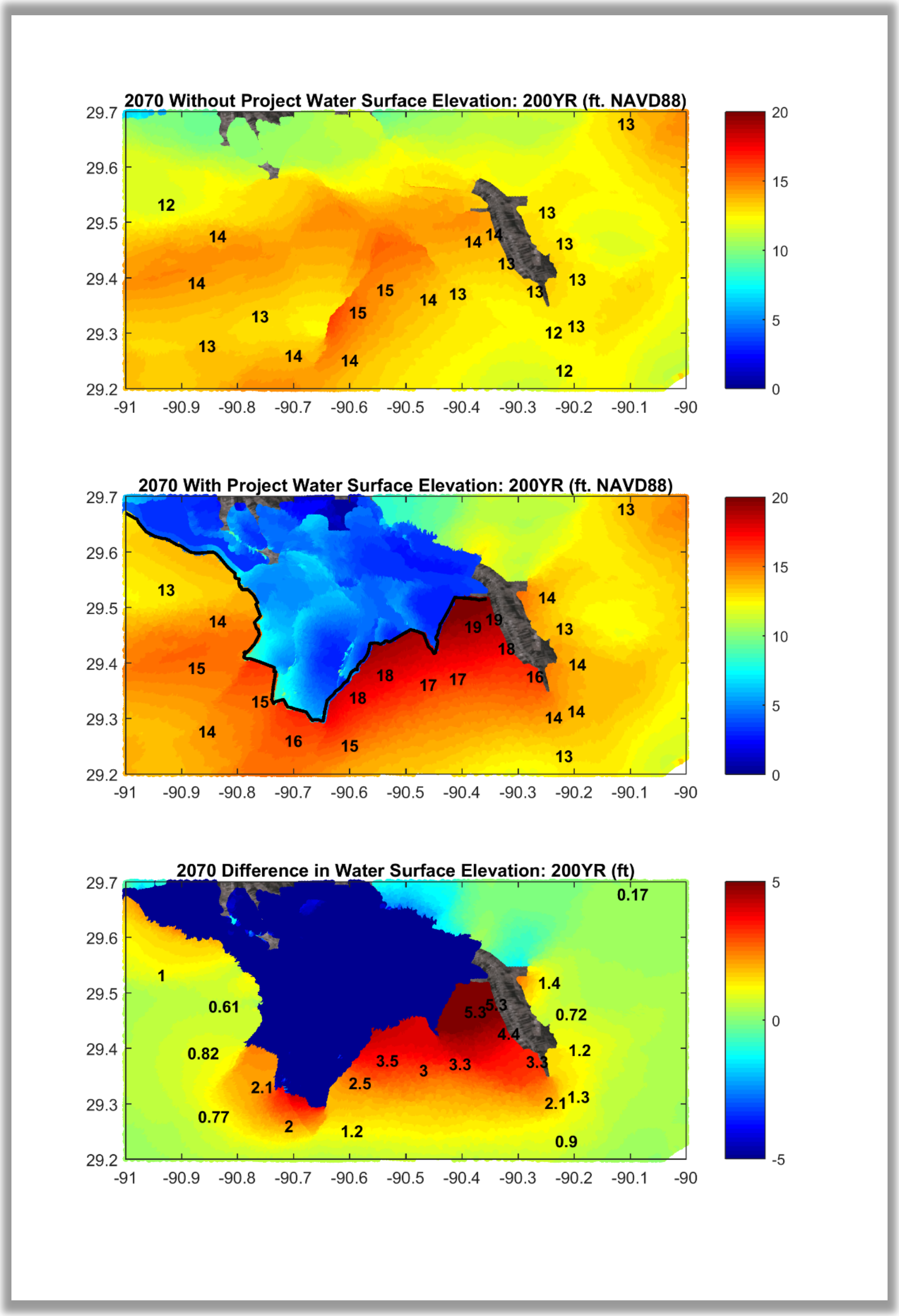


Figure 22-2070 with-and without-project maximum 200-year stillwater elevations and maximum difference between with-and without-project

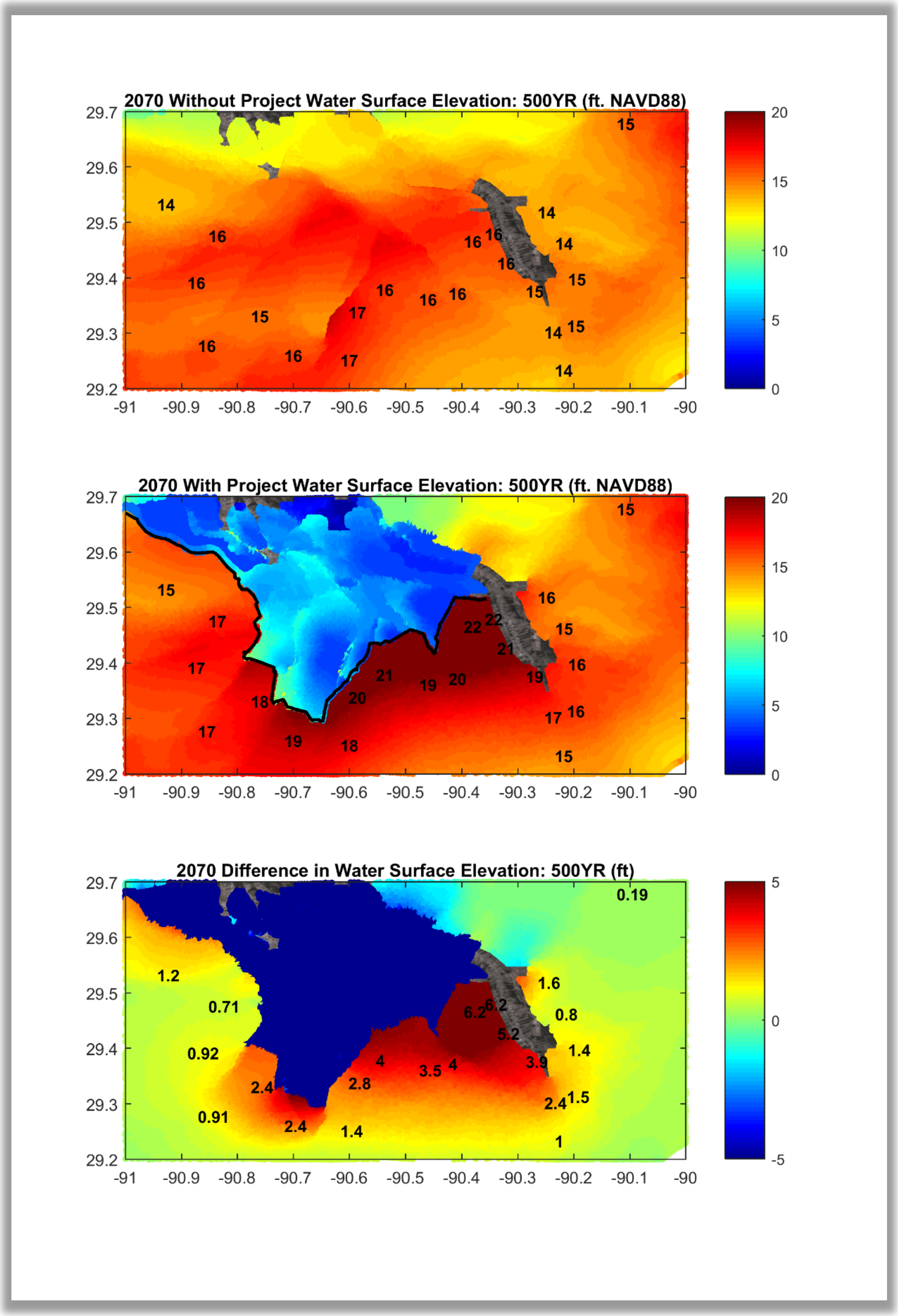


Figure 23-2070 with-and without-project maximum 500-year stillwater elevations and maximum difference between with-and without-project

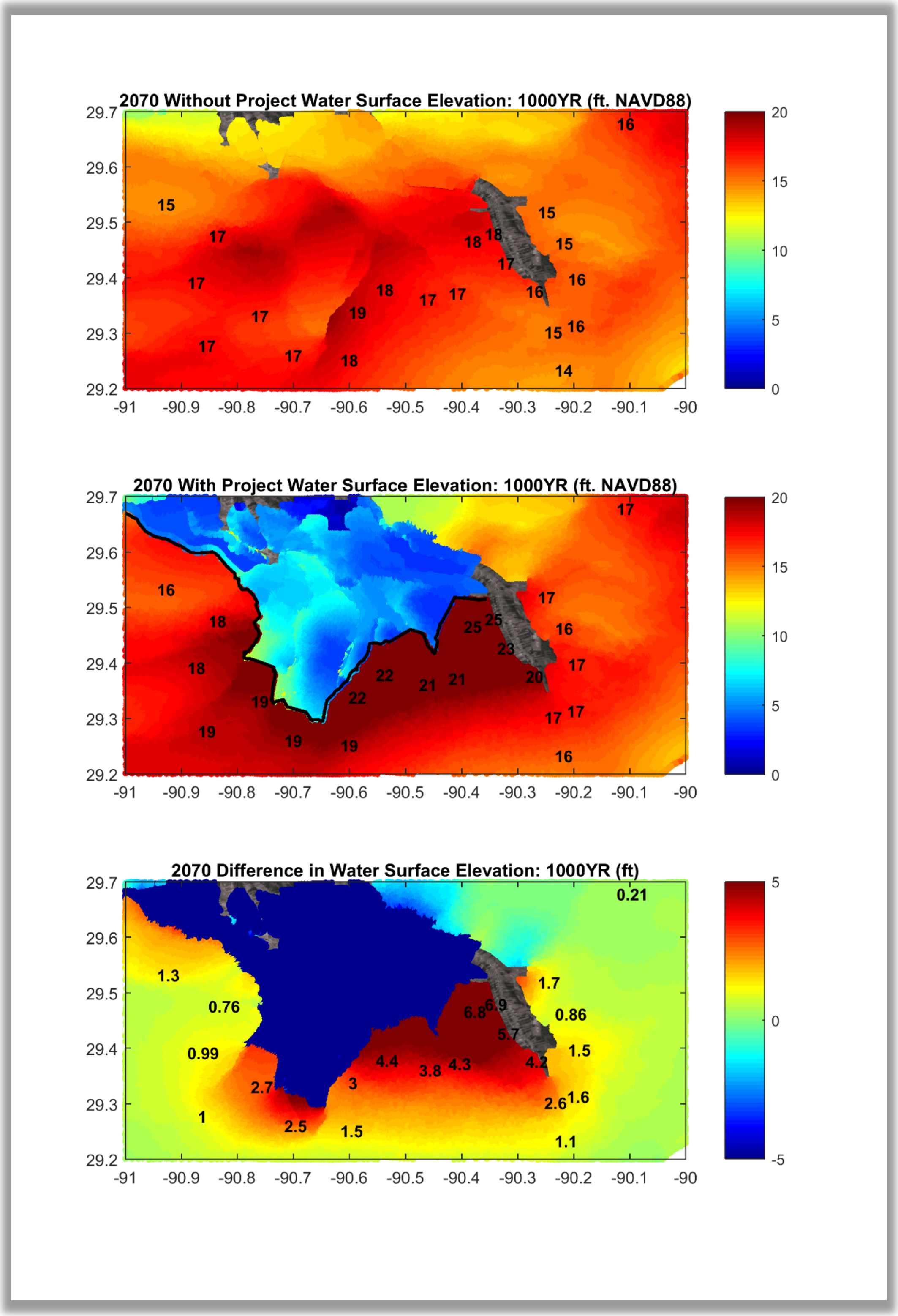


Figure 24-2070 with-and without-project maximum 1000-year stillwater elevations and maximum difference between with-and without-project

2.2 Federal Levee and Structure Design Elevations Methodology

The federal levees and structure elevations were designed for the 1% (100-yr) return period for the Morganza to the Gulf alignment. Design elevations were computed using results from the coupled model for each hydraulic reach (also referred to as a levee construction reach). Figure 1 shows the proposed MTG federal levee alignment and levee reach names.

The hydraulic boundary conditions for each hydraulic reach for the 1% return period for years 2035 and 2085 were obtained from the couples model results presented in Section 2.1 and tabulated in Tables 1 and 2 below where SWE is the stillwater elevation in feet NAVD88(2004.65), Hs is the significant wave height in feet, and Tp is the peak period in seconds.

Design elevations for the future condition scenario are considered to reflect conditions that are likely to exist in the year 2085 due to sea level rise and subsidence. Estimated changes in stillwater elevations in the future year, 2085, are calculated based on 50 years of intermediate relative sea level rise that will occur from the base year, 2035. An intermediate sea level rise rate of 2.42 feet was adopted from the PACR for the analysis.

2035 MTG 1% Existing Conditions Wave and Surge Parameters									
Hydraulic Reach	SWE (ft)	Std. Dev.	Hs (ft)	Tp (s)	Hydraulic Reach	SWE (ft)	Std. Dev.	Hs (ft)	Tp (s)
A-North of GIWW	8.0	1.2	2.1	2.8	I1	14.0	1.4	6.2	5.4
A-South of GIWW	9.0	1.0	2.2	2.6	I2	14.3	1.4	6.9	5.7
B	10.3	1.0	3.8	3.7	I3	14.7	1.4	5.6	5.2
E2	12.6	1.2	5.8	4.8	J2	14.6	1.4	7.0	5.6
E1	12.5	1.2	5.5	4.6	J1	14.7	1.4	6.2	5.4
F2	12.2	1.2	4.5	4.1	K	14.6	1.4	5.9	5.1
F1	12.0	1.2	4.3	3.8	J3	14.2	1.5	5.9	5.2
G1	13.1	1.1	4.9	4.2	L	15.6	1.5	5.0	4.6
G2	13.0	1.1	5.4	4.7	C-North	6.6	1.5	0.8	2.0
G3	12.9	1.1	5.9	4.9	GIWW	6.9	1.2	1.2	2.1
H2	13.5	1.1	5.4	4.8	Lockport-A	7.4	1.2	1.9	2.8
H3	13.8	1.2	6.8	5.3	Lockport-B	5.8	1.2	1.7	2.0
H1	12.5	1.4	4.8	4.3	Barrier	8.2	1.2	2.4	2.8

Table 1 - 1% 2035 hydraulic boundary conditions

2085 MTG 1% Future Conditions Wave and Surge Parameters									
Hydraulic Reach	SWE (ft)	Std. Dev.	Hs (ft)	Tp (s)	Hydraulic Reach	SWE (ft)	Std. Dev.	Hs (ft)	Tp (s)
A-North of GIWW	13.3	1.4	3.0	3.9	I1	16.0	1.6	7.7	6.2
A-South of GIWW	13.3	1.2	3.7	3.5	I2	16.2	1.6	8.3	6.4
B	13.9	1.2	5.6	4.6	I3	16.5	1.6	7.1	6.2
E2	14.5	1.4	7.0	5.2	J2	16.4	1.6	8.3	6.3
E1	14.3	1.4	6.5	5.1	J1	16.4	1.6	7.4	6.0
F2	14.0	1.4	5.7	4.7	K	17.4	1.6	7.9	6.3
F1	13.7	1.4	5.4	4.4	J3	16.0	1.7	7.1	5.9
G1	14.6	1.3	5.9	4.7	L	18.2	1.7	6.0	5.6
G2	14.7	1.3	6.4	5.0	C-North	13.5	1.7	2.2	4.0
G3	14.5	1.3	6.8	5.1	GIWW	12.9	1.4	2.6	3.5
H2	15.6	1.3	6.8	5.6	Lockport -A	10.3	1.4	2.1	3.3
H3	15.8	1.4	8.3	6.0	Lockport -B	8.5	1.4	2.0	2.7
H1	14.2	1.6	5.9	5.0	Barrier	13.9	1.4	3.5	3.8

Table 2 - 1% 2085 hydraulic boundary conditions

Design criteria for the levee and structure elevations also consider wave overtopping limits. Guidelines for establishing the overtopping rate threshold (i.e., the threshold associated with the onset of levee erosion and damage) for different types of embankments can be found in Engineering Manual (EM) 1110-2-1100 (Part VI), Table VI-5-6. These threshold values are consistent with those that are adopted in the EurOtop 2018 Manual on wave overtopping of sea defenses and related structures. The EurOtop manual has overtopping guidance largely based on European research, but for worldwide application. Van der Meer, J.W., Allsop, N.W.H., Bruce, T., De Rouck, J., Kortenhaus, A., Pullen, T., Schüttrumpf, H., Troch, P. and Zanuttigh, B., www.overtopping-manual.com. (December 2018). The following wave overtopping rates have been established for the Morganza to the Gulf hurricane protection system:

- For the design water surface elevation, wave height and wave period, the maximum allowable average wave overtopping

  of 0.5 cubic feet per second per foot (cfs/ft) at 90% level of assurance for grass covered levees.
- For the design water surface elevation, wave height and wave period, the maximum allowable average wave overtopping of 0.5 cfs/ft at 90% level of assurance for floodwalls with appropriate protection on the back side.

The application of a Monte Carlo analysis is then used to determine the overtopping rate with a Matlab script for overtopping. The probabilistic overtopping formulations from EurOtop are applied for the levees. Besides the geometric parameters (levee height and slope), hydraulic input parameters for determination of the overtopping rate in Equation 1 and 2 are the water elevation (ζ), the spectral wave height (Hm0) and the spectral wave period (Tm). Reference the figure below for equation 1. The EurOtop overtopping formula is shown below.

The general formula for the average overtopping discharge on a slope (dike, levee, and embankment) are given by the mean value approach in equation 1:

$$\frac{q}{\sqrt{g \cdot H_{m0}^3}} = \frac{0.023}{\sqrt{\tan\alpha}} \gamma_b \cdot \xi_{m-1,0} \cdot \exp[-(2.7 \frac{R_c}{\xi_{m-1,0} \cdot H_{m0} \cdot \gamma_b \cdot \gamma_f \cdot \gamma_\beta \cdot \gamma_v})^{1.3}]$$

with a maximum of

$$\frac{q}{\sqrt{g \cdot H_{m0}^3}} = 0.09 \cdot \exp[-(1.5 \frac{R_c}{H_{m0} \cdot \gamma_f \cdot \gamma_\beta \cdot \gamma *})^{1.3}]$$

Equation 1

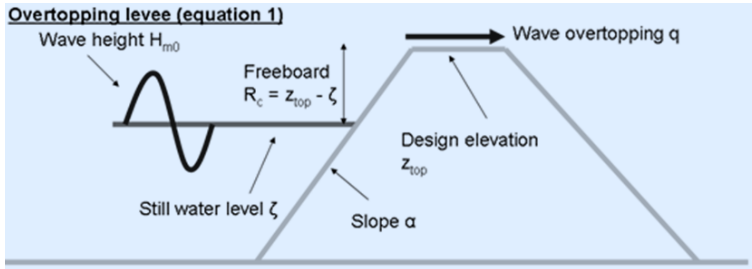
The mean value approach for the vertical wall is given by equation 2:

$$\frac{q}{\sqrt{g \cdot H_{m0}^3}} = 0.047 \cdot \exp[-(2.35 \frac{R_c}{H_{m0} \cdot \gamma_f \cdot \gamma_\beta})^{1.3}]$$

Equation 2

with:
q : average overtopping rate [cfs/ft],
g : gravitational acceleration [ft/s2],
Hm0 : wave height at toe of the structure [ft],
ξm-1,0: breaker parameter [-],
α : slope [-],
Rc : freeboard [ft],
γ : coefficient for presence of berm (b), friction (f), wave incidence (β), vertical wall (v),

Equations 1 and 2 show quite a number of influence factors: γb is the influence factor for a berm [-], γf is the influence factor for roughness elements on a slope [-], γβ is the influence factor for oblique wave attack [-] and γv is the influence factor for a wall at the end of a slope. Compared to EurOtop (2007), an influence factor γ* [-] has been added for non-breaking waves (relatively steep slopes) for a storm wall on a slope or promenade. ξm-1,0, the breaker parameter, or surf similarity parameter, relates the slope steepness tan α to the wave steepness sm-1,0 and is often used to distinguish different breaker types. For relatively gentle slopes, the breaker parameter is generally smaller than ξm-1,0= 4. In case larger values are found for slopes of 1:2.5 or gentler, this can only be due to very small wave steepness, probably caused by severe wave breaking on a very shallow foreshore. Steep slopes of 1:2 up to vertical walls, give less wave run-up and wave overtopping. Wave steepness is defined as the ratio of wave height to wavelength (e.g. s0 = Hm0/L0). The breaker parameter, surf similarity or Iribarren number is defined as ξm-1,0 = tanα/(Hm0/Lm-1,0)½, where α is the slope of the front face of the structure and Lm-1,0 being the deep water wave length gT2 m-1,0/(2π).



Overtopping levee (Equation 1)

The Monte Carlo Analysis is executed as follows:

1. Draw a random number between 0 and 1 to set the exceedance probability (p).
2. Compute the water elevation from a normal distribution using the mean 1% surge elevation and standard deviation as parameters and with an exceedance probability (p).
3. Draw a random number between 0 and 1 to set the exceedance probability (p).
4. Compute the wave height and wave period from a normal distribution using the mean 1% wave height/wave period and associated standard deviation and with an exceedance probability (p).
5. Repeat steps 3 and 4 for the three overtopping coefficients independently.
6. Compute the overtopping rate for these hydraulic parameters and overtopping coefficients determined in steps 2, 4 and 5 using the EurOtop overtopping formulations for levees and floodwalls as referenced in equations 1 and 2).
7. Repeat steps 1 through 5 many times (N).
8. Compute the 50% and 90% confidence limit of the overtopping rate. (i.e. q50 and q90).

The resulting levee design elevations, produced using the Hurricane Storm Damage Risk Reduction System (HSDRRS) guidelines for earthen levees without-wave berms, and an overtopping rate threshold of q90 = 0.5 cfs/ft for levees with a 1V:6H slope for the base and future year are contained in Tables 3 and 4 below. Elevations are referenced to NAVD88(2004.65).

2035 MTG 1% Base Year Design Elevations			
Hydraulic Reach	Levee Elevation (ft)	Hydraulic Reach	Levee Elevation (ft))
A-North of GIWW	12.0	I1	20.0
A-South of GIWW	13.5	I2	21.0
B	15.0	I3	20.0
E2	18.0	J2	21.5
E1	18.0	J1	20.5
F2	17.5	K	20.5
F1	17.0	J3	20.0
G1	19.0	L	20.5
G2	19.0	C-North	14.0
G3	19.0	GIWW	13.0

H2	19.0	Lockport -A	10.0
H3	20.0	Lockport-B	8.5
H1	18.5	Barrier	12.0

Table 3 - % 2035 hydraulic levee design elevations (0.5cfs/ft overtopping)

2085 MTG 1% Future Year Design Elevations			
Hydraulic Reach	Levee Elevation (ft)	Hydraulic Reach	Levee Elevation (ft))
A-North of GIWW	17.0	I1	24.0
A-South of GIWW	18.0	I2	25.0
B	18.5	I3	24.5
E2	21.0	J2	25.0
E1	20.0	J1	24.0
F2	19.0	K	26.0
F1	18.5	J3	23.5
G1	20.0	L	24.5
G2	20.5	C-North	16.5
G3	20.5	GIWW	16.0
H2	22.0	Lockport -A	14.0
H3	24.0	Lockport-B	12.0
H1	20.0	Barrier	18.0

Table 4 -1% 2085 hydraulic levee design elevations (0.5cfs/ft overtopping)

The design elevations in Tables 3 and 4 vary by levee reach because of surge and wave differences due to storm path, wind speeds and direction, etc. Hydraulic structure design elevations are the same as the levee elevations when considering elevations for structures. If structures are in the middle of a hydraulic reach with varying heights, the higher elevation of the two reaches should be used to determine the required structure height to satisfy hydraulic design requirements.

2.3 Interior and Exterior Stillwater Frequency Curves

Storm surge stillwater frequency curves for the interior and exterior were derived using the results of the coupled ADCIRC + SWAN model for each economic reach within the study area for use in computing a benefit cost ratio in the HEC-FDA model. The stage frequency curves include eight annual chance exceedance (ACE) events: 99% (1-year), 20% (5-year), 10% (10-year), 4% (25-year), 2% (50-year), 1% (100-year), 0.5% (200-year), and 0.2% (500-year) as shown in tables 5 through 16. Elevations are referenced to NAVD88(2004.65).

Interior stage frequency curves were developed for without-project conditions for the base year 2035 and future year 2085 for each of the 266 economic reaches within the study area as shown in Figure 25. Using the ADCIRC + SWAN output values stillwater elevations for year 2085 were linearly extrapolated from the 2070 values; stillwater elevations for the base year 2035 were interpolated from the results of the 2020 and 2070 model results. Values for returns lower than the 10-year were also extrapolated; values for the 25-year were interpolated using the 20- and 50-year values.

Similarly, the exterior frequency curves were also developed for each reach for with-project conditions as shown in Tables 10 through 16. Stillwater elevations are in NAVD88 epoch 2004.5. Each interior reach was associated with an exterior stillwater stage, based location along the proposed federal levee. The exterior stages represent the stage in which the water will rise in the interior due to a federal levee breach. The without-project interior stage frequency data does not include the effects of rainfall, wave overtopping, pumping, or levee breaching. The values represent stillwater levels in the study area before the construction of the federal levee system due to storm surge as modeled in the coupled model. The with-project exterior stage frequency data does not include the effects of rainfall, wave overtopping, pumping, or levee breaching. The values represent predicted stillwater levels along the exterior of the proposed levee system. The with-and without-project curves were used in HEC-FDA to compute the project benefits. Reference Section 2.5 for more details.

Figure 25-MTG economic reach map

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2035 MTG Without-Project Interior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
1-1AB	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**4-2**	1.55	3.00	4.70	6.75	9.00	10.80	12.60	14.90
1-1AN	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**4-2A**	1.55	3.00	4.70	6.75	9.00	10.80	12.60	14.90
11BE1	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**4-2B**	1.50	2.70	4.20	6.82	9.90	11.50	13.70	15.60
11BE2	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**4-2C**	1.50	2.70	4.20	6.73	9.90	11.40	13.30	15.10
11BE3	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**4-7**	1.33	2.70	4.17	5.67	7.00	8.30	9.80	11.60
11BE4	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**4MGT**	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40
11BE5	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**5-1A**	1.50	2.90	4.60	6.60	8.60	10.40	12.40	14.70
11BE6-E	1.15	2.40	3.60	4.97	6.30	7.30	8.50	10.00	**5-1B**	1.50	2.90	4.60	6.77	9.10	11.00	12.90	15.50
11BE6-W	1.15	2.50	3.63	4.93	6.10	7.10	8.20	9.70	**6-1B1**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-1BU3-U1	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70	**6-1B1-B**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-1BU3-U2	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70	**8-1N**	1.55	3.10	4.86	6.62	8.20	9.90	11.80	14.10
1-1BU3-U3	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70	**8-1N-B**	1.55	3.10	4.86	6.62	8.20	9.90	11.80	14.10
11BU4	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**8-1S-B**	1.53	3.10	4.78	6.52	8.10	10.00	11.70	13.90
11BW11	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**8-2C**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
11BW2-W1	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**8-2D**	1.70	3.50	5.63	7.57	8.90	10.20	12.10	14.40
11BW2-W2	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**9-1AE**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW4-W3	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**9-1AMID**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW4-W4	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**9-1AW**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW4-W4A	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**9-1BE**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW5	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**9-1BMIDE**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW6	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**9-1BMIDW**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW79	1.15	2.50	3.63	4.93	6.10	7.10	8.20	9.70	**9-1BW**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
11BW79-W7	0.81	2.07	2.78	3.87	5.20	6.90	8.20	9.50	**A1**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-2MID	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**B1**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-2N	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**BB1**	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40
1-2S	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80	**BB2**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
1-3	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80	**BB3**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-5	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**BB4**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-7_N3-4	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BB5**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-7_N4-7	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BB6**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-7_N7-10	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BB7**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
1-7-N10-13	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BB8-B**	1.10	2.40	3.50	4.82	5.90	7.00	8.30	10.00
1-7N13-16	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BD1**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
1-7N16-17	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BDL0**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
1-7N17-24	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BDL1**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
1-7N24-28	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BDL2**	1.55	3.10	4.86	6.58	8.00	9.70	11.60	14.00
1-8	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BDL3**	1.70	3.50	5.63	7.57	8.90	10.20	12.10	14.40
2-1A2	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**BDL4**	1.58	3.00	4.90	6.67	8.00	9.70	11.70	13.80
2-1B2-MID	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**BDL4-B**	1.58	3.00	4.90	6.67	8.00	9.70	11.70	13.80
2-1B2N	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**BDL5**	1.53	3.00	4.70	6.50	8.00	9.80	11.90	14.00
2-1B2S	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**BGC0**	1.43	2.90	4.47	6.17	8.00	9.80	11.70	14.30
3-1B	1.43	2.80	4.40	6.13	7.80	9.50	11.30	13.40	**BGC1**	1.60	3.20	5.01	6.80	8.30	10.00	11.90	14.50
3-1C	1.70	3.50	5.55	7.47	8.80	10.20	11.80	14.30	**BGC2**	1.60	3.20	5.01	6.83	8.50	10.30	12.10	14.70
4-1N	1.70	3.60	5.48	7.40	8.90	10.60	12.40	14.30	**BGC3**	1.70	3.50	5.55	7.47	8.80	10.10	11.80	14.20
4-1S	1.80	4.00	6.63	8.82	9.90	11.30	13.40	15.30	**BGC4**	1.60	3.40	5.32	7.15	8.40	9.70	11.50	13.60

Table 5-2035 without-project interior frequency curves (feet NAVD88 epoch 2004.65)

2035 MTG Without-Project Interior Frequency Curves

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Economic Reach	0.999	0.2	0.1	0.04	0.02	0.01	0.005	0.002	Economic Reach	0.99 9	0.2	0.1	0.04	0.02	0.01	0.005	0.002
BL1	0.83	2.10	2.85	3.88	4.80	5.70	7.70	9.70	**D-26**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
BL2	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70	**D-28**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BL3	0.81	2.07	2.78	3.73	4.40	5.20	7.40	9.60	**D-29**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BL4	0.81	2.07	2.78	3.75	4.50	5.30	7.80	9.80	**D-30**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BL5	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70	**D-31**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BL6	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70	**D-34N**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BL7	0.86	2.10	2.93	4.03	5.20	7.20	8.40	9.90	**D-34S**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BL89	1.03	2.30	3.32	4.55	5.80	7.10	8.90	10.40	**D-35**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BPC1	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**D-36**	1.60	3.20	5.01	6.83	8.50	10.30	12.10	14.70
BPC2	1.50	2.90	4.60	6.77	9.10	10.90	12.80	15.20	**D-37**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
BPC3	1.50	2.70	4.20	6.82	9.90	11.50	13.70	15.60	**D-38**	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80
BPC4	1.50	2.70	4.20	6.73	9.90	11.40	13.30	15.10	**D-39-1**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
BPC5	1.45	3.00	4.55	6.18	7.60	9.20	10.90	12.90	**D-39-2**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
BPC5-B	1.45	3.00	4.55	6.18	7.60	9.20	10.90	12.90	**D-39-3**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
BT1	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**D-42**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BT10	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**D-43**	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80
BT2	1.55	3.00	4.70	6.75	9.00	10.80	12.60	14.90	**D-44**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BT3	1.33	2.70	4.17	5.67	7.00	8.30	9.80	11.60	**D-45**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BT4	1.50	2.90	4.60	6.87	9.20	10.90	12.90	15.10	**D-48**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BT4-SA	1.80	4.00	6.48	8.65	9.90	11.30	13.40	15.40	**D-49**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BT5	1.50	2.60	4.10	6.73	9.90	11.40	13.40	15.20	**D-50**	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80
BT5-B	1.50	2.60	4.10	6.73	9.90	11.40	13.40	15.20	**D-51**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
BT6	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**D-53**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
BT6A	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**D-56**	1.50	2.60	3.90	6.75	10.00	11.60	13.60	15.50
BT7	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**D-60**	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80
BT8	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**D-61**	1.70	3.70	5.94	7.98	9.40	10.90	13.00	15.10
BT9	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**D-61-B**	1.70	3.70	5.94	7.98	9.40	10.90	13.00	15.10
C1	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**D-62-B**	1.23	2.60	3.86	5.23	6.40	7.90	9.90	11.90
C1-LF	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**D-64**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
CC1	1.20	2.60	3.78	5.15	6.40	7.70	9.10	10.80	**E1**	1.10	2.40	3.50	4.82	5.90	7.00	8.30	10.00
D-01	1.70	3.60	5.94	7.98	9.40	10.70	12.50	14.60	**E1-LF**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
D-06	1.45	3.00	4.55	6.18	7.60	9.20	10.90	12.90	**E1-LF-B**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
D10	1.60	3.40	5.32	7.15	8.40	9.80	11.50	13.80	**E2**	1.18	2.50	3.70	5.03	6.20	7.50	9.00	10.90
D-16N	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**E2-B**	1.18	2.50	3.70	5.03	6.20	7.50	9.00	10.90
D-16S	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**E2-LF**	1.18	2.50	3.70	5.03	6.20	7.50	9.10	10.90
D-1732	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**E2-LF-B**	1.18	2.50	3.70	5.03	6.20	7.50	9.10	10.90
D1A	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**FC**	1.70	3.60	5.71	7.65	8.90	10.20	12.00	14.40
D1B	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**GW10**	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40
D1b-LF	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**GW11**	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40
D1C	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**GW12**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
D1c-LF1	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**GW13**	1.15	2.40	3.60	4.97	6.30	7.30	8.50	10.00
D1c-LF2	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**GW14**	1.18	2.10	3.00	5.08	6.50	7.70	9.00	10.90
D1c-LF3	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**GW14-1**	1.18	2.10	3.00	5.08	6.50	7.70	9.00	10.90
D-25	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40	**GW15**	1.18	2.40	3.70	5.07	6.40	7.60	8.80	10.50
D-25-B	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40	**GW16**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60

Table 6-2035 without-project interior frequency curves (feet NAVD88 epoch 2004.65)

2035 MTG Without-Project Interior Frequency Curves																	
Economic	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic**	**0.99**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**

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Reach									Reach	9							
GW17	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80	**LL1**	1.25	2.60	3.93	5.37	6.70	8.00	9.50	11.20
GW18	1.23	2.60	3.86	5.23	6.40	7.90	9.90	11.90	**LL2**	1.25	2.70	3.93	5.37	6.70	8.00	9.50	11.20
GW18-B	1.23	2.60	3.86	5.23	6.40	7.90	9.90	11.90	**LL3**	1.30	2.70	4.09	5.63	7.30	8.60	10.10	11.80
GW2	1.33	2.70	4.17	5.67	7.00	8.30	9.80	11.60	**MC1**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
GW3	1.33	2.70	4.17	5.67	7.00	8.30	9.80	11.60	**OB1**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
GW4	1.38	2.80	4.32	5.90	7.40	8.80	10.40	12.20	**OB2**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
GW5	1.50	2.90	4.60	6.62	8.20	9.50	11.20	13.10	**OB3**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
GW6	1.50	2.90	4.70	6.73	8.40	9.80	11.50	13.40	**OB4**	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40
GW7	1.20	2.30	3.50	5.33	7.50	9.00	10.50	12.20	**PAC1**	1.60	3.40	5.70	7.93	9.60	11.10	13.00	14.90
GW8	1.03	2.30	3.32	4.55	5.80	7.10	8.90	10.40	**SL1**	1.60	3.30	5.17	6.93	8.10	9.40	11.00	12.60
GW9	1.45	2.90	4.55	6.23	7.90	9.20	11.00	12.90	**SL2**	1.60	3.40	5.40	7.30	8.80	10.30	12.00	13.90
HC1	1.08	2.40	3.47	4.75	6.00	7.10	8.20	9.60	**SL3**	1.70	3.50	5.79	7.82	9.40	10.90	12.90	14.80
HC2	1.05	2.40	3.39	4.65	5.90	7.10	8.20	9.60	**TS1**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HC3	1.18	2.60	3.70	5.03	6.20	7.40	8.70	10.40	**TS10**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HC4	1.15	2.60	3.63	4.93	6.10	7.30	8.60	10.10	**TS11**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC0	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80	**TS12**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC1	1.40	2.90	4.40	6.03	7.70	9.40	11.20	13.40	**TS13**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC10	1.58	3.20	4.94	6.62	7.70	9.20	11.10	13.20	**TS14**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC10-B	1.58	3.20	4.94	6.62	7.70	9.20	11.10	13.20	**TS15**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC2	1.55	3.10	4.86	6.58	8.00	9.70	11.60	14.00	**TS16**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC3	1.70	3.50	5.63	7.57	8.90	10.10	12.00	14.40	**TS17**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC4	1.70	3.50	5.63	7.57	8.90	10.20	11.90	14.40	**TS18**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC5	1.60	3.20	5.01	6.80	8.30	10.00	11.90	14.50	**TS19**	1.05	2.40	3.39	4.65	5.90	7.10	8.20	9.60
HNC6	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80	**TS2**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC7	1.43	2.90	4.47	6.13	7.80	9.60	11.40	13.80	**TS20**	1.05	2.40	3.39	4.65	5.90	7.10	8.20	9.60
HNC8	1.60	3.40	5.40	7.25	8.50	9.80	11.60	13.80	**TS21**	1.05	2.40	3.39	4.65	5.90	7.10	8.20	9.60
HNC9	1.70	3.60	5.55	7.40	8.40	9.70	11.40	13.60	**TS22**	1.05	2.40	3.39	4.65	5.90	7.10	8.20	9.60
HNC9-B	1.70	3.60	5.55	7.40	8.40	9.70	11.40	13.60	**TS3**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC9-E	1.70	3.60	5.48	7.32	8.40	9.80	11.50	13.70	**TS4**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
HNC9-W	1.70	3.50	5.55	7.45	8.70	10.00	11.70	14.10	**TS5**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
LB1	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**TS6**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
LB2	1.50	2.90	4.50	6.52	8.60	10.50	12.40	14.80	**TS7**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
LB3	1.50	2.90	4.60	6.80	8.80	10.60	12.40	14.90	**TS9**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
LB4	1.58	3.00	4.70	6.80	8.80	10.60	12.40	15.00	**US1**	0.81	2.07	2.78	3.73	4.40	5.30	7.70	9.70
LB5	1.43	2.80	4.40	6.13	7.80	9.50	11.30	13.40	**GW11-B**	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40
LBB2	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**E1-B**	1.10	2.40	3.50	4.82	5.90	7.00	8.30	10.00
LBB3	1.20	2.60	3.78	5.17	6.50	7.80	9.30	11.40	**BB7-B**	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60
LBB4	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**BD1-B**	1.23	2.50	3.86	5.27	6.60	8.20	10.20	12.60
LBB5	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**BC**	0.98	2.20	3.16	4.73	7.90	9.60	11.50	13.50
LBB6	0.78	1.94	2.62	3.60	4.60	5.80	7.50	8.60	**L2L-A**	1.25	2.89	3.93	5.33	6.50	8.20	9.80	11.20
LBC1	1.23	2.60	3.86	5.27	6.60	8.10	10.10	12.40	**L2L-B**	0.98	2.32	3.16	4.33	5.50	6.70	8.20	9.60
LBC2	1.80	4.40	7.17	9.53	10.7 0	12.00	14.20	16.30									
LF1	1.03	2.30	3.30	4.60	6.10	7.30	8.40	9.80									
LF2	1.03	2.30	3.30	4.60	6.10	7.30	8.40	9.80									
LF-GB	1.60	3.40	5.60	7.70	9.20	10.30	11.80	14.00									

Table 7-2035 without-project interior frequency curves (feet NAVD88 epoch 2004.65)

2085 MTG Without-Project Interior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.99 9**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
1-1AB	2.43	4.80	6.82	8.78	10.2 0	11.40	12.80	14.80	**4-2**	3.27	5.70	8.32	10.42	11.50	13.10	15.00	17.40
1-1AN	2.43	4.80	6.82	8.78	10.2 0	11.40	12.80	14.80	**4-2A**	3.27	5.70	8.32	10.42	11.50	13.10	15.00	17.40

APPENDIX E
MORGANZA TO THE GULF
EDS INPUT TO THE 2021 MII COST CERTIFICATION

11BE1	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**4-2B**	3.40	6.10	8.90	10.93	11.60	13.20	15.40	17.80
11BE2	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**4-2C**	3.40	6.20	8.82	10.75	11.00	12.50	14.60	16.90
11BE3	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**4-7**	2.60	5.20	7.30	9.32	10.40	11.70	13.60	15.20
11BE4	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**4MGT**	2.78	5.00	7.40	9.62	11.20	12.70	14.20	16.00
11BE5	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**5-1A**	3.14	5.50	7.99	10.05	11.30	13.00	14.60	17.20
11BE6-E	2.16	4.70	6.30	8.13	9.30	10.40	12.00	14.00	**5-1B**	3.30	5.80	8.65	10.75	12.00	13.60	15.40	18.20
11BE6-W	2.11	4.58	6.14	7.93	9.10	10.30	11.80	13.80	**6-1B1**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
1-1BU3-U1	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50	**6-1B1-B**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
1-1BU3-U2	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50	**8-1N**	2.84	5.25	7.66	9.70	11.20	12.85	14.95	17.05
1-1BU3-U3	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50	**8-1N-B**	2.84	5.25	7.66	9.70	11.20	12.85	14.95	17.05
11BU4	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**8-1S-B**	2.75	5.20	7.49	9.47	10.80	12.40	14.40	16.10
11BW11	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**8-2C**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20
11BW2-W1	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**8-2D**	2.87	5.30	7.82	9.90	11.40	13.10	15.40	17.60
11BW2-W2	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**9-1AE**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW4-W3	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**9-1AMID**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW4-W4	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**9-1AW**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW4-W4A	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**9-1BE**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW5	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**9-1BMIDE**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW6	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**9-1BMIDW**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW79	2.11	4.58	6.14	7.93	9.10	10.30	11.80	13.80	**9-1BW**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
11BW79-W7	2.19	4.70	6.38	8.22	9.30	10.10	11.60	13.60	**A1**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
1-2MID	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**B1**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
1-2N	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**BB1**	2.78	5.00	7.40	9.62	11.20	12.70	14.20	16.00
1-2S	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30	**BB2**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
1-3	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30	**BB3**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
1-5	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**BB4**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
1-7_N3-4	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BB5**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
1-7_N4-7	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BB6**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
1-7_N7-10	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BB7**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
1-7-N10-13	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BB8-B**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
1-7N13-16	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BD1**	2.78	5.05	7.45	9.56	11.10	12.50	14.30	16.30
1-7N16-17	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BDL0**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20
1-7N17-24	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BDL1**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20
1-7N24-28	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BDL2**	2.90	5.40	7.90	10.00	11.50	12.90	14.80	17.40
1-8	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BDL3**	2.87	5.30	7.82	9.90	11.40	13.10	15.40	17.60
2-1A2	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**BDL4**	2.75	5.25	7.49	9.48	10.90	12.70	14.80	16.60
2-1B2-MID	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**BDL4-B**	2.75	5.25	7.49	9.48	10.90	12.70	14.80	16.60
2-1B2N	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**BDL5**	3.14	5.40	7.99	10.08	11.50	13.00	15.10	17.10
2-1B2S	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**BGC0**	3.27	5.60	8.32	10.48	11.90	13.50	15.00	18.00
3-1B	2.75	5.30	7.49	9.45	10.70	12.20	13.80	16.10	**BGC1**	3.17	5.50	8.07	10.22	11.80	13.40	15.00	18.00
3-1C	2.78	5.20	7.57	9.62	11.20	12.80	14.60	17.10	**BGC2**	3.17	5.50	8.07	10.18	11.60	13.30	15.00	17.90

4-1N	2.87	5.40	7.82	9.85	11.10	12.60	14.70	16.70	**BGC3**	2.75	5.20	7.49	9.52	11.10	12.70	14.60	17.10
4-1S	3.17	5.60	8.07	10.17	11.50	13.10	15.50	17.80	**BGC4**	2.51	5.10	7.06	9.10	10.60	12.20	14.00	16.20

Table 8-2085 without-project interior frequency curves (feet NAVD88 epoch 2004.65)

2085 MTG Without-Project Interior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
BL1	2.30	4.80	6.70	8.67	10.00	11.20	12.40	14.20	**D-26**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20
BL2	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50	**D-28**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BL3	2.30	4.70	6.70	8.70	10.20	11.60	12.80	14.60	**D-29**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BL4	2.46	4.80	6.90	8.90	10.40	11.70	12.80	14.70	**D-30**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BL5	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50	**D-31**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BL6	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50	**D-34N**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BL7	2.46	4.90	6.90	8.88	10.30	11.10	12.60	14.70	**D-34S**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BL89	2.27	4.70	6.62	8.65	10.40	11.80	13.70	15.50	**D-35**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BPC1	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**D-36**	3.17	5.50	8.07	10.18	11.60	13.30	15.00	17.90
BPC2	3.30	5.80	8.57	10.63	11.80	13.40	15.20	17.80	**D-37**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20
BPC3	3.40	6.10	8.90	10.93	11.60	13.20	15.40	17.80	**D-38**	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30
BPC4	3.40	6.20	8.82	10.75	11.00	12.50	14.60	16.90	**D-39-1**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
BPC5	2.51	5.05	7.06	9.05	10.30	11.75	13.55	15.80	**D-39-2**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
BPC5-B	2.51	5.05	7.06	9.05	10.30	11.75	13.55	15.80	**D-39-3**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
BT1	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**D-42**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BT10	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**D-43**	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30
BT2	3.27	5.70	8.32	10.42	11.50	13.10	15.00	17.40	**D-44**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BT3	2.60	5.20	7.30	9.32	10.40	11.70	13.60	15.20	**D-45**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BT4	3.30	5.90	8.65	10.68	11.60	13.30	15.40	17.70	**D-48**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BT4-SA	3.17	5.60	8.07	10.17	11.50	13.10	15.50	17.80	**D-49**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BT5	3.24	5.95	8.24	10.33	10.90	12.65	14.90	17.00	**D-50**	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10
BT5-B	3.24	5.95	8.24	10.33	10.90	12.65	14.90	17.00	**D-51**	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90
BT6	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**D-53**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
BT6A	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**D-56**	3.40	6.20	8.82	10.75	11.00	12.50	14.80	17.00
BT7	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**D-60**	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10
BT8	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**D-61**	2.84	5.45	7.74	9.73	10.90	12.25	14.55	16.75
BT9	2.43	4.80	6.82	8.78	10.2	11.40	12.80	14.80	**D-61-B**	2.84	5.45	7.74	9.73	10.90	12.25	14.55	16.75

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C1	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**D-62-B**	2.57	5.00	7.22	9.32	10.90	12.40	14.00	15.70
C1-LF	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**D-64**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
CC1	2.49	5.00	6.98	8.93	10.10	11.50	13.10	14.90	**E1**	2.27	4.80	6.62	8.60	10.10	11.30	12.70	14.50
D-01	2.90	5.60	7.90	9.90	10.90	12.10	14.20	16.80	**E1-LF**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
D-06	2.51	5.10	7.06	9.05	10.30	11.70	13.30	15.40	**E1-LF-B**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
D10	2.51	5.10	7.06	9.08	10.50	12.10	13.80	15.90	**E2**	2.54	4.95	7.14	9.12	10.70	12.05	13.35	15.15
D-16N	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**E2-B**	2.49	4.95	6.98	9.02	10.60	12.05	13.35	15.15
D-16S	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**E2-LF**	2.51	5.00	7.06	9.07	10.40	11.65	12.85	14.60
D-1732	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**E2-LF-B**	2.51	5.00	7.06	9.07	10.40	11.65	12.85	14.60
D1A	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**FC**	2.75	5.20	7.49	9.52	11.10	12.80	14.90	17.10
D1B	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**GW10**	2.78	5.00	7.40	9.62	11.20	12.70	14.20	16.00
D1b-LF	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**GW11**	2.78	5.00	7.40	9.62	11.20	12.70	14.20	16.00
D1C	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**GW12**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
D1c-LF1	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**GW13**	2.16	4.70	6.30	8.13	9.30	10.40	12.00	14.00
D1c-LF2	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**GW14**	2.46	5.20	6.90	8.83	10.00	11.60	13.20	15.40
D1c-LF3	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**GW14-1**	2.46	5.20	6.90	8.83	10.00	11.60	13.20	15.40
D-25	2.78	5.30	7.57	9.62	11.20	12.80	14.80	16.90	**GW15**	2.27	4.90	6.62	8.53	9.70	11.00	12.60	14.50
D-25-B	3.17	5.30	7.95	9.88	11.30	12.80	14.80	16.90	**GW16**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20

Table 9-2085 without-project interior frequency curves (feet NAVD88 epoch 2004.65)

2085 MTG Without-Project Interior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
GW17	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30	**LL1**	2.75	5.20	7.49	9.42	10.50	11.70	13.40	15.00
GW18	2.57	5.00	7.22	9.32	10.90	12.55	14.10	15.85	**LL2**	2.60	5.20	7.30	9.32	10.40	11.70	13.50	15.10
GW18-B	2.57	5.00	7.22	9.32	10.90	12.55	14.10	15.85	**LL3**	2.81	5.30	7.66	9.60	10.60	11.80	13.80	15.60
GW2	2.60	5.20	7.30	9.32	10.40	11.70	13.60	15.20	**MC1**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
GW3	2.60	5.20	7.30	9.32	10.40	11.70	13.60	15.20	**OB1**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
GW4	2.75	5.30	7.49	9.43	10.60	11.90	14.00	15.90	**OB2**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
GW5	2.84	5.40	7.74	9.73	10.90	12.40	14.70	17.10	**OB3**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
GW6	2.87	5.40	7.82	9.85	11.10	12.60	14.80	17.40	**OB4**	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80
GW7	2.90	5.50	7.90	9.85	10.60	11.70	13.70	15.60	**PAC1**	3.20	5.70	8.16	10.20	11.20	12.50	14.80	17.30
GW8	2.27	4.70	6.62	8.65	10.40	11.80	13.70	15.50	**SL1**	2.57	5.20	7.22	9.25	10.50	12.00	14.00	15.80
GW9	2.78	5.20	7.57	9.55	10.80	12.00	13.90	16.20	**SL2**	2.84	5.40	7.74	9.73	10.90	12.30	14.40	16.30
HC1	2.19	4.70	6.38	8.23	9.40	10.50	12.00	13.90	**SL3**	3.24	5.70	8.24	10.30	11.30	12.70	15.00	17.10
HC2	2.22	4.70	6.46	8.32	9.40	10.40	12.00	13.90	**TS1**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HC3	2.30	4.90	6.70	8.63	9.80	11.10	12.60	14.40	**TS10**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HC4	2.27	4.90	6.62	8.53	9.70	10.90	12.30	14.20	**TS11**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC0	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30	**TS12**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC1	2.84	5.30	7.74	9.78	11.20	12.50	14.30	16.70	**TS13**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC10	2.27	4.94	6.62	8.57	9.90	11.45	13.25	15.55	**TS14**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50

HNC10-B	2.27	4.94	6.62	8.57	9.90	11.45	13.25	15.55	**TS15**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC2	2.90	5.40	7.90	10.00	11.50	12.90	14.80	17.40	**TS16**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC3	2.84	5.30	7.74	9.80	11.30	13.00	15.10	17.50	**TS17**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC4	2.81	5.30	7.66	9.72	11.30	13.00	14.90	17.40	**TS18**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC5	3.17	5.50	8.07	10.22	11.80	13.40	15.00	18.00	**TS19**	2.22	4.70	6.46	8.32	9.40	10.40	12.00	13.90
HNC6	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30	**TS2**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC7	3.14	5.40	7.99	10.08	11.50	13.00	14.60	17.30	**TS20**	2.22	4.70	6.46	8.32	9.40	10.40	12.00	13.90
HNC8	2.57	5.10	7.22	9.30	10.80	12.40	14.20	16.50	**TS21**	2.22	4.70	6.46	8.32	9.40	10.40	12.00	13.90
HNC9	2.30	4.90	6.70	8.65	9.90	11.60	13.30	15.55	**TS22**	2.22	4.70	6.46	8.32	9.40	10.40	12.00	13.90
HNC9-B	2.30	4.90	6.70	8.65	9.90	11.60	13.30	15.55	**TS3**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC9-E	2.27	4.90	6.62	8.58	10.00	11.60	13.20	15.40	**TS4**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
HNC9-W	2.46	5.00	6.90	8.88	10.30	11.90	13.60	15.80	**TS5**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
LB1	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**TS6**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
LB2	3.30	5.80	8.65	10.77	12.10	13.50	15.10	18.10	**TS7**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
LB3	3.24	5.70	8.24	10.35	11.60	13.20	14.90	17.70	**TS9**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
LB4	3.27	5.70	8.32	10.47	11.80	13.40	15.10	18.10	**US1**	2.43	4.80	6.82	8.80	10.30	11.60	12.60	14.50
LB5	2.75	5.30	7.49	9.45	10.70	12.20	13.80	16.10	**GW11-B**	2.78	5.00	7.40	9.62	11.20	12.70	14.20	16.00
LBB2	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**E1-B**	2.27	4.80	6.62	8.60	10.10	11.30	12.70	14.50
LBB3	2.43	4.80	6.82	8.78	10.20	11.40	12.80	14.80	**BB7-B**	2.14	4.64	6.22	8.10	9.60	10.85	11.80	13.20
LBB4	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**BD1-B**	2.78	5.00	7.40	9.63	11.30	12.60	14.30	16.20
LBB5	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**BC**	3.20	5.50	8.16	10.10	10.60	12.10	13.70	15.80
LBB6	2.14	4.64	6.22	8.10	9.60	10.40	10.90	11.90	**L2L-A**	2.51	5.00	7.06	9.12	10.70	11.80	13.60	15.80
LBC1	2.78	5.00	7.40	9.62	11.20	12.70	14.20	16.00	**L2L-B**	2.11	4.58	6.14	8.03	9.70	11.20	13.20	14.90
LBC2	3.20	5.60	8.16	10.25	11.50	13.00	15.50	18.00									
LF1	2.27	4.80	6.62	8.52	9.60	10.70	12.20	14.20									
LF2	2.27	4.80	6.62	8.52	9.60	10.70	12.20	14.20									
LF-GB	2.57	5.20	7.22	9.28	10.70	12.00	14.30	16.60									

Table 10-2085 without-project interior frequency curves (feet NAVD88 epoch 2004.65)

2035 MTG With-Project Exterior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
1-1AB	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**4-2**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
1-1AN	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**4-2A**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
11BE1	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**4-2B**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
11BE2	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**4-2C**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
11BE3	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**4-7**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
11BE4	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**4MGT**	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87
11BE5	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**5-1A**	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71
11BE6-E	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**5-1B**	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71
11BE6-W	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**6-1B1**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
1-1BU3-U1	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**6-1B1-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02

APPENDIX E
MORGANZA TO THE GULF
EDS INPUT TO THE 2021 MII COST CERTIFICATION

1-1BU3-U2	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**8-1N**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
1-1BU3-U3	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**8-1N-B**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
11BU4	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**8-1S-B**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
11BW11	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**8-2C**	1.57	3.06	4.93	7.60	8.43	10.29	12.50	14.82
11BW2-W1	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**8-2D**	1.57	3.06	4.93	7.60	8.43	10.29	12.50	14.82
11BW2-W2	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1AE**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW4-W3	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1AMID**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW4-W4	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1AW**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW4-W4A	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1BE**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW5	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1BMIDE**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW6	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1BMIDW**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW79	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**9-1BW**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
11BW79-W7	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**A1**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
1-2MID	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**B1**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
1-2N	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB1**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-2S	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB2**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-3	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB3**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-5	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**BB4**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-7_N3-4	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB5**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-7_N4-7	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB6**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
1-7_N7-10	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB7**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
1-7-N10-13	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BB8-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
1-7N13-16	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BD1**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-7N16-17	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BDL0**	1.57	3.06	4.93	7.60	8.43	10.29	12.50	14.82
1-7N17-24	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BDL1**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-7N24-28	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BDL2**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
1-8	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BDL3**	1.57	3.06	4.93	7.60	8.43	10.29	12.50	14.82
2-1A2	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BDL4**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
2-1B2-MID	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BDL4-B**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
2-1B2N	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BDL5**	1.57	3.06	4.93	7.60	8.43	10.29	12.50	14.82
2-1B2S	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BGC0**	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09
3-1B	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BGC1**	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09
3-1C	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**BGC2**	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09
4-1N	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**BGC3**	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09
4-1S	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**BGC4**	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09

Table 11-2035 with-project exterior frequency curves (feet NAVD88 epoch 2004.65)

2035 MTG With-Project Exterior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
BL1	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-26**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56

APPENDIX E
MORGANZA TO THE GULF
EDS INPUT TO THE 2021 MII COST CERTIFICATION

BL2	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-28**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BL3	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-29**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BL4	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-30**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BL5	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-31**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BL6	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-34N**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BL7	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-34S**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BL89	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**D-35**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BPC1	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**D-36**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
BPC2	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**D-37**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
BPC3	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**D-38**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BPC4	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**D-39-1**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BPC5	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**D-39-2**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BPC5-B	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**D-39-3**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BT1	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49	**D-42**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT10	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-43**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
BT2	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49	**D-44**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT3	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49	**D-45**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT4	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49	**D-48**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT4-SA	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**D-49**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT5	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49	**D-50**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT5-B	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49	**D-51**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
BT6	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-53**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
BT6A	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-56**	1.99	5.15	9.09	11.91	12.69	14.32	17.03	19.49
BT7	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-60**	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71
BT8	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-61**	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87
BT9	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-61-B**	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87
C1	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-62-B**	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87
C1-LF	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**D-64**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
CC1	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**E1**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D-01	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**E1-LF**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D-06	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**E1-LF-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D10	1.83	4.36	7.52	10.23	11.10	13.00	15.56	18.79	**E2**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D-16N	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**E2-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D-16S	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**E2-LF**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D-1732	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**E2-LF-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
D1A	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**FC**	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83
D1B	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**GW10**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
D1b-LF	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**GW11**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
D1C	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**GW12**	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09

D1c-LF1	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**GW13**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
D1c-LF2	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**GW14**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
D1c-LF3	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02	**GW14-1**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
D-25	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**GW15**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
D-25-B	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**GW16**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56

Table 12-2035 with-project exterior frequency curves (feet NAVD88 epoch 2004.65)

2035 MTG With-Project Exterior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
GW17	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83	**LL1**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
GW18	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**LL2**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
GW18-B	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**LL3**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
GW2	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**MC1**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
GW3	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**OB1**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
GW4	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**OB2**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
GW5	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**OB3**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
GW6	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**OB4**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
GW7	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**PAC1**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
GW8	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**SL1**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
GW9	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**SL2**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
HC1	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**SL3**	1.96	5.02	8.83	12.00	12.88	14.64	17.04	19.88
HC2	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**TS1**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HC3	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**TS10**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HC4	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41	**TS11**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC0	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83	**TS12**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC1	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83	**TS13**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC10	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**TS14**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC10-B	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**TS15**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC2	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83	**TS16**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC3	1.80	4.19	7.18	9.95	10.88	12.55	14.82	17.83	**TS17**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC4	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**TS18**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC5	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**TS19**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC6	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**TS2**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC7	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**TS20**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC8	1.77	4.03	6.87	9.54	10.43	12.12	14.20	17.09	**TS21**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41

HNC9	1.83	4.36	7.52	10.23	11.10	13.00	15.56	18.79	**TS22**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
HNC9-B	1.83	4.36	7.52	10.23	11.10	13.00	15.56	18.79	**TS3**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC9-E	1.83	4.36	7.52	10.23	11.10	13.00	15.56	18.79	**TS4**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
HNC9-W	1.83	4.36	7.52	10.23	11.10	13.00	15.56	18.79	**TS5**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
LB1	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**TS6**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
LB2	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**TS7**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
LB3	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**TS9**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
LB4	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**US1**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
LB5	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71	**GW11-B**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56
LBB2	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**E1-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
LBB3	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BB7-B**	1.49	2.67	4.14	6.67	6.80	8.22	9.99	12.02
LBB4	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BD1-B**	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.60
LBB5	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**BC**	1.88	4.62	8.04	10.70	11.58	13.25	15.95	18.71
LBB6	1.50	2.70	4.21	5.93	6.93	8.49	10.47	12.56	**L2L-A**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
LBC1	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87	**L2L-B**	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41
LBC2	1.99	5.13	9.06	12.05	12.82	14.49	17.33	19.87									
LF1	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41									
LF2	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41									
LF-GB	2.01	5.25	9.29	12.68	13.81	15.56	17.82	20.41									

Table 13-2035 with-project exterior frequency curves (feet NAVD88 epoch 2004.65)

2085 MTG With-Project Exterior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
1-1AB	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**4-2**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
1-1AN	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**4-2A**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
11BE1	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**4-2B**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
11BE2	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**4-2C**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
11BE3	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**4-7**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17
11BE4	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**4MGT**	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50
11BE5	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**5-1A**	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82
11BE6-E	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**5-1B**	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82
11BE6-W	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**6-1B1**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-1BU3-U1	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**6-1B1-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-1BU3-U2	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**8-1N**	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21
1-1BU3-U3	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**8-1N-B**	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21

APPENDIX E
MORGANZA TO THE GULF
EDS INPUT TO THE 2021 MII COST CERTIFICATION

11BU4	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**8-1S-B**	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21
11BW11	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**8-2C**	1.94	4.89	8.59	11.39	12.25	13.85	16.19	18.31
11BW2-W1	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**8-2D**	1.94	4.89	8.59	11.39	12.25	13.85	16.19	18.31
11BW2-W2	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1AE**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW4-W3	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1AMID**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW4-W4	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1AW**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW4-W4A	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1BE**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW5	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1BMIDE**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW6	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1BMIDW**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW79	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**9-1BW**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
11BW79-W7	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**A1**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-2MID	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**B1**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-2N	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB1**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-2S	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB2**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-3	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB3**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-5	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**BB4**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-7_N3-4	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB5**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-7_N4-7	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB6**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-7_N7-10	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB7**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-7-N10-13	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BB8-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
1-7N13-16	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BD1**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-7N16-17	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BDL0**	1.94	4.89	8.59	11.39	12.25	13.85	16.19	18.31
1-7N17-24	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BDL1**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-7N24-28	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BDL2**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
1-8	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BDL3**	1.94	4.89	8.59	11.39	12.25	13.85	16.19	18.31
2-1A2	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BDL4**	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21
2-1B2-MID	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BDL4-B**	2.75	5.25	8.66	11.42	12.42	14.41	16.77	19.21
2-1B2N	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BDL5**	1.94	4.89	8.59	11.39	12.25	13.85	16.19	18.31
2-1B2S	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BGC0**	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39
3-1B	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BGC1**	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39
3-1C	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**BGC2**	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39
4-1N	2.15	5.93	10.6	13.4	14.3	16.29	19.56	22.50	**BGC3**	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39

			7	2	7												
4-1S	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50	**BGC4**	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39

Table 14- 2085 with-project exterior frequency curves (feet NAVD88 epoch 2004.65)

2085 MTG With-Project Exterior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
BL1	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-26**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BL2	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-28**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BL3	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-29**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BL4	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-30**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BL5	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-31**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BL6	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-34N**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BL7	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-34S**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BL89	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**D-35**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BPC1	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**D-36**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
BPC2	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**D-37**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
BPC3	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**D-38**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BPC4	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**D-39-1**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BPC5	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**D-39-2**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BPC5-B	2.51	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**D-39-3**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BT1	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04	**D-42**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT10	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-43**	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21
BT2	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04	**D-44**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT3	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04	**D-45**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT4	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04	**D-48**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT4-SA	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50	**D-49**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT5	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04	**D-50**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT5-B	3.24	5.98	10.76	13.49	14.37	16.23	19.40	22.04	**D-51**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
BT6	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-53**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
BT6A	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-56**	2.16	5.98	10.76	13.49	14.37	16.23	19.40	22.04
BT7	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-60**	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82
BT8	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-61**	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50
BT9	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-61-B**	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50

C1	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-62-B**	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50
C1-LF	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**D-64**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
CC1	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**E1**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D-01	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50	**E1-LF**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D-06	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**E1-LF-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D10	1.97	5.07	8.94	11.62	12.59	14.56	16.85	19.91	**E2**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D-16N	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**E2-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D-16S	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**E2-LF**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D-1732	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**E2-LF-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
D1A	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**FC**	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21
D1B	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**GW10**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
D1b-LF	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**GW11**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
D1C	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**GW12**	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39
D1c-LF1	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**GW13**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17
D1c-LF2	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**GW14**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17
D1c-LF3	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54	**GW14-1**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
D-25	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50	**GW15**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
D-25-B	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50	**GW16**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27

Table 15-2085 with-project exterior frequency curves (feet NAVD88 epoch 2004.65)

2085 MTG With-Project Exterior Frequency Curves																	
Economic Reach	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**	**Economic Reach**	**0.999**	**0.2**	**0.1**	**0.04**	**0.02**	**0.01**	**0.005**	**0.002**
GW17	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21	**LL1**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
GW18	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**LL2**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
GW18-B	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**LL3**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
GW2	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**MC1**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
GW3	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**OB1**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
GW4	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**OB2**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
GW5	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**OB3**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
GW6	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**OB4**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
GW7	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**PAC1**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17
GW8	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**SL1**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17
GW9	2.29	6.64	12.07	15.2	16.3	18.23	21.15	24.49	**SL2**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17

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				4	7												
HC1	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**SL3**	2.24	6.39	11.57	14.70	15.67	17.42	20.64	24.17
HC2	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**TS1**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HC3	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**TS10**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HC4	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49	**TS11**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC0	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21	**TS12**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC1	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21	**TS13**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC10	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**TS14**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC10-B	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**TS15**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC2	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21	**TS16**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC3	1.95	4.93	8.66	11.42	12.42	14.41	16.77	19.21	**TS17**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC4	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**TS18**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC5	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**TS19**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC6	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**TS2**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC7	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**TS20**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC8	1.92	4.79	8.39	10.94	11.97	13.86	16.01	18.39	**TS21**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
HNC9	1.97	5.07	8.94	11.62	12.59	14.56	16.85	19.91	**TS22**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
HNC9-B	1.97	5.07	8.94	11.62	12.59	14.56	16.85	19.91	**TS3**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC9-E	1.97	5.07	8.94	11.62	12.59	14.56	16.85	19.91	**TS4**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
HNC9-W	1.97	5.07	8.94	11.62	12.59	14.56	16.85	19.91	**TS5**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
LB1	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**TS6**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
LB2	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**TS7**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
LB3	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**TS9**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
LB4	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**US1**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
LB5	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82	**GW11-B**	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27
LBB2	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**E1-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
LBB3	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BB7-B**	1.90	4.68	8.16	11.71	12.30	13.90	15.45	17.54
LBB4	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BD1-B**	2.78	5.00	7.84	10.16	11.67	13.30	15.19	17.27
LBB5	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**BC**	2.05	5.46	9.72	12.47	13.47	15.23	18.12	20.82
LBB6	1.86	4.52	7.84	10.16	11.67	13.30	15.19	17.27	**L2L-A**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
LBC1	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50	**L2L-B**	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49
LBC2	2.15	5.93	10.67	13.42	14.37	16.29	19.56	22.50									

LF1	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49									
LF2	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49									
LF-GB	2.29	6.64	12.07	15.24	16.37	18.23	21.15	24.49									

Table 16-2085 with-project exterior frequency curves (feet NAVD88 epoch 2004.65)

2.4 Fragility Curves for Non-Federal and Federal Levees

The MTG project study project levees will be designed to reduce risk in the study area from storm surge and tidal influences from the Gulf of Mexico. Even though the project levees are designed and engineered to withstand the conditions chosen by the project members, a levee performance analysis is required for both non-federal (local levees) and federal levee. The levees will endure atypical conditions and must perform differently than other levees in a normal river system. This is primarily due to their continuous exposure to water on both sides of the levees. Additional issues associated with levees include tidal fluctuation, wave run-up; and poor foundation conditions due to organic soils. The study evaluated the integrity of the local levees and federal levee performance by implementation of fragility curves within the HEC-FDA model. Local levee systems provide flood risk reduction in the without-project conditions for base year 2035 and future year 2085. The fragility curves for the non-federal levees from the PACR were adopted for the study. The fragility curves from the PACR were based on structural failure of the local levees due to erodibility and stability; wave overtopping was not considered. Table 17 shows the non-Federal levee fragility curves and the top of levee elevations developed for each economic reach containing a local levee for without-project conditions. Local levees were also considered in the with-project condition if the economic reach will be located on the flood side after the federal levee was constructed. Economic reaches located outside of the proposed MTG alignment on the flood side are denoted with the suffix-B except for economic reach L2L-B.

MTG Non-Federal Levee Fragility Curves							
Economic Reach	**Top of Levee**	**Economic Reach**	**Top of Levee**	**Econom ic Reach**	**Top of Levee**	**Econom ic Reach**	**Top of Levee**
1-1AB	5	1-7N24-28	5.5	9-1AE	8	D-16S	4
1-1AN	5	3-1B	9.5	9-1AMID	8	D-25	7
11BE4	6	3-1C	6	9-1AW	8	D-25-B	7
11BE5	4	4-1N	4	9-1BE	8	D-29	6.5
11BE6-W	6	4-1S	7	9-1BMIDE	8	D-30	4
11BW11	3	4-2	4	9-1BMIDW	8	D-36	9.5
11BW5	5.5	4-2A	6	9-1BW	8	D-48	4
11BW6	5.5	4-2B	6	BL2	6	D-53	5
11BW79	6	4-2C	6	BL3	6	D-56	6
11BW79-W7	5.5	4-7	6	BL4	5	D-60	6
1-2S	4	4MGT	6	BL5	5	D-61	6
1-3	6.5	5-1A	6	BL6	5	D-61-B	6
1-5	3	5-1B	6	BL7	6	D-62-B	6
1-7_N3-4	5.5	6-1B1	6	BL89	5	D-64	5

1-7_N4-7	5.5	6-1B1-B	6	BPC3	6	E2-LF	5.4
1-7_N7-10	5.5	8-1N	4	BPC4	6	E2-LF-B	5.4
1-7-N10-13	5.5	8-1N-B	4	BT4	6	LBC1	6
1-7N13-16	5.5	8-1S-B	4	BT4-SA	7	LBC2	6
1-7N16-17	5.5	8-2C	6	D-01	10	PAC1	10
1-7N17-24	5.5	8-2D	6	D10	6	SL3	10

Table 17-Non-federal levee fragility curves (feet NAVD88 epoch 2004.65)

The proposed federal levee system will provide flood protection to the interior study area. The performance of the federal levee was also analyzed in the study by implementing fragility curves in HEC-FDA model. The fragility curves were used to analyze the risk of levee failure based on breaching due to overtopping along the system in the with-project condition for base year 2035 and future year 2085. The fragility curves were developed using the same criteria from the PACR but with revised surge and wave parameters from the updated coupled ADCIRC + SWAN model. Single point fragility curves were developed for each levee construction reach based on a stillwater elevation which would produce an overtopping rate of 2cfs/ft in agreement with the wave overtopping simulator results completed by Colorado State University. The research concluded grass covered levees would likely fail if armoring was not present once an overtopping rate of 2 cfs/ft or higher was achieved. The single point failure mode is the proxy for a typical fragility curve that meets the intent of ER 1105-2-101 to address risk and associated consequences. The stillwater elevation which initiates erosion is summarized by levee reach in Table 18. It is important to note the elevations are not the same as the levee design elevations listed in Tables 3 and 4.

MTG Federal Levee Fragility Curves		
Levee Reach	Single Point Fragility Curves based on 2cfs/ft Overtopping Rate	
	2035 with- project	2085 with- project
	HEC-FDA top of levee	HEC-FDA top of levee
A	12.13	16.16
B	13.83	16.90
E	16.00	18.50
F	15.47	16.97
G	16.77	17.97
H	17.12	19.62
I	18.32	21.83
J	18.53	21.29
K	18.22	22.59
L	18.54	21.76
Barrier	11.43	16.55

Table 18-Federal levee fragility curves (feet NAVD88 epoch 2004.65)

2.5 Interior- Exterior Relationships for Federal Levees

An interior-exterior stage relationship must be considered in the analysis in the HEC-FDA model to accurately model the existing levees in the study area. The interior-exterior stage relationship defines the relationship between the water surface, or stage, inside of the levee and the stage within the floodplain behind the levee. In the event of a levee failure as determined by the fragility curves, the interior water surface elevations would rise in the interior (on the protected side) to the same stillwater elevation of the exterior in the with-project conditions.

2.6 Updates to Design Parameters from the PACR

Table 19 lists revisions to design parameters, models, and assumptions from the PACR and changes due to implementation of the revisions. In the PACR report for the 1% levee design, elevations range from 14.0 to 24.0 for year 2035 and 19.5 to 26.5 for year 2085. The updated design elevations based on updated parameters range from 8.5 to 21.5 for year 2035 and 12.0 to 26.0 for year 2085. The updated levee elevations have decreased for the same level of protection since the adjusted overtopping rate was implemented in the levee design. Additionally, the stillwater elevations in the updated coupled ADCIRC + SWAN model are lower for the design return (100 year).

Design Parameter	Design Change	Notes
ADCIRC + SWAN model storm surge characteristics	New storm surge characteristics from the updated ADCIRC model were used to develop stage frequency curves, fragility curves, levee design elevations, and structure design elevations.	Stage frequency curves, fragility curves, levee designs and structure design elevations are lower than the elevations presented in the PACR. The stillwater elevations for the 1,2,5,10 year are higher than the PACR coupled ADCIRC + SWAN model. The stillwater elevations for the 25 year to 1000 year are lower than the PACR ADCIRC + SWAN model.
Overtopping equations	Van der Meer overtopping equations changed to EurOtop overtopping equations for use in computing levee design elevations.	Implementation of the EurOtop equation resulted in a change in levee height of approximately 0.50 feet lower than van der Meer. The ½ foot variation is within the uncertainty band of the model (+/-0.50 feet) and could vary based on the use of a different surge model result output point.
Overtopping threshold rate	Overtopping threshold rate increased from 0.1cfs/ft to 0.5cfs/ft	Overtopping threshold rate of 0.5cfs/ft approved from the post PACR RMC site adaptation report was used for levee designs and corresponding structure design elevations which resulted in lower design elevations.
Removal of wave berm design option	A berm factor was not incorporated in the levee design equations.	In the PACR levee elevations for a few construction reaches were determined with-and without-wave berms. In this analysis wave berms were not used which would result in higher elevations than levees designed with-wave berms.

Table 19-Design Changes

2.7 Conclusions

All information presented above is based on available data and applicable guidance at the time of the study. **For this reason, all stage and wave frequency data should be reviewed and possibly recomputed during the Preconstruction Engineering and Design (PED) phase of the project.**

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Appendix E

EDS (Structures) Input

APPENDIX E
MORGANZA TO THE GULF
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TABLE OF CONTENTS

1.0 Introduction and General

Appendix E summarizes the work that was performed to develop sufficient quantities for the structural features that are part of the Morganza to the Gulf Hurricane Risk Reduction Alignment (M2G). Feasibility level designs for structural components were last developed during the 2013 PACR for the 1% AEP. New quantities for structural components were developed based on:

1. New (lower) hydraulic design grades (Reference Appendix D)
2. Input from the NFS regarding structures that have been locally built
3. Application of "adapted criteria" which is explained in the main text of the report.

In general, quantities were pro-rated in consideration of these factors based on the 2013 PACR feasibility level designs. For the 56' barge gate structures, previously assumed to be sector gates in the PACR, a limited design approach was followed, utilizing existing designs from the Non-Federal Sponsor constructed within the last 10 years.

The design elevations used for each structure are the same as the design elevation developed by EDHH for each levee reach. The table below summarizes the design elevations used for each structure.

Structure	Design EL (ft)
Bayou Black 56' BG	17.00
Shell Canal East 56' BG	17.00
Minors Canal 56' BG	16.50
Falgout Canal 56' BG	18.50
Bayou du Large 56' BG	21.00
Bayou Grand Caillou 56' BG	18.50
Bayou Petite Caillou 56' BG	20.00
Placid Canal 56' BG	22.00
Bush Canal 56' BG	24.00
Bayou Terrebonne 56' BG	25.00
Humble Canal 56' BG	24.50
Pointe Aux Chenes 56' BG	23.50
Grand Bayou 56' BG	24.50
GIWW West 125' BG	16.50
GIWW East 125' BG	15.50
Elliot Jones 20' Stoplog Gate	17.00
Humphreys Canal 20' Stoplog Gate	17.00
Shell Canal West 30' Stoplog Gate	17.00
Marmande Canal 30' Stoplog Gate	18.50
Four Point Bayou 30' Stoplog Gate	19.50
Barrier 1 ECS	17.00

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Structure	Design EL (ft)
Barrier 2 ECS	17.00
Barrier 3 ECS	17.00
Barrier 4 ECS	17.00
Barrier 5 ECS	17.00
Barrier 6 ECS	17.00
Barrier 7 ECS	17.00
Reach A ECS	16.50
Reach E-1 ECS	20.00
Reach E-2 ECS	21.00
Reach G-2 – 1 ECS	20.50
Reach G-2 – 2 ECS	20.50
Reach G-2 – 3 ECS	20.50
Reach H-1 – 1 ECS	20.00
Reach H-1 – 2 ECS	20.00
Reach J2 – 1 ECS	25.00
Reach J2 – 2 ECS	25.00
Reach J2 – 3 ECS	25.00
Reach K – 1 ECS	26.00
Reach K – 2 ECS	26.00
Reach L ECS	24.50
Madison PS Fronting Protection	25.00
Pointe Aux Chenes PS Fronting Protection	23.50
Bayou Black PS Fronting Protection	17.00
Hanson Canal PS Fronting Protection	17.00
Hwy 315 Swing Gate	21.00
Hwy 55 Swing Gate	25.00
Hwy 56 Swing Gate	20.00
Hwy 665 Swing Gate	23.50
Four Point Road Swing Gate	19.50
NAFTA Swing Gate	17.00
C North Gulf South Pipeline	16.50
C North American Midstream Pipeline	16.50
C North Williams Discovery Pipeline	16.50
ECS Lockport to Larose 1	13.00
ECS Lockport to Larose 2	13.00
Union Pacific Railroad 36’ Swing Gate	13.00
Larose FG 56’ SG	16.50
GIWW Floodwall and Hwy 24 and Hwy 3235 36’ Swing Gates	16.50

1.1 Electrical & Mechanical Designs

No electrical or mechanical designs were developed under the current effort (i.e. 2021 Economic Analysis) for any of the structural components in the levee alignment. Historical bid data from the NFS was used to develop a cost estimate. The same operating machinery used in the 3% AEP PACR was used for the new 2085 1% AEP.

1.2 General statements regarding EDS Approach

This Appendix describes the structural design approach that was utilized during development of the 2013 PACR feasibility level designs and how prorations were applied where applicable. Generally, unless stated otherwise, designs with pro-rated quantities have been developed based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation.

ER 1110-2-8152 will be followed throughout the project design process, requiring that all cofferdams will be designed by the Government.

2.0 Houma Navigation Canal Lock

Houma Navigation Lock was not designed as part of this study. The cost was based on actual bid costs for the NFS designed Lock complex.

3.0 56-foot Barge Gates

The barge gates will consist of various structural shapes and plates in a hollow box configuration. All connections will be welded connections. Gate quantities were estimated using examples of Non-Federal Sponsor barge gates that are currently in use. Steel tonnage was estimated by overall gate geometry with current levels of risk reduction and depth of gate submergence. The estimates were then prorated for future required levels of risk reduction.

Guidewalls and pile clusters will be provided as aids to navigation and to protect the main flood gate structure from impact. Details were taken from historical 56-foot sector gate structures constructed in the New Orleans District rather than performing actual design on these components

The table below provides a list of 56-foot Barge gates in the alignment.

Structure	Sill Elevation	Design EL (ft)	Top of Guidewalls
Bayou Black	-12.0	17.0	10
Shell Canal East	-12.0	17.0	10
Minors Canal	-9.0	16.5	10
Falgout Canal	-9.0	18.5	10
Bayou du Large	-7.0	21.0	10
Bayou Grand Caillou	-12.0	18.5	10
Bayou Petite Caillou	-8.0	20.0	10
Placid Canal	-8.0	22.0	10
Bush Canal	-12.0	24.0	10
Bayou Terrebonne	-9.0	25.0	10
Humble Canal	-9.0	24.5	10
Pointe Aux Chenes	-6.0	23.5	10
Grand Bayou	-9.0	24.5	10
Larose	-12.3	16.5	10

3.1 Physical Features

The physical features associated with the construction of the 56-foot barge gate structures are:

- Temporary Bypass Channels
- Phase 1 and 2 Interior Braced Cofferdams
- Barge Gate Concrete Landing Slab
- Landing Slab Pile Foundation
- Receiving Structure Concrete Monoliths
- Receiving Structure Pile Foundations
- Pivot Arm Assembly
- Steel Barge Gate
- Needle Girder, Needles and Supports
- Needle Girder Storage Platform
- Guidewalls and Pile Clusters
- Sluice Gate Concrete Monolith*
- Sluice Gate Pile Foundation*
- Sluice Gates*
- Sluice Gate Bulkheads*
- Tie-in T-Walls
- Electrical Controls and Circuitry

- Mechanical Equipment

*(Bayou Grand Caillou, Bush Canal, Falgout Canal, Grand Bayou, Placid Canal, and Bayou Petite Caillou only)

3.2 Construction Sequencing

All barge gates will be constructed approximately in the center of the existing channels. A minimum 60-foot temporary bypass channel will be constructed as the first order of construction, allowing navigation passage during construction. Once navigation is routed through the temporary bypass channel, a cofferdam will be constructed, permitting the construction of the 56-foot barge gate landing slab, receiving structure monoliths, and the sluice gate monoliths, if applicable. Reduced power will be required for vessels passing through the construction area to reduce the risk of impact to the cofferdam. A timber guidewall and pile clusters will be provided along the bypass channel to prevent vessel impact on the cofferdam. Once construction of the 56-foot barge gate landing slab, pivot arm assembly, receiving structure monoliths, and sluice gate monoliths is completed, navigation will be re-routed through the permanent barge gate structure. A phase 2 cofferdam will be required for the T-Walls adjacent to the barge gate/sluice gate structures. Once navigation is re-routed, the phase 2 cofferdam, permanent guidewalls and pile clusters, tie-in T-walls and final civil site work can be completed.

3.3 Cofferdams

A Phase 1 cofferdam will be constructed to permit the in-the-dry construction of the barge gate concrete landing slab, pivot arm assembly, receiving structure concrete monoliths, and the sluice gate concrete monolith (if applicable). The cofferdam is an internally braced cofferdam with wide-flange walers and pipe braces supporting PZ sheet piling. Anchor forces, bending moment in the sheet piling, and required sheet piling tip elevations were computed for Bush Canal, Bayou du Large, and Point Aux Chenes. Bayou du Large cofferdam design was conservatively used for all remaining structures where no design was performed.

A Phase 2 cofferdam will be constructed to permit the construction of the adjacent T-Walls to the barge gate/sluice gate structures that will be in the water. The same anchor forces, moments, and tips used for the Phase 1 cofferdams will be conservatively used for the Phase 2 cofferdams.

3.4 Receiving Structure Monolith Concrete

Receiving Structure walls were designed as cantilever beams extending from the base slab. A constant wall thickness was assumed for the full height of the walls. Typical walls were designed for gates with water protection elevations of 17 feet and 25 feet. No pro-rating of wall thickness was performed. The resulting calculated wall thicknesses are summarized in the table below.

Structure	Wall Thickness (ft) (2085 1% AEP)
Bayou Black	4.50
Shell Canal East	4.50
Minors Canal	4.50
Falgout Canal	4.50
Bayou du Large	7.50
Bayou Grand Caillou	4.50
Bayou Petite Caillou	7.50
Placid Canal	4.50
Bush Canal	7.50
Bayou Terrebonne	7.50
Humble Canal	7.50
Pointe Aux Chenes	4.50
Grand Bayou	7.50
Larose	4.50

3.5 Receiving Structure Slabs

The Receiving Structure base slabs for 17-foot protection level were estimated to be 45 feet long by 36 feet wide. The Receiving Structure base slabs for 25-foot protection level were estimated to be 72 feet long by 48 feet wide. The base slab thicknesses were determined by matching the wall thicknesses (for ease of moment transfer) and adding depth for pile embedment. The base slab thicknesses are summarized in the table below.

Structure	Slab Thickness (ft) (2085 1% AEP)
Bayou Black	6.50
Shell Canal East	6.50
Minors Canal	6.00
Falgout Canal	6.00
Bayou du Large	6.50
Bayou Grand Caillou	6.50
Bayou Petite Caillou	9.50
Placid Canal	6.50
Bush Canal	9.50
Bayou Terrebonne	9.50
Humble Canal	9.50

Structure	Slab Thickness (ft) (2085 1% AEP)
Pointe Aux Chenes	6.50
Grand Bayou	9.50
Larose	6.50

3.6 Landing Slab

The 56-foot barge gate landing slab was estimated to be 72 feet long by 36 feet wide by 4 feet deep.

3.7 Receiving Structure Pile Foundations

The pile foundation for Receiving Structures will include 20, 36-inch pipe piles for 17-foot protection level and 24, 48-inch pipe piles for 25-foot protection level. The design Factors of Safety utilized for the design comply with EM 1110-2-2906 and the latest requirements in the HSDRRS Design Guidelines. Pile capacities were based on data curves for Bush Canal Flood Gate. Tension hooks would be provided on all piles experiencing tension loads. CPGA analysis was performed. No pro-rating was performed. Alternative pile types and arrangements will be investigated during detailed design for each structure to optimize the pile foundation. The pile foundation for Landing Slabs will include 32, 36-inch pipe piles.

3.8 CPGA Analysis

CPGA was utilized to develop the pile layouts for the receiving structures and determine the required tip elevation. The piles were modeled as pinned connections with the piles providing all of the lateral resistance. The horizontal subgrade modulus was based on the soil within the top ten pile diameters from grade. The horizontal subgrade modulus was reduced for group effects in accordance with EM 1110-2-2906.

3.9 Pile Curves and Horizontal Subgrade Modulus

Pile curves and horizontal subgrade modulus were taken from “36-in Diameter Steel Pipe Piles” data curves for Bush Canal Flood Gate provided by Geotechnical Branch. The resulting pile tip estimates are summarized in the table below:

Structure	Pile Tip (ft) (1% AEP)
Bayou Black	-145.0
Shell Canal East	-145.0
Minors Canal	-145.0

Structure	Pile Tip (ft) (1% AEP)
Falgout Canal	-145.0
Bayou du Large	-145.0
Bayou Grand Caillou	-145.0
Bayou Petite Caillou	-155.0
Placid Canal	-145.0
Bush Canal	-155.0
Bayou Terrebonne	-155.0
Humble Canal	-155.0
Pointe Aux Chenes	-145.0
Grand Bayou	-155.0
Larose	-145.0

3.10 Cut-off Wall

A cut-off sheetpile wall will be provided to reduce possible seepage, scouring and uplift. A PZC-13 sheetpile meeting the requirements of ASTM A572, Grade 50 was assumed for the cutoff wall. Tip elevations were provided by New Orleans District Engineering Division Geotechnical Branch utilizing Lane's Weighted Creep Ratio for each structure.

3.11 Sluice Gates & Walls

The sluice gates will be manufactured 16'0" by 16'0" or 16'0" by 12'0" cast iron gates. The sluice gate wall quantities were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the December 2020, 2085 1% design elevations provided by EDHH.

3.12 Sluice Gate Base Slab

The sluice gate base slab thickness from the 3% AEP PACR was used for the new 2085 1% AEP elevation and are summarized below:

Structure	Slab Thickness (ft) (2085 1% AEP)
Bayou Grand Caillou	5
Bayou Petite Caillou	7
Placid Canal	7
Bush Canal	7
Falgout Canal	5
Grand Bayou	7

3.13 Sluice Gate Pile Foundation

The pile foundation for the sluice gates will include HP14x73 piles battered on 3V/1H. Pile capacities were based on the use of compression pile testing, but no tension pile testing. Tension hooks will be provided on all piles on the flood side of the sheet pile cut-off wall to handle the maximum tensile load. The tip elevations were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. Alternative pile types and arrangements will be investigated during PED design phases for each structure to optimize the pile foundation.

3.14 Cut-off Wall

A cut-off sheetpile wall will be provided to reduce possible seepage, scouring and uplift. A PZC-13 sheetpile meeting the requirements of ASTM A572, Grade 50 was assumed for the cut-off wall. Tip elevations from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

3.15 Bulkheads

The sluice gate bulkheads are designed to dewater the entire gatebay permitting maintenance of the sluice gates and concrete gatebay. The bulkheads were designed for a sill elevation of -12.0 with a water elevation of +5.0. Each sluice gate structure will be provided with four bulkheads, permitting the dewatering of two sluice gate bays at a time.

The steel bulkheads consist of horizontal L8x4x1/2 members with a 3/8-inch skin plate. The bulkhead design from the 3% AEP PACR structures was used for the new 20185 1% AEP elevation as the dewatering loads are the same. All steel will be constructed from material conforming to ASTM A572, Grade 50.

3.16 Tie-in T-Walls

Tie-in T-Walls extend from the sector gate/sluice gate structures to the adjacent full-levee section. The distance from the gate structure to the full-levee section was calculated for the 3% AEP PACR. The monolith numbers and lengths determined from the PACR were used for the new 2085 1% AEP. A 30-foot sheetpile cut-off will be embedded into the levee at the transition between the tie-in T-Walls and the levee section. Nine inches of reinforced concrete scour protection will be provided at the transition area. A 2-foot soil pre-load will be provided above the final grade along the T-Walls to eliminate settlement induced bending effects.

Typical designs were created during the development of the 3% AEP PACR and were categorized according to hydraulic reach and base elevation. For the 2085 1% AEP, the T-wall sections were re-categorized based on the new elevations and the designs developed from the 3% AEP PACR were used. The required pile tip was determined individually for each structure based on the pile capacity demand from the typical designs. Pile capacities were based on the use of compression pile testing, but no tension pile testing. Tension hooks are provided on all piles on the flood side of the sheet pile cutoff- wall to handle the maximum tensile load.

4.0 125-foot Sector Gate

The sector gates will consist of structural pipe sections supporting the vertical intercostals and skin plate with a central angle of 70. All connections will be welded connections. A rack and pinion gear system will operate the gate. All steel members on the gate will be painted with a coal tar epoxy paint system. The sector gate steel quantities were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. The table below lists the structures examined:

Structure	Sill Elevation	Design El (ft)	Top of Guidewalls
GIWW West	-16	28	10
GIWW East	-16	18	10

4.1 Physical Features

The physical features associated with the construction of the 125-foot sector gate structures are:

- Temporary Bypass Channels
- Phase 1 Cellular Cofferdam
- Phase 2 Interior Braced Cofferdams
- Sector Gate Concrete Monolith
- Sector Gate Pile Foundation
- Steel Sector Gate
- Needle Girder, Needles and Supports
- Needle Girder Storage Platform
- Guidewalls
- End Cell Dolphins
- Sluice Gate Concrete Monolith
- Sluice Gate Pile Foundation

- Sluice Gates
- Sluice Gate Bulkheads
- Tie-in T-Walls
- Electrical Controls and Circuitry
- Mechanical Equipment

4.2 Construction Sequencing

Both 125-foot sector gates will be constructed in the approximate center of the existing channels. A minimum 125-foot temporary bypass channel will be constructed as the first order of construction, to allow navigation passage during construction. Once navigation is routed through the temporary bypass channel, a cellular cofferdam will be constructed, permitting the construction of the 125-foot sector gate monolith and the sluice gate monoliths. Reduced power will be required for vessels passing through the construction area to reduce the risk of impact to the cofferdam. A timber guidewall and pile clusters will be provided along the bypass channel to minimize potential vessel impact on the cofferdam. Once construction of the 125-foot sector gate monolith and sluice gate monoliths is completed, navigation will be re-routed through the permanent sector gate structure. A phase 2 cofferdam will be required for the T-Walls adjacent to the sector gate/sluice gate structures. Once navigation is re-routed, the phase 2 cofferdam, needle girder storage platform, permanent guidewalls, end cell dolphins, tie-in T-Walls and final civil site work can be completed.

4.3 Phase 1 Cellular Cofferdam

A Phase 1 cellular cofferdam will be constructed to permit the in the dry construction of the sector gate concrete monolith and the sluice gate concrete monolith. The cofferdam will be a sheet pile cellular cofferdam filled with sand. Deep soil mixing will be necessary in the interior of the cellular structure to provide adequate geotechnical safety factors. The same cofferdam designed for the PACR structures was used for this cost certification.

4.4 Phase 2 Interior Braced Cofferdams

A phase 2 cofferdam will be constructed to permit the construction of the adjacent T-Walls to the sector gate/sluice gate structures that will be in the water. The anchor forces, moments, and tips used for the Phase 1 Bayou du Large sector gate phase 1 cofferdams developed for the PACR was conservatively used for the Phase 2 cofferdams.

4.5 Sector Gate Monolith Concrete, Wall, and Thrust/Machinery Block

Quantities for these features were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation.

4.6 Sector Gate Base Slab

The 125-foot sector gate base slab will measure 310'6" long by 117'8" wide. The sector gate base slab thickness from the 3% AEP PACR was used for the new 2085 1% AEP elevation and is summarized in the table below:
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Structure	Slab Thickness (ft) (2085 1% AEP)
GIWW West	10
GIWW East	10

4.7 Sector Gate Pile Foundation

The pile foundation for the sector gates will include 246 24-inch pipe piles with 1/2-inch thick wall thickness battered on 4 vertical to 1 horizontal slope. Pile capacities were based on the use of compression pile testing, but no tension pile testing. Tension hooks are provided on all piles. The tip elevations were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. Alternative pile types and arrangements will be investigated during detailed PED design for each structure to optimize the pile foundation.

4.8 Cut-off Wall

A cut-off sheetpile wall will be provided to reduce possible seepage, scouring and uplift. A PZC-13 sheetpile meeting the requirements of ASTM A572, Grade 50 was assumed for the cut-off wall. Tip elevations from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

4.9 Needle Girders, Needles and Supports

The needle girder system arrangement was designed to dewater the entire gatebay permitting maintenance of the sector gates. The needle girder system was designed for a sill elevation of -16.0 with a water elevation of +5.0. Each gate structure will be provided with 24 steel needles (12 on each side of the structure), measuring 14'6" in width, used to dewater the concrete gatebay monoliths. The steel needles will consist of vertical WT8x38.5 members with a 7/16-inch skin plate. The needles will be supported by the sill of the concrete gatebay and the needle girder at El +5.0. The needle girder was designed as a simply supported, built-up girder, spanning across the 125-foot gate opening. The girder will be supported along its weak axis by three support towers. The girder at mid-span has a depth of 8’4” with a 3/4-inch web and 2 inch by 20 inch flanges. The girder will taper down to a depth of 5’4” at the ends. The support towers will consist of welded HSS connections, supporting the dead and vertical live loads of the needle girder.

4.10 Needle Girder Storage Platform

The needle girder storage platform will be a reinforced concrete structure measuring 71 feet wide by 135 feet long. The structure will consist of an 8-inch cast-in-place slab supported by 40-inch wide by 30-inch deep cast-in-place beams, spaced 9 feet on center. The storage platform will be supported by 60 24-inch square, 80-foot long, precast, pre-stressed concrete (PPC) piles.

4.11 Guidewalls

Guidewalls will be provided as aids to navigation and to protect the main flood gate structure from impact. Details were taken from the HNC Lock structure as both structures will see similar vessel traffic.

4.12 End Cell Dolphins

End Cell Dolphins will protect the main flood gate structure and guidewalls from head-on impact from errant vessels. The end cell design was taken from the Western Closure Complex 225-foot Sector Gate, where similar vessel traffic is seen along the GIWW. The end cell will consist of a 60-foot sheet pile cellular structure with a concrete ring in the interior of the cell. The inside of the concrete ring will be filled with lightweight material. The concrete structure will be supported by 18-inch diameter pipe piles.

4.13 Control Houses

A precast 14-foot square concrete control house will be provided for each gate leaf to shelter the gate control systems and machinery and provide space for a gate operator as required. The buildings are considered small and were not designed; so, historical dimensions were used for cost estimation purposes. It is assumed that these buildings will be pre-fabricated products.

4.14 Sector Gate Sluice Gates

The sluice gates will be manufactured 16’ by 16’ or 16’ by 12’ iron gates.

5.0 Stop-Log Gates

This section contains a summary of work for the three 30-foot stop log gate structures and the two 20-foot stop log gate structures. The table below lists the structures examined:

Structure	Sill Elevation	Design El (ft)	Top of Guidewalls
Elliot Jones	-8.0	17.0	10.0
Humphreys Canal	-8.0	17.0	10.0
Shell Canal West	-8.0	17.0	10.0
Marmande Canal	-8.0	18.5	10.0
Four Point Bayou	-8.0	19.5	10.0

5.1 Physical Features

The physical features associated with the construction of the stop log gate structures are:

- Interior Braced Cofferdams
- Stop Log Gate Concrete Monolith
- Stop Log Gate Pile Foundation
- Stop Log Gate
- Crane Platform T-Wall
- Needle Girder and Needles
- Bulkhead Storage Platform
- Guidewalls & Pile Clusters
- Tie-in T-Walls
- Mechanical Equipment

5.2 Construction Sequencing

All stop log gates will be constructed approximately in the center of the existing channels. A minimum 20-foot or 30-foot (depending on gate opening size) temporary bypass channel will be constructed as the first order of construction, allowing navigation passage during construction. Once navigation is routed through the temporary bypass channel, a cofferdam will be constructed, permitting the construction of the stop log gate monolith and the crane platform T-Wall monolith. Reduced power will be required for vessels passing through the construction area to reduce the risk of impact to the cofferdam. A timber guidewall and pile clusters will be provided along the bypass channel to prevent vessel impact on the cofferdam. Once construction of the stop log gate monolith and the crane platform T-Wall monolith is completed, navigation will be re-routed through the permanent stop log gate structure. A phase 2 cofferdam will be required for the T-Wall adjacent to the stop log gate structures. Once navigation is re-routed, the phase 2 cofferdam, bulkhead storage platform, permanent guidewalls and pile clusters, tie-in T-Walls and final civil site work can be completed.

5.3 Cofferdams

A Phase 1 cofferdam will be constructed to permit the in the dry construction of the stop log concrete monolith and the crane platform T-Wall monolith. The cofferdam is an internally braced cofferdam with wide flange walers and pipe braces supporting PZ sheet piling. Anchor forces, bending moment in the sheet piling, and required sheet piling tip elevation calculated for Bayou du Large sector gate during the development of the PACR were conservatively used for the stop log gate structures.

A phase 2 cofferdam will be constructed to permit the construction of the adjacent T-Walls to the stop log gate that will be in the water. The same anchor forces, moments, and tips used for the Phase 1 cofferdams were conservatively used for the Phase 2 cofferdams.

5.4 Walls & Base Slab

The stop log wall quantities were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. The stop log base slab thickness from the 3% AEP PACR was used for the new 2085 1% AEP elevation and is summarized in the table below:
.

Structure	Slab Thickness (ft) (2085 1% AEP)
Elliot Jones	6
Humphreys Canal	6
Shell Canal West	6
Marmande Canal	6
Four Point Bayou	6

5.5 Gate Pile Foundation

The pile foundations for the 20-foot and 30-foot stop log gates will include 30 HP14x73 and 49 HP14x73 piles, respectively, each battered on 3V/1H. Pile capacities were based on the use of compression pile testing, but no tension pile testing. Tension hooks will be provided on all piles. The tip elevations were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. Alternative pile types and arrangements will be investigated during detailed PED design for each structure to optimize the pile foundation.

5.6 Cut-off Wall

A cut-off sheetpile wall will be provided to reduce possible seepage, scouring and uplift. A PZC-13 sheetpile meeting the requirements of ASTM A572, Grade 50 was assumed for the cut-off wall. Tip elevations from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

5.7 Gate

The stop log gates will consist of horizontal wide-flanges supporting the vertical intercostals and skin plate. All connections will be welded connections. A crane mounted on an adjacent T-Wall will be used to lower the gate in place. All steel members on the gate will be painted with a coal tar epoxy paint system.

5.8 Crane Platform T-Wall

The crane platform T-Wall will be located adjacent to the stop log gate monolith and functions as a T-Wall with the addition of a crane load imposed on the monolith. The crane platform wall quantities were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. The crane platform base slab thickness from the 3% AEP PACR was used for the new 2085 1% AEP elevation.

5.9 Needle Girders and Needles

The needle girder system arrangement was designed to dewater the entire gatebay to permit maintenance of the sluice gate concrete gatebay if necessary. The needle girder system was designed for a sill elevation of -8.0 with a water elevation of +5.0. Each stop log gate structure will utilize existing steel needles from other structures in the Morganza to the Gulf alignment as it is not anticipated that maintenance dewatering will be necessary during the design life of the structure. The needles are supported by the sill of the concrete gatebay and the needle girder at El +5.0. The needle girder was designed as a simply supported, built-up girder, spanning across the 20-foot or 30-foot gate opening. The girder will be a plate girder with a depth of 2’1-1/2” with a 5/8-inch web and 3/4-inch by 12-inch flanges. The design and quantities from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

5.10 Bulkhead Storage Platform

The bulkhead storage platform for the 20-foot stop log gate structures will be a reinforced concrete structure measuring 22’6” wide by 30’0” long. The structure consists of a 12-inch cast-in-place slab supported by 22-inch wide by 16-inch deep cast-in-place beams, spaced 14’1” on center. The storage platform will be supported by 15 14-inch square precast, pre-stressed concrete (PPC) piles.

The bulkhead storage platform for the 30-foot stop log gate structures will be a reinforced concrete structure measuring 22’6” wide by 30’0” long. The structure consists of a 15-inch cast-in-place slab supported by 22e by 24” cast-in-place beams, spaced 19’1” on center. The storage platform will be supported by 15 14-inch square precast, pre-stressed concrete (PPC) piles. The design and quantities from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

5.11 Guidewalls and Pile Clusters

Guidewalls and pile clusters will be provided as aids to navigation and to protect the main flood gate structure from impact. Details were taken from historical 56-foot sector gate structures constructed in the New Orleans District rather than performing actual design on this component. The quantities from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

6.0 Environmental Control Structures

This section contains a summary of work for the 21 environmental control structures, which are part of the Morganza to the Gulf Alignment for the 1% AEP level of protection. The table below**Error! Reference source not found.** lists the structures examined.

Structure	Culvert Type	Sill Elevation	Design El (ft)
Barrier 1	6 – 6’ X 6’	-4.5	17.0
Barrier 2	6 – 6’ X 6’	-4.5	17.0
Barrier 3	6 – 6’ X 6’	-4.5	17.0
Barrier 4	6 – 6’ X 6’	-4.5	17.0
Barrier 5	6 – 6’ X 6’	-4.5	17.0
Barrier 6	6 – 6’ X 6’	-4.5	17.0
Barrier 7	6 – 6’ X 6’	-4.5	17.0
Reach A	6 – 6’ X 6’	-4.5	16.5
Reach E-1	9 – 6’ X 6’	-4.5	20.0
Reach E-2	9 – 6’ X 6’	-4.5	21.0
Reach G-2 - 1	6 – 6’ X 6’	-4.5	20.5
Reach G-2 - 2	4 – 6’ X 6’	-4.5	20.5
Reach G-3 - 1	4 – 6’ X 6’	-4.5	20.5
Reach H-1 – 1	1 – 6’ X 6’	-4.5	20.0
Reach H-1 – 2	6 – 6’ X 6’	-4.5	20.0
Reach J2 – 1	4 – 5’ X 10’	-3.5	25.0
Reach J2 – 2	4 – 5’ X 10’	-3.5	25.0

Structure	Culvert Type	Sill Elevation	Design El (ft)
Reach J2 – 3	5 – 5' X 10'	-3.5	25.0
Reach K – 1	2 – 6' X 6'	-4.5	26.0
Reach K – 2	2 – 6' X 6'	-4.5	26.0
Reach L	6 – 6' X 6'	-4.5	24.5
Larose to Lockport 1	3 – 5' X 10'	-3.5	13.0
Larose to Lockport 2	2 – 6.5' X 7.5'	-5.0	13.0

All elevations listed in this text and shown on the Tables and Plates, unless otherwise noted, are in feet, NAVD88.

6.1 Physical Features

The physical features associated with the construction of the environmental control structures are:

- Interior Braced Cofferdam
- Concrete Monolith
- Pile Foundation
- Sluice Gate
- Bulkheads
- Trash Racks
- Wingwalls
- Tie-in T-Walls
- Mechanical Equipment

6.2 Construction Sequencing

All environmental control structures will be constructed approximately in the center of the existing channels. A cofferdam will be constructed, permitting the construction of the environmental control structure concrete monolith and the wingwalls.

6.3 Cofferdams

A cofferdam will be constructed to permit the in the dry construction of the environmental control structure. The cofferdam is an internally braced cofferdam with wide flange walers and pipe braces supporting PZ sheet piling. Anchor forces, bending moment in the sheet piling, and required sheet piling tip elevation calculated for Bayou du Large sector gate during the development of the PACR were conservatively used for the environmental control structures.

6.4 Walls & Base Slab

The ECS wall quantities were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. The base slab thickness from the 3% AEP PACR was used for the new 2085 1% AEP elevation.

6.5 Pile Foundation

The pile foundation for the environmental control structures will include HP14x73 piles battered on 3 vertical to 1 horizontal slope. Pile capacities were based on the use of compression pile testing, but no tension pile testing. Tension hooks are provided on all piles on the flood side of the sheet pile cutoff. The tip elevations were pro-rated based on the elevation difference between the 3% AEP quantities developed from the PACR and the new 2085 1% elevation. Alternative pile types and arrangements will be investigated during detailed design for each structure to optimize the pile foundation.

6.6 Cut-off Wall

A cut-off sheetpile wall will be provided to reduce possible seepage, scouring and uplift. A PZC-13 sheetpile meeting the requirements of ASTM A572, Grade 50 was assumed for the cut-off wall. Tip elevations from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

6.7 Sluice Gates

The sluice gates will be manufactured 6’ by 6’, 5’ by 10’, 6.5’ by 7.5’ or 5’ by 10’ cast iron gates.

6.8 Bulkheads

The bulkheads were designed to dewater the sluice gate bays to permit maintenance of the sluice gates and concrete gatebay. The bulkheads were designed for a sill elevation of -4.5 with a water elevation of +5.0. Each sluice gate structure will be provided with two bulkheads, permitting the dewatering of 1 sluice gate bay at a time. The design and quantities from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

6.9 Trash Racks

Trash racks will be provided on both the flood and protected sides of the sluice gates to prevent large debris from blocking the closure of the sluice gates. The tracks will be constructed of galvanized steel plate conforming to the requirements of ASTM A572, Grade 50. The design and quantities from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

6.10 Wingwalls

Wingwalls will be provided on all 4 corners of the environmental control structure to retain fill and to provide a smooth flow transition into the environmental control structures. The wingwalls are pile founded T-Wall type concrete monoliths. The wing walls will be supported on HP14x73 steel piling, whose tips will be extended to the same tip elevation of the environmental control structure pile tips to prevent differential settlement. The design and quantities from the 3% AEP PACR structures were used for the new 2085 1% AEP elevation.

7.0 Pump Station Fronting Protection

This section contains a summary of work for the four pump station fronting protections. The table below lists the structures examined.

Pump Station	Pump Sizes	Design El (ft)
Madison	2 – 48”	25.0
Pointe Aux Chenes	2 – 20”	23.5
Bayou Black	2 – 42”	17.0
Hanson Canal	2 – 42”	17.0

7.1 Physical Features

The physical features associated with the construction of the pump station fronting protection are:

- Fronting Protection T-Walls
- Mechanical Equipment – Butterfly Valves

7.2 Construction Sequencing

All fronting protections will be constructed on the flood side of the existing protection. Based on site visits conducted for this report, the discharge pipes extend far enough such that additional pipe length will not be needed.

7.3 Fronting Protection Walls

All fronting protection walls were designed as T-Walls as described herein

8.0 Roadway/Railroad Gates

This section contains a summary of work for the ten roadway/railroad swing gates. The table below lists the structures examined.

Roadway	Gate Opening (ft)	Design El (ft)
Hwy 315	36	21.0
Hwy 55	36	25.0
Hwy 56	36	20.0
Hwy 665	36	23.5
NAFTA	36	17.0
Four Point Road	36	19.5
Hwy 24	36	16.5
Hwy 3235 - 1	36	16.5
Hwy 3235 - 2	36	16.5
Union Pacific RR	36	13.0

8.1 Physical Features

The physical features associated with the construction of the roadway gates structures are:

- Steel Swing Gate
- Traffic Control Devices
- Falsework (Railroad Gates)
- Concrete Monolith
- Tie-in T-Walls

8.2 Construction Sequencing

All roadway gates except for the NAFTA gate are directly adjacent to navigation gates; therefore, they will be constructed concurrent with those structures. The roadway gate concrete monoliths will be constructed in two halves to permit traffic flow during construction of the concrete monoliths. Detours and traffic control will conform to LADOTD Standards. Railroad gates will be constructed with temporary falsework to minimize disruptions to the railroad during construction

8.3 Steel Swing Gates

The structural design of the steel swing gates was performed in accordance with Corps engineering guidance and applicable industry standards. The swing gates will consist of structural wide flange sections supporting the vertical ribs and skin plate. All connections will be welded connections. All steel members on the gate will be painted with a vinyl paint system. The swing gates were re-designed for the new 2085 1% AEP.

8.4 Skin Plate

The skin plate was designed conservatively as a continuously supported member by vertical intercostals. An allowable stress of 0.50 times the yield stress was permitted for basic loading conditions with a permissible increase of one-third for abnormal loading conditions.

8.5 Vertical Intercostals

The skin plate will be attached to the vertical intercostals by continuous welds. The intercostals were designed as simply supported members between the horizontal girders. The skin plate was considered as an effective part of the vertical intercostals, with the effective width of skin plate determined according to the AISC specifications for a non-compact flange. A minimum depth of 8 inches for the intercostals is required to facilitate painting and maintenance. The intercostals will be constructed from steel material conforming to ASTM A572, Grade 50.

8.6 Horizontal Beams

The gate will consist of horizontal wide flange sections supporting the vertical intercostals and skin plate. The beam was designed as simply supported between the concrete pilasters of the swing gate monolith. The beams are constructed from steel material conforming to ASTM A992.

8.7 Concrete Monolith and Pile Foundation

The swing gate concrete monolith and pile foundation was not designed; rather the typical T-Wall design as described herein for other structure components was utilized for quantity estimation.

8.8 Traffic Control Devices

Each roadway gate will include guardrails meeting the requirements of LADOTD GR-200 and end treatment on all four sides of the structure. Removable Vulcan barriers will be provided as guardrails in the gate swing radius.

9.0 Pipeline Crossings

This section contains a summary of work for the three pipelines crossing T-Walls. The table below lists the structures examined.

Pipeline	Top Elevation (2085 1% AEP)
C North Gulf South Pipeline	16.5
C North American Midstream Pipeline	16.5
C North Williams Discovery Pipeline	16.5

9.1 Physical Features

The physical features associated with the construction of the pipeline crossing structures are:

- Utility Crossing T-Wall
- Utility Sleeve
- Cofferdam
- Tie-in T-Walls (Union Pacific Railroad Gate Only)

9.2 Construction Sequencing

A cofferdam will be constructed to construct the sleeve of the pipeline crossing through the T-Wall.

9.3 T-Wall Concrete Monolith and Pile Foundation

The utility crossing concrete monolith and pile foundation was not designed, rather the typical T-Wall design as described earlier herein was utilized for quantity estimation.

9.4 Cofferdam

The cofferdam design as described earlier herein was used to develop quantities for the cofferdam required to construct the pipeline crossing sleeve.

9.5 Tie-in T-Walls

Tie-in T-Walls extend from the utility crossing T-Wall to the full levee section. T-walls shall be designed as described earlier herein for other structural feature.

Appendix B—Economics & Level 3 Economic Reevaluation Report

MORGANZA TO THE GULF OF MEXICO, LOUISIANA

ECONOMIC APPENDIX OUTLINE

PART 1: BACKGROUND INFORMATION

INTRODUCTION

General. This appendix presents the results of the economic analysis in support of a Level 3 Economic Update under Civil Works' Policy Memorandum (CWPM) 12-001 for the Morganza to the Gulf of Mexico, Louisiana (MTG) project and also serves to document the economics on the current design for the MTG project that is describe in the Engineering Documentation Report. The source of the previous authorized economic data is the document titled "Morganza to the Gulf of Mexico Louisiana Final Post-Authorization Change Report" dated May 2013 (hereafter referred to as 2013 PAC Report). The 2013 PAC Report was an update to the 2008 analysis, which determined that the Morganza to the Gulf project updated with the Hurricane and Storm Damage Risk Reduction System (HSDRRS) criteria would still be economically justified. The current design, described in the EDR, includes the incorporation of the adaptive design criteria as recommended in the Adaptive Criteria Assessment Report (ACAR) and other design refinements that have evolved since the PAC Report. Many of the descriptions in this appendix focus on the changes of the benefits from 2013 PAC Report to the current design.

This document was prepared in accordance with Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook, and ER 1105-2-101, Planning Guidance, Risk Analysis for Flood Damage Reduction Studies. The National Economic Development Procedures Manual for Flood Risk Management and Coastal Storm Risk Management, prepared by the Water Resources Support Center, Institute for Water Resources, was also used as a reference, along with the Users Manual for the Hydrologic Engineering Center Flood Damage Analysis Model and CWPM 12-001: Methodology for Updating Benefit-to-Cost Ratios (BCR) for Budget Development.

The economic appendix consists of a description of the methodology used to determine national economic development (NED) damages and benefits under existing and future conditions, projects costs, net benefits, and BCR. The evaluation reports benefits and costs at fiscal year (FY) 2022 price levels (October 2021). The proposed alternative was evaluated by comparing estimated equivalent annual benefits that would accrue to the study area with estimated average annual project costs. Equivalent annual benefits and average annual project costs were computed using a period of analysis of 50 years and the current FY 2022 Federal discount rate of 2.25 percent, as well as the Office of Management and Budget
(OMB) discount rate of 7 percent. The year in which significant benefits will accrue as a result of project construction is 2035. The alternative in the remainder of the appendix will be referred to as the 1 percent annual exceedance probability (AEP) alternative.

In addition to the NED account, two other project accounts have been used to evaluate the 1 percent AEP alternative: regional economic development (RED) and other social effects (OSE). Both of these accounts will be discussed in separate appendices.

NED Benefit Categories Considered. The NED procedure manuals for coastal and urban areas recognize four primary categories of benefits for flood risk management measures:

inundation reduction, intensification, location, and employment benefits. The majority of the benefits attributable to a project alternative generally result from the reduction of actual or potential damages caused by inundation. Inundation reduction, which is the only category of NED benefits addressed in this evaluation, includes the reduction of physical damages to structures, contents, and vehicles, avoidance of structure-raising costs, emergency cost reduction, agricultural benefits, water supply benefits, and safe harbor benefits. While all of these were calculated for the PAC report, only reduction of physical damages to structures, contents, and vehicles and emergency cost reduction were recalculated for this economic update. Avoidance of structure-raising costs, water supply benefits, and safe harbor benefits were all scaled from previous values to current values using the change in benefits to the recalculated categories. This scaling accounts for both changes in price level and interest rate, as well as changes in the with-project and without-project hydraulic conditions.

Physical Flood Damage Reduction. Physical flood damage reduction benefits include the decrease in potential damages to residential and commercial structures, their contents, and the privately owned vehicles associated with these structures. Inundation reduction benefits were considered under both existing and future conditions. Projections of the future development expected to place in the study area during the period of analysis were included as part of the future condition analysis in the PAC report, but were not included in this economic update due to development in many of those areas being actualized and consequently included in the current inventory as the existing condition.

At the time of the PAC report, partial storm surge risk reduction was expected to be provided before the base year of the project alternative, leading to inundation reduction benefits for residential and commercial structures, their contents, and vehicles being achieved during construction. In the PAC report, the benefits during construction were computed by comparing the expected without-project damages to the with-project damages receiving partial risk reduction beginning in the year 2024. It has been determined at the time of this economic update that the alternative will not produce benefits until initial project completion in 2035.

OMB survey forms were used to collect information on the value and placement of contents in the 24 industrial facilities located in the study area. The information from these surveys was used to develop the physical flood damage and benefits for these industrial properties. Additional information regarding the use of the OBM approved forms can be found in the final report dated May 2009 titled *Morganza to the Gulf Post Authorization Change Report: Residential and Nonresidential Structure Inventory and Nonresidential Surveys*.

Avoidance of Structure-Raising Costs. Typically, property owners in areas that incur repetitive flooding have three options for reducing their flood risk: raise their structures in place, floodproof/retrofit their structures, or relocate to other areas. For purposes of this evaluation, only structure-raising measures were considered. The avoidance of structure-raising costs for all residential and non-residential structures that would otherwise incur repetitive flooding is considered a benefit attributable to the 1 percent AEP alternative. The benefits captured for this category at the time of the PAC report were scaled for this economic update.

Emergency Cost Reduction Benefits. Emergency costs are those costs incurred by the community during and immediately following a major storm. They include the costs of emergency measures, such as evacuation and reoccupation activities conducted by local governments and homeowners, repair of streets, highways, and railroad tracks, and the subsequent cleanup and restoration of private, commercial, and public properties. In this evaluation, only the emergency cost reduction benefits associated with debris removal and cleanup, and the reduction of damages to major and secondary highways, streets, and railroads were considered.

Agricultural Benefits. NED agricultural benefits are defined as the increase in the value of the agricultural output of the area and the decrease in the cost of maintaining a given level of output attributable to a project alternative. These benefits include reductions in production costs and in associated costs, the reduction in damage costs from floods, erosion, sedimentation, inadequate drainage, or inadequate water supply, the value of increased production of crops, and the economic efficiency of increasing the production of crops in the project area.

Agricultural benefits have not been quantified and are not included in this appendix. Although the average annual agricultural acres inundated under without-project and with-project conditions were provided for the 1 percent AEP alternative in the PAC report, inundation mapping sufficient for the same level of detail was not done for this economic update and thus is not included.

Municipal Water Supply Benefits. The NED benefits from municipal water supply are defined as the willingness of a community to pay for an increase in the value of goods and services attributable to the water supply. In most cases, the marginal cost of supplying water is used to calculate the willingness of the consumers to pay for the additional water supply. However, because the marginal cost was not determined in this study, the water supply benefits were measured by comparing the reduction in the cost of treating water for municipal usage during periods of high salinity that is attributable to the 1 percent AEP alternative. The benefits captured for this category at the time of the PAC report were scaled for this economic update.

Safe Harbor Benefits for Large Recreational and Commercial Boat Fleets. The 1 percent AEP alternative reduces the risk of physical damage to large recreational and commercial boat fleet boats from the storm surges associated with minor storms, tropical storms, and hurricanes. The reduction in damages to large vessels and the reduction in the cost of moving the vessels to safer areas are considered benefits attributable to the 1 percent AEP alternative. However, only the reduction in travel costs was considered in this evaluation. The benefits captured for this category at the time of the PAC report were scaled for this economic update.

Regional Economic Development. The RED account has been addressed in a separate appendix to evaluate the 1 percent AEP alternative. If the economic activity lost in the flooded region can be transferred to another area or region in the national economy, then these losses are not included in the NED account. However, the impacts on the employment, income, and output of the non-Federal or regional economy are considered part of the RED account. The USACE input-output macroeconomic Regional Economic System model (RECONS) Version 2 was used to address the impacts of the construction spending associated with the 1 percent AEP alternative on the regional economy.

Other Social Effects. The OSE account has been addressed in a separate appendix to evaluate the 1 percent AEP alternative. OSE focuses on the health and safety impacts that the project has on the local population.

DESCRIPTION OF THE STUDY AREA

Geographic Location. The study area, which is located in coastal Louisiana approximately 60 miles southwest of the City of New Orleans, includes all of Terrebonne Parish, the portion of Lafourche Parish to the south and west of Bayou Lafourche, and a small portion of southern Assumption Parish. Communities located within the study area include the City of Houma, the towns of Chauvin, Dulac, and Montegut in southern Terrebonne Parish, the towns of Donner and Gibson in western Terrebonne Parish, and the towns of Gray and Schriever in northern Terrebonne Parish. Also included are the towns of Raceland, Lockport, and Pointe aux Chenes in Lafourche Parish and the portion of the City of Thibodaux south of Bayou Lafourche. The Gulf Intracoastal Waterway (GIWW) passes through the northern part of the study area in an east-west direction, and the Houma Navigation Channel (HNC) extends due south from Houma to the Gulf of Mexico. The southern extent of the study area is the alignment for the proposed hurricane protection structure that would cross the southern part of Terrebonne Parish in an east-west direction. At the time of the PAC report, the Morganza evaluation area was divided into 276 unique hydrologic reaches to enable an economic analysis of the project alternative through the use of the HEC-FDA certified model. However, an inventory of residential and non-residential structures was only assembled in the 266 study area reaches that could be impacted by storm surges under the without-project condition. The two reaches added to the economic analysis since the time of the PAC report are located on the eastern extent of the study area between Lockport and Larose. These reaches are highlighted in Figure 1 below.

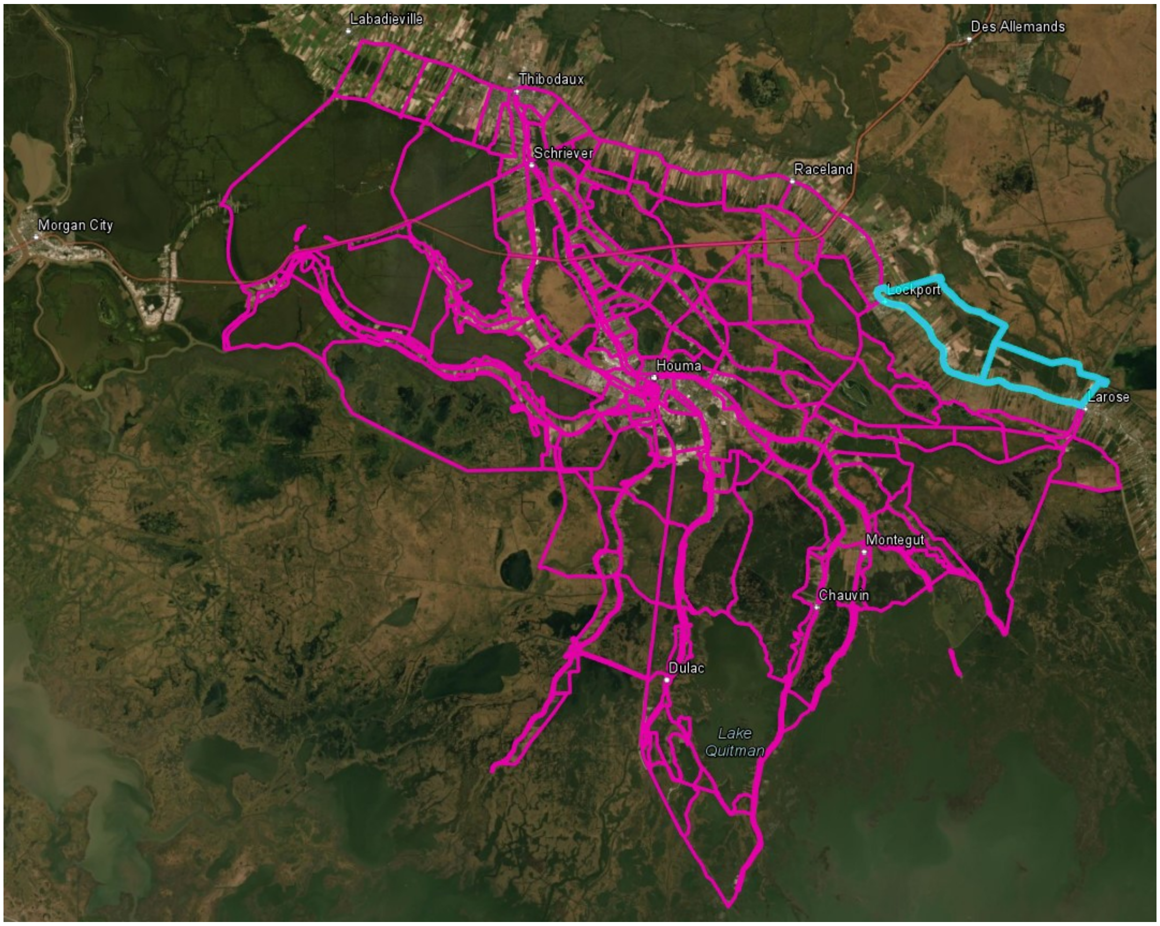

Figure 1 - Study Area Reaches

Land Use. The total number of acres of developed land, agricultural land, undeveloped land, and open water included in the study area as of the year 2020 is shown in Table 1. As shown in the table, approximately 11 percent of the study area is currently developed and approximately 17 percent of the study area is being used as agricultural land. Over 70 percent of the study area is categorized as either wetland or open water, which leaves a very small percentage of the study area available for future development.

Table 1
Morganza to the Gulf Economic Update
Land Use in the Study Area

Land Class Name	Acres	Percentage of Total
Developed Land	**53,047**	**11.0%**
Low Intensity	31,311	6.5%
Open Space	10,537	2.2%
Medium Intensity	7,242	1.5%
High Intensity	3,957	0.8%
Agricultural Land	**82,405**	**17.0%**
Grass/Pasture	46,001	9.5%
Sugarcane	23,290	4.8%
Fallow/Idle Cropland	12,481	2.6%
Soybeans	473	0.1%
Miscellaneous Agricult	160	0.0%
Undeveloped Land	**294,086**	**60.8%**
Herbaceous Wetlands	155,066	32.1%
Woody Wetlands	137,894	28.5%
Mixed Forest	354	0.1%
Shrubland	272	0.1%
Barren	245	0.1%
Evergreen Forest	133	0.0%
Deciduous Forest	122	0.0%
Open Water	**53,996**	**11.2%**
Total	**483,534**	**100.0%**

Source: National Agricultural Statistical Service 2020
Note: "Miscellaneous Agriculture" is all agricultural categories that account for less than 0.1% of the study area

SOCIOECONOMIC SETTING

Population and Number of Households. Tables 2 and 3 display the Census population and number of households in each of the parishes for the years 1970, 1980, 1990, 2000, , and 2010; American Community Survey estimates for the years 2015 and 2019; as well as projections for the years 2035 and 2085. Projections are provided by the Moody's County Forecast Database to the year 2046. Moody's projections were extended by New Orleans District from the year 2046 to the year 2085.

Table 2
Morganza to the Gulf Economic Update
Historical and Projected Parish Population
(Thousands)

Parish	1970	1980	1990	2000	2010	2015	2019	2035	2085
Assumption	19.7	22.2	22.7	23.3	23.4	23.1	22.5	22.0	19.3
Lafourche	69.1	83.5	85.8	90.0	96.7	97.5	98.1	99.4	104.2
Terrebonne	76.2	95.1	97.0	104.5	111.5	112.7	112.1	115.7	123.9
Total	165.0	200.8	205.5	217.8	231.6	233.3	232.6	237.1	247.4

Source: U.S. Census Bureau (BOC); American Community Survey (ACS); Moody's Analytics (ECCA) Forecast

Table 3
Morganza to the Gulf Economic Update
Number of Households by Parish
(Thousands)

Parish	1970	1980	1990	2000	2010	2015	2019	2035	2085
Assumption	5.0	6.5	7.4	8.2	8.7	10.5	10.8	9.2	10.0
Lafourche	18.0	25.7	28.8	32.1	35.7	39.4	41.1	40.8	51.1
Terrebonne	19.6	29.5	31.9	36.0	40.0	44.4	45.4	46.3	58.9
Total	42.6	61.7	68.1	76.3	84.4	94.3	97.3	96.3	120.1

Source: U.S. Census Bureau (BOC); American Community Survey (ACS); Moody's Analytics (ECCA) Forecast

While Assumption Parish is forecasted to experience a slight decline in population, the populations of the two main parishes of the study area are both expected to increase with the overall study area seeing a population increase throughout the life of the project. All parishes within the study area are projected to experience an increase in number of households over the life of the project. More information about the population and number of households can be found in the OSE Appendix.

Income. Table 4 shows the per capita personal income levels in each parish for the years 1990, 2000, 2010, and 2015 through 2019, the year with the latest available data.

Table 4
Morganza to the Gulf Economic Update
Per Capita Personal Income
($ Dollars)

Parish	1990	2000	2010	2015	2016	2017	2018	2019
Assumption	12,146	19,765	33,641	41,467	39,971	43,542	46,833	47,947
Lafourche	13,376	23,760	40,455	45,366	42,683	44,034	44,316	45,806
Terrebonne	13,415	20,962	38,418	42,223	39,116	39,511	41,058	42,267

Source: Bureau of Economic Analysis

As shown in the table, all parishes experienced a steady increase in per capita income between 1990 and 2015. The growth in per capita income during this time reflects the increased oil and gas exploration and production activities in the Gulf of Mexico, and the improvement in the economy of the state. Between 2015 and 2016, however, the parishes experienced a slight decline in per capita income, which is likely a result of the oil price-driven recession experienced during this time. The decline is followed by a fairly slow recovery through 2019.

Employment. Table 5 shows the total non-farm employment by parish for the years 1970, 1980, 1990, 2000, 2010, 2015, and projections for the years 2035 and 2085. The employment projections were based on the Moody's County Forecast Database and extended from the year 2046 to the year 2085 by New Orleans District based on the growth rate forecasted by Moody's. More information about employment can be found in the OSE Appendix.

Table 5
Morganza to the Gulf Economic Update
Total Non-Farm Employment
(Thousands)

Parish	1970	1980	1990	2000	2010	2015	2035	2085
Assumption	4.7	7.6	5.9	5.3	4.5	4.4	4.5	5.6
Lafourche	15.1	24.4	22.1	30.4	37.5	38.5	34.9	38.9
Terrebonne	24.6	42.4	35.8	47.3	54.9	58.6	53.4	60.0
Total	44.4	74.4	63.8	83.0	96.9	101.5	92.9	104.5

Source: U.S. Bureau of Labor Statistics: Census of Employment & Wages (QCEW - ES202); Moody's Analytics (ECCA) Forecast

Compliance with Policy Guidance Letter (PGL) 25 and Executive Order (EO) 11988. Given the growth trends in employment and income, it is expected that development will continue to occur in the study area with or without the storm surge risk reduction system. The project will not conflict with PGL 25 and EO 11988, which state that the primary objective of a flood risk reduction project is to protect existing development rather than make undeveloped land available for more valuable uses. The project will not induce development, but it will reduce the risk of the population being displaced after a major storm event.

RECENT FLOOD HISTORY

Tropical Flood Events. While the study area has periodically experienced localized flooding from excessive rainfall events, the primary cause of the flood events that have taken place in the study area has been the tidal surges from hurricanes and tropical storms. Figure 2 shows the 64 hurricane and tropical storm tracks on record that have come within 50 miles of the City of Houma, located near the center of the study area.

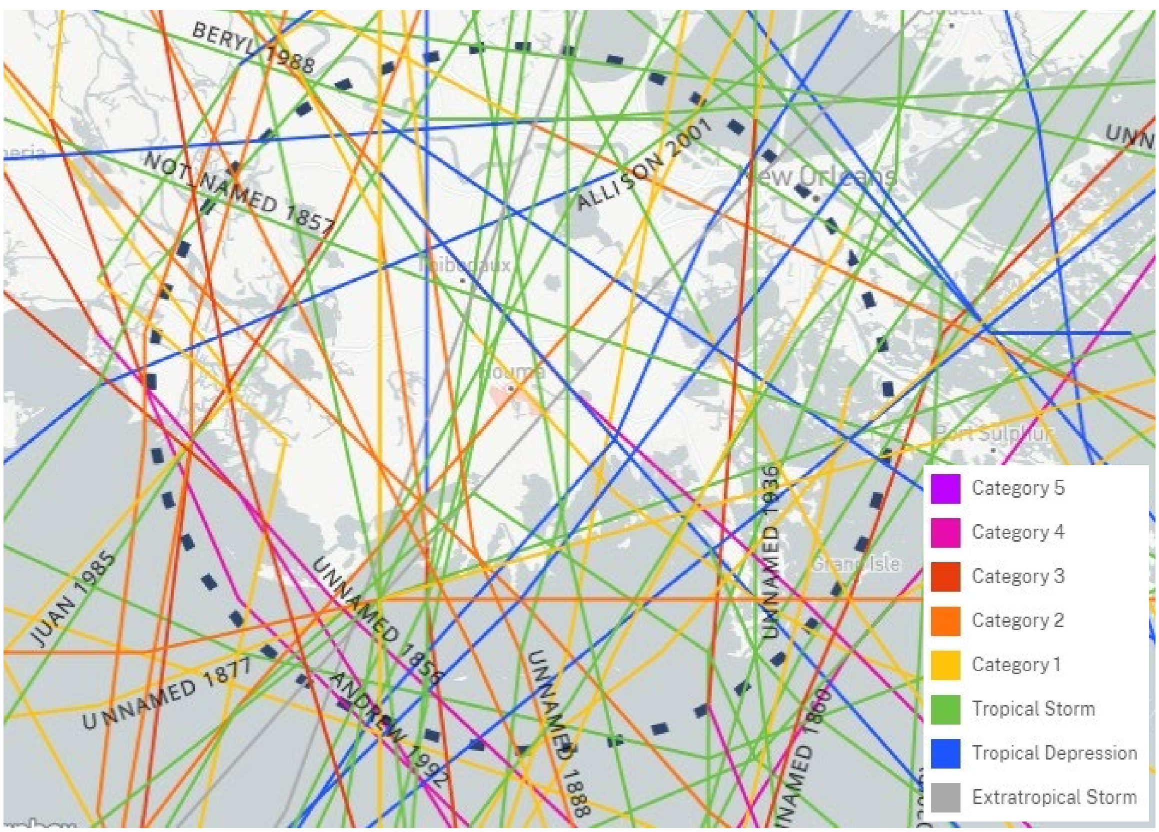

Figure 2 – NOAA Historical Hurricane and Storm Tracks

During the past 35 years, coastal Louisiana has been impacted by several major tropical events. In 2020 alone, the Louisiana coast experienced four hurricanes and one tropical storm landfall. Though not all of these storms tracked directly through the study area, the tidal surges associated with these storm events inundated structures and resulted in billions of dollars in damages to coastal Louisiana. On August 29, 2021, during the writing of this document, the study area was severely impacted by Hurricane Ida

Table 6 provides a summary of the total FEMA flood claims paid to all Louisiana policy holders as a result of tropical events. The table includes the number of paid losses, the total amount paid, and the average amount paid on each loss. The total and average paid losses have been converted to reflect 2022 price levels. The table only includes losses that were covered by flood insurance.

Table 6
Morganza to the Gulf Economic Update
FEMA Flood Claims in Louisiana

Event	Year	Number of Paid Claims	Total Amount Paid ($ Millions)	Average Amount Paid ($ Thousands)
Tropical Storm Juan	Oct-85	6,187	$252	$41
Hurricane Andrew	Aug-92	5,589	$359	$64
Tropical Storm Isadore	Sep-02	8,441	$188	$22
Hurricane Lili	Oct-02	2,563	$61	$24
Hurricane Katrina	Aug-05	167,099	$24,583	$147
Hurricane Rita	Sep-05	9,507	$714	$75
Hurricane Gustav	Sep-08	4,524	$153	$34
Hurricane Ike	Sep-08	46,137	$3,594	$78
Tropical Storm Bonnie	Jul-10	1,022	$6	$6
Hurricane Isaac	Aug-12	13,493	$861	$64
Tropical Storm Olga	Oct-19	9,544	$87	$9

Source: Federal Emergency Management Agency (FEMA), National Hurricane Center (NHC)

Notes: Total amount paid and average amount paid have been updated reflect FY22 price levels. Data from recent events in 2020 and 2021 are not yet available.

The following is a summary of eight of the major tropical events and their effects on the two-parish area and coastal Louisiana.

Hurricane Juan. Hurricane Juan caused extensive flooding throughout southern Louisiana due to its prolonged 5-day movement back and forth along the Louisiana coast. Rainfall totals in the area ranged from 5 inches to almost 17 inches. The storm was responsible for storm surges of 5 to 8 feet and tides of 3 to 6 feet above normal.

According to FEMA officials, the estimated value of the residential and commercial damage and public assistance throughout coastal Louisiana totaled $112.5 million.

Over 800 homes were inundated in the coastal portion of Terrebonne Parish south of the City of Houma. Scattered pockets of flooding were also reported in the portions of Terrebonne and Lafourche Parishes north of Houma. Approximately 40 percent of the homes in the coastal areas of Lafourche Parish, including Pointe aux Chenes, were also inundated by the high tides.

Agricultural damages from the storm totaled $175 million, with 24 percent of these damages occurring in the two-parish study area. The soybean crop suffered over half of the agricultural damage, while the sugar cane crop incurred 20 percent of the damage. Excessive rains and storm surge oversaturated the fields and caused a reduction in crop yields. The saturated fields also made it easier for the winds to topple over the cane stalks.

Hurricane Andrew. On August 26, 1992, Hurricane Andrew made landfall in St. Mary Parish, 80 miles west of Morgan City. FEMA reported that over 2,000 flood claims were filed as a result of the storm in Louisiana. These claims had a total value of over $25 million. Over 90 percent of this flood damage occurred in the Terrebonne Parish communities south of Houma, where up to six feet of water was reported. Only minor flooding in the back parts of subdivisions was reported in the City of Houma and in the areas north of the city. The unleveed portion of Lafourche Parish along its border with Terrebonne Parish, which includes the community of Pointe aux Chenes, also incurred extensive flood damage. However, most of the agricultural damage in the area occurred as the result of wind damage to the sugar cane crop.

Tropical Storm Isidore and Hurricane Lili. On October 3, 2002, one week after Tropical Storm Isidore affected the southeastern and south central coastal areas of Louisiana, Hurricane Lili made landfall on the western edge of Vermilion Bay, south of the cities of Abbeville and New Iberia, as a weak category 2 hurricane. The high winds caused tidal flooding in the communities east of the eye of the storm. The ridge communities in Terrebonne Parish south of the city of Houma, including Cocodrie, Dulac, Isle de Jean Charles, and Montegut, and the community of Pointe aux Chenes in Lafourche Parish, were affected by tidal flooding. The only community south of Houma that did not flood was Chauvin.

Insured flood losses from Tropical Storm Isidore and Hurricane Lili totaled nearly $600 million. Approximately $105 million of insured losses were related to Tropical Storm Isidore, while Hurricane Lili caused $471 million of insured losses. According to windshield surveys conducted by the American Red Cross, approximately 10,000 residential structures were damaged by winds and storm surges of the two storms. These surveys included both insured and uninsured structures. Tropical Storm Isidore caused damage to 2,905 structures, while Hurricane Lili caused damage to 7,356 structures.

In a revised report released in mid-November by the Louisiana State University Agricultural Center (LSU AgCenter), the estimated agricultural damages caused by Tropical Storm Isidore and Hurricane Lili totaled $454.3 million. This estimate also includes the agricultural damages caused by the continuation of rain during the month of October, which delayed the harvesting of crops. The excessive rains and storm surge flooded the agricultural fields and increased the harvest costs.

The wind and waves of Tropical Storm Isidore and Hurricane Lili caused extensive beach erosion in the barrier islands of Louisiana. These islands protect the Louisiana coastline from storm surges and provide a natural habitat for many species of wildlife. The barrier islands west of the mouth of the Mississippi River that were affected by the two storm events include the Isles Dernieres (Whiskey Bayou, Raccoon Island, Trinity Island, and East Island), Timbalier Island, East Timbalier Island, Elmer Island, and Grand Terre. Grand Isle incurred extensive damage along its eastern beach. Three small islands east of the mouth of the Mississippi River, Grand Gosier Island, Curlew Island, and Chandeleur Island, incurred extensive damage and beach erosion. A monetary value has not been determined for these environmental damages.

Hurricane Katrina. On August 29, 2005, Hurricane Katrina made landfall near the town of Buras in Plaquemines Parish about 50 miles east of coastal Lafourche and Terrebonne Parishes. While it entered as a category 3 storm with winds in excess of 120 mile per hour, its storm surge of approximately 30 feet was more characteristic of a Category 5 hurricane. The majority of the damages from Hurricane Katrina occurred outside of the Morganza study area. However, if the hurricane had taken a more westerly track, the Houma area could have experienced the same magnitude of flooding as the City of New Orleans.

According to the Department of Health and Hospitals, approximately 1,400 deaths were reported following Hurricane Katrina. Approximately 1.3 million residents were displaced immediately following the storm, and 900,000 residents remained displaced as of October 5, 2005. According to the Louisiana Recovery Authority (LRA), two years after the storm, approximately 210,000 FEMA applicants still had out-of-state mailing addresses, while 230,000 FEMA applicants had an in-state mailing address in a different zip code.

The storm caused more than $40.6 billion of insured losses to the homes, businesses, and vehicles in six states. Approximately two thirds of these losses, or $25.3 billion, occurred in Louisiana based on data obtained from the Insurance Information Institute. According to the LRA, approximately 150,000 housing units were damaged, and according to the Department of Environmental Quality, 350,000 vehicles, and 60,000 fishing and recreational vessels were damaged.

The storm surge from Hurricane Katrina inundated marshes and farmland throughout the coastal area, including Terrebonne and Lafourche Parishes. According to the LSU AgCenter, agricultural losses totaled approximately $825 million. The agricultural resources impacted by the storm include sugarcane, cotton, rice, soybeans, timber, pecans, citrus, and livestock. The losses to aquaculture (crawfish, alligators, and turtles), fisheries (shrimp, oysters, and menhaden), and wildlife and recreational resources totaled approximately $175 million.

Hurricane Rita. The hurricane made landfall along the Texas-Louisiana border on September 24, 2005, as a category 3 storm with winds in excess of 120 miles per hour. As the hurricane passed south of the study area, its high winds pushed water north into coastal Lafourche and Terrebonne Parishes. A storm surge of approximately 15 - 20 feet affected coastal Louisiana from Terrebonne Parish to the Texas border. With estimated insured losses of approximately $3 billion, Hurricane Rita became one of the costliest natural disasters in U.S. history.

Approximately 2,000 square miles of farmland and marshes throughout the coastal area were inundated. According to the LSU AgCenter, agricultural losses totaled approximately $490 million. The agricultural resources impacted by the storm include sugarcane, cotton, rice, soybeans, timber, pecans, citrus, and livestock. The losses to aquaculture (crawfish, alligators, and turtles), fisheries (shrimp, oysters, and menhaden), and wildlife and recreational resources totaled approximately $100 million.

Hurricanes Gustav and Ike. On September 1, 2008, almost three years after Hurricane Katrina, Hurricane Gustav made landfall near Cocodrie in Terrebonne Parish as a strong category 2 hurricane. It followed a northwest path into central Louisiana, and most of the damages caused by the storm resulted from its high winds and heavy rain. Coastal flooding occurred in the low-lying areas of Jefferson and Lafourche Parishes and the coastal areas of Terrebonne Parish south of the City of Houma.

Nearly 2 million residents of south Louisiana evacuated in the days before Gustav made landfall. Louisiana officials reported that emergency spending totaled approximately $500 million, which included $210 million for state agencies, $48 million for deploying the National Guard, $13.5 million for general evacuation shelters, $3 million for special-needs medical shelters, $6.1 million for transporting the medical needy, $21 million for costs of contraflow and evacuation from coastal communities and other areas, $20 million in special generators to open ice plants, pharmacies and service stations throughout the impacted areas, $5 million for state-purchased fuel, $19.7 million for ready-to-eat meals, $5.3 million for ice, and $2.5 million for water supplies. The State Department of Transportation estimated that it cost approximately $50 million to remove 1.5 million cubic yards of debris, and approximately $20 million to repair draw bridges.

Almost two weeks later, on September 12 and 13, the Louisiana coastal region incurred additional flood damages as Hurricane Ike moved along the Louisiana coast. According to estimates from the state officials, approximately 12,000 homes and businesses were flooded by the two storms. Approximately 2,500 buildings in Terrebonne Parish, south of the City of Houma, incurred flood damages from Hurricane Ike.

The LSU AgCenter estimated that potential lost revenues and damages to the infrastructure of the agriculture, forestry, and fisheries industries in Louisiana resulting from the two hurricanes totaled approximately $959 million. The storm surge primarily affected the cattle, rice, soybeans, and sugarcane.

Hurricane Ida. On August 29, 2021, Hurricane Ida made landfall near Port Fourchon in Lafourche Parish as a major Category 4 hurricane with sustained wind speeds of 150 mph and a central pressure of 930 millibars. The storm held a Category 4 status for four hours after landfall until weakening into Category 3 status for the subsequent four hours. The hurricane hovered over Louisiana for sixteen hours before moving North into Mississippi. Figure 3 below, developed by Dan Swenson for the local news source The New Orleans Advocate, shows the path of the storm with some snapshots of areas impacted.

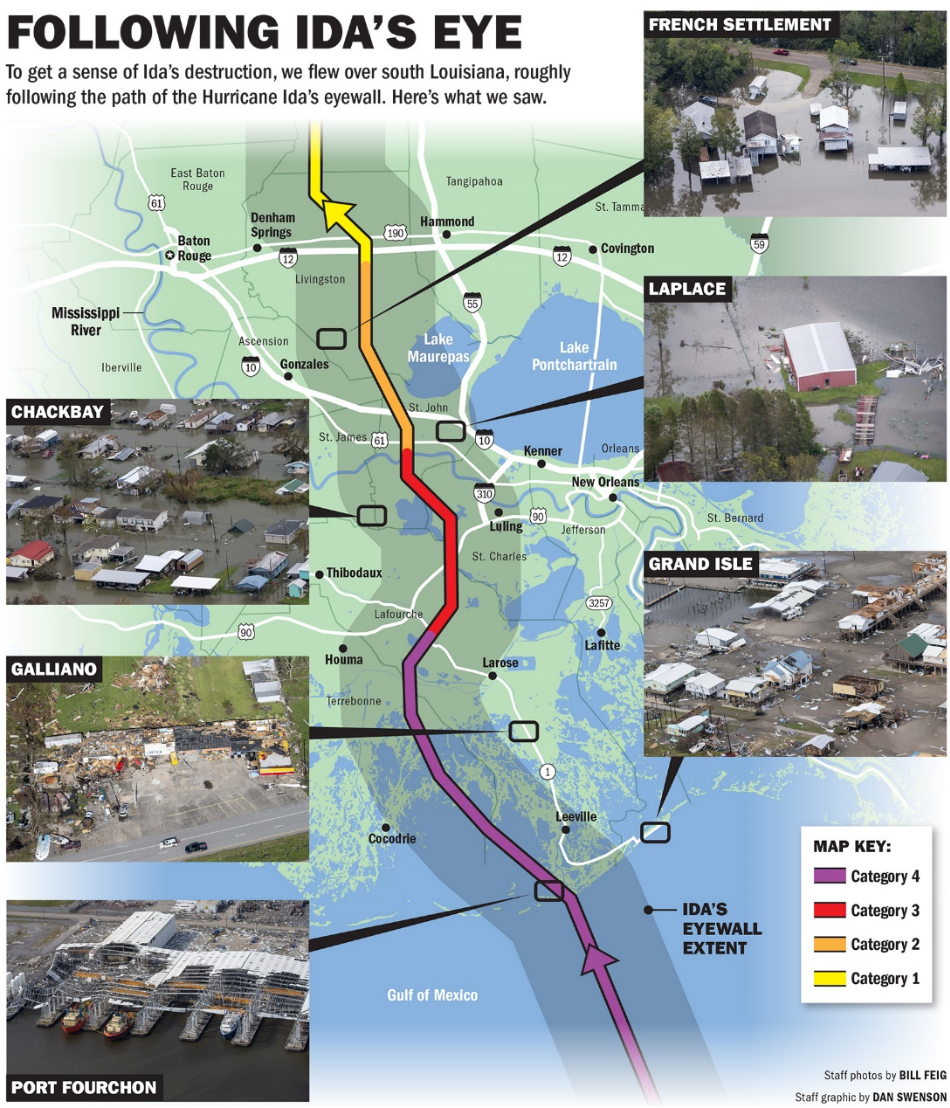

Figure 3 – Path of Hurricane Ida with Aerial Photography of Impacted Areas

Within the state of Louisiana, Hurricane Ida caused the deaths of at least 29 people and inflicted an estimated $27 billion to $40 billion in damages in both insured and uninsured losses by the end of September 2021. These damages are from wind, storm surge and inland flooding for residential and commercial properties. Many of the deaths are attributed to the excessive heat during extended power outages and generator-related deaths. Additionally, over a million residents lost power throughout the state. Post-storm analysis and recovery efforts are currently ongoing as of the writing of this report, but FEMA has paid $493 million in claims as of November 23, 2021.

SCOPE OF THE STUDY

Problem Description. The study area is characterized by low, flat terrain with ridges surrounding the waterways. The terrain has made the area highly susceptible to flooding from the tidal surges of hurricanes and tropical storms. The apparent subsidence, or relative sea level rise, that has been taking place in the Morganza study area is expected to magnify the flooding problems in the future. While the Terrebonne Levee and Conservation District is currently maintaining a system of forced drainage levees, pump stations, and flood control structures for Terrebonne Parish, an adequate overall storm surge risk reduction system is not currently available for the entire study area.

Project Alternative. As part of the 2002 Morganza to the Gulf, Louisiana Feasibility Report, a project alignment was selected and later authorized to provide storm surge risk reduction for portions of Terrebonne and Lafourche Parishes. The authorized alignment was designed to contain the pre-Katrina surge elevations associated with the 1 percent (100-year) AEP storm surge risk reduction system, and the costs were provided in 2002 price levels. Since that time, the hydrology, project design criteria, and implementation costs have changed. A revised project cost estimate (RPCE) report was developed in 2008 using post-Katrina design criteria and water surface profiles for the 1 percent (100-year) AEP storm surge risk reduction system. This alignment involves the construction of new earthen levees that would run parallel to Louisiana Highway 57 south of Lake Boudreaux and north of the Falgout Canal and would connect to existing forced drainage levees. The levees will be used in conjunction with flood risk management and environmental structures and would minimize the adverse impacts to the environment, local interests, navigation, and industry. Finally, construction of a lock structure on the HNC south of Bayou Grand Caillou has been included as part of the system. In this document, "the 1 percent AEP alternative" refers to the alignment using post-Katrina HSDRRS design criteria, which is the selected and authorized project alternative for the Morganza to the Gulf study.

PART 2: ECONOMIC AND ENGINEERING INPUTS TO THE HEC-FDA MODEL

HEC-FDA MODEL

Model Overview. The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.4.2 Corps-certified model was used to calculate the damages and benefits for the Morganza evaluation. The economic and engineering inputs necessary for the model to calculate damages for the project base year (2035) and the final year in the period of analysis (2084) are described in this section of the report. The economic inputs include structure inventory, contents-to-structure value ratios, vehicles, first floor elevations, and depth-damage relationships. The engineering inputs include ground elevations, exterior and interior relationships, local levee performance, and Federal levee performance.

The uncertainty surrounding each of the economic and engineering variables was also entered into the model. Either a normal probability distribution, with a mean value and a standard deviation, or a triangular probability distribution, with a most likely, a maximum and a minimum value, was entered into the model to quantify the uncertainty associated with the key economic variables. A normal probability distribution was entered into the model to quantify the uncertainty surrounding the ground elevations. The number of years that stages were recorded at a given gage was entered for each study area reach to quantify the hydrologic uncertainty or error surrounding the stage-probability relationships. The uncertainty associated with the levee performance was quantified using the levee features section of the model, which related the elevation of exterior storm surges to the probability of levee failure.

ECONOMIC INPUTS TO THE HEC-FDA MODEL

Structure Inventory. The structure inventory used in this economic update is comprised of both the inventory from the PAC report with values indexed to reflect the current FY21 price level, hereafter referred to as the “original inventory”, as well as a supplemental inventory that incorporates new development since the initial creation of the original inventory. As the team was not able to develop this supplemental inventory with the same level of detail as the original inventory, statistics from the original inventory were captured and applied to incorporate more site-specific information.

Original Inventory. Field surveys were conducted in 2009 to develop a residential and non-residential structure inventory for the economic analysis. The areas to be inventoried had been selected in 2008 based on estimates of surge elevations for this area developed as part of the Louisiana Coastal Protection and Restoration (LACPR) evaluation. Based on the structural information collected during the field surveys, the Marshall and Swift

Valuation Service was used to calculate a depreciated replacement cost for all residential and non-residential structures in the study area reaches. The inventoried structures were classified as one of 14 structure types: residential one-story with slab or pier foundation, residential two-story with slab or pier foundation, mobile home, eating and recreation, grocery and gas station, multi-family residence, professional building, public and semi-public building, repairs and home use establishment, retail and personal services building, and warehouse, and contractor services building. The inventory also included 24 industrial structures that were inventoried using OMB approved interview forms. At the time of the PAC report, these industrial structures were analyzed using a separate HEC-FDA model. For this economic update, these industrial structures and their corresponding depth-damage functions were included in the HEC-FDA model for residential and non-residential structures using the category indicator “IND_S”. All values associated with the original inventory were first indexed using RSMeans Historical Cost Index to represent a FY21 price level and then indexed using the Consumer Price Index (CPI) less food and energy to represent a FY22 price level. The points for the 51,606 structures in the original inventory are shown in Figure 4.

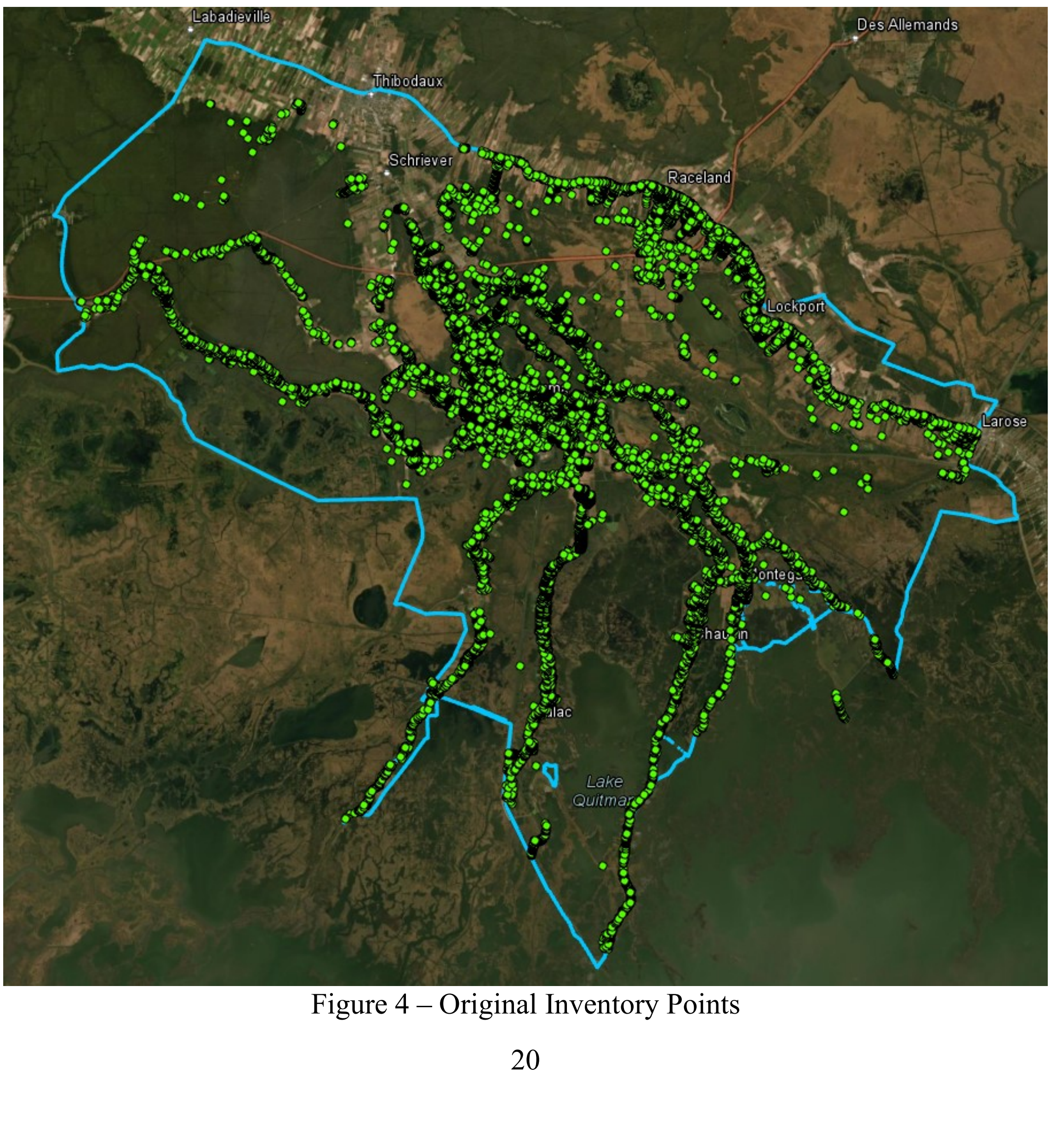

Figure 4 – Original Inventory Points

Supplemental Inventory. The original inventory was supplemented with additional structure points to represent newer development not previously accounted for while conducting the windshield surveys or development that occurred after the original windshield surveys. These supplemental structures were added from either the National Structure Inventory (NSI) Version 2 or were manually added using aerial imagery. As the NSI provides information about occupancy type, that information was leveraged to assign a corresponding occupancy used in the original inventory. For manually added points, Google Street View was used to determine which occupancy used in the original inventory best fit the point. Square footage statistics were calculated from the original inventory by occupancy type and reach and applied to the supplemental inventory. These square footages were then used to assign depreciated replacement values using RSMeans Square Foot Costs. The points for the 15,928 structures in the supplemental inventory are shown in Figure 5. The vast majority (about 68 percent) of the supplemental inventory is in the northern portion of the study area near Thibodaux, which is protected by local levees and was previously expected to not experience damages with or without project.

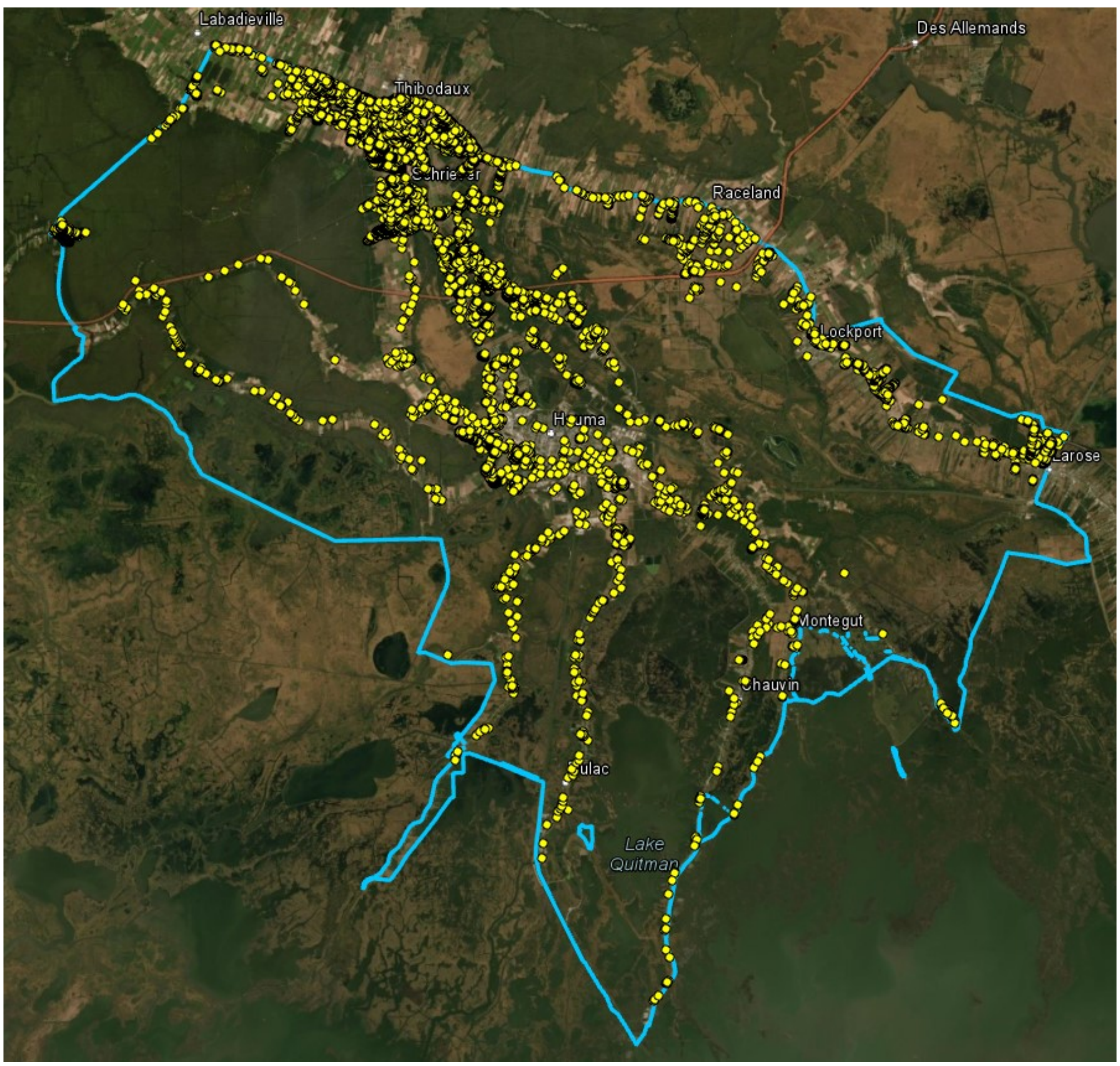

Figure 5 – Supplemental Inventory Points

Table 7 shows the total number of structures by category and vehicles in each study area reach. Due to size, the tables have been added at the end of this appendix. Table 8 displays the number of structures and vehicles by occupancy type, as well as the average depreciated replacement value.

Table 8
Morganza to the Gulf Economic Update
Residential, Non-Residential, and Vehicle Inventory
(2022 Price Level)

Structure Occupancy	HEC-FDA Occupancy Name	Number of Structures	Total Depreciated Replacement Value ($ Millions)	Average Depreciated Replacement Value ($ Thousands)
Residential				
One-Story Slab	1STY-SLAB	27,618	$6,520	$236
One-Story Pier	1STY-PIER	15,435	$2,159	$140
Two-Story Slab	2STY-SLAB	3,640	$1,083	$297
Two-Story Pier	2STY-PIER	1,516	$315	$208
Mobile Home	MOBHOM	12,607	$218	$17
Total Residential		**60,816**	**$10,294**	**$169**
Non-Residential				
Eating and Recreation	EAT	387	$196	$506
Professional	PROF	1,503	$1,320	$878
Public and Semi-Public	PUBL	779	$949	$1,219
Repair and Home Use	REPA	276	$117	$424
Retail and Personal Services	RETA	744	$649	$872
Warehouse	WARE	3,220	$1,018	$316
Grocery and Gas Station	GROC	144	$79	$546
Multi-Family Occupancy	MULT	410	$325	$792
Interviewed Industrial	IND_S	24	$67	$2,790
Total Non-Residential		**7,487**	**$4,720**	**$630**
Vehicles				
Autos	AUTO	70,846	$853	$12

Note: "Interviewed Industrial" is a category, not an occupancy in HEC-FDA

Future Development. At the time of the PAC report, projections were made of the future residential and non-residential development to take place in the Morganza study area under without-project conditions. Much of the undeveloped land within the study area reaches where this development was projected has already been developed at the time of this report, so no additional projection of future development was included in this economic update.

Residential and Non-Residential Content-to-Structure Value Ratios (CSVR). Onsite interviews were conducted with the owners of a sample of ten structures from each of the three residential content categories (30 residential structures) and each of the eight non-residential content categories (80 non-residential structures). A CSVR was computed for each residential and non-residential structure in the sample based on the total depreciated content value developed from the surveys. An average CSVR for each of the five residential structure categories and nine commercial structure classifications was calculated as the average of the individual structure CSVRs.

Since only a limited number of field surveys were conducted for each of the residential and non-residential content categories, statistical bootstrapping was performed to address the potential error in estimating the mean and standard deviation CSVR values. Statistical bootstrapping is a method that uses re-sampling with replacement to improve the estimate of a population statistic when the sample size is insufficient for straightforward statistical inference. The bootstrapping method has the effect of increasing the sample size. Thus, bootstrapping provides a way to account for the distortions caused by the specific sample that may not be fully representative of the population.

With use of the @Risk software, a simulation using 100,000 iterations was executed for each content category. Within each iteration, a new ten-observation sample with replacement, called a bootstrap sample, was taken from the original sample of ten observations. Each observation within the original sample was given a uniform probability or chance of being selected as each one of the ten values within the bootstrap sample. The @Risk spreadsheet calculated a mean value and a standard deviation for each of the bootstrap samples, and then calculated a mean value for all of the bootstrap means and mean value of all the standard deviations.

Table 9 shows the CSVRs and standard deviations for each of the residential and non-residential structure categories derived using the statistical bootstrapping technique. The CSVRs and standard deviations were used in the HEC-FDA model, along with the depth-damage relationships, to calculate flood damages for residential and non-residential structures. A unique CSVR was developed for each of the 24 industrial structures in the study area based on the content values provided by the owners of the properties using OMB-approved interview forms.

Table 9
Morganza to the Gulf Economic Update
Content-to-Structure Value Ratios (CSVRs) and Standard Deviations (SDs)

Structure Category	Structure Occupancy	FDA Occupancy	CSVR %	SD %
Residential	One-Story Single Family	1STY-	71	23
	Two-Story Single Family	2STY-	50	27
	Mobile Home	MOBHOM	148	68
Non-Residential	Eating and Recreation	EAT	305	448
	Grocery and Gas Station	GROC	128	96
	Professional	PROF	78	70
	Public and Semi-Public	PUBL	81	103
	Multi-Family	MULT	23	13
	Repair and Home Use	REPA	251	208
	Retail and Personal Services	RETA	148	113
	Warehouse	WARE	373	481
Interviewed Industrial	Gulf	Gulf	573	0
	Benoit	Benoit	2,356	0
	Prison	Prison	72	0
	Juvy	Juvy	115	0
	CandiesB	CandiesB	738	0
	CandiesA	CandiesA	6,292	0
	WeatherfordE	WeatherfordE	853	0
	ChabertA	ChabertA	111	0
	ChabertB	ChabertB	1,930	0
	ERA	ERA	8,113	0
	EBI	EBI	41	0
	WeatherfordA	WeatherfordA	73	0
	WeatherfordB	WeatherfordB	993	0
	WeatherfordF	WeatherfordF	117	0
	WeatherfordC	WeatherfordC	1,282	0
	WeatherfordD	WeatherfordD	72	0
	Oilstates	Oilstates	339	0
	Caillou	Caillou	478	0
	ApacheC	ApacheC	4	0
	ApacheA	ApacheA	23	0
	ApacheB	ApacheB	15	0
	Hercules	Hercules	18,686	0
	Chauvinbros	Chauvinbros	25	0
	Thomasea	Thomasea	4,774	0

Vehicle Inventory. Based on 2012-2016 American Community Survey data for the evaluation area, it was determined that there are an average of 1.73 vehicles associated with each household (owner occupied housing or rental unit). According to the Southeast Louisiana Evacuation Behavioral Report published in 2006 following Hurricanes Katrina and Rita, approximately 70 percent of privately owned vehicles are used for evacuation during storm events. The remaining 30 percent of the privately owned vehicles remain parked at the residences and are subject to flood damages. According to the 2019 Edmunds Used Vehicle Report, the average value of a used car was $22,095 (FY21 price level). Because only those vehicles not used for evacuation can be included in the damage calculations, an adjusted average vehicle value of $11,470 ($22,095 x 1.73 x 0.30) was assigned to each individual residential automobile structure record in the HEC-FDA model. If an individual structure contained more than one housing unit, then the adjusted vehicle value was assigned to each housing unit in a residential or multi-family structure category. Only vehicles associated with residential structures were included in the analysis. Finally, every apartment building was assumed to contain 25 units, so each apartment's vehicle record was assigned a structure count of 25. All vehicle values were indexed using the CPI to represent an FY22 value.

First Floor Elevations and Elevation of Vehicles. Topographical data obtained from the Light Detection and Ranging (LIDAR) digital elevation model (DEM) using the North American Vertical Datum of 1988 (NAVD88 epoch 2004.65) were used to determine ground elevations. For the creation of the original inventory, field survey teams estimated the height of each residential and non-residential structure above the ground using hand levels. The ground elevation was added to the height of the foundation of the structure above the ground to determine the first floor elevation of the structure. Vehicles were assigned to the ground elevation of the adjacent residential structures.

For this economic update, the inventory from the PAC Report was updated to use ground stage and foundation height instead of one first floor elevation. The supplemental inventory was assigned ground stages using the same LiDAR DEM as was used in the original inventory and the engineering inputs. Foundation height statistics were computed by reach and occupancy type from the original inventory and applied to the supplemental inventory. If statistics were not available for a certain reach and occupancy combination, then the statistics for the occupancy across the entire study area were applied to the supplemental inventory.

Emergency Cost Reduction. At the time of the PAC report, damages and benefits associated with debris removal and cleanup were computed in separate HEC-FDA models. For this analysis, the "other" category in the residential and non-residential structure inventory, as well as the associated depth-damage functions, were used to incorporate debris damages and benefits. Damages to infrastructure were also added to the same HEC-FDA model, but maintained a separate inventory and depth-damage functions.

*Damages to Infrastructure***.** The reduction of potential flood damages to the infrastructure (streets and highways, bridges, railroads, ports, airports, land-based pipelines, and petroleum wells) in an evaluation area can form a significant category of benefits attributable to a project alternative. For purposes of this analysis, only the damages to streets, highway, and railroads were considered. Streets are defined as roadways with two lanes with relatively lower volumes of traffic and access, while major and secondary highways are defined as roadways with four lanes with relatively higher volumes of traffic and access.

Details about the creation of the infrastructure inventory and depth-damage functions can be found in the PAC report. For the purposes of this economic update, the same inventory and depth-damage functions were used with the inventory indexed to reflect a FY22 price level using the Civil Works Construction Cost Index System for the Roads, Railroads & Bridges feature code.

Debris Removal Costs. Debris removal costs are typically discussed in the Other Benefit Categories section of the Economic Appendix. However, since debris removal costs were included as part of the HEC-FDA structure records for the individual residential and non-residential structures in this economic update, these costs are being treated as an economic input. The HEC-FDA model does not report debris removal costs separately from the total expected annual without-project and with-project damages.

Following Hurricanes Katrina and Rita, interviews were conducted with experts in the fields of debris collection, processing and disposal to estimate the cost of debris removal following a storm event. Information obtained from these interviews was used to assign debris removal costs for each residential and non-residential structure in the Coastal Texas structure inventory. The experts provided a minimum, most likely, and maximum estimate for the cleanup costs associated with the 2 feet, 5 feet, and 12 feet depths of flooding. A prototypical structure size in square feet was used for the residential occupancy categories and for the non-residential occupancy categories. The experts were asked to estimate the percentage of the total cleanup caused by floodwater and to exclude any cleanup that was required by high winds.

To account for the cost/damage surrounding debris cleanup, values for debris removal were incorporated into the structure inventory for each record according to its occupancy type. These values were then assigned a corresponding depth-damage function with uncertainty in the HEC-FDA model. For all structure occupancy types, 100 percent damage was reached at 12 feet of flooding. All values and depth-damage functions were selected according to the long-duration flooding data specified in a report titled "Development of Depth-Emergency Cost and Infrastructure Damage Relationships for Selected South Louisiana Parishes." The debris clean-up values provided in the report were expressed in 2010 price levels for the New Orleans area. All values were first indexed using RSMeans Historical Cost Index to represent a FY21 price level and then indexed using the Consumer Price Index (CPI) less food and energy to represent a FY22 price level. The debris removal costs included as the “other” category on the HEC-FDA structure records for the individual residential and non-residential structures and used to calculate the expected annual without-project and with-project debris removal and cleanup costs are displayed in Table 10.

Table 10
Morganza to the Gulf Economic Update
Debris Values
(FY22 Price Level)

Structure Category	Structure Occupancy	FDA Occupancy	Debris Value ($ Dollars)
Residential	One-Story Single Family	1STY-	$7,989
	Two-Story Single Family	2STY-	$10,690
	Mobile Home	MOBHOM	$8,215
Non-Residential	Eating and Recreation	EAT	$48,388
	Grocery and Gas Station	GROC	$51,315
	Professional	PROF	$50,077
	Public and Semi-Public	PUBL	$50,077
	Multi-Family	MULT	$14,404
	Repair and Home Use	REPA	$51,877
	Retail and Personal Services	RETA	$49,740
	Warehouse	WARE	$88,788
	Interviewed Industrial	IND_S	$88,788

Note: "Interviewed Industrial" is a category, not an occupancy in HEC-FDA

Depth-Damage Relationships. Site-specific saltwater, long duration (approximately one week) depth-damage relationships, developed by a panel of building and construction experts for the Morganza evaluation, were used in the economic analysis. These curves indicate the percentage of the total structure value that would be damaged at various depths of flooding. Damage percentages were determined for each one-half foot increment from one-half foot below first floor elevation to two feet above first floor, and for each one-foot increment from 2 feet to 15 feet above first floor elevation. The panel of experts developed depth-damage relationships for five residential structure categories and for three commercial structure categories. Depth-damage relationships were also developed for three residential content categories and eight commercial content categories. A unique depth-damage relationship was developed for the contents of each of the 24 industrial structures in the study area based on information provided by the owners of the properties using OMB-approved interview forms.

The depth-damage relationships for vehicles were developed based on interviews with the owners of automobile dealerships that had experienced flood damages and were used to calculate flood damages to vehicles at the various levels of flooding.

Table 11 shows the residential and non-residential depth-damage relationships developed for structures, contents, and vehicles, as well as transportation infrastructure. Due to length, this table can be found at the end of this appendix. More specific data regarding the depth-damage relationships can be found in the final report dated May 1997 titled *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVRs) in Support of the Lower Atchafalaya and Morganza to the Gulf, Louisiana, Feasibility Study*.

Uncertainty Surrounding the Economic Inputs. The uncertainty surrounding the four key economic variables was quantified and entered into the HEC-FDA model. These economic variables included structure values, contents-to-structure value ratios, first floor elevations, and depth-damage relationships. The HEC-FDA model used the uncertainty surrounding these variables to estimate the uncertainty surrounding the stage-damage relationships developed for each study area reach.

Structure and Vehicle Values. To quantify the uncertainty surrounding the values calculated for the residential and non-residential structure inventory, several survey teams valued an identical set of structures from various evaluation areas in the gulf coast region. The structure values calculated by each of the teams during windshield surveys were used to develop a mean value and a standard deviation for each structure in the sample. The standard deviation was then expressed as a percentage of the mean value for that structure. The average standard deviation as a percentage of the mean for the sampled structures was then used to represent the uncertainty surrounding the structure value for all the inventoried residential and non-residential structures. The average standard deviation, which was expressed as a percentage of the mean structure value, totaled 12.15 percent for residential structures and 14.28 percent for non-residential structures.

The uncertainty surrounding the values assigned to the vehicles in the inventory was determined using a triangular probability distribution function. The Manheim vehicle value, adjusted for number of vehicles per household and for the evacuation of vehicles prior to a storm event, was used as the most likely value. The average value of a new vehicle before taxes, license, and shipping charges was used as the maximum value, while the average 10-year depreciation value of a vehicle was used as the minimum value.

Content-to-Structure Value Ratios. Onsite interviews were conducted with the owners of a sample of ten structures from each of the three residential content categories (30 residential structures) and each of the eight non-residential content categories (80 non-residential structures). A CSVR was computed for each residential and non-residential structure in the sample based on the total depreciated content value developed from these interviews. A probability distribution function derived using the statistical bootstrapping method was then used to describe the distribution of these observations around the expected mean value. The mean and standard deviation values for each residential and non-residential category were entered into the HEC-FDA model. The model used a normal probability density function to describe the uncertainty surrounding the CSVR for each content category. The expected values and standard deviations are shown for each of the three residential categories and the eight non-residential categories in the final report dated May 1997 titled *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVRs) in Support of the Lower Atchafalaya and Morganza to the Gulf, Louisiana Feasibility Study*. Since the CSVRs for the 24 surveyed industrial structures in the study area were based on information provided by the property owners, there was no uncertainty surrounding these ratios.

First Floor Elevations. The topographical data used to estimate the first-floor elevations assigned to the structure inventory contain two sources of uncertainty. The first source of uncertainty arises from the use of the 2009 LIDAR data, and the second source of uncertainty arises from the use of hand levels to determine the structure foundation heights above ground elevation. The error implicit in using LIDAR data to estimate the ground elevation of each of the inventoried structures is normally distributed with a mean of zero and a standard deviation of 0.219 feet. These statistics were calculated based on comparing 2,241 engineering survey points or spot elevations to the elevations determined using the 2009 LIDAR data throughout the evaluation area. According to the Hydrologic Engineering Center training manual, the uncertainty implicit in estimating foundation heights using hand levels from within 50 feet of the structure is normally distributed with a mean of zero and a standard deviation of 0.3 feet at the 95 percent level of confidence.

Based on the error surrounding the LIDAR data and the error arising from the use of hand levels, the total uncertainty was estimated for each structure category at the 90 percent level of confidence. The two standard deviations (LIDAR and hand levels) were squared and then totaled. The square root of this total, 0.297 feet, represents the uncertainty surrounding the first-floor elevations assigned to the structures located in the Morganza evaluation area.

Debris Removal Costs. The uncertainty surrounding debris percentage values at 2 feet, 5 feet and 12 feet depths of flooding were based on range of values provided by the four experts in the fields of debris collection, processing, and disposal. The questionnaires used in the interview process were designed to elicit information from the experts regarding the cost of each stage of the debris cleanup process by structure occupancy type. The range of responses from the experts were used to calculate a mean value and standard deviation value for the cleanup costs' percentages provided at 2 feet, 5 feet, and 12 feet depths of flooding. The mean values and the standard deviation values were entered into the HEC-FDA model as a normal probability distribution to represent the uncertainty surrounding the costs of debris removal for residential and non-residential structures. The depth-damage relationships containing the damage percentages at the various depths of flooding and the corresponding standard deviations representing the uncertainty are shown within the depth–damage tables.

Depth-Damage Relationships. A triangular probability density function was used to determine the uncertainty surrounding the damage percentage associated with each depth of flooding. A minimum, maximum and most likely damage estimate was provided by a panel of experts for each depth of flooding. The specific range of values regarding probability distributions for the depth-damage curves can be found in the final report dated May 1997 titled *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVRs) in Support of the Lower Atchafalaya and Morganza to the Gulf, Louisiana, Feasibility Study*.

The owners of the 11 industrial properties provided a minimum, maximum, and most likely content damage estimate for each depth of flooding using OBM-approved survey forms. Copies of the OBM survey forms used to develop the depth-damage relationships can be found in the final report dated May 2009 titled *Morganza to the Gulf Post Authorization Change Report: Residential and Nonresidential Structure Inventory and Nonresidential Surveys*.

ENGINEERING INPUTS TO THE HEC-FDA MODEL

Ground Elevations. Geospatial Engineering acquired elevation data for the Morganza study area in 2009. The LIDAR data were processed and used to create a DEM with a five-foot by five-foot horizontal grid resolution. The DEM used NAVD88 epoch 2004.65 vertical datum to determine the ground elevations for each of the residential and non-residential structures in the evaluation area. Since the engineering inputs provided for the economic update continued to be based off of this datum, all economic inputs were also kept at the NAVD88 epoch 2004.65 vertical datum.

Stage-Probability Relationships. Stage-probability relationships were provided for the base year of the project (2035) and the final year in the period of analysis (2085) under both without-project and with-project conditions for each of the 266 study area reaches. Water surface profiles were provided for eight AEP events: 99 percent (1-year), 20 percent (5-year), 10 percent (10-year), 4 percent (25-year), 2 percent (50-year), 1 percent (100-year), 0.5 percent (200-year), and 0.2 percent (500-year). The water surface profiles were based only on storm surge and did not incorporate heavy rainfall events.

Non-Federal and Federal Levee Performance. Local levee systems provide flood risk reduction under existing conditions for structures located within 78 of the study area reaches. A set of fragility curves, which relates specific stages in NAVD 88 (2004.65 epoch) on the exterior side of the levee to four probabilities of levee failure (zero percent, ten percent, forty-five percent, and ninety-five percent), were developed for each of the local levee systems under the without-project condition. It was assumed that there was a zero percent probability of failure at the 2-foot stage for all local levees.

The fragility curves developed for each of the local levee systems considered multiple failure modes, including the slope of the levee, seepage, wave heights, overtopping, and erodibility. The failure of an existing non-Federal levee typically occurs when the structural integrity of the levee is compromised by the storm surge. However, geotechnical failure analyses conducted in the evaluation area determined that there is only a 1 to 3 percent probability of failure at the top of the levee due to stability issues. Thus, overtopping and erodibility were used to develop the non-Federal levee fragility curves.

The fragility curves for the non-Federal levee system were entered into the HEC-FDA model for each study area reach containing a non-Federal levee to assess the performance of the non-Federal levee system. Table 12 shows the non-Federal levee fragility curves and the top of levee elevation developed for each of the study area reaches containing a levee.

Table 12
Morganza to the Gulf Economic Update
Non-Federal Levee Fragility Curves
(Feet; NAVD88 epoch 2004.65)

Reach Name	Station	Elevation Associated with Probability of Failure				Top of Levee Elevation
		0%	10%	45%	95%	
1-1AB	1	2.0	3.8	4.4	4.7	5.0
1-1AN	4	2.0	3.8	4.4	4.7	5.0
11BE4	16	2.0	4.5	5.3	5.6	6.0
11BE5	19	2.0	3.0	3.5	3.7	4.0
11BE6-W	25	2.0	4.5	5.3	5.6	6.0
11BW11	40	2.0	2.3	2.6	2.8	3.0
11BW5	58	2.0	4.1	4.8	5.1	5.5
11BW6	61	2.0	4.1	4.8	5.1	5.5
11BW79	64	2.0	4.5	5.3	5.6	6.0
11BW79-W7	67	2.0	4.1	4.8	5.1	5.5
1-2S	76	2.0	3.0	3.5	3.7	4.0
1-3	79	2.0	4.9	5.7	6.0	6.5
1-5	82	2.0	2.3	2.6	2.8	3.0
1-7_N3-4	85	2.0	4.1	4.8	5.1	5.5
1-7_N4-7	88	2.0	4.1	4.8	5.1	5.5
1-7_N7-10	91	2.0	4.1	4.8	5.1	5.5
1-7-N10-13	94	2.0	4.1	4.8	5.1	5.5
1-7N13-16	97	2.0	4.1	4.8	5.1	5.5
1-7N16-17	100	2.0	4.1	4.8	5.1	5.5
1-7N17-24	103	2.0	4.1	4.8	5.1	5.5
1-7N24-28	106	2.0	4.1	4.8	5.1	5.5
3-1B	124	2.0	7.1	8.4	8.8	9.5
3-1C	127	2.0	4.5	5.3	5.6	6.0
4-1N	130	2.0	3.0	3.5	3.7	4.0
4-1S	133	2.0	5.3	6.2	6.5	7.0
4-2	136	2.0	3.0	3.5	3.7	4.0
4-2A	139	2.0	4.5	5.3	5.6	6.0
4-2B	142	2.0	4.5	5.3	5.6	6.0
4-2C	145	2.0	4.5	5.3	5.6	6.0
4-7	148	2.0	4.5	5.3	5.6	6.0
4MGT	151	2.0	4.5	5.3	5.6	6.0
5-1A	154	2.0	4.5	5.3	5.6	6.0
5-1B	157	2.0	4.5	5.3	5.6	6.0
6-1B1	160	2.0	4.5	5.3	5.6	6.0
6-1B1-B	163	2.0	4.5	5.3	5.6	6.0
8-1N	166	2.0	3.0	3.5	3.7	4.0
8-1N-B	169	2.0	3.0	3.5	3.7	4.0
8-1S-B	175	2.0	3.0	3.5	3.7	4.0
8-2C	178	2.0	4.5	5.3	5.6	6.0

Table 12 (continued)
Morganza to the Gulf Economic Update
Non-Federal Levee Fragility Curves
(Feet; NAVD88 epoch 2004.65)

Reach Name	Station	Elevation Associated with Probability of Failure				Top of Levee Elevation
		0%	10%	45%	95%	
8-2D	181	2.0	4.5	5.3	5.6	6.0
9-1AE	184	2.0	6.0	7.0	7.4	8.0
9-1AMID	187	2.0	6.0	7.0	7.4	8.0
9-1AW	190	2.0	6.0	7.0	7.4	8.0
9-1BMIDE	196	2.0	6.0	7.0	7.4	8.0
9-1BMIDW	199	2.0	6.0	7.0	7.4	8.0
9-1BW	202	2.0	6.0	7.0	7.4	8.0
BL2	280	2.0	4.5	5.3	5.6	6.0
BL3	283	2.0	4.5	5.3	5.6	6.0
BL4	286	2.0	3.8	4.4	4.7	5.0
BL5	289	2.0	3.8	4.4	4.7	5.0
BL6	292	2.0	3.8	4.4	4.7	5.0
BL7	295	2.0	4.5	5.3	5.6	6.0
BL89	298	2.0	3.8	4.4	4.7	5.0
BPC3	307	2.0	4.5	5.3	5.6	6.0
BPC4	310	2.0	4.5	5.3	5.6	6.0
BT4	331	2.0	4.5	5.3	5.6	6.0
BT4-SA	334	2.0	5.3	6.2	6.5	7.0
D-01	367	2.0	7.5	8.8	9.3	10.0
D10	373	2.0	4.5	5.3	5.6	6.0
D-16S	379	2.0	3.0	3.5	3.7	4.0
D-25	406	2.0	5.3	6.2	6.5	7.0
D-29	418	2.0	4.9	5.7	6.0	6.5
D-30	421	2.0	3.0	3.5	3.7	4.0
D-36	436	2.0	7.1	8.4	8.8	9.5
D-48	466	2.0	3.0	3.5	3.7	4.0
D-53	478	2.0	3.8	4.4	4.7	5.0
D-56	481	2.0	4.5	5.3	5.6	6.0
D-60	484	2.0	4.5	5.3	5.6	6.0
D-61	487	2.0	4.5	5.3	5.6	6.0
D-61-B	490	2.0	4.5	5.3	5.6	6.0
D-62-B	496	2.0	4.5	5.3	5.6	6.0
D-64	499	2.0	3.8	4.4	4.7	5.0
E2-LF	517	2.0	4.0	4.7	5.0	5.4
E2-LF-B	520	2.0	4.0	4.7	5.0	5.4
LBC1	670	2.0	4.5	5.3	5.6	6.0
LBC2	673	2.0	4.5	5.3	5.6	6.0
PAC1	709	2.0	7.5	8.8	9.3	10.0
SL3	718	2.0	7.5	8.8	9.3	10.0

Federal levees will provide flood risk reduction under future conditions for residential and non-residential structures located within 235 of the study area reaches. Each of these 235 study area reaches was assigned to one of the ten major Federal levee reaches (A, B, and E through L) based on the location of the reach and the path of the storm surge, should the Federal levee fail. Single point fragility curves were developed for the Federal levee system. The Federal levees are assumed to fail with certainty once the surge stage reaches the top of the levee height assigned to each study area reach. Only a top of the Federal levee elevation was entered into the HEC-FDA model for each of the study area reaches. The top of the levee elevation in this analysis does not represent the actual height of the Federal levee; rather, it represents the still water stage elevation at which the levee is assumed to fail. At this stage, which is below the actual top of the levee, waves will overtop the Federal levee at a rate of 2 cubic feet per second (cfs). Table 13 shows the top of Federal levee still water stage or elevation for each of the major levee reaches for each of the 1 percent AEP alternative.

Table 13
Morganza to the Gulf Economic Update
Elevation Associated with Failure by Federal Levee Reach
(Feet; NAVD88 epoch 2004.65)

Reach	Levee Failure Elevation	
	2035	2085
A	12.13	16.16
B	13.83	16.90
E	16.00	18.50
F	15.47	16.97
G	16.77	17.97
H	17.12	19.62
I	18.32	21.83
J	18.53	21.29
K	18.22	22.59
L	18.54	21.76

When existing non-Federal or Federal levees are included in the analysis, an exterior-interior stage relationship must be considered in the analysis. The exterior-interior stage relationship defines the relationship between the water surface elevation, or stage, outside of the levee and the stage within the floodplain behind the levee. Under the with-project conditions, exterior and interior stage relationships were provided for each study area reach. In the event of a Federal levee failure, the interior surge elevation changes as the distance from the levee increases. Thus, a unique interior surge elevation curve was provided for each interior study area reach under with-project conditions. Under the without-project condition, an exterior-interior stage relationship was not provided for each study area reach. In the event of a non-Federal levee failure, the elevation of the surges within the reach is the same on both sides of the levee regardless of the distance from the levee.

Uncertainty Surrounding the Engineering Inputs. The uncertainty surrounding three key engineering parameters was quantified and entered into the HEC-FDA model. These engineering variables included ground elevations, stage-probability curves, and performance of the non-Federal and Federal levees. The HEC-FDA model used the uncertainty surrounding these variables to estimate the uncertainty surrounding the elevation of the storm surges for each study area reach.

Ground Elevations. An engineering survey was conducted to estimate the uncertainty surrounding the use of the 2009 LIDAR data to estimate ground elevations in urbanized areas. The LIDAR data were compared to 2,241 spot elevations, or engineering survey points, throughout the urbanized portions of the evaluation area. The uncertainty surrounding these data was found to be normally distributed with a mean of zero and a standard deviation of 0.219 feet. (A combination of the uncertainty surrounding the ground elevations and the foundation height of a residential and non-residential structure was discussed in the first-floor elevation uncertainty section of this report.)

Stage-Probability Relationships. A 50-year equivalent record length was used to quantify the uncertainty surrounding the stage-probability relationships for each study area reach. Based on this equivalent record length, the HEC-FDA model calculated the confidence limits surrounding the stage-probability functions.

Levee Performance. The uncertainty surrounding the performance of the non-Federal levees was based on the fragility curves entered for each study area reach. The Federal levees are assumed to fail with certainty once the surge stage reaches the top of the levee height assigned to each study area reach.

PART 3: NATIONAL ECONOMIC DEVELOPMENT (NED) FLOOD DAMAGE AND BENEFIT CALCULATIONS

NED FLOOD DAMAGE AND BENEFIT CALCULATIONS FOR STRUCTURES, CONTENTS, AND VEHICLES

HEC-FDA Model Calculations. The HEC-FDA model was used to evaluate flood damages using risk-based analysis. Damages were reported at the index location for each of the 266 study area reaches. A range of possible values, with a maximum and a minimum value for each economic variable (first floor elevation, structure and content values, and depth-damage relationships), was entered into the HEC-FDA model to calculate the uncertainty or error surrounding the elevation-damage, or stage-damage, relationships. The model also used the number of years that stages were recorded at a given gage to determine the hydrologic uncertainty surrounding the stage-probability relationships. Fragility curves for the non-Federal levees and top of levee elevations and exterior/interior stage relationships for Federal levees were entered into the levee features section of the model.

The possible occurrences of each variable were derived through the use of Monte Carlo simulation, which used randomly selected numbers to simulate the values of the selected variables from within the established ranges and distributions. For each variable, a sampling technique was used to select from within the range of possible values. With each sample, or iteration, a different value was selected. The number of iterations performed affects the simulation execution time and the quality and accuracy of the results. This process was conducted simultaneously for each economic and hydrologic variable. The resulting mean value and probability distributions formed a comprehensive picture of all possible outcomes.

Stage-Damage Relationships with Uncertainty. The HEC-FDA model used the economic inputs to generate a stage-damage relationship for each structure category in each study area for the base year of 2035 and future year of 2085. The possible occurrences of each economic variable were derived through the use of Monte Carlo simulation. A total of 1,000 iterations were executed by the model for the Morganza evaluation. The sum of all sampled values was divided by the number of samples to yield the expected value for a specific simulation. A mean and standard deviation was automatically calculated for the damages at each stage.

Stage-Probability Relationships with Uncertainty. The HEC-FDA model used an equivalent record length (50 years) for each study area reach to generate a stage-probability relationship with uncertainty for the without-project and the with-project alternatives in 2035 and 2085 conditions through the use of graphical analysis. Due to uncertainties remaining relatively the same as the time of the PAC Report, the equivalent record length from that time, which was based on gage data, was adapted without alteration. The model used the eight stage-probability events together with the equivalent record length to define the full range of the stage-probability or stage-probability functions by interpolating between the data points. Confidence bands surrounding the stages for each of the probability events were also provided.

Without-Project Expected Annual Damages. The model used Monte Carlo simulation to sample from the stage-probability curve with uncertainty. For each of the iterations within the simulation, stages were simultaneously selected for the entire range of probability events. For the study area reaches without a non-Federal levee system, the Monte Carlo simulation then selects a corresponding damage value for each of the stages from the stage-damage relationships with uncertainty. For the study area reaches with a non-Federal levee system, the Monte Carlo simulation also selects a failure probability from the fragility curve developed for the non-Federal levee. If the selected stages from the stage-probability curve are below the height of the non-Federal levee, then the fragility curve is used to determine if there is levee failure. If the levee fails, then a damage estimate is sampled from the stage-damage relationship. However, if the levee does not fail, then zero damages will be selected for that iteration. If the selected stages are equal to or above the height of the non-Federal levee and the levee fails, then the Monte Carlo simulation will select a damage value from the stage-damage relationship with uncertainty for that iteration. There are no exterior-interior stage probability relationships under the without-project conditions.

The sum of all damage values divided by the number of iterations run by the model yielded the expected value, or mean damage value, with confidence bands for each probability event. The probability-damage relationships are integrated by weighting the damages corresponding to each magnitude of flooding (stage) by the percentage chance of exceedance (probability). From these weighted damages, the model determined the expected annual damages (EAD) with confidence bands (uncertainty). For the without-project alternative, the EAD were totaled for each study area reach to obtain the total without-project EAD under base year 2035 and future year 2085 conditions.

Most Likely Future Condition Adjustments. The without-project EAD calculated as part of the economic analysis do not consider the behavior of property owners whose structures have incurred repetitive flood losses. The HEC-FDA model implicitly assumes that all damaged assets will be restored to their prior market value completely and instantaneously after each storm event. However, property owners could also opt to have their structures raised in place, floodproof and/or retrofit their structures, relocate within the floodplain, or permanently evacuate from the study area. The course of action selected by an individual property owner following repetitive flood losses depends upon many factors, including the degree of aversion to future anticipated flood risk by that property owner.

Historical Response to Flood Events. The Morganza study area experienced numerous flood events during the past several decades. Historical data show that the post-flood response of property owners to the flood events prior to 2005 did not result in significant outmigration from the study area. Data from the 2000 Census show that approximately 65 percent of residents in the Lafourche and Terrebonne Parishes lived in the same housing unit as they had in 1995. This percentage ranged from a high of 81 percent in Dulac (southern portion of the study area) to a low of 54 percent in Thibodaux (northern portion of the study area). In comparison, the national percentage of the population residing in the same house in 2000 as in 1995 was 54 percent.

According to local officials, residents in low-lying communities began relocating to areas in the northern parts of the study area after Hurricanes Katrina and Rita impacted the area in 2005. Reasons for this intra-parish shift were a combination of weariness on the part of residents of having to deal with repeat flooding and the more stringent requirements to obtain permits for rebuilding after homes were damaged. To rebuild, residents had to incur the cost of building to higher elevations. The ability to secure insurance at a reasonable price was also cited as a reason for the exodus.

The rate of retreat from the southern communities slowed around 2008 after Hurricane Ike impacted the area due to Federal assistance, as well as the construction of local levees, which reduced damages to the area. In addition, the two parishes have also implemented elevation programs designed to raise the structures in flood-prone areas. The elevation costs have been offset by state and Federal funding and, in the case of properties with flood insurance, supplemental support in the form of FEMA Increased Cost of Compliance Grants. These programs have made structure elevation more affordable for residents.

Local officials also stated that residents prefer to remain due to the culture of the residents and the economy of the area. The economy of Terrebonne Parish is closely tied to its abundant natural resources, and many of the residents in the small communities outside of Houma are shrimpers, oystermen, crabbers, fishermen, and trappers. In Lafourche Parish, the economy is strongly tied to the production and distribution of natural gas and oil, commercial fishing, and sugar cane.

Historical data show that recent flood events have not resulted in significant outmigration from the study area, and the post-flood response of property owners in the past has been consistent with the HEC-FDA assumption that the structure inventory will remain in place throughout the period of analysis. Although the HEC-FDA certified model is a probability-based, and not an event-driven, model, the assumption that structures will be completely and immediately repaired is rarely the case for major flood events. While it may require considerable time (months to years) to fully complete repairs, past population trends, nevertheless, indicate that residents and the structures in which they live have not been permanently removed from the study area. However, the manner in which property owners have responded in the past may or may not be representative of how they will respond in the future to more repetitive and more severe flood events. The more frequent and damaging that flood events become due to sea level rise, the less time property owners have to repair damaged structures prior to the next flood. Thus, adjustments were made to the 2035 and 2085 structure inventories to account for the projected rise in relative sea level.

Structure Inventory Adjustments. The adjustments were made to the structure inventory in two phases. First, all properties with a first floor elevation less than or equal to 2035 or 2085 without-project 99 percent AEP (1-year) water surface elevation exterior to the non-Federal levee, if it exists, within each study area reach were raised to the 2085 99 percent AEP (1-year) plus 0.01 feet. This adjustment was made to 379 structures and corrects for possible errors in placement of the inventory while not allowing yearly recurring damages. This adjusted inventory was run through HEC-FDA and the intermediary outputs were used for the next phase of adjustments. Second, all structures showing 50 percent or more structure damage in the 2035 without-project 10 percent AEP (10-year) event were raised to the 2085 1 percent AEP (100-year) without-project stage. This adjustment was made to 191 structures and follows the assumption that owners experiencing severe frequent flooding will perform some kind of self-mitigation. Table 14 shows the number of structures damaged after adjustments at each probability event in the 2035 without-project condition.

Table 14
Morganza to the Gulf Economic Update
Number of Structures Damaged by 2035 Without-Project Probability Event and Category

Annual Chance Exceedance Event (ACE)	Residential	Mobile Homes	Commercial	Industrial	Surveyed Industrial	Total
0.99 (1 yr)	-	-	-	-	-	-
0.20 (5 yr)	210	-	98	-	-	308
0.10 (10 yr)	797	146	542	10	4	1,499
0.04 (25 yr)	5,348	2,039	1,367	25	18	8,797
0.02 (50 yr)	12,637	3,725	2,644	50	22	19,078
0.01 (100 yr)	21,910	5,842	3,990	63	23	31,828
0.005 (200 yr)	31,706	7,807	5,029	87	23	44,652
0.002 (500 yr)	39,559	9,778	5,944	108	23	55,412

Rationale for the Adjustments. The adjustments made to the structure inventory were designed to account for the future behavior of property owners whose structures incur repetitive flooding. Beyond the dollar damage and disruptions associated with a flood event, a variety of considerations influence individual property owner rebuild decisions. Significant among these considerations are FEMA requirements for participation in the flood insurance program and the local permitting rules adopted by communities.

FEMA rules require that a structure located within the 1 percent AEP (100-year) floodplain receiving 50 percent or more structural damage from an individual flood event must elevate if it is to be rebuilt/repaired at the original location. Additionally, FEMA has requirements in place to address repetitively damaged properties. FEMA defines a repetitive flood loss property as one that incurs flood damages greater than $1,000 two or more times during a 10-year period. FEMA defines a severe repetitively flooded property as one that incurs flood damage two or more times during a ten-year period with the cumulative value of these damages exceeding the value of the structure, or one that has four claims exceeding a specifically defined amount over the same period. Thus, to be compliant with FEMA rules, severely repetitively flooded properties experiencing such damages would have to be elevated to the 1 percent AEP (100-year) event level. Property owners could also choose to implement an equivalent mitigation measure or face a significant increase in flood insurance premiums. Finally, the parish could enforce its own elevation requirements for properties in the high-risk flood zones that are severely damaged or are identified as repetitive flood properties, even if the owners are not National Flood Insurance Program policy holders.

With-Project Expected Annual Damages. The with-project stage probability curves with uncertainty relate the stages on the exterior of the Federal levee system to each probability event. An exterior-interior stage relationship was also entered into the HEC-FDA model for each study area reach. The exterior-interior stage curve relates the stages on the outside of the Federal levee system to the stages on the inside of the Federal levee system for each study area reach. For the Morganza evaluation, the exterior stages were set equal to the water surface profiles from the with-project stage probability relationships for each reach, and the interior stages were set equal to the water surface profiles from the without-project stage-probability relationships. Additionally, since only single point fragility curves were developed for the Federal levee system, a top of the levee elevation was assigned and entered into the model for each study area reach. This elevation is below the actual top of the levee elevation to account for wave action above the still water stages. At stages below the top of the levee elevation, there is a 100 percent chance that the Federal levee will not fail. At stages equal to or greater than the top of the levee elevation, there is a 100 percent chance that the levee will fail.

The HEC-FDA model used Monte Carlo simulation to sample from the with-project stage-probability relationships with uncertainty for each iteration run by the model. The exterior stage randomly selected by the model was then compared to the top of the Federal levee elevation for each study area reach. If the exterior stage was below the top of the levee elevation, a zero damage value was assigned to that exterior stage. If the exterior stage selected by the model was equal to or above the height of the Federal levee, the related interior stage was used to calculate the damages from the stage-damage relationships with uncertainty. In this case, the with-project interior damages would be equal to the without-project damages for that probability event.

The sum of all damage values divided by the number of iterations run by the model yielded the expected value, or mean damage value, with confidence bands for each probability event. The probability-damage relationships were integrated by weighting the damages corresponding to each magnitude of flooding (stage) by the percentage chance of exceedance (probability). From these weighted damages, the model determined the EAD with confidence bands (uncertainty). For the with-project alternative, the EAD were totaled for each study area reach to obtain the total with-project EAD under base year 2035 and future year 2085 conditions.

Damages resulting from waves overtopping Federal levees were not calculated in this analysis. Since the top of levee elevations specified in the HEC-FDA model are less than the design top of the Federal levee, wave action above the still water stage has been incorporated into levee performance. Also, the study area reaches south of the City of Houma contain marshland that function as storage area for any excess storm surges attributable to residual wave overtopping. The exclusion of the potential damages from overtopping are not expected to be significant and does not affect plan formulation.

The performance of non-Federal levees was also not included in the calculation of with-project damages for study area reaches that are inside the Federal levee system. If the storm surge overtops the Federal levees, then it is expected that it will also overtop the non-Federal levees. The HEC-FDA model currently does not have the capability to analyze the performance of two levees simultaneously. The exclusion of non-Federal levee performance under the with-project conditions is not considered to have a significant impact on with-project damages.

For those reaches exterior to the Federal levee, the same process was used to calculate damages as was discussed under the without-project conditions. If a non-Federal levee was present in the reach, then a non-Federal levee fragility curve was used along with the with-project stage-damage relationships with uncertainty to calculate damages. If a non-Federal levee was not present in the reach, then the with-project stage-probability curves were used along with the stage-damage relationships with uncertainty to calculate damages. The with-project stages for the exterior reaches could be higher than the without-project stages for a range of probability events. The Federal levee reduces the impact of the storm surge on the interior reaches, but it elevates the stages and induces damages in all exterior reaches.

Induced Damages. Fifteen study area reaches located outside the proposed Federal levee system incur higher stages for various AEP storm events with the project in place for the years 2035 and 2085. The HEC-FDA model station numbers associated with these reaches are 163, 169, 175, 235, 256, 316, 340, 490, 496, 508, 514, 556, 604, 631, and 796. Since these reaches experience induced damages as a direct result of the project alternative, all properties in the impacted reaches would be acquired and the residents would be relocated to areas outside the 100-year floodplain. This approach ensures the project captures the maximum cost estimate for buyouts associated with inducements. To model this, all residential and non-residential structures, their contents, and vehicles, as well as the debris removal and cleanup costs, were removed for each of these reaches in the with-project modeling and were not included in the total damages for the 1 percent AEP with-project alternative.

Expected Annual Inundation Reduction Benefits. The HEC-FDA model compared the without-project damages with uncertainty to the with-project damages with uncertainty to calculate the expected benefits with uncertainty for the project alternative. Benefits were calculated for the project base year (2035) and future conditions (2085). Table 15 shows the expected annual without-project damages, with-project damages, and benefits (damages reduced) for the years 2035 and 2085 for all categories modeled in the HEC-FDA model. This table also displays the percentage of expected annual benefits attributable to each modeled category.

Table 15
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Category
($ Thousands; FY22 Price Level)

2035				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
Residential	$257,399	$49,518	$207,881	46.0%
Mobile Homes	$11,477	$1,940	$9,537	2.1%
Commercial	$225,808	$38,430	$187,378	41.5%
Industrial	$12,066	$1,826	$10,240	2.3%
Interviewed Industrial	$12,808	$2,154	$10,654	2.4%
Vehicles	$20,577	$2,774	$17,803	3.9%
Streets	$8,847	$2,600	$6,247	1.4%
Highways	$2,603	$602	$2,001	0.4%
Railroads	$29	$9	$20	0.0%
Total	**$551,614**	**$99,854**	**$451,760**	**100%**
2085				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
Residential	$1,487,220	$74,997	$1,412,223	50.0%
Mobile Homes	$61,307	$2,876	$58,431	2.1%
Commercial	$1,148,300	$64,793	$1,083,507	38.4%
Industrial	$63,845	$3,566	$60,279	2.1%
Interviewed Industrial	$57,876	$2,480	$55,395	2.0%
Vehicles	$103,599	$4,008	$99,591	3.5%
Streets	$43,569	$4,231	$39,337	1.4%
Highways	$15,296	$1,129	$14,167	0.5%
Railroads	$210	$62	$148	0.0%
Total	**$2,981,220**	**$158,142**	**$2,823,078**	**100%**

Table 16 shows the expected annual without-project damages, with-project damages, and benefits for the years 2035 and 2085. The table also shows the expected annual benefits at the 25, 50, and 75 percentiles. These percentiles reflect the percentage chance that the benefits will be greater than or equal to the indicated amount. Table 17, which can be found at the back of this appendix, displays expected annual damages and benefits for the years 2035 and 2085 by reach.

Table 16
Morganza to the Gulf Economic Update
Expected Annual Damage Reduced and Distributed
($ Thousands; FY22 Price Level)

Year	Total Without-Project Damages	Total With-Project Damages	Damages Reduced	Probability Damage Reduced Exceeds Indicated Values		
				0.75	0.50	0.25
2035	$ 551,614	$ 99,854	$ 451,760	$ 246,530	$ 422,508	$ 628,350
2085	$ 2,981,220	$ 158,142	$ 2,823,080	$2,165,980	$2,802,510	$ 3,453,670

Equivalent Annual Damages and Benefits. Damages and benefits for each of the years during the period of analysis were computed by the HEC-FDA model for the years between 2035 and 2085 for the 1 percent AEP alternative. The FY22 Federal interest rate of 2.25 percent, or OMB interest rate of 7 percent, was used to discount the stream of expected annual damages and benefits occurring after the base year to calculate the total present value of the damages and benefits over the period of analysis. The present value of the expected annual damages and benefits was then amortized over the period of analysis using the corresponding discount rate to calculate the equivalent annual benefits.

Table 18 shows the equivalent annual without-project damages, with-project damages, and benefits (damages reduced) for the 50-year period of analysis from 2035 to 2085 for all categories modeled in the HEC-FDA model. This table also displays the percentage of equivalent annual benefits attributable to each modeled category.

Table 18
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Category
($ Thousands; FY22 Price Level)

FY 2022 Federal Interest Rate of 2.25%				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
Residential	$758,342	$59,896	$698,446	49.3%
Mobile Homes	$31,774	$2,321	$29,453	2.1%
Commercial	$601,569	$49,169	$552,400	39.0%
Industrial	$33,157	$2,535	$30,622	2.2%
Interviewed Industrial	$31,166	$2,287	$28,878	2.0%
Vehicles	$54,395	$3,276	$51,118	3.6%
Streets	$22,990	$3,265	$19,726	1.4%
Highways	$7,773	$817	$6,956	0.5%
Railroads	$103	$31	$72	0.0%
Total	**$1,541,270**	**$123,596**	**$1,417,674**	**100%**
OMB Interest Rate of 7%				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
Residential	$571,848	$56,032	$515,816	48.8%
Mobile Homes	$24,218	$2,179	$22,038	2.1%
Commercial	$461,678	$45,171	$416,507	39.4%
Industrial	$25,305	$2,271	$23,034	2.2%
Interviewed Industrial	$24,331	$2,238	$22,094	2.1%
Vehicles	$41,805	$3,089	$38,715	3.7%
Streets	$17,725	$3,017	$14,708	1.4%
Highways	$5,848	$737	$5,111	0.5%
Railroads	$75	$23	$53	0.0%
Total	**$1,172,830**	**$114,757**	**$1,058,073**	**100%**

Table 19 shows the equivalent annual without-project damages, with-project damages, and benefits (damages reduced) for the 50-year period of analysis from 2035 to 2085 for all categories modeled in the HEC-FDA model. The table also shows the equivalent annual benefits at the 25, 50, and 75 percentiles. These percentiles reflect the percentage chance that the benefits will be greater than or equal to the indicated amount. Table 20, which can be found at the back of this appendix, displays equivalent annual damages and benefits for the 50-year period of analysis by reach.

Table 19
Morganza to the Gulf Economic Update
Equivalent Annual Damage Reduced and Distributed
($ Thousands; FY22 Price Level)

Interest Rate	Total Without-Project Damages	Total With-Project Damages	Damages Reduced	Probability Damage Reduced Exceeds Indicated Values		
				0.75	0.50	0.25
Federal 2.25%	$ 1,541,270	$ 123,596	$ 1,417,670	$ 1,028,380	$ 1,391,950	$ 1,779,190
OMB 7%	$ 1,172,830	$ 114,757	$ 1,058,080	$ 737,305	$ 1,031,040	$ 1,350,750

OTHER NED BENEFIT CATEGORIES

General. In addition to the physical damages to structures, contents, and vehicles, there are five other categories of NED benefits that are attributable to the Morganza alternative: avoidance of structure-raising costs, emergency cost reductions, agricultural benefits, safe harbor of large commercial and recreational boat fleets, and municipal water supply benefits. At the time of the PAC report, these benefit categories accounted for less than 10 percent of the total benefits associated with the project alternative. For this economic update, only the debris removal and cleanup of the residential and non-residential structures, and the physical damages to streets and highways (emergency cost reductions) were analyzed using updated costs and hydraulic conditions. Benefit calculations from the PAC report associated with avoidance of structure-raising costs, safe harbor of large commercial and recreational boat fleets, and municipal water supply were scaled to current values using the with- and without-project HEC-FDA results as shown in Table 21 below. More information about the initial creation and assessment of these benefit categories can be found in the PAC report.

Table 21
Morganza to the Gulf Economic Update
Scaling of Water Supply, Boat Fleets, and Avoided Structure-Raising Cost Categories
($ Thousands)

PAC Report Equivalent Annual Damages and Benefits Without Future Development (FY 2011 Price Level; 3.75% Discount Rate)				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
HEC-FDA Categories	$812,182	$123,697	$688,486	99.3%
Water Supply	$141	$72	$68	0.0%
Boat Fleets	$17	$2	$15	0.0%
Avoided Structure-Raising Costs	$4,937	$0	$4,937	0.7%
Total	**$817,277**	**$123,771**	**$693,506**	**100.0%**
FY 2022 Federal Interest Rate (FY 2022 Price Level; 2.25% Discount Rate)				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
HEC-FDA Categories	$1,541,270	$123,596	$1,417,670	99.3%
Water Supply	$267	$72	$195	0.0%
Boat Fleets	$32	$2	$30	0.0%
Avoided Structure-Raising Costs	$9,369	$0	$9,369	0.7%
Total	**$1,550,938**	**$123,670**	**$1,427,263**	**100%**
OMB Interest Rate (FY 2022 Price Level; 7% Discount Rate)				
Category	Without-Project Damages	With- Project Damages	Damages Reduced	% of Total Benefits
HEC-FDA Categories	$1,172,830	$114,757	$1,058,080	99.3%
Water Supply	$203	$67	$136	0.0%
Boat Fleets	$24	$2	$23	0.0%
Avoided Structure-Raising Costs	$7,129	$0	$7,129	0.7%
Total	**$1,180,187**	**$114,826**	**$1,065,368**	**100%**

Note: The values used for the PAC Report "HEC-FDA Categories" correspond to the following damage categories in the PAC Report analysis: Residendial & Commercial - Structure/Content/Vehicles, Industrial - Structure/Contents, Highways, Streets, and Debris Removal & Cleanup. All of these categories were analyzed previously in separate HEC-FDA models. For the economic update, all these categories are represented in one HEC-FDA model.

PART 4: LIFE CYCLE COSTS OF THE PROJECT ALTERNATIVE

CONSTRUCTION OF THE PROJECT ALTERNATIVE

Construction Schedule. Construction of the project alternative is scheduled to begin in the year 2022 and will continue through the year 2070 for the 1 percent AEP alternative. The authorized levee alignment for the alternative will be constructed using the existing non-Federal levee systems throughout the area whenever possible and will be constructed in phases due to the relatively poor foundation conditions and the absence of quality burrow material. The 1 percent AEP alternative requires two or three levee lifts, depending on the levee reach, to achieve the design elevation by the year 2035. Three additional levee lifts are scheduled after the year 2035 to maintain the design elevation. The first levee lifts will be overbuilt and allowed to settle for several years before the later levee lifts are added. The later lifts will account for the relative sea-level rise and subsidence that is projected to occur throughout the period of analysis. The life cycle costs also include the construction of sector gates and a lock structure on the HNC and the major periodic rehabilitation cost of these hurricane and storm damage risk reduction structures on navigable waterways.

Average Annual Costs. Life cycle cost estimates were provided for the 1 percent AEP alternative in October 2021 price levels. The first costs, along with the schedule of expenditures, were used to determine the interest during construction and gross investment cost at the end of the installation period. The FY22 Federal discount rate of 2.25 percent was used to discount the costs to the base year and then amortize the costs over the 50-year period of analysis. After the average annual construction costs were calculated, the annual operations and maintenance (O&M) costs were added.

Table 22 displays how the annual O&M cost from the PAC Report was brought to 2011 present value, indexed, and re-annualized at both the FY22 Federal discount rate of 2.25 percent and the OMB discount rate of 7 percent. Table 23a provides the life cycle costs for the 1 percent AEP alternative, the average annual construction cost, the annual operation and maintenance cost, and the total average annual cost using the FY22 Federal discount rate of 2.25 percent. Table 23b shows the same data using the OMB discount rate of 7 percent. Both tables have summaries of costs with and without sunk costs from years 2000 to 2021 to represent total cost and remaining cost.

Table 22
Morganza to the Gulf Economic Update
Price Indexing and Annualization of Operation and Maintenance Costs

Report	Present Value	Discount Rate	Amortization Factor	Average Annual O&M Cost
PAC Report (FY11)	$130,770,672	4%	0.04655	$6,087,401
Economic Update (FY22)	$164,992,449	2.25%	0.03352	$5,530,276
		7%	0.07246	$11,955,328

Note: The average annual O&M cost from the PAC Report was brought to present value using the amortization factor it was created with. That present value was then indexed using CWCCIS Levees & Floodwalls Yearly Cost Indices (EM 1110-2-1304 - 31 March 2021) from FY2011 (769.26) to FY2022 (970.57). The FY2022 present value was then annualized at both the current federal discount rate and the OMB discount rate.

Table 23a
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 2.25% Discount Rate)

Year	Analysis Year	Sunk Construction Costs (Nominal Price Level)	CWCCIS Index	Total Construction Costs	Present Value Factor	Present Value Cost
2000	-35.5	$ 0.35	1.89	$ 0.66	1.0000	$ 0.66
2001	-34.5	$ 1.72	1.87	$ 3.21	1.0000	$ 3.21
2002	-33.5	$ 4.35	1.81	$ 7.89	1.0000	$ 7.89
2003	-32.5	$ 6.53	1.77	$ 11.53	1.0000	$ 11.53
2004	-31.5	$ 5.52	1.65	$ 9.13	1.0000	$ 9.13
2005	-30.5	$ 3.21	1.56	$ 5.01	1.0000	$ 5.01
2006	-29.5	$ 1.93	1.48	$ 2.85	1.0000	$ 2.85
2007	-28.5	$ 2.97	1.42	$ 4.21	1.0000	$ 4.21
2008	-27.5	$ 8.84	1.34	$ 11.88	1.0000	$ 11.88
2009	-26.5	$ 5.34	1.35	$ 7.21	1.0000	$ 7.21
2010	-25.5	$ 6.84	1.32	$ 9.00	1.0000	$ 9.00
2011	-24.5	$ 5.23	1.26	$ 6.60	1.0000	$ 6.60
2012	-23.5	$ 3.93	1.23	$ 4.83	1.0000	$ 4.83
2013	-22.5	$ 1.73	1.21	$ 2.09	1.0000	$ 2.09
2014	-21.5	$ 0.76	1.18	$ 0.90	1.0000	$ 0.90
2015	-20.5	$ 0.47	1.17	$ 0.55	1.0000	$ 0.55
2016	-19.5	$ 0.18	1.16	$ 0.21	1.0000	$ 0.21
2017	-18.5	$ 0.18	1.13	$ 0.20	1.0000	$ 0.20
2018	-17.5	$ 0.02	1.11	$ 0.02	1.0000	$ 0.02
2019	-16.5	$ 0.06	1.07	$ 0.06	1.0000	$ 0.06
2020	-15.5	$ 0.46	1.05	$ 0.48	1.0000	$ 0.48
2021	-14.5			$ -	1.0000	$ -
2022	-13.5			$ 673.06	1.3504	$ 908.89
2023	-12.5			$ 81.09	1.3207	$ 107.09
2024	-11.5			$ 326.73	1.2916	$ 422.01
2025	-10.5			$ 159.23	1.2632	$ 201.13
2026	-9.5			$ 148.11	1.2354	$ 182.97
2027	-8.5			$ 100.60	1.2082	$ 121.55
2028	-7.5			$ 145.66	1.1816	$ 172.12
2029	-6.5			$ 193.36	1.1556	$ 223.44
2030	-5.5			$ 126.64	1.1302	$ 143.12
2031	-4.5			$ 394.20	1.1053	$ 435.72
2032	-3.5			$ 468.47	1.0810	$ 506.41

Table 23a
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 2.25% Discount Rate)

Year	Analysis Year	Sunk Construction Costs (Nominal Price Level)	CWCCIS Index	Total Construction Costs	Present Value Factor	Present Value Cost
2033	-2.5			$ 489.55	1.0572	$ 517.55
2034	-1.5			$ 377.27	1.0339	$ 390.08
2035	-0.5			$ 171.54	1.0112	$ 173.45
2036	0.5			$ 89.97	0.9889	$ 88.98
2037	1.5			$ 501.02	0.9672	$ 484.57
2038	2.5			$ 382.10	0.9459	$ 361.43
2039	3.5			$ 101.50	0.9251	$ 93.90
2040	4.5			$ 101.50	0.9047	$ 91.83
2041	5.5			$ 100.79	0.8848	$ 89.18
2042	6.5			$ 127.79	0.8653	$ 110.58
2043	7.5			$ 64.39	0.8463	$ 54.49
2044	8.5			$ 38.16	0.8277	$ 31.58
2045	9.5			$ 53.31	0.8095	$ 43.15
2046	10.5			$ 137.05	0.7917	$ 108.50
2047	11.5			$ 137.05	0.7742	$ 106.11
2048	12.5			$ 137.05	0.7572	$ 103.78
2049	13.5			$ 126.73	0.7405	$ 93.85
2050	14.5			$ 34.28	0.7242	$ 24.83
2051	15.5			$ -	0.7083	$ -
2052	16.5			$ -	0.6927	$ -
2053	17.5			$ -	0.6775	$ -
2054	18.5			$ -	0.6626	$ -
2055	19.5			$ -	0.6480	$ -
2056	20.5			$ -	0.6337	$ -
2057	21.5			$ -	0.6198	$ -
2058	22.5			$ -	0.6061	$ -
2059	23.5			$ -	0.5928	$ -
2060	24.5			$ -	0.5798	$ -
2061	25.5			$ -	0.5670	$ -
2062	26.5			$ -	0.5545	$ -
2063	27.5			$ -	0.5423	$ -
2064	28.5			$ -	0.5304	$ -
2065	29.5			$ 6.58	0.5187	$ 3.41

Table 23a (continued)
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 2.25% Discount Rate)

Year	Analysis Year	Sunk Construction Costs (Nominal Price Level)	CWCCIS Index	Total Construction Costs	Present Value Factor	Present Value Cost
2066	30.5			$ 93.43	0.5073	$ 47.40
2067	31.5			$ 113.45	0.4961	$ 56.28
2068	32.5			$ 113.45	0.4852	$ 55.05
2069	33.5			$ 99.09	0.4745	$ 47.02
2070	34.5			$ 47.58	0.4641	$ 22.08
2071	35.5			$ -	0.4539	$ -
2072	36.5			$ -	0.4439	$ -
2073	37.5			$ -	0.4341	$ -
2074	38.5			$ -	0.4246	$ -
2075	39.5			$ -	0.4152	$ -
2076	40.5			$ -	0.4061	$ -
2077	41.5			$ -	0.3972	$ -
2078	42.5			$ -	0.3884	$ -
2079	43.5			$ -	0.3799	$ -
2080	44.5			$ -	0.3715	$ -
2081	45.5			$ -	0.3633	$ -
2082	46.5			$ -	0.3553	$ -
2083	47.5			$ -	0.3475	$ -
2084	48.5			$ -	0.3399	$ -
2085	49.5			$ -	0.3324	$ -

Table 23a (continued)
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 2.25% Discount Rate)

Total Cost Summary		
	Cost	Present Value Cost
Sunk Costs:	$ 89	$ 89
Remaining Costs:	$ 6,462	$ 6,624
Total Costs:	$ 6,550	$ 6,712
	Discount Rate: 2.25%	
	Amortization Factor: 0.03352	
	Interest During Construction:	$ 650
	Total Average Annual Construction Costs:	$ 225
	Operations and Maintenance Cost:	$ 6
	Total Annual Costs:	$ 231

Remaining Cost Summary		
	Cost	Present Value Cost
Remaining Costs:	$ 6,462	$ 6,624
	Discount Rate: 2.25%	
	Amortization Factor: 0.03352	
	Interest During Construction:	$ 650
	Remaining Average Annual Construction Costs:	$ 222
	Operations and Maintenance Cost:	$ 6
	Remaining Annual Costs:	$ 228

Note: All costs pior to 2021 are considered sunk. Sunk costs were indexed for 2022 price levels using the yearly Civil Works Construction Cost Index dated 31 March 2021 Levees and Floodwalls.

Table 23b
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 7% Discount Rate)

Year	Analysis Year	Sunk Construction Costs (Nominal Price Level)	CWCCIS Index	Total Construction Costs	Present Value Factor	Present Value Cost
2000	-35.5	$ 0.35	1.89	$ 0.66	1.0000	$ 0.66
2001	-34.5	$ 1.72	1.87	$ 3.21	1.0000	$ 3.21
2002	-33.5	$ 4.35	1.81	$ 7.89	1.0000	$ 7.89
2003	-32.5	$ 6.53	1.77	$ 11.53	1.0000	$ 11.53
2004	-31.5	$ 5.52	1.65	$ 9.13	1.0000	$ 9.13
2005	-30.5	$ 3.21	1.56	$ 5.01	1.0000	$ 5.01
2006	-29.5	$ 1.93	1.48	$ 2.85	1.0000	$ 2.85
2007	-28.5	$ 2.97	1.42	$ 4.21	1.0000	$ 4.21
2008	-27.5	$ 8.84	1.34	$ 11.88	1.0000	$ 11.88
2009	-26.5	$ 5.34	1.35	$ 7.21	1.0000	$ 7.21
2010	-25.5	$ 6.84	1.32	$ 9.00	1.0000	$ 9.00
2011	-24.5	$ 5.23	1.26	$ 6.60	1.0000	$ 6.60
2012	-23.5	$ 3.93	1.23	$ 4.83	1.0000	$ 4.83
2013	-22.5	$ 1.73	1.21	$ 2.09	1.0000	$ 2.09
2014	-21.5	$ 0.76	1.18	$ 0.90	1.0000	$ 0.90
2015	-20.5	$ 0.47	1.17	$ 0.55	1.0000	$ 0.55
2016	-19.5	$ 0.18	1.16	$ 0.21	1.0000	$ 0.21
2017	-18.5	$ 0.18	1.13	$ 0.20	1.0000	$ 0.20
2018	-17.5	$ 0.02	1.11	$ 0.02	1.0000	$ 0.02
2019	-16.5	$ 0.06	1.07	$ 0.06	1.0000	$ 0.06
2020	-15.5	$ 0.46	1.05	$ 0.48	1.0000	$ 0.48
2021	-14.5			$ -	1.0000	$ -
2022	-13.5			$ 673.06	2.4928	$ 1,677.78
2023	-12.5			$ 81.09	2.3297	$ 188.90
2024	-11.5			$ 326.73	2.1773	$ 711.38
2025	-10.5			$ 159.23	2.0348	$ 324.00
2026	-9.5			$ 148.11	1.9017	$ 281.66
2027	-8.5			$ 100.60	1.7773	$ 178.80
2028	-7.5			$ 145.66	1.6610	$ 241.95
2029	-6.5			$ 193.36	1.5524	$ 300.16
2030	-5.5			$ 126.64	1.4508	$ 183.73
2031	-4.5			$ 394.20	1.3559	$ 534.50
2032	-3.5			$ 468.47	1.2672	$ 593.64

Table 23b
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 7% Discount Rate)

Year	Analysis Year	Sunk Construction Costs (Nominal Price Level)	CWCCIS Index	Total Construction Costs	Present Value Factor	Present Value Cost
2033	-2.5			$ 489.55	1.1843	$ 579.77
2034	-1.5			$ 377.27	1.1068	$ 417.57
2035	-0.5			$ 171.54	1.0344	$ 177.44
2036	0.5			$ 89.97	0.9667	$ 86.98
2037	1.5			$ 501.02	0.9035	$ 452.67
2038	2.5			$ 382.10	0.8444	$ 322.64
2039	3.5			$ 101.50	0.7891	$ 80.10
2040	4.5			$ 101.50	0.7375	$ 74.86
2041	5.5			$ 100.79	0.6893	$ 69.47
2042	6.5			$ 127.79	0.6442	$ 82.32
2043	7.5			$ 64.39	0.6020	$ 38.77
2044	8.5			$ 38.16	0.5626	$ 21.47
2045	9.5			$ 53.31	0.5258	$ 28.03
2046	10.5			$ 137.05	0.4914	$ 67.35
2047	11.5			$ 137.05	0.4593	$ 62.95
2048	12.5			$ 137.05	0.4292	$ 58.83
2049	13.5			$ 126.73	0.4012	$ 50.84
2050	14.5			$ 34.28	0.3749	$ 12.85
2051	15.5			$ -	0.3504	$ -
2052	16.5			$ -	0.3275	$ -
2053	17.5			$ -	0.3060	$ -
2054	18.5			$ -	0.2860	$ -
2055	19.5			$ -	0.2673	$ -
2056	20.5			$ -	0.2498	$ -
2057	21.5			$ -	0.2335	$ -
2058	22.5			$ -	0.2182	$ -
2059	23.5			$ -	0.2039	$ -
2060	24.5			$ -	0.1906	$ -
2061	25.5			$ -	0.1781	$ -
2062	26.5			$ -	0.1665	$ -
2063	27.5			$ -	0.1556	$ -
2064	28.5			$ -	0.1454	$ -
2065	29.5			$ 6.58	0.1359	$ 0.89

Table 23b (continued)
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 7% Discount Rate)

Year	Analysis Year	Sunk Construction Costs (Nominal Price Level)	CWCCIS Index	Total Construction Costs	Present Value Factor	Present Value Cost
2066	30.5			$ 93.43	0.1270	$ 11.87
2067	31.5			$ 113.45	0.1187	$ 13.46
2068	32.5			$ 113.45	0.1109	$ 12.58
2069	33.5			$ 99.09	0.1037	$ 10.27
2070	34.5			$ 47.58	0.0969	$ 4.61
2071	35.5			$ -	0.0905	$ -
2072	36.5			$ -	0.0846	$ -
2073	37.5			$ -	0.0791	$ -
2074	38.5			$ -	0.0739	$ -
2075	39.5			$ -	0.0691	$ -
2076	40.5			$ -	0.0646	$ -
2077	41.5			$ -	0.0603	$ -
2078	42.5			$ -	0.0564	$ -
2079	43.5			$ -	0.0527	$ -
2080	44.5			$ -	0.0493	$ -
2081	45.5			$ -	0.0460	$ -
2082	46.5			$ -	0.0430	$ -
2083	47.5			$ -	0.0402	$ -
2084	48.5			$ -	0.0376	$ -
2085	49.5			$ -	0.0351	$ -

Table 23b (continued)
Morganza to the Gulf Economic Update
Morganza to the Gulf
1% AEP Alternative Total Annual Costs
(2022 Price Level; $ Millions; 7% Discount Rate)

Total Cost Summary				
		Cost		Present Value Cost
Sunk Costs:	$	89	$	89
Remaining Costs:	$	6,462	$	7,955
Total Costs:	$	6,550	$	8,044
Discount Rate:		7.00%		
Amortization Factor:		0.07246		
Interest During Construction:			$	2,536
Total Average Annual Construction Costs:			$	583
Operations and Maintenance Cost:			$	12
Total Annual Costs:			$	595

Remaining Cost Summary				
		Cost		Present Value Cost
Remaining Costs:	$	6,462	$	7,955
Discount Rate:		7.00%		
Amortization Factor:		0.07246		
Interest During Construction:			$	2,536
Remaining Average Annual Construction Costs:			$	576
Operations and Maintenance Cost:			$	12
Remaining Annual Costs:			$	588

Note: All costs pior to 2021 are considered sunk. Sunk costs were indexed for 2022 price levels using the yearly Civil Works Construction Cost Index dated 31 March 2021 Levees and Floodwalls.

PART 5: RESULTS OF THE ECONOMIC ANALYSIS

NET BENEFIT ANALYSIS

Calculation of Net Benefits. The expected annual benefits attributable to the 1 percent AEP alternative for each of the benefit categories were converted to an equivalent time frame by using both the current Federal discount rate of 2.25 percent and the OMB discount rate of 7 percent. The base year for this conversion is the year. The equivalent annual benefits were then compared to the average annual costs to develop a benefit-to-cost ratio for each interest rate scenario. The net benefits for each alternative were calculated by subtracting the average annual costs from the equivalent annual benefits. Table 24a summarizes the equivalent annual damages and benefits, total first costs (including sunk and remaining costs), total annual costs, benefit-to-cost ratio, and equivalent annual net benefits at the current Federal discount rate. Table 24b summarizes the same, but using only remaining costs. Tables 25a and 25b show the same at the OMB discount rate.

Table 24a
Morganza to the Gulf Economic Update
Total Equivalent Annual Net Benefits at Federal Discount Rate
(2022 Price Level; $ Millions; 2.25% Discount Rate)

Item	Equivalent Annual		
	Without-Project Damages	With-Project Damages	Benefits and Costs
Damage Category			
Structures, Contents, Autos, Debris, Transportation			
Infrastructure	$1,541	$124	$1,418
Water Supply	$0	$0	$0
Boat Fleets	$0	$0	$0
Avoided Structure-Raising Costs	$9	$0	$9
Total	$1,551	$124	$1,427
Sunk Costs			$89
Remaining Costs			$6,462
Total First Costs			$6,550
Interest During Construction			$650
Total Average Annual Construction Costs			$225
Annual Operation & Maintenance Costs			$6
Total Average Annual Project Costs			$231
B/C Ratio			6.19
Total Equivalent Annual Net Benefits			$1,197

Table 24b
Morganza to the Gulf Economic Update
Remaining Equivalent Annual Net Benefits at Federal Discount Rate
(2022 Price Level; $ Millions; 2.25% Discount Rate)

Item	Equivalent Annual		
	Without-Project Damages	With-Project Damages	Benefits and Costs
Damage Category			
Structures, Contents, Autos, Debris, Transportation			
Infrastructure	$1,541	$124	$1,418
Water Supply	$0	$0	$0
Boat Fleets	$0	$0	$0
Avoided Structure-Raising Costs	$9	$0	$9
Total	$1,551	$124	$1,427
		Remaining Costs	$6,462
		Interest During Construction	$650
		Remaining Average Annual Construction Costs	$222
		Annual Operation & Maintenance Costs	$6
		Remaining Average Annual Project Costs	$228
		B/C Ratio	6.27
		Remaining Equivalent Annual Net Benefits	$1,200

Table 25a
Morganza to the Gulf Economic Update
Total Equivalent Annual Net Benefits at OMB Discount Rate
(2022 Price Level; $ Millions; 7% Discount Rate)

Item	Equivalent Annual		
	Without-Project Damages	With-Project Damages	Benefits and Costs
Damage Category			
Structures, Contents, Autos, Debris, Transportation			
Infrastructure	$1,173	$115	$1,058
Water Supply	$0	$0	$0
Boat Fleets	$0	$0	$0
Avoided Structure-Raising Costs	$7	$0	$7
Total	$1,180	$115	$1,065
		Sunk Costs	$89
		Remaining Costs	$6,462
		Total First Costs	$6,550
		Interest During Construction	$2,536
		Total Average Annual Construction Costs	$583
		Annual Operation & Maintenance Costs	$12
		Total Average Annual Project Costs	$595
		B/C Ratio	1.79
		Total Equivalent Annual Net Benefits	$471

Table 25b
Morganza to the Gulf Economic Update
Remaining Equivalent Annual Net Benefits at OMB Discount Rate
(2022 Price Level; $ Millions; 7% Discount Rate)

Item	Equivalent Annual		
	Without-Project Damages	With-Project Damages	Benefits and Costs
Damage Category			
Structures, Contents, Autos, Debris, Transportation			
Infrastructure	$1,173	$115	$1,058
Water Supply	$0	$0	$0
Boat Fleets	$0	$0	$0
Avoided Structure-Raising Costs	$7	$0	$7
Total	$1,180	$115	$1,065
		Remaining Costs	$6,462
		Interest During Construction	$2,536
		Remaining Average Annual Construction Costs	$576
		Annual Operation & Maintenance Costs	$12
		Remaining Average Annual Project Costs	$588
		B/C Ratio	1.81
		Remaining Equivalent Annual Net Benefits	$477

RISK ANALYSIS AND PROJECT PERFORMANCE

Benefit Exceedance Probability Relationship. The HEC-FDA model incorporates the uncertainty surrounding the economic and engineering inputs to generate results that can be used to assess the performance of proposed plans. The HEC-FDA model was used to calculate equivalent annual without-project and with-project damages and the damages reduced for the 1 percent AEP alternative. Table 26 shows the equivalent annual benefits and the benefits at the 75, 50, and 25 percentiles for the 50-year period of analysis at the Federal discount rate. The percentiles shown in the tables reflect the percentage chance that the benefits will be greater than or equal to the indicated values. Since the additional benefit categories were not calculated in HEC-FDA, the values associated with these percentiles were scaled based on the results from the model. Finally, the benefit exceedance probability relationships are compared to the point estimate of the annual costs to show the percentage chance that the equivalent annual benefits will exceed the annual costs at the Federal discount rate. Table 27 shows the same data using the OMB discount rate.

Table 26
Morganza to the Gulf Economic Update
Probability Equivalent Annual Benefits Exceed Total Annual Costs at Federal Discount Rate
(2022 Price Level; 2.25% Discount Rate; $ Thousands)

Damage Category	Equivalent Annual Damages Reduced	Probability Damage Reduced Exceeds Values			Total Annual Costs	Probabilty Benefits Exceed Costs
		75%	50%	25%		
HEC-FDA Categories	$1,417,670	$1,028,380	$1,391,950	$1,779,190	$230,507	Greater than 75%
Water Supply	$195	$141	$191	$245		
Boat Fleets	$30	$22	$29	$38		
Avoided Structure-Raising Costs	$9,369	$6,796	$9,199	$11,758		
Total Benefits	$1,427,263	$1,035,339	$1,401,369	$1,791,230		

Table 27
Morganza to the Gulf Economic Update
Probability Equivalent Annual Benefits Exceed Total Annual Costs at OMB Discount Rate
(2022 Price Level; 7% Discount Rate; $ Thousands)

Damage Category	Equivalent Annual Damages Reduced	Probability Damage Reduced Exceeds Values			Total Annual Costs	Probabilty Benefits Exceed Costs
		75%	50%	25%		
HEC-FDA Categories	$1,058,080	$737,305	$1,031,040	$1,350,750	$594,796	Greater than 75%
Water Supply	$136	$95	$133	$174		
Boat Fleets	$23	$16	$22	$29		
Avoided Structure-Raising Costs	$7,129	$4,968	$6,947	$9,101		
Total Benefits	$1,065,368	$742,383	$1,038,141	$1,360,054		

Project Performance by Reach for the Years of Analysis. The results from the HEC-FDA model were also used to calculate the long-term AEP and the conditional non-exceedance probability, or assurance, for various probability events. The model provided a target stage to assess project performance for each study area reach for the analysis years 2035 and 2085 for the without-project condition and for the 1 percent AEP alternative. For each study area reach, the target stage was set by default at the elevation where the model calculated five percent residual damages for the 1 percent AEP (100-year) event.

The HEC-FDA model calculated a target stage AEP with a median and expected value that reflected the likelihood that the target stages will be exceeded in a given year. The median value was calculated using point estimates, while the expected value was calculated using Monte Carlo simulation. The results also show the long-term risk or the probability of a target stage being exceeded over 10-year, 30-year, and 50-year periods. Finally, the model results show the conditional non-exceedance probability or the likelihood that a target stage will not be exceeded by the 10 percent (10 year) AEP, 4 percent (25-year), 2 percent (50-year), 1 percent (100-year), the 0.04 percent (250-year), and 0.02 percent (500-year) AEP events. Tables 28 and 29, available at the end of this appendix, display the project performance results for the categories analyzed using the HEC-FDA model for each study area reach for the analysis years 2035 and 2085 for both the without-project and with-project conditions.

Residual Risk. Any flood risk to either existing or future development that remains in the floodplain after the implementation of the 1 percent AEP alternative is considered residual risk. The total equivalent annual residual damages by category are shown in Table 30. The values are shown using both the Federal discount rate and the OMB discount rate.

Table 30
Morganza to the Gulf Economic Update
Residual Equivalent Annual Damages by Category
($ Thousands; FY22 Price Level)

FY 2022 Federal Interest Rate of 2.25%		
Category	Residual Damages	Residual Damages
Residential	$59,896	48%
Mobile Homes	$2,321	2%
Commercial	$49,169	40%
Industrial	$2,535	2%
Interviewed Industrial	$2,287	2%
Vehicles	$3,276	3%
Streets	$3,265	3%
Highways	$817	1%
Railroads	$31	0%
Water Supply	$72	0%
Boat Fleets	$2	0%
Avoided Structure-Raising Costs	$0	0%
Total	**$123,671**	100%
OMB Interest Rate of 7%		
Category	Residual Damages	% of Total Residual Damages
Residential	$56,032	49%
Mobile Homes	$2,179	2%
Commercial	$45,171	39%
Industrial	$2,271	2%
Interviewed Industrial	$2,238	2%
Vehicles	$3,089	3%
Streets	$3,017	3%
Highways	$737	1%
Railroads	$23	0%
Water Supply	$67	0%
Boat Fleets	$2	0%
Avoided Structure-Raising Costs	$0	0%
Total	**$114,826**	100%

PART 6: POST AUTHORIZATION CHANGES

CHANGES SINCE THE PAC REPORT

Changes in Structure Inventory. At the time of the PAC report, a structure inventory representing estimated future development was used in the damage analysis for the final authorized project. Since the majority of the area previously designated for future development has already been developed, the inventory was supplemented as described in the narrative above. Table 31 shows a comparison between the full structure inventory from the PAC report (including future development, which accounted for about 20 percent of the total inventory) at both 2011 and 2022 price levels and the structure inventory used in this economic update.

Table 31
Morganza to the Gulf Economic Update
Structure Inventory Comparison

Structure Occupancy	PAC Report Inventory (2011 Price Level)			PAC Report Inventory (2022 Price Level)		Economic Update Inventory (2022 Price Level)		
	Number of Structures	Total Depreciated Replacement Value ($ Millions)	Average Depreciated Replacement Value ($ Thousands)	Total Depreciated Replacement Value ($ Millions)	Average Depreciated Replacement Value ($ Thousands)	Number of Structures	Total Depreciated Replacement Value ($ Millions)	Average Depreciated Replacement Value ($ Thousands)
Residential								
One-Story Slab	29,527	$4,749	$161	$6,300	$213	27,618	$6,520	$236
One-Story Pier	16,290	$1,437	$88	$1,906	$117	15,435	$2,159	$140
Two-Story Slab	2,121	$448	$211	$594	$280	3,640	$1,083	$297
Two-Story Pier	811	$112	$138	$149	$183	1,516	$315	$208
Mobile Home	13,145	$124	$9	$164	$13	12,607	$218	$17
Total Residential	**61,894**	**$6,870**	**$111**	**$9,113**	**$147**	**60,816**	**$10,294**	**$169**
Non-Residential								
Eating and Recreation	970	$351	$362	$465	$480	387	$196	$506
Professional	1,933	$1,332	$689	$1,768	$914	1,503	$1,320	$878
Public and Semi-Public	812	$658	$810	$872	$1,074	779	$949	$1,219
Repair and Home Use	246	$41	$168	$55	$223	276	$117	$424
Retail and Personal Services	958	$540	$564	$716	$748	744	$649	$872
Warehouse	5,288	$950	$180	$1,261	$238	3,220	$1,018	$316
Grocery and Gas Station	238	$83	$349	$110	$463	144	$79	$546
Multi-Family Occupancy	419	$223	$533	$296	$707	410	$325	$792
Interviewed Industrial	24	$43	$2	$57	$2,365	24	$67	$2,790
Total Non-Residential	**10,864**	**$4,179**	**$385**	**$5,544**	**$510**	**7,487**	**$4,720**	**$630**
Totals								
	72,758	**$11,049**		**$14,657**		**68,303**	**$15,014**	

Note: PAC Report inventory includes future deveolpment (about 20% of total inventory) and was indexed using the RSMeans 2021 Historical Cost Index (2011 at 162.1 and 2021 at 204.8) and the Consumer Price Index for 2021 to 2022 (5%)

Table 32 provides the project first cost comparisons of the latest authorization PAC (at 2012 price levels) and current first costs (2022 price levels).

Table 32
Morganza to the Gulf Economic Update
Project First Cost Comparison
($ Millions)

Project as Authorized by Congress		Current Project First Costs (2022 Price Level)	Current Project Fully Funded First Cost (2022 Price Level)
(2012 Price Level)	(2022 Price Level)		
$10,265	$12,629.13	$6,550	$10,148

Note: Authorized cost pulled from PAC Report Table 55 and indexed using CWCCIS Yearly Cost Indices for feature code 11 Levees & Floodwalls

Changes in Project BCR and Net Benefits. The existing project benefits result from flood damage reduction as a result of the proposed levee system. Table 33 shows all components of the net benefit analysis for the project as authorized by Congress in the PAC report at both the 2012 price level and an indexed 2022 price level compared to the current economic update net benefit analysis at a 2022 price level using both the current Federal discount rate of 2.25 percent and the OMB discount rate of 7 percent.

Table 33
Morganza to the Gulf Economic Update
Damages, Benefits, Costs, and BCR Comparison
($ Millions)

Item	PAC Report - Project As Authroized by Congress		Economic Update - Total Cost		Economic Update - Remaining Cost	
Price Level	2012	2022	2022	2022	2022	2022
Interest Rate	3.75	3.75	2.25	7.00	2.25	7.00
Total Equivalent Annual Without-Project Damages	$906	$1,134	$1,551	$1,180	$1,551	$1,180
Total Equivalent Annual With-Project Damages	$136	$170	$124	$115	$124	$115
Total Equivalent Annual Benefits	$1,023	$1,282	$1,427	$1,065	$1,427	$1,065
First Costs	$10,265	$12,629	$6,550	$6,550	$6,462	$6,462
Interest During Construction	$5,914	$7,276	$650	$2,536	$650	$2,536
Annual Operation & Maintenance Costs	$7	$9	$6	$12	$6	$12
Total Annual Costs	$716	$881	$231	$595	$228	$588
B/C Ratio	1.43	1.45	6.19	1.79	6.27	1.81
Equivalent Annual Net Benefits	$307	$401	$1,197	$471	$1,200	$477

Note: PAC Report values were indexed using RSMeans from 2021 to 2021 (2012 171.7 and 2021 204.8E) and the Consumer Price Index from 2021 to 2022 (5%) on the damages and benefits. Costs were indexed using CWCCIS (FY12 788.89 and FY22 970.57)

Referenced Tables

Table 7
Morganza to the Gulf Economic Update
Number of Structures by Reach and Category

Reach Name	Station Number	Residential	Mobile Homes	Commercial	Industrial	Interviewed Industrial	Vehicles	Structure Total
1-1AB	1	41	81	148	3	0	263	273
1-1AN	4	1,122	441	242	3	0	2,109	1,808
11BE1	7	300	253	11	2	0	553	566
11BE2	10	228	47	18	2	0	274	295
11BE3	13	256	368	38	1	0	606	663
11BE4	16	168	116	69	1	0	282	354
11BE5	19	74	106	44	0	0	505	224
11BE6-E	22	0	1	2	0	0	1	3
11BE6-W	25	1	145	25	0	0	146	171
1-1BU3-U1	28	295	76	38	0	0	746	409
1-1BU3-U2	31	180	13	8	0	0	193	201
1-1BU3-U3	34	41	0	6	1	0	41	48
11BU4	37	277	36	14	3	0	313	330
11BW11	40	91	43	38	0	0	129	172
11BW2-W1	43	100	20	6	2	0	120	128
11BW2-W2	46	436	150	12	0	0	586	598
11BW4-W3	49	9	13	4	0	0	22	26
11BW4-W4	52	672	87	29	0	0	955	788
11BW4-W4A	55	296	5	12	0	0	299	313
11BW5	58	1,575	1	54	0	0	2,326	1,630
11BW6	61	762	9	81	0	0	1,971	852
11BW79	64	1,570	35	89	0	0	1,605	1,694
11BW79-W7	67	767	67	120	0	0	1,159	954
1-2MID	70	1	0	62	1	0	1	64
1-2N	73	210	34	94	0	0	259	338
1-2S	76	1	1	28	2	0	2	32
1-3	79	1,008	84	53	3	0	1,405	1,148
1-5	82	2,501	321	379	2	1	2,822	3,204
1-7_N3-4	85	16	0	2	0	0	16	18
1-7_N4-7	88	35	0	3	0	0	35	38
1-7_N7-10	91	68	0	3	0	0	68	71
1-7-N10-13	94	87	3	7	0	0	88	97
1-7N13-16	97	38	4	33	0	0	40	75
1-7N16-17	100	0	0	2	0	0	0	2
1-7N17-24	103	43	1	36	0	0	44	80
1-7N24-28	106	217	4	22	0	0	221	243
1-8	109	337	44	221	0	0	767	602
2-1A2	112	3	0	2	0	0	3	5
2-1B2-MID	115	6	1	2	0	0	7	9
2-1B2N	118	88	2	8	0	0	90	98
2-1B2S	121	1,254	19	272	11	0	1,473	1,556
3-1B	124	249	32	20	0	0	281	301
3-1C	127	74	21	6	0	0	95	101
4-1N	130	174	39	13	0	0	213	226
4-1S	133	162	88	10	0	0	250	260
4-2	136	460	134	11	0	0	594	605
4-2A	139	347	317	23	0	0	658	687
4-2B	142	120	118	11	0	0	238	249
4-2C	145	102	27	5	0	0	129	134
4-7	148	205	36	16	0	0	241	257
4MGT	151	194	78	9	0	0	270	281

Table 7 (continued)
Morganza to the Gulf Economic Update
Number of Structures by Reach and Category

Reach Name	Station Number	Residential	Mobile Homes	Commercial	Industrial	Interviewed Industrial	Vehicles	Structure Total
5-1A	154	855	197	39	0	0	1,052	1,091
5-1B	157	497	105	38	0	0	602	640
6-1B1	160	8	0	2	0	0	8	10
6-1B1-B	163	2	1	0	0	0	3	3
8-1N	166	15	5	3	0	0	18	23
8-1N-B	169	39	12	1	0	0	51	52
8-1S-B	175	122	42	10	0	0	164	174
8-2C	178	1	0	2	1	0	1	4
8-2D	181	57	24	3	0	0	81	84
9-1AE	184	136	44	6	3	0	180	189
9-1AMID	187	15	2	3	1	0	17	21
9-1AW	190	80	29	4	1	0	134	114
9-1BE	193	371	129	102	15	0	1,075	617
9-1BMIDE	196	2,040	116	25	0	0	2,181	2,181
9-1BMIDW	199	141	198	19	3	0	414	361
9-1BW	202	1,288	274	69	12	0	1,837	1,643
A1	205	118	231	26	5	0	349	380
B1	208	12	11	2	0	0	23	25
BB1	211	145	1	8	0	0	171	154
BB2	214	4	0	10	0	0	3	14
BB3	217	16	4	49	0	0	45	69
BB4	220	6	0	0	0	0	6	6
BB5	223	391	0	2	0	0	391	393
BB6	226	8	6	3	0	0	14	17
BB7	229	121	104	45	2	0	225	272
BB8-B	235	0	6	47	0	0	6	53
BD1	238	64	21	4	0	0	85	89
BDL0	241	13	50	1	0	0	61	64
BDL1	244	19	4	1	0	0	23	24
BDL2	247	4	0	0	0	0	4	4
BDL3	250	86	30	5	1	0	116	122
BDL4	253	66	0	3	0	0	66	69
BDL4-B	256	53	14	8	0	0	92	75
BDL5	259	35	10	19	0	0	45	64
BGC0	262	24	78	12	0	0	82	114
BGC1	265	24	8	2	0	0	32	34
BGC2	268	28	11	3	0	0	39	42
BGC3	271	135	47	27	0	0	178	209
BGC4	274	51	31	46	1	0	76	129
BL1	277	1	10	7	0	0	11	18
BL2	280	174	22	36	0	0	196	232
BL3	283	105	16	24	0	0	121	145
BL4	286	64	33	21	0	0	97	118
BL5	289	507	191	119	0	0	698	817
BL6	292	1,419	431	99	0	0	1,924	1,949
BL7	295	1,560	146	229	0	0	2,104	1,935
BL89	298	1,922	525	233	0	0	3,293	2,680
BPC1	301	349	12	3	0	0	361	364
BPC2	304	54	35	7	0	0	89	96
BPC3	307	114	58	13	0	1	172	186
BPC4	310	54	18	18	0	0	72	90

Table 7 (continued)
Morganza to the Gulf Economic Update
Number of Structures by Reach and Category

Reach Name	Station Number	Residential	Mobile Homes	Commercial	Industrial	Interviewed Industrial	Vehicles	Structure Total
BPC5	313	263	35	9	0	0	298	307
BPC5-B	316	210	23	39	0	0	233	272
BT1	319	492	45	119	2	0	562	658
BT10	322	41	0	16	1	0	116	58
BT2	325	107	26	3	1	0	129	137
BT3	328	17	3	6	0	0	20	26
BT4	331	98	72	15	0	0	168	185
BT4-SA	334	55	6	3	0	0	61	64
BT5	337	10	0	4	0	0	10	14
BT5-B	340	14	0	0	0	0	14	14
BT6	343	405	25	238	0	0	528	668
BT6A	346	271	41	162	0	0	400	474
BT7	349	149	49	74	0	0	348	272
BT8	352	207	25	56	5	0	282	293
BT9	355	142	45	89	6	0	387	282
C1	358	26	9	5	0	0	35	40
C1-LF	361	7	1	2	0	0	8	10
CC1	364	67	71	8	0	0	138	146
D-01	367	20	10	0	0	0	30	30
D-06	370	21	9	1	0	0	30	31
D10	373	28	12	5	0	0	40	45
D-16N	376	38	35	7	0	0	73	80
D-16S	379	150	128	9	0	0	278	287
D-1732	382	122	87	13	0	0	209	222
D1A	385	0	0	0	0	0	0	0
D1B	388	0	0	0	0	0	0	0
D1b-LF	391	2	1	4	1	0	3	8
D1C	394	12	9	10	0	0	21	31
D1c-LF1	397	185	109	29	0	0	294	323
D1c-LF2	400	151	65	20	0	0	216	236
D1c-LF3	403	6	1	4	0	0	7	11
D-25	406	116	29	24	0	0	145	169
D-25-B	409	0	0	0	0	0	0	0
D-26	412	48	2	2	0	0	50	52
D-28	415	434	224	26	11	0	683	695
D-29	418	1,601	1	65	1	0	1,702	1,668
D-30	421	32	2	1	0	0	34	35
D-31	424	12	6	3	0	0	18	21
D-34N	427	19	0	5	0	0	19	24
D-34S	430	6	1	2	0	0	7	9
D-35	433	7	0	2	0	0	7	9
D-36	436	136	98	6	0	0	234	240
D-37	439	62	0	0	0	0	62	62
D-38	442	277	0	23	0	0	627	300
D-39-1	445	300	14	30	0	0	314	344
D-39-2	448	67	1	22	0	0	293	90
D-39-3	451	184	3	70	0	0	212	257
D-42	454	28	30	3	1	0	58	62
D-43	457	153	43	11	0	0	184	207
D-44	460	3	74	6	0	0	102	83
D-45	463	5	0	0	0	0	5	5

Table 7 (continued)
Morganza to the Gulf Economic Update
Number of Structures by Reach and Category

Reach Name	Station Number	Residential	Mobile Homes	Commercial	Industrial	Interviewed Industrial	Vehicles	Structure Total
D-48	466	8	3	0	0	0	11	11
D-49	469	0	5	0	0	0	5	5
D-50	472	30	35	6	0	0	65	71
D-51	475	47	2	2	0	0	49	51
D-53	478	87	0	6	0	0	87	93
D-56	481	70	13	5	0	0	83	88
D-60	484	0	458	5	0	0	458	463
D-61	487	43	28	1	0	0	71	72
D-61-B	490	2	0	0	0	0	2	2
D-62-B	496	26	3	2	0	0	29	31
D-64	499	94	0	0	0	0	94	94
E1	502	5	21	14	0	0	26	40
E1-LF	505	0	1	0	0	0	1	1
E1-LF-B	508	0	0	8	0	0	0	8
E2	511	0	0	1	0	0	0	1
E2-B	514	0	0	4	0	0	0	4
E2-LF	517	142	81	76	0	0	223	299
FC	523	0	0	1	0	0	0	1
GW10	526	589	4	38	0	1	618	632
GW11	529	56	0	14	0	0	56	70
GW12	532	982	48	147	0	0	1,103	1,177
GW13	535	288	456	65	0	2	744	811
GW14	538	833	39	115	0	1	1,497	988
GW14-1	541	32	13	13	0	0	45	58
GW15	544	133	156	22	0	0	289	311
GW16	547	31	64	7	0	0	95	102
GW17	550	0	0	13	0	0	0	13
GW18	553	52	0	2	0	0	52	54
GW18-B	556	0	1	0	0	0	1	1
GW2	559	22	7	1	0	0	29	30
GW3	562	21	19	12	0	0	40	52
GW4	565	0	4	1	0	0	4	5
GW5	568	0	4	0	0	0	4	4
GW6	571	0	10	0	0	0	10	10
GW7	574	0	4	0	0	0	4	4
GW8	577	0	2	0	0	0	2	2
GW9	580	24	7	16	0	0	31	47
HC1	583	101	132	19	0	0	233	252
HC2	586	0	0	2	0	0	0	2
HC3	589	46	51	9	0	0	97	106
HC4	592	7	0	3	0	0	7	10
HNC0	595	2	3	76	1	0	5	82
HNC1	598	34	12	10	0	0	42	56
HNC10	601	14	3	1	0	0	17	18
HNC10-B	604	89	26	9	0	0	115	124
HNC2	607	143	58	22	0	0	197	223
HNC3	610	61	37	13	0	0	98	111
HNC4	613	27	8	1	0	0	35	36
HNC5	616	64	116	5	0	0	172	185
HNC6	619	1	9	54	3	0	10	67
HNC7	622	36	10	262	9	15	42	332

Table 7 (continued)
Morganza to the Gulf Economic Update
Number of Structures by Reach and Category

Reach Name	Station Number	Residential	Mobile Homes	Commercial	Industrial	Interviewed Industrial	Vehicles	Structure Total
HNC8	625	61	3	13	1	1	64	79
HNC9	628	0	0	0	0	0	0	0
HNC9-B	631	142	29	7	0	0	171	178
HNC9-E	634	6	9	0	0	0	15	15
HNC9-W	637	7	4	7	0	0	9	18
LB2	643	9	15	7	0	2	24	33
LB3	646	0	0	3	0	0	0	3
LB4	649	32	263	17	0	0	295	312
LB5	652	34	17	12	0	0	51	63
LBB2	655	2	0	3	0	0	2	5
LBB3	658	64	9	8	1	0	73	82
LBB4	661	106	3	144	0	0	109	253
LBB5	664	623	0	37	0	0	648	660
LBB6	667	88	0	35	0	0	88	123
LBC1	670	0	0	1	0	0	0	1
LBC2	673	0	0	3	0	0	0	3
LF1	676	24	0	11	0	0	24	35
LF2	679	13	1	4	0	0	14	18
LF-GB	682	0	5	9	0	0	5	14
LL1	685	3	0	0	0	0	3	3
LL3	691	0	1	0	0	0	1	1
MC1	694	0	0	0	0	0	0	0
OB1	697	183	17	6	2	0	200	208
OB2	700	43	74	5	3	0	117	125
OB3	703	21	13	11	0	0	184	45
OB4	706	56	0	3	0	0	56	59
PAC1	709	34	2	7	0	0	36	43
SL1	712	58	36	12	0	0	94	106
SL2	715	20	0	2	0	0	20	22
SL3	718	140	55	8	0	0	195	203
TS1	721	604	60	237	11	0	1,164	912
TS10	724	75	41	8	0	0	116	124
TS11	727	88	1	19	2	0	89	110
TS12	730	27	25	23	0	0	52	75
TS13	733	13	6	4	0	0	19	23
TS14	736	0	3	0	0	0	3	3
TS15	739	332	323	5	2	0	655	662
TS16	742	484	261	7	2	0	745	754
TS17	745	34	4	1	0	0	38	39
TS18	748	14	0	0	0	0	14	14
TS19	751	459	215	31	0	0	674	705
TS2	754	878	62	41	9	0	965	990
TS20	757	5	1	1	0	0	6	7
TS21	760	0	0	0	0	0	0	0
TS22	763	234	213	46	0	0	443	493
TS3	766	177	42	5	2	0	219	226
TS4	769	129	13	19	1	0	142	162
TS5	772	87	57	39	0	0	144	183
TS6	775	268	55	56	0	0	323	379
TS7	778	4	2	0	0	0	6	6
TS9	781	219	61	24	0	0	280	304

Table 7 (continued)
Morganza to the Gulf Economic Update
Number of Structures by Reach and Category

Reach Name	Station Number	Residential	Mobile Homes	Commercial	Industrial	Interviewed Industrial	Vehicles	Structure Total
US1	784	0	0	2	0	0	0	2
E1-B	790	0	0	0	0	0	0	0
BB7-B	793	0	0	0	0	0	0	0
BD1-B	796	1	0	0	0	0	1	1
BC	799	0	0	0	0	0	0	0
L2L-A	802	308	76	33	9	0	384	426
L2L-B	805	278	244	57	8	0	672	587
Total		48,209	12,607	7,286	177	24	70,846	68,303

Table 11
Morganza to the Gulf Economic Update
Depth-Damage Relationships for Structures, Contents, Vehicles, and Debris Removal

Residential
1-Story on Pier (1STY-PIER)

Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.1	0.0	0.0	0.0
-1.0	1.1	1.0	1.7
-0.5	12.2	11.0	18.3
0.0	15.2	13.7	22.8
0.5	49.4	44.4	74.0
1.0	50.1	45.1	75.1
1.5	66.7	60.0	100.0
2.0	70.2	63.2	100.0
3.0	71.2	64.1	100.0
4.0	97.5	87.7	100.0
5.0	97.5	87.7	100.0
6.0	97.5	87.7	100.0
7.0	97.5	87.7	100.0
8.0	97.5	87.7	100.0
9.0	97.5	87.7	100.0
10.0	97.5	87.7	100.0
11.0	97.5	87.7	100.0
12.0	97.5	87.7	100.0
13.0	97.5	87.7	100.0
14.0	97.5	87.7	100.0
15.0	97.5	87.7	100.0

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	95.0	90.0	98.0
1.0	95.0	90.0	98.0
1.5	95.0	90.0	98.0
2.0	95.0	95.0	98.0
3.0	95.0	95.0	98.0
4.0	98.0	98.0	100.0
5.0	98.0	98.0	100.0
6.0	98.0	98.0	100.0
7.0	98.0	98.0	100.0
8.0	98.0	98.0	100.0
9.0	98.0	98.0	100.0
10.0	98.0	98.0	100.0
11.0	98.0	98.0	100.0
12.0	98.0	98.0	100.0
13.0	98.0	98.0	100.0
14.0	98.0	98.0	100.0
15.0	98.0	98.0	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	85.0	15.0
5.0	92.0	14.0
12.0	100.0	15.0

Residential
1-Story on Slab (1STY-SLAB)

Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	1.1	1.0	1.7
0.0	1.1	1.0	1.7
0.5	23.3	21.0	35.0
1.0	23.3	21.0	35.0
1.5	37.2	35.5	55.9
2.0	41.9	37.7	62.9
3.0	45.3	40.8	68.0
4.0	92.0	82.8	100.0
5.0	92.0	82.8	100.0
6.0	92.0	82.8	100.0
7.0	92.0	82.8	100.0
8.0	92.0	82.8	100.0
9.0	92.0	82.8	100.0
10.0	92.0	82.8	100.0
11.0	92.0	82.8	100.0
12.0	92.0	82.8	100.0
13.0	92.0	82.8	100.0
14.0	92.0	82.8	100.0
15.0	92.0	82.8	100.0

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	95.0	90.0	98.0
1.0	95.0	90.0	98.0
1.5	95.0	90.0	98.0
2.0	95.0	95.0	98.0
3.0	95.0	95.0	98.0
4.0	98.0	98.0	100.0
5.0	98.0	98.0	100.0
6.0	98.0	98.0	100.0
7.0	98.0	98.0	100.0
8.0	98.0	98.0	100.0
9.0	98.0	98.0	100.0
10.0	98.0	98.0	100.0
11.0	98.0	98.0	100.0
12.0	98.0	98.0	100.0
13.0	98.0	98.0	100.0
14.0	98.0	98.0	100.0
15.0	98.0	98.0	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	87.0	14.0
5.0	94.0	15.0
12.0	100.0	15.0

Residential
2-Story on Pier (2STY-PIER)

Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.1	0.0	0.0	0.0
-1.0	1.4	1.2	2.1
-0.5	2.2	2.0	3.3
0.0	6.4	5.8	9.6
0.5	19.0	17.1	28.5
1.0	19.0	17.1	28.5
1.5	31.9	28.7	47.9
2.0	32.6	29.3	48.9
3.0	33.3	30.0	49.9
4.0	93.4	84.0	100.0
5.0	93.4	84.0	100.0
6.0	93.4	84.0	100.0
7.0	93.4	84.0	100.0
8.0	93.4	84.0	100.0
9.0	93.6	84.2	100.0
10.0	93.6	84.2	100.0
11.0	93.6	84.2	100.0
12.0	96.6	86.9	100.0
13.0	96.6	86.9	100.0
14.0	96.6	86.9	100.0
15.0	96.6	86.9	100.0

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	69.6	66.2	73.1
1.0	69.6	66.2	73.1
1.5	74.7	70.9	78.4
2.0	74.7	70.9	78.4
3.0	78.5	74.6	82.5
4.0	79.9	75.9	83.9
5.0	83.2	79.0	87.3
6.0	83.2	79.0	87.3
7.0	83.2	79.0	87.3
8.0	83.2	79.0	87.3
9.0	83.2	79.0	87.3
10.0	83.2	79.0	87.3
11.0	97.5	92.6	100.0
12.0	97.8	92.9	100.0
13.0	98.5	93.6	100.0
14.0	98.5	93.6	100.0
15.0	98.5	93.6	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	85.0	14.0
5.0	92.0	14.0
12.0	100.0	15.0

Table 11 (continued)
Morganza to the Gulf Economic Update
Depth-Damage Relationships for Structures, Contents, Vehicles, and Debris Removal

Residential — 2-Story on Slab (2STY-SLAB)

Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	1.2	1.1	1.8
0.0	1.2	1.1	1.8
0.5	16.1	14.5	24.2
1.0	16.1	14.5	24.2
1.5	26.1	23.5	39.1
2.0	27.1	24.4	40.7
3.0	28.5	25.7	42.8
4.0	80.0	72.0	100.0
5.0	80.0	72.0	100.0
6.0	80.0	72.0	100.0
7.0	80.0	72.0	100.0
8.0	80.0	72.0	100.0
9.0	80.0	72.0	100.0
10.0	80.3	72.3	100.0
11.0	80.3	72.3	100.0
12.0	80.3	72.3	100.0
13.0	83.2	74.9	100.0
14.0	83.2	74.9	100.0
15.0	83.2	74.9	100.0

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	69.6	66.2	73.1
1.0	69.6	66.2	73.1
1.5	74.7	70.9	78.4
2.0	74.7	70.9	78.4
3.0	78.5	74.6	82.5
4.0	79.9	75.9	83.9
5.0	83.2	79.0	87.3
6.0	83.2	79.0	87.3
7.0	83.2	79.0	87.3
8.0	83.2	79.0	87.3
9.0	83.2	79.0	87.3
10.0	83.2	79.0	87.3
11.0	97.5	92.6	100.0
12.0	97.8	92.9	100.0
13.0	98.5	93.6	100.0
14.0	98.5	93.6	100.0
15.0	98.5	93.6	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	82.0	11.0
5.0	90.0	12.0
12.0	100.0	12.0

Mobile Home — Mobile Home (MOBHOM)

Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.1	0.0	0.0	0.0
-1.0	6.4	6.1	8.6
-0.5	7.3	6.9	9.8
0.0	9.9	9.4	13.4
0.5	43.4	41.2	58.6
1.0	44.7	42.5	60.3
2.0	97.6	92.7	100.0
3.0	97.6	92.7	100.0
4.0	97.6	92.7	100.0
5.0	97.6	92.7	100.0
6.0	97.6	92.7	100.0
7.0	97.6	92.7	100.0
8.0	97.6	92.7	100.0
9.0	97.6	92.7	100.0
10.0	97.6	92.7	100.0
11.0	97.6	92.7	100.0
12.0	97.6	92.7	100.0
13.0	97.6	92.7	100.0
14.0	97.6	92.7	100.0
15.0	97.6	92.7	100.0

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	95.0	90.0	100.0
1.0	96.0	92.0	100.0
1.5	97.0	94.0	100.0
2.0	98.0	96.0	100.0
3.0	99.0	98.0	100.0
4.0	100.0	100.0	100.0
5.0	100.0	100.0	100.0
6.0	100.0	100.0	100.0
7.0	100.0	100.0	100.0
8.0	100.0	100.0	100.0
9.0	100.0	100.0	100.0
10.0	100.0	100.0	100.0
11.0	100.0	100.0	100.0
12.0	100.0	100.0	100.0
13.0	100.0	100.0	100.0
14.0	100.0	100.0	100.0
15.0	100.0	100.0	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	82.0	14.0
5.0	90.0	14.0
12.0	100.0	15.0

Commercial — Multi-Family Residence (MULTI)

Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	6.6	6.2	7.6
0.5	19.8	18.4	22.8
1.0	19.8	18.4	22.8
1.5	24.5	22.8	28.2
2.0	24.5	22.8	29.5
3.0	29.6	26.6	37.0
4.0	34.7	31.2	43.4
5.0	37.9	34.1	47.4
6.0	37.9	34.1	47.4
7.0	37.9	34.1	47.4
8.0	63.3	57.0	79.2
9.0	63.3	57.0	79.2
10.0	63.3	57.0	79.2
11.0	63.3	57.0	79.2
12.0	63.3	57.0	79.2
13.0	63.3	57.0	79.2
14.0	63.3	57.0	79.2
15.0	63.3	57.0	79.2

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	20.1	15.8	22.2
1.0	26.2	22.4	28.7
1.5	33.5	31.2	35.2
2.0	42.4	40.5	46.2
3.0	49.8	46.6	51.4
4.0	51.7	50.3	53.0
5.0	51.7	50.3	53.1
6.0	51.7	50.3	54.6
7.0	51.7	50.3	54.6
8.0	51.7	50.3	54.6
9.0	51.7	50.3	54.6
10.0	71.8	56.4	79.3
11.0	85.2	79.6	89.5
12.0	100.0	93.5	100.0
13.0	100.0	97.1	100.0
14.0	100.0	97.1	100.0
15.0	100.0	97.1	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	77.0	7.0
5.0	83.0	7.0
12.0	100.0	10.0

Table 11 (continued)
Morganza to the Gulf Economic Update
Depth-Damage Relationships for Structures, Contents, Vehicles, and Debris Removal

Commercial			
Warehouses & Contractors (WARE)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	1.1	1.1	1.3
0.5	22.3	20.8	25.7
1.0	23.7	22.1	27.3
1.5	25.8	24.0	29.7
2.0	32.7	29.5	39.3
3.0	34.4	31.0	43.0
4.0	79.1	71.2	100.0
5.0	79.1	71.2	100.0
6.0	79.1	71.2	100.0
7.0	79.1	71.2	100.0
8.0	79.1	71.2	100.0
9.0	79.1	71.2	100.0
10.0	79.1	71.2	100.0
11.0	79.1	71.2	100.0
12.0	80.5	72.4	100.0
13.0	80.5	72.4	100.0
14.0	80.5	72.4	100.0
15.0	80.5	72.4	100.0

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	17.6	16.8	22.0
1.0	22.1	21.0	27.7
1.5	22.1	21.0	27.7
2.0	29.2	27.8	36.6
3.0	34.0	32.3	42.5
4.0	42.8	40.7	53.6
5.0	50.8	48.3	63.5
6.0	58.7	55.8	73.4
7.0	66.7	63.4	83.4
8.0	74.6	70.9	93.3
9.0	79.7	75.7	99.6
10.0	79.7	75.7	99.6
11.0	79.7	75.7	99.6
12.0	79.7	75.7	99.6
13.0	79.7	75.7	99.6
14.0	79.7	75.7	99.6
15.0	79.7	75.7	99.6

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	76.0	13.0
5.0	87.0	14.0
12.0	100.0	14.0

Commercial			
Grocery (GROC)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	6.6	6.2	7.6
0.5	19.8	18.4	22.8
1.0	19.8	18.4	22.8
1.5	24.5	22.8	28.2
2.0	24.5	22.8	29.5
3.0	29.6	26.6	37.0
4.0	34.7	31.2	43.4
5.0	37.9	34.1	47.4
6.0	37.9	34.1	47.4
7.0	37.9	34.1	47.4
8.0	63.3	57.0	79.2
9.0	63.3	57.0	79.2
10.0	63.3	57.0	79.2
11.0	63.3	57.0	79.2
12.0	63.3	57.0	79.2
13.0	63.3	57.0	79.2
14.0	63.3	57.0	79.2
15.0	63.3	57.0	79.2

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	99.1	94.1	100.0
1.0	100.0	95.0	100.0
1.5	100.0	95.0	100.0
2.0	100.0	95.0	100.0
3.0	100.0	95.0	100.0
4.0	100.0	95.0	100.0
5.0	100.0	95.0	100.0
6.0	100.0	95.0	100.0
7.0	100.0	95.0	100.0
8.0	100.0	95.0	100.0
9.0	100.0	95.0	100.0
10.0	100.0	95.0	100.0
11.0	100.0	95.0	100.0
12.0	100.0	95.0	100.0
13.0	100.0	95.0	100.0
14.0	100.0	95.0	100.0
15.0	100.0	95.0	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	95.0	21.0
5.0	97.0	21.0
12.0	100.0	21.0

Commercial			
Professional Services (PROF)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	6.6	6.2	7.6
0.5	19.8	18.4	22.8
1.0	19.8	18.4	22.8
1.5	24.5	22.8	28.2
2.0	24.5	22.8	29.5
3.0	29.6	26.6	37.0
4.0	34.7	31.2	43.4
5.0	37.9	34.1	47.4
6.0	37.9	34.1	47.4
7.0	37.9	34.1	47.4
8.0	63.3	57.0	79.2
9.0	63.3	57.0	79.2
10.0	63.3	57.0	79.2
11.0	63.3	57.0	79.2
12.0	63.3	57.0	79.2
13.0	63.3	57.0	79.2
14.0	63.3	57.0	79.2
15.0	63.3	57.0	79.2

Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	35.0	30.0	50.0
1.0	43.3	37.1	61.8
1.5	56.7	48.6	81.0
2.0	63.9	54.8	91.3
3.0	100.0	85.7	100.0
4.0	100.0	100.0	100.0
5.0	100.0	100.0	100.0
6.0	100.0	100.0	100.0
7.0	100.0	100.0	100.0
8.0	100.0	100.0	100.0
9.0	100.0	100.0	100.0
10.0	100.0	100.0	100.0
11.0	100.0	100.0	100.0
12.0	100.0	100.0	100.0
13.0	100.0	100.0	100.0
14.0	100.0	100.0	100.0
15.0	100.0	100.0	100.0

Debris Depth	Debris Percent Damage	Debris Standard Deviation
0.0	0.0	0.0
2.0	95.0	22.0
5.0	96.0	22.0
12.0	100.0	22.0

Table 11 (continued)
Morganza to the Gulf Economic Update
Depth-Damage Relationships for Structures, Contents, Vehicles, and Debris Removal

Commercial Repairs & Home Use (REPA)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	1.1	1.1	1.3
0.5	22.3	20.8	25.7
1.0	23.7	22.1	27.3
1.5	25.8	24.0	29.7
2.0	32.7	29.5	39.3
3.0	34.4	31.0	43.0
4.0	79.1	71.2	100.0
5.0	79.1	71.2	100.0
6.0	79.1	71.2	100.0
7.0	79.1	71.2	100.0
8.0	79.1	71.2	100.0
9.0	79.1	71.2	100.0
10.0	79.1	71.2	100.0
11.0	79.1	71.2	100.0
12.0	80.5	72.4	100.0
13.0	80.5	72.4	100.0
14.0	80.5	72.4	100.0
15.0	80.5	72.4	100.0
Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	33.3	31.7	41.7
1.0	34.3	32.6	42.9
1.5	34.3	32.6	42.9
2.0	69.2	65.7	86.5
3.0	70.6	67.1	88.3
4.0	72.1	68.5	90.2
5.0	80.6	76.6	100.0
6.0	83.7	79.6	100.0
7.0	83.7	79.6	100.0
8.0	83.7	79.6	100.0
9.0	83.7	79.6	100.0
10.0	83.7	79.6	100.0
11.0	83.7	79.6	100.0
12.0	83.7	79.6	100.0
13.0	83.7	79.6	100.0
14.0	83.7	79.6	100.0
15.0	83.7	79.6	100.0
Debris Depth	Debris Percent Damage	Debris Standard Deviation	
0.0	0.0	0.0	
2.0	95.0	21.0	
5.0	97.0	21.0	
12.0	100.0	21.0	

Commercial Retail and Personal Services (RETA)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	1.1	1.1	1.3
0.5	22.3	20.8	25.7
1.0	23.7	22.1	27.3
1.5	25.8	24.0	29.7
2.0	32.7	29.5	39.3
3.0	34.4	31.0	43.0
4.0	79.1	71.2	100.0
5.0	79.1	71.2	100.0
6.0	79.1	71.2	100.0
7.0	79.1	71.2	100.0
8.0	79.1	71.2	100.0
9.0	79.1	71.2	100.0
10.0	79.1	71.2	100.0
11.0	79.1	71.2	100.0
12.0	80.5	72.4	100.0
13.0	80.5	72.4	100.0
14.0	80.5	72.4	100.0
15.0	80.5	72.4	100.0
Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	36.6	34.8	45.7
1.0	60.5	57.5	75.7
1.5	60.5	57.5	75.7
2.0	75.4	71.6	94.2
3.0	85.1	80.8	100.0
4.0	94.5	89.7	100.0
5.0	100.0	95.0	100.0
6.0	100.0	95.0	100.0
7.0	100.0	95.0	100.0
8.0	100.0	95.0	100.0
9.0	100.0	95.0	100.0
10.0	100.0	95.0	100.0
11.0	100.0	95.0	100.0
12.0	100.0	95.0	100.0
13.0	100.0	95.0	100.0
14.0	100.0	95.0	100.0
15.0	100.0	95.0	100.0
Debris Depth	Debris Percent Damage	Debris Standard Deviation	
0.0	0.0	0.0	
2.0	95.0	22.0	
5.0	96.0	22.0	
12.0	100.0	22.0	

Commercial Eating & Recreation (EAT)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	6.6	6.2	7.6
0.5	19.8	18.4	22.8
1.0	19.8	18.4	22.8
1.5	24.5	22.8	28.2
2.0	24.5	22.8	29.5
3.0	29.6	26.6	37.0
4.0	34.7	31.2	43.4
5.0	37.9	34.1	47.4
6.0	37.9	34.1	47.4
7.0	37.9	34.1	47.4
8.0	63.3	57.0	79.2
9.0	63.3	57.0	79.2
10.0	63.3	57.0	79.2
11.0	63.3	57.0	79.2
12.0	63.3	57.0	79.2
13.0	63.3	57.0	79.2
14.0	63.3	57.0	79.2
15.0	63.3	57.0	79.2
Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	41.2	39.2	51.5
1.0	45.6	43.3	57.0
1.5	73.3	69.6	91.6
2.0	74.8	71.1	93.5
3.0	92.4	87.8	100.0
4.0	100.0	95.0	100.0
5.0	100.0	95.0	100.0
6.0	100.0	95.0	100.0
7.0	100.0	95.0	100.0
8.0	100.0	95.0	100.0
9.0	100.0	95.0	100.0
10.0	100.0	95.0	100.0
11.0	100.0	95.0	100.0
12.0	100.0	95.0	100.0
13.0	100.0	95.0	100.0
14.0	100.0	95.0	100.0
15.0	100.0	95.0	100.0
Debris Depth	Debris Percent Damage	Debris Standard Deviation	
0.0	0.0	0.0	
2.0	96.0	22.0	
5.0	98.0	22.0	
12.0	100.0	22.0	

Table 11 (continued)
Morganza to the Gulf Economic Update
Depth-Damage Relationships for Structures, Contents, Vehicles, and Debris Removal

Commercial			
Public Facilities (PUBL)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	1.1	1.1	1.3
0.5	22.3	20.8	25.7
1.0	23.7	22.1	27.3
1.5	25.8	24.0	29.7
2.0	32.7	29.5	39.3
3.0	34.4	31.0	43.0
4.0	79.1	71.2	100.0
5.0	79.1	71.2	100.0
6.0	79.1	71.2	100.0
7.0	79.1	71.2	100.0
8.0	79.1	71.2	100.0
9.0	79.1	71.2	100.0
10.0	79.1	71.2	100.0
11.0	79.1	71.2	100.0
12.0	80.5	72.4	100.0
13.0	80.5	72.4	100.0
14.0	80.5	72.4	100.0
15.0	80.5	72.4	100.0
Depth in Structure	Contents Percent Damage	Contents Lower Percent	Contents Higher Percent
-1.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.5	80.0	60.0	88.0
1.0	85.0	63.8	93.5
1.5	85.7	64.3	94.2
2.0	86.6	65.0	95.3
3.0	100.0	75.0	100.0
4.0	100.0	75.0	100.0
5.0	100.0	75.0	100.0
6.0	100.0	75.0	100.0
7.0	100.0	75.0	100.0
8.0	100.0	75.0	100.0
9.0	100.0	75.0	100.0
10.0	100.0	75.0	100.0
11.0	100.0	75.0	100.0
12.0	100.0	75.0	100.0
13.0	100.0	75.0	100.0
14.0	100.0	75.0	100.0
15.0	100.0	75.0	100.0
Debris Depth	Debris Percent Damage	Debris Standard Deviation	
0.0	0.0	0.0	
2.0	95.0	22.0	
5.0	96.0	22.0	
12.0	100.0	22.0	

Autos			
Vehicles (AUTO)			
Depth in Structure	Structure Percent Damage	Structure Lower Percent	Structure Higher Percent
0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0
1.0	3.6	0.0	8.0
1.5	13.3	7.0	19.0
2.0	45.6	10.0	100.0
3.0	100.0	100.0	100.0
4.0	100.0	100.0	100.0
5.0	100.0	100.0	100.0
6.0	100.0	100.0	100.0
7.0	100.0	100.0	100.0
8.0	100.0	100.0	100.0
9.0	100.0	100.0	100.0
10.0	100.0	100.0	100.0
11.0	100.0	100.0	100.0
12.0	100.0	100.0	100.0
13.0	100.0	100.0	100.0
14.0	100.0	100.0	100.0
15.0	100.0	100.0	100.0
16.0	100.0	100.0	100.0
17.0	100.0	100.0	100.0

Table 11 (continued)
Morganza to the Gulf Economic Update
Depth-Damage Relationships for Transportation Infrastructure

Streets		
STREET		
Street Depth	Street Percent Damage	Street Standard Deviation
1.9	0.0	0.0
2.0	54.2	9.1
5.0	66.2	11.0
12.0	100.0	15.4

Highways		
HWY		
Highway Depth	Highway Percent Damage	Highway Standard Deviation
1.9	0.0	0.0
2.0	32.7	3.6
5.0	72.3	7.1
12.0	100.0	9.9

Railroads		
RAIL		
Railroad Depth	Railroad Percent Damage	Railroad Standard Deviation
1.9	0.0	0.0
2.0	90.6	37.8
5.0	93.9	37.9
12.0	100.0	38.1

Table 17
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
1-1AB	1	$12,659	$3,056	$9,603	$61,813	$5,258	$56,555
1-1AN	4	$14,111	$2,066	$12,045	$73,894	$4,182	$69,713
11BE1	7	$549	$152	$397	$3,272	$558	$2,714
11BE2	10	$1,248	$304	$944	$8,675	$815	$7,861
11BE3	13	$2,452	$515	$1,937	$17,832	$1,276	$16,556
11BE4	16	$1,337	$411	$926	$8,345	$988	$7,357
11BE5	19	$1,039	$304	$735	$7,278	$667	$6,611
11BE6-E	22	$28	$2	$26	$106	$4	$102
11BE6-W	25	$864	$219	$644	$4,041	$489	$3,552
1-1BU3-U1	28	$189	$85	$104	$2,332	$561	$1,771
1-1BU3-U2	31	$163	$42	$121	$1,540	$308	$1,232
1-1BU3-U3	34	$16	$3	$12	$210	$77	$133
11BU4	37	$233	$37	$196	$1,053	$477	$575
11BW11	40	$3,179	$352	$2,828	$30,991	$543	$30,449
11BW2-W1	43	$135	$43	$92	$694	$162	$532
11BW2-W2	46	$978	$317	$661	$5,224	$1,135	$4,089
11BW4-W3	49	$18	$5	$13	$95	$24	$71
11BW4-W4	52	$2,744	$808	$1,936	$18,752	$1,515	$17,236
11BW4-W4A	55	$2,964	$491	$2,474	$26,414	$741	$25,673
11BW5	58	$10,296	$2,677	$7,619	$73,000	$4,500	$68,500
11BW6	61	$5,500	$1,577	$3,923	$37,552	$2,658	$34,894
11BW79	64	$11,909	$1,825	$10,084	$52,699	$3,003	$49,696
11BW79-W7	67	$4,854	$1,363	$3,491	$32,644	$2,569	$30,075
1-2MID	70	$2,519	$666	$1,854	$10,563	$884	$9,679
1-2N	73	$4,349	$1,347	$3,002	$17,319	$1,582	$15,737
1-2S	76	$1,030	$160	$870	$4,852	$191	$4,661
1-3	79	$8,027	$1,869	$6,159	$33,244	$2,213	$31,031
1-5	82	$40,245	$7,377	$32,868	$180,953	$7,052	$173,901
1-7_N3-4	85	$126	$23	$102	$582	$27	$556
1-7_N4-7	88	$181	$45	$136	$854	$53	$801
1-7_N7-10	91	$247	$71	$176	$1,152	$90	$1,062
1-7-N10-13	94	$383	$120	$263	$1,781	$169	$1,612
1-7N13-16	97	$760	$217	$543	$3,559	$300	$3,259
1-7N16-17	100	$21	$7	$14	$97	$14	$83
1-7N17-24	103	$1,213	$336	$877	$5,635	$467	$5,168
1-7N24-28	106	$1,171	$350	$821	$5,508	$459	$5,049
1-8	109	$7,134	$2,102	$5,032	$34,499	$3,497	$31,002
2-1A2	112	$1	$0	$1	$10	$3	$7

Table 17 (continued)
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
2-1B2-MID	115	$7	$1	$5	$71	$13	$58
2-1B2N	118	$244	$79	$166	$2,416	$255	$2,161
2-1B2S	121	$14,210	$4,339	$9,871	$144,012	$9,148	$134,864
3-1B	124	$1,664	$427	$1,237	$6,370	$487	$5,883
3-1C	127	$1,442	$93	$1,349	$3,310	$105	$3,206
4-1N	130	$3,088	$312	$2,775	$8,899	$296	$8,603
4-1S	133	$6,167	$310	$5,857	$10,233	$289	$9,944
4-2	136	$8,414	$874	$7,539	$39,025	$676	$38,350
4-2A	139	$5,813	$582	$5,231	$25,122	$449	$24,674
4-2B	142	$2,423	$239	$2,184	$16,049	$186	$15,863
4-2C	145	$1,410	$137	$1,273	$9,925	$115	$9,809
4-7	148	$3,220	$603	$2,616	$14,544	$575	$13,969
4MGT	151	$1,580	$249	$1,331	$8,094	$243	$7,851
5-1A	154	$11,477	$1,050	$10,427	$47,612	$984	$46,628
5-1B	157	$10,149	$1,064	$9,085	$50,265	$976	$49,289
6-1B1	160	$56	$16	$41	$549	$23	$526
6-1B1-B	163	$21	$5	$16	$204	$14	$190
8-1N	166	$387	$29	$359	$1,794	$27	$1,767
8-1N-B	169	$428	$69	$359	$1,864	$105	$1,759
8-1S-B	175	$1,642	$255	$1,387	$7,331	$373	$6,958
8-2C	178	$104	$28	$76	$541	$36	$505
8-2D	181	$1,924	$113	$1,810	$4,454	$126	$4,328
9-1AE	184	$104	$36	$68	$1,018	$177	$841
9-1AMID	187	$11	$4	$7	$104	$18	$87
9-1AW	190	$34	$12	$21	$326	$57	$269
9-1BE	193	$171	$48	$122	$1,687	$342	$1,345
9-1BMIDE	196	$1,308	$598	$710	$12,244	$1,543	$10,700
9-1BMIDW	199	$450	$206	$244	$4,210	$483	$3,728
9-1BW	202	$1,684	$708	$976	$16,072	$2,345	$13,727
A1	205	$3,067	$323	$2,744	$24,995	$499	$24,496
B1	208	$136	$28	$108	$1,546	$51	$1,495
BB1	211	$365	$189	$176	$1,910	$342	$1,568
BB2	214	$97	$41	$56	$459	$100	$359
BB3	217	$409	$137	$272	$4,144	$464	$3,680
BB4	220	$3	$0	$3	$35	$13	$22
BB5	223	$1,189	$461	$728	$11,354	$1,319	$10,036
BB6	226	$214	$19	$195	$1,211	$35	$1,177
BB7	229	$1,262	$263	$999	$13,480	$425	$13,055
BB8-B	235	$2,123	$55	$2,067	$9,493	$249	$9,244

Table 17 (continued)
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
BD1	238	$615	$137	$478	$3,442	$194	$3,248
BDL0	241	$127	$32	$95	$702	$36	$666
BDL1	244	$85	$24	$62	$473	$33	$440
BDL2	247	$52	$5	$48	$222	$7	$215
BDL3	250	$1,881	$137	$1,744	$4,875	$167	$4,708
BDL4	253	$720	$41	$678	$1,973	$79	$1,894
BDL4-B	256	$1,179	$382	$797	$3,828	$703	$3,125
BDL5	259	$2,691	$122	$2,570	$9,117	$144	$8,973
BGC0	262	$906	$107	$799	$4,815	$122	$4,693
BGC1	265	$332	$25	$308	$1,290	$30	$1,260
BGC2	268	$784	$50	$734	$2,918	$57	$2,861
BGC3	271	$5,473	$245	$5,228	$13,035	$287	$12,748
BGC4	274	$5,434	$256	$5,177	$13,333	$297	$13,036
BL1	277	$771	$28	$743	$2,352	$35	$2,317
BL2	280	$2,354	$689	$1,665	$28,295	$711	$27,584
BL3	283	$973	$309	$664	$11,598	$323	$11,275
BL4	286	$1,224	$235	$989	$18,489	$244	$18,245
BL5	289	$945	$335	$610	$12,926	$1,173	$11,753
BL6	292	$3,460	$1,501	$1,959	$49,672	$2,486	$47,187
BL7	295	$9,461	$3,105	$6,357	$74,829	$5,367	$69,461
BL89	298	$22,182	$4,945	$17,237	$150,755	$6,110	$144,645
BPC1	301	$4,840	$1,174	$3,666	$20,365	$1,082	$19,283
BPC2	304	$1,335	$94	$1,241	$6,825	$90	$6,734
BPC3	307	$2,337	$261	$2,077	$14,073	$243	$13,829
BPC4	310	$1,462	$139	$1,323	$10,913	$132	$10,781
BPC5	313	$3,917	$157	$3,761	$10,444	$214	$10,230
BPC5-B	316	$2,843	$229	$2,613	$7,932	$343	$7,589
BT1	319	$11,772	$1,761	$10,011	$56,498	$1,405	$55,093
BT10	322	$34	$3	$32	$161	$93	$68
BT2	325	$1,604	$269	$1,335	$5,783	$212	$5,571
BT3	328	$588	$38	$550	$2,588	$35	$2,553
BT4	331	$2,327	$224	$2,104	$11,913	$173	$11,740
BT4-SA	334	$1,700	$103	$1,598	$2,900	$95	$2,805
BT5	337	$369	$22	$348	$1,785	$17	$1,768
BT5-B	340	$170	$163	$7	$906	$269	$637
BT6	343	$5,024	$1,794	$3,230	$23,323	$3,679	$19,644
BT6A	346	$3,015	$956	$2,058	$14,432	$1,986	$12,446
BT7	349	$728	$281	$447	$3,442	$783	$2,658
BT8	352	$320	$115	$204	$1,479	$598	$881

Table 17 (continued)
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
BT9	355	$304	$53	$251	$1,405	$762	$642
C1	358	$339	$77	$262	$3,989	$134	$3,855
C1-LF	361	$28	$11	$17	$268	$27	$241
CC1	364	$994	$173	$822	$5,388	$200	$5,187
D-01	367	$157	$25	$132	$370	$23	$347
D-06	370	$225	$16	$209	$701	$21	$680
D10	373	$652	$54	$598	$1,435	$62	$1,373
D-16N	376	$210	$40	$170	$2,300	$59	$2,241
D-16S	379	$599	$129	$470	$7,757	$173	$7,584
D-1732	382	$901	$164	$737	$9,338	$234	$9,103
D1A	385	$25	$5	$20	$266	$9	$257
D1B	388	$7	$1	$6	$94	$2	$92
D1b-LF	391	$32	$10	$22	$340	$18	$323
D1C	394	$282	$42	$241	$2,985	$63	$2,922
D1c-LF1	397	$755	$214	$541	$7,670	$349	$7,321
D1c-LF2	400	$635	$213	$422	$6,246	$421	$5,825
D1c-LF3	403	$29	$11	$18	$286	$24	$262
D-25	406	$2,048	$388	$1,660	$11,879	$380	$11,500
D-25-B	409	$1	$7	($6)	$7	$9	($2)
D-26	412	$880	$103	$777	$4,925	$139	$4,786
D-28	415	$1,108	$265	$843	$11,169	$669	$10,500
D-29	418	$6,082	$2,290	$3,792	$56,852	$4,297	$52,555
D-30	421	$178	$36	$142	$2,358	$48	$2,310
D-31	424	$43	$13	$30	$453	$25	$428
D-34N	427	$315	$55	$259	$3,658	$75	$3,584
D-34S	430	$165	$18	$146	$1,552	$25	$1,527
D-35	433	$102	$12	$91	$937	$16	$921
D-36	436	$1,283	$243	$1,040	$4,727	$189	$4,538
D-37	439	$355	$48	$307	$2,172	$37	$2,135
D-38	442	$3,602	$473	$3,128	$16,997	$680	$16,317
D-39-1	445	$1,504	$359	$1,145	$7,546	$575	$6,971
D-39-2	448	$643	$161	$482	$3,162	$276	$2,886
D-39-3	451	$1,761	$446	$1,314	$8,726	$768	$7,958
D-42	454	$285	$52	$233	$2,796	$76	$2,719
D-43	457	$3,018	$282	$2,736	$14,477	$265	$14,212
D-44	460	$224	$39	$186	$2,338	$55	$2,284
D-45	463	$37	$5	$32	$431	$6	$425
D-48	466	$35	$6	$29	$488	$8	$480
D-49	469	$6	$1	$4	$61	$1	$60

Table 17 (continued)
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
D-50	472	$1,079	$47	$1,032	$5,296	$62	$5,234
D-51	475	$410	$50	$359	$3,178	$73	$3,105
D-53	478	$3,053	$437	$2,616	$15,515	$610	$14,905
D-56	481	$794	$82	$712	$5,646	$65	$5,581
D-60	484	$1,631	$159	$1,472	$8,863	$148	$8,715
D-61	487	$432	$37	$394	$982	$37	$945
D-61-B	490	$16	$17	($2)	$35	$30	$5
D-62-B	496	$79	$6	$73	$404	$10	$394
D-64	499	$1,221	$211	$1,010	$5,970	$290	$5,680
E1	502	$451	$37	$414	$2,103	$57	$2,046
E1-LF	505	$1	$0	$1	$10	$1	$10
E1-LF-B	508	$359	$27	$331	$4,192	$91	$4,101
E2	511	$35	$2	$33	$173	$2	$171
E2-B	514	$124	$12	$112	$541	$41	$500
E2-LF	517	$5,000	$647	$4,354	$31,467	$870	$30,597
E2-LF-B	520	$0	$0	$0	$0	$0	$0
FC	523	$88	$8	$81	$187	$7	$180
GW10	526	$7,386	$1,714	$5,671	$40,891	$2,424	$38,467
GW11	529	$586	$154	$432	$3,104	$241	$2,863
GW12	532	$3,630	$1,677	$1,953	$17,101	$2,761	$14,339
GW13	535	$4,021	$920	$3,101	$18,887	$1,082	$17,804
GW14	538	$8,330	$2,552	$5,778	$45,371	$2,876	$42,495
GW14-1	541	$1,082	$159	$923	$7,734	$185	$7,549
GW15	544	$1,420	$463	$957	$7,190	$664	$6,526
GW16	547	$408	$81	$327	$2,051	$127	$1,924
GW17	550	$1,624	$130	$1,493	$6,179	$126	$6,053
GW18	553	$485	$146	$340	$2,700	$210	$2,490
GW18-B	556	$1	$0	$1	$8	$0	$8
GW2	559	$428	$47	$381	$2,294	$49	$2,245
GW3	562	$1,603	$133	$1,470	$6,659	$153	$6,507
GW4	565	$77	$20	$57	$343	$25	$318
GW5	568	$38	$6	$33	$140	$7	$133
GW6	571	$53	$5	$48	$213	$5	$208
GW7	574	$45	$2	$44	$208	$2	$206
GW8	577	$14	$1	$13	$59	$1	$58
GW9	580	$3,440	$298	$3,141	$12,928	$319	$12,610
HC1	583	$999	$265	$734	$5,617	$382	$5,235
HC2	586	$114	$8	$106	$494	$12	$482
HC3	589	$1,004	$139	$865	$5,408	$157	$5,251

Table 17 (continued)
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
HC4	592	$229	$22	$208	$1,077	$26	$1,052
HNC0	595	$11,380	$942	$10,437	$51,575	$856	$50,720
HNC1	598	$1,309	$188	$1,121	$5,846	$169	$5,676
HNC10	601	$109	$10	$99	$305	$15	$290
HNC10-B	604	$2,148	$137	$2,011	$4,596	$202	$4,394
HNC2	607	$3,840	$378	$3,462	$15,322	$341	$14,981
HNC3	610	$2,299	$147	$2,152	$6,079	$149	$5,930
HNC4	613	$548	$26	$522	$1,176	$30	$1,147
HNC5	616	$871	$104	$767	$3,356	$126	$3,230
HNC6	619	$7,778	$734	$7,045	$36,714	$848	$35,867
HNC7	622	$39,634	$4,325	$35,310	$180,988	$5,091	$175,897
HNC8	625	$1,788	$107	$1,680	$4,631	$200	$4,432
HNC9	628	$39	$2	$37	$85	$2	$83
HNC9-B	631	$1,961	$142	$1,819	$3,435	$192	$3,243
HNC9-E	634	$110	$5	$105	$224	$6	$218
HNC9-W	637	$521	$28	$493	$1,127	$31	$1,096
LB1	640	$0	$0	$0	$0	$0	$0
LB2	643	$1,310	$145	$1,165	$6,597	$134	$6,463
LB3	646	$76	$2	$73	$259	$2	$257
LB4	649	$2,143	$325	$1,819	$9,316	$308	$9,009
LB5	652	$1,707	$89	$1,618	$6,146	$89	$6,057
LBB2	655	$9	$3	$6	$39	$19	$21
LBB3	658	$371	$172	$200	$1,737	$437	$1,300
LBB4	661	$663	$179	$484	$6,549	$1,381	$5,168
LBB5	664	$1,308	$515	$793	$12,414	$2,004	$10,410
LBB6	667	$182	$62	$121	$1,765	$330	$1,435
LBC1	670	$20	$2	$18	$105	$2	$103
LBC2	673	$51	$3	$48	$101	$3	$98
LF1	676	$359	$35	$324	$2,144	$44	$2,100
LF2	679	$241	$17	$225	$1,147	$25	$1,123
LF-GB	682	$1,693	$140	$1,553	$4,316	$146	$4,169
LL1	685	$131	$5	$126	$565	$5	$560
LL2	688	$0	$0	$0	$0	$0	$0
LL3	691	$16	$0	$16	$45	$0	$45
MC1	694	$34	$16	$18	$478	$22	$456
OB1	697	$213	$86	$127	$987	$333	$654
OB2	700	$115	$33	$82	$544	$163	$381
OB3	703	$674	$83	$591	$2,837	$143	$2,694
OB4	706	$1,131	$209	$922	$5,687	$308	$5,379

Table 17 (continued)
Morganza to the Gulf Economic Update
Expected Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	2035			2085		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
PAC1	709	$1,164	$159	$1,004	$3,222	$131	$3,092
SL1	712	$2,747	$229	$2,518	$8,291	$198	$8,094
SL2	715	$440	$68	$372	$1,162	$59	$1,102
SL3	718	$1,753	$274	$1,479	$5,015	$224	$4,791
TS1	721	$237	$19	$217	$3,236	$1,450	$1,786
TS10	724	$190	$99	$91	$2,382	$290	$2,093
TS11	727	$622	$200	$422	$8,162	$363	$7,799
TS12	730	$538	$99	$439	$4,799	$200	$4,598
TS13	733	$123	$23	$100	$1,109	$42	$1,067
TS14	736	$28	$9	$19	$343	$17	$326
TS15	739	$605	$323	$282	$7,558	$912	$6,646
TS16	742	$958	$465	$492	$12,434	$1,022	$11,412
TS17	745	$117	$50	$67	$1,559	$91	$1,468
TS18	748	$147	$37	$110	$1,773	$61	$1,713
TS19	751	$4,386	$902	$3,484	$26,335	$1,709	$24,626
TS2	754	$1,452	$549	$903	$16,098	$1,887	$14,211
TS20	757	$83	$11	$72	$516	$20	$495
TS21	760	$3	$2	$2	$20	$3	$18
TS22	763	$2,953	$844	$2,109	$17,671	$1,194	$16,477
TS3	766	$712	$221	$491	$7,931	$426	$7,506
TS4	769	$624	$245	$379	$7,988	$481	$7,507
TS5	772	$106	$29	$77	$1,266	$228	$1,039
TS6	775	$473	$160	$313	$5,732	$623	$5,109
TS7	778	$9	$5	$4	$112	$18	$93
TS9	781	$327	$121	$206	$4,271	$373	$3,898
US1	784	$13	$10	$3	$166	$18	$149
GW11-B	787	$0	$0	$0	$0	$0	$0
E1-B	790	$3	$7	($4)	$18	$23	($4)
BB7-B	793	$2	$8	($6)	$26	$29	($3)
BD1-B	796	$13	$0	$13	$78	$1	$77
BC	799	$5	$0	$4	$43	$0	$43
L2L-A	802	$17,080	$1,197	$15,883	$62,669	$1,354	$61,315
L2L-B	805	$5,878	$995	$4,883	$29,493	$1,587	$27,906
Total		**$551,614**	**$99,854**	**$451,760**	**$2,981,220**	**$158,142**	**$2,823,078**

Table 20
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
1-1AB	1	$32,681	$3,953	$28,728	$25,227	$3,619	$21,608
1-1AN	4	$38,463	$2,928	$35,535	$29,397	$2,607	$26,790
11BE1	7	$1,658	$317	$1,341	$1,245	$256	$989
11BE2	10	$4,273	$512	$3,762	$3,147	$434	$2,713
11BE3	13	$8,717	$825	$7,892	$6,384	$709	$5,675
11BE4	16	$4,191	$646	$3,546	$3,129	$558	$2,570
11BE5	19	$3,581	$452	$3,128	$2,634	$397	$2,237
11BE6-E	22	$60	$3	$57	$48	$3	$45
11BE6-W	25	$2,158	$329	$1,829	$1,676	$288	$1,388
1-1BU3-U1	28	$1,062	$279	$783	$737	$207	$530
1-1BU3-U2	31	$724	$150	$573	$515	$110	$405
1-1BU3-U3	34	$95	$33	$62	$65	$22	$43
11BU4	37	$567	$216	$350	$442	$150	$293
11BW11	40	$14,508	$430	$14,078	$10,291	$401	$9,890
11BW2-W1	43	$362	$91	$271	$278	$73	$204
11BW2-W2	46	$2,707	$650	$2,057	$2,064	$526	$1,538
11BW4-W3	49	$50	$13	$37	$38	$10	$28
11BW4-W4	52	$9,264	$1,096	$8,168	$6,837	$989	$5,848
11BW4-W4A	55	$12,516	$592	$11,924	$8,960	$555	$8,405
11BW5	58	$35,837	$3,420	$32,418	$26,329	$3,143	$23,185
11BW6	61	$18,556	$2,017	$16,538	$13,695	$1,853	$11,842
11BW79	64	$28,524	$2,305	$26,219	$22,338	$2,126	$20,212
11BW79-W7	67	$16,174	$1,854	$14,320	$11,960	$1,671	$10,288
1-2MID	70	$5,796	$754	$5,041	$4,576	$721	$3,854
1-2N	73	$9,632	$1,443	$8,189	$7,665	$1,407	$6,258
1-2S	76	$2,587	$173	$2,414	$2,007	$168	$1,839
1-3	79	$18,299	$2,009	$16,290	$14,475	$1,957	$12,518
1-5	82	$97,560	$7,245	$90,315	$76,222	$7,294	$68,929
1-7_N3-4	85	$312	$25	$287	$242	$24	$218
1-7_N4-7	88	$455	$48	$407	$353	$47	$306
1-7_N7-10	91	$615	$79	$537	$478	$76	$402
1-7-N10-13	94	$952	$140	$812	$740	$132	$608
1-7N13-16	97	$1,900	$251	$1,649	$1,476	$238	$1,237
1-7N16-17	100	$52	$10	$42	$40	$9	$31
1-7N17-24	103	$3,014	$389	$2,625	$2,343	$369	$1,974
1-7N24-28	106	$2,938	$395	$2,543	$2,280	$378	$1,902
1-8	109	$18,281	$2,670	$15,610	$14,131	$2,459	$11,672
2-1A2	112	$5	$1	$4	$3	$1	$3

Table 20 (continued)
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
2-1B2-MID	115	$33	$6	$27	$23	$4	$19
2-1B2N	118	$1,129	$151	$978	$800	$124	$676
2-1B2S	121	$67,082	$6,298	$60,784	$47,399	$5,569	$41,830
3-1B	124	$3,581	$452	$3,129	$2,868	$443	$2,425
3-1C	127	$2,203	$98	$2,105	$1,920	$96	$1,824
4-1N	130	$5,455	$306	$5,149	$4,574	$308	$4,265
4-1S	133	$7,823	$302	$7,522	$7,207	$305	$6,902
4-2	136	$20,883	$793	$20,089	$16,241	$823	$15,417
4-2A	139	$13,678	$528	$13,151	$10,750	$548	$10,202
4-2B	142	$7,973	$217	$7,756	$5,907	$225	$5,682
4-2C	145	$4,878	$128	$4,750	$3,587	$131	$3,456
4-7	148	$7,832	$592	$7,241	$6,115	$596	$5,519
4MGT	151	$4,234	$247	$3,987	$3,246	$247	$2,998
5-1A	154	$26,196	$1,023	$25,173	$20,716	$1,033	$19,683
5-1B	157	$26,490	$1,028	$25,462	$20,406	$1,041	$19,365
6-1B1	160	$257	$19	$238	$182	$18	$165
6-1B1-B	163	$95	$9	$87	$68	$7	$60
8-1N	166	$960	$28	$932	$747	$28	$719
8-1N-B	169	$1,013	$84	$929	$795	$78	$717
8-1S-B	175	$3,959	$303	$3,656	$3,096	$285	$2,811
8-2C	178	$282	$31	$251	$216	$30	$186
8-2D	181	$2,954	$119	$2,836	$2,571	$117	$2,454
9-1AE	184	$477	$93	$383	$338	$72	$266
9-1AMID	187	$49	$10	$39	$35	$8	$27
9-1AW	190	$153	$30	$122	$108	$24	$85
9-1BE	193	$788	$168	$620	$558	$123	$435
9-1BMIDE	196	$5,762	$983	$4,779	$4,104	$839	$3,264
9-1BMIDW	199	$1,982	$319	$1,663	$1,411	$277	$1,135
9-1BW	202	$7,545	$1,375	$6,170	$5,363	$1,127	$4,236
A1	205	$11,999	$395	$11,604	$8,674	$368	$8,306
B1	208	$711	$38	$673	$497	$34	$463
BB1	211	$994	$251	$743	$760	$228	$532
BB2	214	$245	$65	$180	$190	$56	$134
BB3	217	$1,930	$270	$1,660	$1,364	$221	$1,143
BB4	220	$16	$5	$11	$11	$3	$8
BB5	223	$5,330	$810	$4,519	$3,788	$680	$3,108
BB6	226	$620	$25	$595	$469	$23	$446
BB7	229	$6,239	$329	$5,910	$4,386	$304	$4,082
BB8-B	235	$5,125	$134	$4,991	$4,007	$105	$3,902

Table 20 (continued)
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
BD1	238	$1,767	$160	$1,606	$1,338	$152	$1,186
BDL0	241	$361	$33	$328	$274	$33	$241
BDL1	244	$243	$27	$216	$185	$26	$159
BDL2	247	$121	$6	$116	$96	$5	$90
BDL3	250	$3,101	$149	$2,951	$2,647	$145	$2,502
BDL4	253	$1,230	$57	$1,174	$1,040	$51	$989
BDL4-B	256	$2,258	$513	$1,745	$1,856	$464	$1,392
BDL5	259	$5,309	$131	$5,178	$4,334	$127	$4,207
BGC0	262	$2,498	$113	$2,385	$1,905	$111	$1,795
BGC1	265	$722	$27	$695	$577	$26	$551
BGC2	268	$1,653	$53	$1,600	$1,330	$52	$1,278
BGC3	271	$8,553	$262	$8,291	$7,406	$256	$7,151
BGC4	274	$8,651	$273	$8,378	$7,453	$267	$7,187
BL1	277	$1,415	$31	$1,384	$1,176	$30	$1,145
BL2	280	$12,921	$698	$12,222	$8,987	$695	$8,292
BL3	283	$5,301	$315	$4,986	$3,690	$313	$3,377
BL4	286	$8,256	$239	$8,018	$5,638	$237	$5,401
BL5	289	$5,825	$677	$5,149	$4,008	$550	$3,459
BL6	292	$22,283	$1,902	$20,381	$15,276	$1,753	$13,523
BL7	295	$36,087	$4,026	$32,061	$26,175	$3,683	$22,492
BL89	298	$74,554	$5,419	$69,135	$55,057	$5,243	$49,814
BPC1	301	$11,164	$1,137	$10,027	$8,810	$1,150	$7,659
BPC2	304	$3,571	$93	$3,479	$2,739	$93	$2,646
BPC3	307	$7,118	$254	$6,864	$5,338	$256	$5,082
BPC4	310	$5,312	$136	$5,176	$3,879	$137	$3,741
BPC5	313	$6,576	$180	$6,396	$5,586	$171	$5,415
BPC5-B	316	$4,916	$276	$4,640	$4,144	$258	$3,886
BT1	319	$29,990	$1,616	$28,374	$23,208	$1,670	$21,538
BT10	322	$86	$40	$46	$67	$26	$41
BT2	325	$3,306	$245	$3,061	$2,672	$254	$2,418
BT3	328	$1,403	$37	$1,366	$1,100	$38	$1,062
BT4	331	$6,232	$203	$6,029	$4,778	$211	$4,568
BT4-SA	334	$2,189	$100	$2,089	$2,007	$101	$1,906
BT5	337	$946	$20	$926	$731	$20	$711
BT5-B	340	$470	$206	$263	$358	$190	$168
BT6	343	$12,478	$2,562	$9,916	$9,703	$2,276	$7,427
BT6A	346	$7,665	$1,376	$6,289	$5,934	$1,220	$4,714
BT7	349	$1,834	$486	$1,348	$1,422	$410	$1,013
BT8	352	$792	$312	$480	$616	$239	$377

Table 20 (continued)
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
BT9	355	$753	$342	$410	$586	$235	$351
C1	358	$1,826	$101	$1,725	$1,272	$92	$1,180
C1-LF	361	$126	$18	$108	$89	$15	$74
CC1	364	$2,784	$184	$2,600	$2,117	$180	$1,938
D-01	367	$244	$24	$220	$212	$25	$187
D-06	370	$419	$18	$401	$347	$17	$330
D10	373	$971	$57	$914	$852	$56	$796
D-16N	376	$1,061	$48	$1,013	$744	$45	$699
D-16S	379	$3,515	$147	$3,368	$2,429	$140	$2,289
D-1732	382	$4,338	$193	$4,145	$3,058	$182	$2,876
D1A	385	$123	$6	$117	$86	$6	$81
D1B	388	$42	$1	$41	$29	$1	$28
D1b-LF	391	$158	$13	$145	$111	$12	$99
D1C	394	$1,383	$50	$1,333	$973	$47	$926
D1c-LF1	397	$3,572	$269	$3,303	$2,523	$249	$2,275
D1c-LF2	400	$2,921	$298	$2,623	$2,070	$266	$1,803
D1c-LF3	403	$134	$16	$117	$95	$15	$80
D-25	406	$6,053	$385	$5,668	$4,562	$386	$4,176
D-25-B	409	$4	$8	($4)	$3	$8	($5)
D-26	412	$2,528	$118	$2,410	$1,915	$112	$1,802
D-28	415	$5,206	$429	$4,777	$3,680	$368	$3,312
D-29	418	$26,762	$3,107	$23,655	$19,063	$2,803	$16,260
D-30	421	$1,066	$41	$1,025	$735	$39	$696
D-31	424	$210	$18	$192	$148	$16	$132
D-34N	427	$1,677	$63	$1,613	$1,169	$60	$1,109
D-34S	430	$730	$21	$709	$519	$20	$499
D-35	433	$442	$13	$429	$316	$13	$303
D-36	436	$2,685	$221	$2,465	$2,163	$229	$1,934
D-37	439	$1,095	$44	$1,052	$820	$45	$774
D-38	442	$9,058	$557	$8,501	$7,027	$526	$6,501
D-39-1	445	$3,965	$447	$3,518	$3,049	$414	$2,635
D-39-2	448	$1,669	$208	$1,461	$1,287	$190	$1,097
D-39-3	451	$4,598	$577	$4,020	$3,542	$529	$3,013
D-42	454	$1,307	$62	$1,246	$927	$58	$869
D-43	457	$7,686	$275	$7,410	$5,948	$278	$5,670
D-44	460	$1,085	$45	$1,040	$765	$43	$722
D-45	463	$197	$5	$192	$138	$5	$133
D-48	466	$219	$7	$212	$151	$7	$144
D-49	469	$28	$1	$27	$20	$1	$19

Table 20 (continued)
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
D-50	472	$2,797	$53	$2,744	$2,157	$51	$2,107
D-51	475	$1,537	$60	$1,478	$1,117	$56	$1,061
D-53	478	$8,129	$508	$7,621	$6,239	$482	$5,758
D-56	481	$2,771	$75	$2,695	$2,035	$78	$1,957
D-60	484	$4,577	$155	$4,422	$3,480	$156	$3,324
D-61	487	$656	$37	$619	$572	$37	$535
D-61-B	490	$23	$23	$1	$20	$21	($0)
D-62-B	496	$211	$8	$204	$162	$7	$155
D-64	499	$3,155	$243	$2,912	$2,435	$231	$2,204
E1	502	$1,124	$45	$1,079	$873	$42	$831
E1-LF	505	$5	$0	$4	$3	$0	$3
E1-LF-B	508	$1,920	$53	$1,867	$1,339	$44	$1,295
E2	511	$91	$2	$89	$70	$2	$68
E2-B	514	$294	$24	$270	$231	$20	$211
E2-LF	517	$15,781	$738	$15,043	$11,767	$704	$11,064
E2-LF-B	520	$0	$0	$0	$0	$0	$0
FC	523	$129	$7	$121	$114	$7	$106
GW10	526	$21,034	$2,003	$19,030	$15,953	$1,896	$14,057
GW11	529	$1,612	$189	$1,422	$1,230	$176	$1,054
GW12	532	$9,117	$2,118	$6,998	$7,074	$1,954	$5,120
GW13	535	$10,076	$986	$9,090	$7,822	$962	$6,861
GW14	538	$23,418	$2,684	$20,734	$17,801	$2,635	$15,166
GW14-1	541	$3,792	$170	$3,622	$2,783	$166	$2,617
GW15	544	$3,771	$545	$3,226	$2,896	$515	$2,381
GW16	547	$1,077	$100	$978	$828	$93	$735
GW17	550	$3,479	$128	$3,351	$2,788	$129	$2,659
GW18	553	$1,387	$172	$1,216	$1,051	$162	$889
GW18-B	556	$4	$0	$4	$3	$0	$3
GW2	559	$1,188	$48	$1,140	$905	$47	$858
GW3	562	$3,662	$141	$3,522	$2,896	$138	$2,758
GW4	565	$186	$22	$164	$145	$21	$124
GW5	568	$80	$6	$74	$64	$6	$58
GW6	571	$118	$5	$113	$94	$5	$89
GW7	574	$112	$2	$110	$87	$2	$85
GW8	577	$32	$1	$32	$25	$1	$25
GW9	580	$7,305	$307	$6,998	$5,866	$304	$5,562
HC1	583	$2,880	$313	$2,568	$2,180	$295	$1,885
HC2	586	$268	$9	$259	$211	$9	$202
HC3	589	$2,798	$146	$2,652	$2,130	$143	$1,987

Table 20 (continued)
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
HC4	592	$575	$23	$551	$446	$23	$423
HNC0	595	$27,752	$907	$26,845	$21,657	$920	$20,737
HNC1	598	$3,157	$180	$2,977	$2,469	$183	$2,286
HNC10	601	$189	$12	$176	$159	$12	$147
HNC10-B	604	$3,145	$163	$2,982	$2,774	$154	$2,621
HNC2	607	$8,517	$363	$8,154	$6,776	$368	$6,408
HNC3	610	$3,839	$148	$3,691	$3,265	$147	$3,118
HNC4	613	$804	$28	$776	$709	$27	$682
HNC5	616	$1,883	$113	$1,770	$1,506	$110	$1,397
HNC6	619	$19,565	$780	$18,785	$15,177	$763	$14,414
HNC7	622	$97,212	$4,637	$92,575	$75,777	$4,521	$71,256
HNC8	625	$2,946	$145	$2,801	$2,515	$131	$2,384
HNC9	628	$58	$2	$56	$51	$2	$49
HNC9-B	631	$2,561	$162	$2,399	$2,338	$155	$2,183
HNC9-E	634	$157	$6	$151	$139	$5	$134
HNC9-W	637	$768	$29	$738	$676	$29	$647
LB1	640	$0	$0	$0	$0	$0	$0
LB2	643	$3,464	$140	$3,323	$2,662	$142	$2,520
LB3	646	$150	$2	$148	$123	$2	$120
LB4	649	$5,065	$318	$4,747	$3,977	$320	$3,657
LB5	652	$3,515	$89	$3,426	$2,842	$89	$2,753
LBB2	655	$21	$9	$12	$17	$7	$10
LBB3	658	$928	$280	$648	$721	$240	$481
LBB4	661	$3,061	$668	$2,392	$2,168	$486	$1,682
LBB5	664	$5,832	$1,122	$4,710	$4,148	$896	$3,252
LBB6	667	$827	$171	$656	$587	$130	$457
LBC1	670	$55	$2	$53	$42	$2	$40
LBC2	673	$71	$3	$68	$63	$3	$60
LF1	676	$1,086	$39	$1,047	$815	$37	$778
LF2	679	$610	$20	$590	$473	$19	$454
LF-GB	682	$2,761	$142	$2,619	$2,364	$142	$2,222
LL1	685	$308	$5	$302	$242	$5	$237
LL2	688	$0	$0	$0	$0	$0	$0
LL3	691	$28	$0	$28	$24	$0	$23
MC1	694	$215	$19	$196	$148	$18	$130
OB1	697	$528	$186	$342	$411	$149	$262
OB2	700	$290	$86	$204	$224	$66	$159
OB3	703	$1,555	$108	$1,448	$1,227	$98	$1,129
OB4	706	$2,987	$249	$2,738	$2,296	$234	$2,062

Table 20 (continued)
Morganza to the Gulf Economic Update
Equivalent Annual Damages and Benefits by Reach
($ Thousands; FY22 Price Level)

Reach Name	Station Number	Federal Interest Rate of 2.25%			OMB Interest Rate of 7%		
		Without-Project Damages	With-Project Damages	Damages Reduced	Without-Project Damages	With-Project Damages	Damages Reduced
PAC1	709	$2,002	$148	$1,855	$1,690	$152	$1,538
SL1	712	$5,005	$216	$4,789	$4,164	$221	$3,943
SL2	715	$734	$65	$669	$625	$66	$559
SL3	718	$3,082	$254	$2,828	$2,587	$261	$2,326
TS1	721	$1,458	$602	$857	$1,004	$385	$619
TS10	724	$1,083	$176	$907	$750	$147	$603
TS11	727	$3,693	$266	$3,427	$2,550	$241	$2,308
TS12	730	$2,273	$140	$2,133	$1,627	$125	$1,503
TS13	733	$525	$31	$494	$376	$28	$347
TS14	736	$156	$12	$144	$108	$11	$98
TS15	739	$3,437	$563	$2,874	$2,383	$474	$1,909
TS16	742	$5,632	$692	$4,940	$3,892	$608	$3,284
TS17	745	$704	$67	$637	$486	$61	$425
TS18	748	$810	$47	$763	$563	$43	$520
TS19	751	$13,327	$1,231	$12,096	$9,998	$1,108	$8,890
TS2	754	$7,418	$1,094	$6,324	$5,197	$891	$4,306
TS20	757	$259	$15	$244	$194	$14	$180
TS21	760	$10	$2	$8	$8	$2	$6
TS22	763	$8,948	$986	$7,961	$6,716	$933	$5,783
TS3	766	$3,653	$305	$3,348	$2,558	$274	$2,284
TS4	769	$3,623	$341	$3,282	$2,507	$305	$2,201
TS5	772	$579	$110	$469	$403	$80	$323
TS6	775	$2,615	$349	$2,266	$1,818	$278	$1,539
TS7	778	$51	$11	$40	$35	$9	$27
TS9	781	$1,934	$224	$1,710	$1,336	$186	$1,150
US1	784	$76	$13	$62	$52	$12	$40
GW11-B	787	$0	$0	$0	$0	$0	$0
E1-B	790	$9	$13	($4)	$7	$11	($4)
BB7-B	793	$12	$16	($4)	$8	$13	($5)
BD1-B	796	$40	$1	$39	$30	$1	$29
BC	799	$20	$0	$20	$15	$0	$14
L2L-A	802	$35,650	$1,261	$34,389	$28,737	$1,237	$27,500
L2L-B	805	$15,497	$1,236	$14,261	$11,916	$1,146	$10,770
Total		**$1,541,270**	**$123,596**	**$1,417,670**	**$1,172,830**	**$114,757**	**$1,058,080**

Table 28
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
1-1AB	1	5	0.090	0.090	0.609	0.940	0.991	0.719	0.240	0.119	0.058	0.007	0.001
1-1AN	4	5	0.090	0.090	0.609	0.940	0.991	0.720	0.241	0.118	0.057	0.007	0.002
11BE1	7	3.963	0.038	0.039	0.330	0.699	0.865	0.992	0.528	0.283	0.143	0.050	0.022
11BE2	10	3.565	0.053	0.052	0.414	0.799	0.931	0.944	0.402	0.200	0.112	0.036	0.016
11BE3	13	3.114	0.077	0.074	0.539	0.902	0.979	0.749	0.209	0.128	0.085	0.025	0.011
11BE4	16	6	0.027	0.028	0.246	0.571	0.756	0.968	0.792	0.470	0.255	0.110	0.060
11BE5	19	4	0.066	0.064	0.483	0.862	0.963	0.847	0.337	0.178	0.102	0.034	0.014
11BE6-E	22	3.054	0.140	0.136	0.767	0.987	0.999	0.216	0.024	0.023	0.008	0.000	0.000
11BE6-W	25	6	0.050	0.052	0.411	0.796	0.929	0.921	0.539	0.264	0.128	0.023	0.004
1-1BU3-U1	28	4.082	0.028	0.031	0.269	0.609	0.791	0.998	0.671	0.387	0.245	0.011	0.000
1-1BU3-U2	31	1.85	0.439	0.440	0.997	1.000	1.000	0.004	0.001	0.001	0.001	0.000	0.000
1-1BU3-U3	34	4.112	0.027	0.030	0.261	0.596	0.779	0.998	0.692	0.402	0.253	0.011	0.000
11BU4	37	5.345	0.019	0.020	0.187	0.462	0.644	1.000	0.873	0.526	0.286	0.124	0.066
11BW11	40	3	0.126	0.123	0.730	0.980	0.999	0.353	0.061	0.056	0.047	0.016	0.007
11BW2-W1	43	6	0.015	0.016	0.151	0.388	0.559	1.000	0.951	0.638	0.372	0.179	0.103
11BW2-W2	46	5.388	0.019	0.020	0.184	0.457	0.638	1.000	0.879	0.533	0.291	0.128	0.069
11BW4-W3	49	5.238	0.020	0.021	0.194	0.476	0.659	1.000	0.855	0.507	0.272	0.117	0.061
11BW4-W4	52	4.347	0.031	0.032	0.274	0.618	0.799	0.999	0.637	0.347	0.175	0.064	0.030
11BW4-W4A	55	3.224	0.070	0.068	0.505	0.879	0.970	0.815	0.261	0.143	0.091	0.027	0.012
11BW5	58	5.5	0.032	0.033	0.284	0.633	0.812	0.962	0.699	0.396	0.207	0.087	0.042

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
11BW6	61	5.5	0.032	0.033	0.284	0.633	0.812	0.962	0.698	0.396	0.207	0.086	0.042
11BW79	64	6	0.050	0.052	0.411	0.795	0.929	0.921	0.541	0.265	0.129	0.024	0.005
11BW79-W7	67	5.5	0.032	0.033	0.284	0.633	0.812	0.962	0.698	0.396	0.207	0.086	0.042
1-2MID	70	6.208	0.047	0.048	0.391	0.774	0.916	0.958	0.436	0.201	0.087	0.016	0.003
1-2N	73	7.281	0.031	0.033	0.284	0.632	0.811	0.997	0.634	0.318	0.155	0.036	0.009
1-2S	76	4	0.199	0.194	0.884	0.998	1.000	0.126	0.011	0.011	0.011	0.003	0.000
1-3	79	6.5	0.077	0.078	0.554	0.911	0.982	0.826	0.354	0.175	0.092	0.017	0.004
1-5	82	3	0.514	0.514	0.999	1.000	1.000	0.009	0.002	0.002	0.002	0.000	0.000
1-7_N3-4	85	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.354	0.172	0.082	0.012	0.002
1-7_N4-7	88	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.354	0.172	0.082	0.012	0.002
1-7_N7-10	91	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.354	0.172	0.082	0.012	0.002
1-7-N10-13	94	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.352	0.173	0.082	0.012	0.002
1-7N13-16	97	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.352	0.172	0.082	0.012	0.002
1-7N16-17	100	5.5	0.072	0.073	0.529	0.895	0.977	0.839	0.357	0.174	0.083	0.011	0.002
1-7N17-24	103	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.352	0.173	0.082	0.012	0.002
1-7N24-28	106	5.5	0.072	0.073	0.531	0.897	0.977	0.836	0.352	0.173	0.082	0.012	0.002
1-8	109	4.82	0.051	0.053	0.417	0.802	0.933	0.930	0.394	0.186	0.089	0.012	0.002
2-1A2	112	0	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
2-1B2-MID	115	3.546	0.042	0.044	0.360	0.738	0.893	0.980	0.478	0.246	0.141	0.022	0.008
2-1B2N	118	4.275	0.025	0.026	0.235	0.552	0.738	1.000	0.747	0.420	0.233	0.049	0.020

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
2-1B2S	121	3.495	0.045	0.046	0.375	0.755	0.904	0.973	0.454	0.230	0.136	0.021	0.008
3-1B	124	9.5	0.032	0.034	0.295	0.650	0.826	0.952	0.815	0.525	0.307	0.101	0.036
3-1C	127	6	0.152	0.151	0.805	0.993	1.000	0.352	0.058	0.019	0.018	0.003	0.000
4-1N	130	4	0.359	0.355	0.987	1.000	1.000	0.024	0.002	0.002	0.002	0.000	0.000
4-1S	133	7	0.156	0.157	0.818	0.994	1.000	0.320	0.029	0.004	0.004	0.002	0.000
4-2	136	4	0.216	0.208	0.903	0.999	1.000	0.113	0.012	0.013	0.008	0.000	0.000
4-2A	139	6	0.108	0.107	0.679	0.967	0.997	0.635	0.182	0.093	0.033	0.005	0.000
4-2B	142	6	0.091	0.089	0.607	0.940	0.991	0.752	0.245	0.075	0.014	0.000	0.000
4-2C	145	6	0.091	0.089	0.605	0.938	0.990	0.755	0.254	0.074	0.010	0.000	0.000
4-7	148	6	0.074	0.076	0.545	0.906	0.981	0.818	0.342	0.161	0.079	0.012	0.002
4MGT	151	6	0.060	0.062	0.470	0.851	0.958	0.889	0.444	0.228	0.126	0.018	0.003
5-1A	154	6	0.102	0.101	0.655	0.959	0.995	0.666	0.206	0.103	0.046	0.007	0.002
5-1B	157	6	0.103	0.102	0.659	0.960	0.995	0.661	0.192	0.098	0.034	0.005	0.000
6-1B1	160	6	0.020	0.022	0.201	0.490	0.675	0.974	0.878	0.597	0.364	0.107	0.054
6-1B1-B	163	6	0.020	0.022	0.201	0.490	0.675	0.974	0.878	0.597	0.364	0.107	0.054
8-1N	166	4	0.230	0.222	0.919	0.999	1.000	0.074	0.005	0.006	0.005	0.002	0.000
8-1N-B	169	4	0.230	0.222	0.919	0.999	1.000	0.076	0.006	0.006	0.006	0.002	0.000
8-1S-B	175	4	0.228	0.221	0.917	0.999	1.000	0.082	0.006	0.008	0.007	0.003	0.000
8-2C	178	6	0.058	0.059	0.457	0.840	0.953	0.886	0.448	0.236	0.132	0.021	0.003
8-2D	181	6	0.154	0.153	0.811	0.993	1.000	0.331	0.052	0.016	0.015	0.000	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
9-1AE	184	8	0.011	0.012	0.116	0.310	0.461	0.984	0.957	0.865	0.659	0.327	0.204
9-1AMID	187	8	0.011	0.012	0.117	0.312	0.464	0.984	0.957	0.865	0.659	0.327	0.204
9-1AW	190	8	0.011	0.012	0.116	0.310	0.461	0.984	0.957	0.866	0.659	0.327	0.204
9-1BE	193	8	0.011	0.012	0.116	0.309	0.461	0.984	0.957	0.866	0.660	0.328	0.205
9-1BMIDE	196	8	0.011	0.012	0.116	0.310	0.461	0.984	0.957	0.866	0.659	0.327	0.204
9-1BMIDW	199	8	0.011	0.012	0.117	0.311	0.462	0.984	0.957	0.865	0.658	0.325	0.203
9-1BW	202	8	0.011	0.012	0.116	0.310	0.461	0.984	0.957	0.866	0.660	0.327	0.205
A1	205	2.194	0.158	0.149	0.801	0.992	1.000	0.172	0.020	0.019	0.018	0.003	0.002
B1	208	3.042	0.069	0.068	0.504	0.878	0.970	0.820	0.270	0.129	0.096	0.012	0.004
BB1	211	7.062	0.016	0.019	0.173	0.435	0.614	1.000	0.903	0.584	0.341	0.082	0.020
BB2	214	6.115	0.025	0.026	0.234	0.550	0.736	1.000	0.756	0.420	0.222	0.047	0.008
BB3	217	3.643	0.039	0.040	0.339	0.711	0.873	0.988	0.515	0.270	0.153	0.024	0.009
BB4	220	0	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BB5	223	4.193	0.027	0.028	0.246	0.572	0.757	1.000	0.718	0.398	0.220	0.044	0.018
BB6	226	1.837	0.314	0.309	0.975	1.000	1.000	0.022	0.003	0.003	0.005	0.000	0.000
BB7	229	3.052	0.068	0.067	0.500	0.875	0.969	0.825	0.275	0.131	0.096	0.013	0.004
BB8-B	235	3.109	0.130	0.128	0.746	0.984	0.999	0.270	0.033	0.020	0.018	0.002	0.000
BD1	238	4.569	0.064	0.065	0.491	0.869	0.966	0.826	0.295	0.135	0.093	0.012	0.002
BDL0	241	5.106	0.045	0.047	0.382	0.763	0.910	0.951	0.450	0.227	0.130	0.019	0.003
BDL1	244	5.523	0.035	0.037	0.315	0.678	0.849	0.987	0.567	0.304	0.165	0.027	0.005

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BDL2	247	4.263	0.129	0.127	0.744	0.983	0.999	0.261	0.029	0.019	0.019	0.004	0.000
BDL3	250	4.125	0.166	0.158	0.822	0.994	1.000	0.089	0.005	0.003	0.002	0.000	0.000
BDL4	253	2.737	0.454	0.456	0.998	1.000	1.000	0.002	0.000	0.000	0.000	0.000	0.000
BDL4-B	256	3.137	0.191	0.181	0.863	0.997	1.000	0.041	0.002	0.002	0.001	0.000	0.000
BDL5	259	2.436	0.746	0.745	1.000	1.000	1.000	0.000	0.000	0.000	0.001	0.000	0.000
BGC0	262	4.019	0.124	0.122	0.729	0.980	0.999	0.302	0.038	0.038	0.027	0.004	0.000
BGC1	265	3.515	0.179	0.169	0.843	0.996	1.000	0.066	0.004	0.004	0.003	0.000	0.000
BGC2	268	3.327	0.192	0.181	0.864	0.997	1.000	0.046	0.003	0.003	0.002	0.000	0.000
BGC3	271	2.971	0.623	0.623	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BGC4	274	2.938	0.567	0.566	1.000	1.000	1.000	0.001	0.000	0.000	0.000	0.000	0.000
BL1	277	0	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BL2	280	6	0.018	0.021	0.192	0.472	0.655	0.968	0.901	0.696	0.452	0.050	0.008
BL3	283	6	0.018	0.021	0.189	0.467	0.649	0.968	0.901	0.709	0.472	0.046	0.004
BL4	286	5	0.031	0.034	0.290	0.643	0.820	0.955	0.708	0.420	0.269	0.011	0.000
BL5	289	5	0.030	0.033	0.283	0.632	0.811	0.955	0.724	0.443	0.278	0.016	0.002
BL6	292	5	0.030	0.033	0.283	0.632	0.811	0.955	0.724	0.444	0.279	0.016	0.002
BL7	295	6	0.028	0.029	0.256	0.588	0.772	0.962	0.774	0.464	0.248	0.128	0.067
BL89	298	5	0.059	0.060	0.463	0.845	0.955	0.878	0.402	0.202	0.108	0.015	0.004
BPC1	301	6.853	0.036	0.038	0.321	0.687	0.856	0.991	0.557	0.268	0.125	0.026	0.006
BPC2	304	3.386	0.167	0.157	0.818	0.994	1.000	0.127	0.013	0.013	0.008	0.000	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BPC3	307	6	0.091	0.089	0.607	0.940	0.991	0.752	0.245	0.075	0.014	0.000	0.000
BPC4	310	6	0.091	0.089	0.605	0.938	0.990	0.755	0.254	0.074	0.010	0.000	0.000
BPC5	313	2.197	0.884	0.882	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BPC5-B	316	2.258	0.851	0.848	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT1	319	4.412	0.104	0.104	0.666	0.963	0.996	0.466	0.083	0.062	0.029	0.004	0.000
BT10	322	7.04	0.015	0.018	0.168	0.423	0.601	1.000	0.915	0.612	0.365	0.103	0.024
BT2	325	5.576	0.069	0.069	0.512	0.884	0.972	0.802	0.272	0.119	0.041	0.006	0.000
BT3	328	2.985	0.177	0.167	0.840	0.996	1.000	0.071	0.004	0.004	0.004	0.000	0.000
BT4	331	6	0.104	0.103	0.662	0.961	0.996	0.657	0.188	0.081	0.026	0.003	0.000
BT4-SA	334	7	0.153	0.153	0.809	0.993	1.000	0.354	0.049	0.010	0.010	0.002	0.000
BT5	337	2.948	0.173	0.159	0.824	0.995	1.000	0.156	0.021	0.017	0.000	0.000	0.000
BT5-B	340	3.254	0.151	0.141	0.782	0.990	1.000	0.231	0.034	0.022	0.000	0.000	0.000
BT6	343	4.366	0.069	0.070	0.515	0.886	0.973	0.795	0.262	0.120	0.059	0.007	0.000
BT6A	346	4.299	0.073	0.073	0.530	0.896	0.977	0.767	0.242	0.113	0.056	0.006	0.000
BT7	349	5.36	0.036	0.038	0.324	0.692	0.859	0.988	0.552	0.272	0.133	0.021	0.003
BT8	352	6.008	0.026	0.028	0.244	0.568	0.754	0.999	0.730	0.397	0.208	0.042	0.007
BT9	355	6.06	0.025	0.027	0.239	0.560	0.745	0.999	0.742	0.408	0.214	0.044	0.008
C1	358	3.114	0.065	0.063	0.481	0.860	0.962	0.858	0.301	0.143	0.101	0.013	0.005
C1-LF	361	4.157	0.027	0.028	0.250	0.578	0.763	1.000	0.707	0.391	0.217	0.043	0.017
CC1	364	3.485	0.121	0.119	0.718	0.978	0.998	0.334	0.047	0.035	0.028	0.004	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-01	367	10	0.055	0.058	0.451	0.835	0.950	0.913	0.606	0.333	0.179	0.029	0.006
D-06	370	2.918	0.264	0.252	0.945	1.000	1.000	0.032	0.002	0.002	0.002	0.000	0.000
D10	373	6	0.140	0.140	0.780	0.989	0.999	0.420	0.081	0.024	0.022	0.003	0.000
D-16N	376	3.044	0.069	0.068	0.503	0.877	0.970	0.821	0.272	0.129	0.095	0.012	0.004
D-16S	379	4	0.054	0.054	0.427	0.812	0.938	0.900	0.415	0.214	0.129	0.021	0.008
D-1732	382	2.956	0.075	0.073	0.532	0.898	0.978	0.766	0.225	0.113	0.088	0.011	0.004
D1A	385	2.792	0.086	0.085	0.590	0.931	0.988	0.639	0.150	0.088	0.074	0.009	0.003
D1B	388	3.087	0.066	0.065	0.489	0.867	0.965	0.844	0.289	0.138	0.099	0.013	0.005
D1b-LF	391	4.023	0.030	0.031	0.270	0.610	0.792	0.999	0.660	0.361	0.199	0.037	0.015
D1C	394	2.78	0.087	0.086	0.595	0.933	0.989	0.629	0.145	0.086	0.073	0.009	0.003
D1c-LF1	397	3.305	0.054	0.054	0.424	0.809	0.937	0.933	0.379	0.184	0.118	0.017	0.006
D1c-LF2	400	4.037	0.030	0.031	0.269	0.610	0.792	0.999	0.660	0.359	0.198	0.037	0.015
D1c-LF3	403	3.731	0.037	0.038	0.321	0.688	0.856	0.993	0.548	0.290	0.162	0.027	0.010
D-25	406	7	0.042	0.043	0.356	0.733	0.889	0.941	0.663	0.372	0.206	0.038	0.008
D-25-B	409	7	0.042	0.043	0.356	0.733	0.889	0.941	0.663	0.372	0.206	0.038	0.008
D-26	412	3.556	0.118	0.117	0.712	0.976	0.998	0.342	0.046	0.039	0.037	0.005	0.000
D-28	415	3.098	0.066	0.064	0.486	0.865	0.964	0.849	0.292	0.139	0.099	0.013	0.004
D-29	418	6.5	0.017	0.019	0.174	0.436	0.615	0.977	0.918	0.687	0.438	0.147	0.078
D-30	421	4	0.054	0.054	0.427	0.812	0.938	0.900	0.415	0.214	0.129	0.021	0.008
D-31	424	3.853	0.034	0.035	0.299	0.655	0.831	0.997	0.594	0.319	0.175	0.031	0.012

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-34N	427	3.032	0.070	0.068	0.507	0.880	0.971	0.814	0.264	0.128	0.095	0.012	0.004
D-34S	430	2.335	0.137	0.132	0.757	0.986	0.999	0.258	0.033	0.031	0.028	0.005	0.002
D-35	433	2.421	0.125	0.122	0.727	0.980	0.998	0.322	0.046	0.042	0.037	0.006	0.002
D-36	436	9.5	0.044	0.046	0.376	0.757	0.905	0.939	0.720	0.423	0.230	0.065	0.016
D-37	439	3.916	0.097	0.097	0.638	0.952	0.994	0.531	0.106	0.063	0.057	0.007	0.000
D-38	442	4.087	0.120	0.119	0.718	0.978	0.998	0.327	0.044	0.041	0.034	0.005	0.000
D-39-1	445	4.131	0.081	0.081	0.569	0.920	0.985	0.688	0.184	0.092	0.047	0.005	0.000
D-39-2	448	4.161	0.079	0.079	0.563	0.916	0.984	0.702	0.194	0.096	0.049	0.005	0.000
D-39-3	451	4.318	0.072	0.072	0.526	0.893	0.976	0.776	0.249	0.115	0.057	0.007	0.000
D-42	454	2.631	0.099	0.100	0.650	0.957	0.995	0.505	0.094	0.066	0.061	0.008	0.003
D-43	457	3.536	0.154	0.148	0.798	0.992	1.000	0.145	0.013	0.013	0.012	0.003	0.000
D-44	460	3.034	0.070	0.068	0.506	0.880	0.971	0.815	0.266	0.127	0.095	0.012	0.004
D-45	463	2.727	0.092	0.091	0.614	0.943	0.991	0.585	0.125	0.078	0.068	0.009	0.003
D-48	466	4	0.054	0.054	0.427	0.812	0.938	0.900	0.415	0.214	0.129	0.021	0.008
D-49	469	3.159	0.062	0.061	0.467	0.848	0.957	0.879	0.319	0.152	0.105	0.014	0.005
D-50	472	2.838	0.252	0.239	0.935	1.000	1.000	0.029	0.004	0.004	0.004	0.000	0.000
D-51	475	2.188	0.159	0.150	0.802	0.992	1.000	0.169	0.020	0.019	0.018	0.003	0.002
D-53	478	5	0.090	0.090	0.609	0.940	0.991	0.720	0.241	0.118	0.057	0.007	0.002
D-56	481	6	0.084	0.082	0.574	0.923	0.986	0.811	0.276	0.077	0.012	0.000	0.000
D-60	484	6	0.099	0.098	0.642	0.954	0.994	0.700	0.231	0.112	0.048	0.008	0.002

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-61	487	6	0.169	0.168	0.840	0.996	1.000	0.253	0.032	0.011	0.011	0.002	0.000
D-61-B	490	6	0.169	0.168	0.840	0.996	1.000	0.252	0.030	0.010	0.011	0.002	0.000
D-62-B	496	6	0.059	0.061	0.465	0.847	0.956	0.890	0.453	0.241	0.142	0.023	0.006
D-64	499	5	0.090	0.090	0.609	0.940	0.991	0.720	0.241	0.118	0.057	0.007	0.002
E1	502	2.636	0.175	0.165	0.835	0.995	1.000	0.094	0.007	0.007	0.007	0.000	0.000
E1-LF	505	4.075	0.029	0.030	0.263	0.600	0.783	0.999	0.675	0.369	0.203	0.039	0.016
E1-LF-B	508	3.323	0.053	0.053	0.417	0.802	0.933	0.940	0.391	0.190	0.120	0.017	0.006
E2	511	2.469	0.227	0.219	0.916	0.999	1.000	0.036	0.002	0.002	0.002	0.000	0.000
E2-B	514	2.18	0.543	0.544	1.000	1.000	1.000	0.000	0.000	0.001	0.000	0.000	0.000
E2-LF	517	5.4	0.070	0.071	0.522	0.891	0.975	0.830	0.345	0.170	0.097	0.014	0.003
E2-LF-B	520	5.4	0.071	0.072	0.528	0.895	0.977	0.831	0.351	0.175	0.100	0.016	0.004
FC	523	5.241	0.118	0.119	0.718	0.978	0.998	0.328	0.042	0.009	0.009	0.000	0.000
GW10	526	4.402	0.072	0.072	0.527	0.894	0.976	0.771	0.245	0.112	0.077	0.008	0.002
GW11	529	4.561	0.065	0.065	0.491	0.868	0.966	0.831	0.291	0.135	0.087	0.010	0.002
GW12	532	5.502	0.034	0.036	0.305	0.664	0.838	0.993	0.590	0.296	0.147	0.025	0.004
GW13	535	4.107	0.073	0.074	0.534	0.899	0.978	0.763	0.241	0.094	0.030	0.003	0.000
GW14	538	4.873	0.044	0.046	0.376	0.758	0.906	0.988	0.443	0.193	0.081	0.012	0.002
GW14-1	541	3.071	0.097	0.098	0.644	0.955	0.994	0.530	0.101	0.028	0.011	0.000	0.000
GW15	544	4.757	0.050	0.052	0.415	0.800	0.932	0.926	0.405	0.184	0.077	0.013	0.002
GW16	547	4.486	0.068	0.069	0.510	0.883	0.972	0.796	0.269	0.124	0.089	0.011	0.002

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
GW17	550	2.95	0.196	0.192	0.881	0.998	1.000	0.041	0.002	0.002	0.002	0.001	0.000
GW18	553	5.298	0.039	0.041	0.341	0.714	0.876	0.978	0.515	0.270	0.159	0.025	0.006
GW18-B	556	4.77	0.056	0.057	0.443	0.827	0.946	0.898	0.350	0.161	0.114	0.015	0.003
GW2	559	3.491	0.140	0.137	0.770	0.988	0.999	0.200	0.020	0.019	0.015	0.002	0.000
GW3	562	2.813	0.191	0.181	0.864	0.997	1.000	0.046	0.002	0.003	0.002	0.000	0.000
GW4	565	5.19	0.062	0.063	0.477	0.857	0.961	0.850	0.319	0.146	0.065	0.008	0.002
GW5	568	5.049	0.083	0.083	0.581	0.927	0.987	0.670	0.174	0.065	0.025	0.002	0.000
GW6	571	4.027	0.132	0.129	0.749	0.984	0.999	0.257	0.031	0.020	0.009	0.000	0.000
GW7	574	1.788	0.839	0.837	1.000	1.000	1.000	0.000	0.000	0.001	0.000	0.000	0.000
GW8	577	1.898	0.655	0.655	1.000	1.000	1.000	0.000	0.000	0.001	0.000	0.000	0.000
GW9	580	3.073	0.187	0.176	0.856	0.997	1.000	0.053	0.003	0.003	0.003	0.000	0.000
HC1	583	3.722	0.085	0.085	0.589	0.930	0.988	0.647	0.160	0.086	0.033	0.004	0.000
HC2	586	2.053	0.567	0.567	1.000	1.000	1.000	0.000	0.001	0.002	0.001	0.000	0.000
HC3	589	3.224	0.138	0.134	0.761	0.986	0.999	0.233	0.028	0.023	0.020	0.002	0.000
HC4	592	2.973	0.158	0.151	0.805	0.993	1.000	0.151	0.015	0.014	0.014	0.002	0.000
HNC0	595	3.139	0.182	0.171	0.847	0.996	1.000	0.066	0.004	0.004	0.004	0.002	0.000
HNC1	598	4.309	0.105	0.105	0.669	0.964	0.996	0.456	0.078	0.059	0.037	0.005	0.000
HNC10	601	3.662	0.169	0.161	0.827	0.995	1.000	0.086	0.005	0.001	0.001	0.000	0.000
HNC10-B	604	2.13	0.960	0.955	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC2	607	4.025	0.142	0.138	0.774	0.988	0.999	0.190	0.018	0.014	0.013	0.003	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
HNC3	610	3.518	0.199	0.200	0.892	0.999	1.000	0.030	0.001	0.001	0.001	0.000	0.000
HNC4	613	3.094	0.518	0.517	0.999	1.000	1.000	0.004	0.000	0.000	0.000	0.000	0.000
HNC5	616	4.566	0.120	0.120	0.720	0.978	0.998	0.321	0.040	0.026	0.026	0.003	0.000
HNC6	619	3.326	0.168	0.160	0.825	0.995	1.000	0.097	0.007	0.007	0.007	0.002	0.000
HNC7	622	3.558	0.153	0.147	0.796	0.991	1.000	0.149	0.013	0.013	0.012	0.003	0.000
HNC8	625	3.356	0.228	0.220	0.917	0.999	1.000	0.022	0.001	0.000	0.000	0.000	0.000
HNC9	628	3.494	0.267	0.256	0.948	1.000	1.000	0.021	0.000	0.000	0.000	0.000	0.000
HNC9-B	631	2.204	0.980	0.974	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-E	634	2.857	0.757	0.754	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-W	637	3.28	0.359	0.358	0.988	1.000	1.000	0.011	0.000	0.000	0.000	0.000	0.000
LB1	640	1	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB2	643	5.065	0.079	0.078	0.558	0.914	0.983	0.713	0.197	0.104	0.043	0.006	0.002
LB3	646	1.709	0.994	0.990	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB4	649	5.313	0.078	0.078	0.556	0.912	0.983	0.719	0.202	0.097	0.038	0.005	0.000
LB5	652	2.662	0.328	0.325	0.980	1.000	1.000	0.026	0.001	0.001	0.002	0.000	0.000
LBB2	655	1	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LBB3	658	6.205	0.023	0.025	0.226	0.536	0.722	1.000	0.775	0.437	0.234	0.051	0.009
LBB4	661	3.476	0.045	0.046	0.377	0.758	0.906	0.971	0.451	0.229	0.134	0.020	0.007
LBB5	664	5.012	0.016	0.018	0.167	0.422	0.599	1.000	0.918	0.598	0.353	0.095	0.044
LBB6	667	5.04	0.016	0.018	0.166	0.420	0.597	1.000	0.923	0.605	0.357	0.096	0.045

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
LBC1	670	6	0.060	0.062	0.470	0.851	0.958	0.889	0.444	0.228	0.126	0.018	0.003
LBC2	673	6	0.221	0.215	0.911	0.999	1.000	0.081	0.003	0.000	0.000	0.000	0.000
LF1	676	2.534	0.172	0.162	0.829	0.995	1.000	0.113	0.011	0.011	0.009	0.000	0.000
LF2	679	2.14	0.364	0.363	0.989	1.000	1.000	0.005	0.002	0.003	0.002	0.000	0.000
LF-GB	682	4.005	0.168	0.160	0.826	0.995	1.000	0.084	0.005	0.003	0.000	0.000	0.000
LL1	685	2.216	0.609	0.609	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LL2	688	1	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LL3	691	1.421	0.997	0.995	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
MC1	694	3.803	0.037	0.039	0.331	0.700	0.866	0.988	0.533	0.292	0.200	0.008	0.000
OB1	697	6.147	0.024	0.026	0.231	0.545	0.731	1.000	0.762	0.425	0.226	0.048	0.008
OB2	700	4.833	0.051	0.052	0.413	0.797	0.930	0.935	0.403	0.190	0.090	0.012	0.002
OB3	703	3.131	0.149	0.144	0.789	0.991	1.000	0.174	0.017	0.016	0.014	0.002	0.000
OB4	706	4.108	0.082	0.082	0.575	0.923	0.986	0.676	0.177	0.089	0.046	0.005	0.000
PAC1	709	10	0.053	0.056	0.435	0.820	0.942	0.921	0.598	0.321	0.166	0.033	0.009
SL1	712	4	0.157	0.151	0.806	0.993	1.000	0.119	0.008	0.003	0.002	0.000	0.000
SL2	715	6.071	0.074	0.076	0.547	0.907	0.981	0.734	0.220	0.086	0.048	0.006	0.002
SL3	718	10	0.053	0.055	0.434	0.819	0.942	0.920	0.630	0.347	0.186	0.037	0.010
TS1	721	4.565	0.018	0.021	0.193	0.475	0.658	1.000	0.865	0.555	0.341	0.021	0.002
TS10	724	4.111	0.027	0.030	0.263	0.600	0.782	0.998	0.686	0.397	0.250	0.012	0.000
TS11	727	3.138	0.072	0.073	0.530	0.896	0.977	0.783	0.210	0.075	0.073	0.003	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
TS12	730	2.17	0.183	0.173	0.850	0.997	1.000	0.090	0.008	0.003	0.003	0.000	0.000
TS13	733	2.293	0.163	0.155	0.815	0.994	1.000	0.141	0.014	0.005	0.005	0.000	0.000
TS14	736	2.543	0.128	0.125	0.738	0.982	0.999	0.297	0.040	0.013	0.012	0.000	0.000
TS15	739	3.672	0.043	0.044	0.365	0.744	0.897	0.975	0.463	0.235	0.181	0.006	0.000
TS16	742	3.651	0.044	0.045	0.370	0.751	0.901	0.972	0.454	0.227	0.178	0.006	0.000
TS17	745	3.557	0.048	0.049	0.397	0.781	0.920	0.956	0.403	0.191	0.165	0.005	0.000
TS18	748	2.653	0.114	0.113	0.699	0.973	0.998	0.392	0.062	0.020	0.019	0.000	0.000
TS19	751	4.099	0.061	0.061	0.469	0.850	0.958	0.872	0.321	0.152	0.066	0.013	0.003
TS2	754	2.461	0.139	0.135	0.765	0.987	0.999	0.238	0.029	0.010	0.009	0.000	0.000
TS20	757	3.79	0.076	0.076	0.547	0.907	0.981	0.737	0.212	0.106	0.048	0.008	0.002
TS21	760	5.228	0.029	0.031	0.268	0.608	0.790	0.999	0.670	0.348	0.171	0.047	0.014
TS22	763	4.002	0.066	0.066	0.492	0.869	0.966	0.836	0.290	0.136	0.060	0.011	0.003
TS3	766	2.534	0.129	0.126	0.740	0.982	0.999	0.294	0.041	0.014	0.013	0.000	0.000
TS4	769	3.121	0.073	0.074	0.536	0.900	0.978	0.772	0.204	0.072	0.070	0.003	0.000
TS5	772	3.016	0.081	0.081	0.572	0.922	0.986	0.695	0.169	0.055	0.053	0.002	0.000
TS6	775	2.846	0.094	0.095	0.632	0.950	0.993	0.554	0.112	0.033	0.032	0.002	0.000
TS7	778	5.015	0.013	0.016	0.149	0.383	0.553	1.000	0.955	0.694	0.431	0.038	0.005
TS9	781	3.257	0.065	0.065	0.491	0.868	0.966	0.852	0.258	0.101	0.096	0.003	0.000
US1	784	4.145	0.026	0.029	0.257	0.589	0.773	0.999	0.702	0.408	0.256	0.012	0.000
GW11-B	787	1	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
E1-B	790	4.593	0.047	0.049	0.396	0.780	0.920	0.951	0.418	0.200	0.100	0.014	0.002
BB7-B	793	3.36	0.051	0.051	0.409	0.794	0.928	0.947	0.400	0.197	0.123	0.018	0.007
BD1-B	796	4.177	0.083	0.083	0.581	0.926	0.987	0.658	0.173	0.086	0.072	0.008	0.002
BC	799	2.824	0.130	0.125	0.738	0.982	0.999	0.307	0.045	0.044	0.009	0.000	0.000
L2L-A	802	2.466	0.567	0.566	1.000	1.000	1.000	0.000	0.001	0.000	0.000	0.002	0.000
L2L-B	805	2.431	0.184	0.172	0.848	0.997	1.000	0.096	0.010	0.009	0.009	0.003	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
1-1AB	1	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
1-1AN	4	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BE1	7	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BE2	10	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BE3	13	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BE4	16	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BE5	19	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437
11BE6-E	22	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.996	0.912	0.663	0.436
11BE6-W	25	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437
1-1BU3-U1	28	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
1-1BU3-U2	31	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
1-1BU3-U3	34	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.996	0.912	0.663	0.436
11BU4	37	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW11	40	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW2-W1	43	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW2-W2	46	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW4-W3	49	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437
11BW4-W4	52	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW4-W4A	55	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW5	58	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
11BW6	61	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW79	64	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
11BW79-W7	67	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
1-2MID	70	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.876	0.572	0.287
1-2N	73	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-2S	76	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.876	0.573	0.287
1-3	79	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-5	82	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
1-7_N3-4	85	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-7_N4-7	88	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-7_N7-10	91	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-7-N10-13	94	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-7N13-16	97	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-7N16-17	100	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.574	0.288
1-7N17-24	103	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-7N24-28	106	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
1-8	109	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
2-1A2	112	12.132	0.002	0.004	0.040	0.115	0.185	1.000	1.000	0.997	0.912	0.663	0.436
2-1B2-MID	115	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.996	0.912	0.663	0.436
2-1B2N	118	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
2-1B2S	121	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
3-1B	124	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
3-1C	127	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.876	0.573	0.287
4-1N	130	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.571	0.327
4-1S	133	18.53	0.003	0.005	0.044	0.127	0.202	1.000	1.000	0.999	0.909	0.571	0.327
4-2	136	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
4-2A	139	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
4-2B	142	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
4-2C	145	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
4-7	148	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.877	0.559	0.294
4MGT	151	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.571	0.327
5-1A	154	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
5-1B	157	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
6-1B1	160	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
6-1B1-B	163	6	0.088	0.091	0.616	0.943	0.992	0.772	0.033	0.000	0.000	0.000	0.000
8-1N	166	15.996	0.004	0.005	0.049	0.139	0.220	1.000	1.000	0.995	0.883	0.557	0.263
8-1N-B	169	4	0.649	0.648	1.000	1.000	1.000	0.002	0.000	0.000	0.000	0.000	0.000
8-1S-B	175	4	0.649	0.648	1.000	1.000	1.000	0.001	0.000	0.000	0.000	0.000	0.000
8-2C	178	13.834	0.003	0.005	0.046	0.133	0.212	1.000	1.000	0.996	0.868	0.593	0.379
8-2D	181	13.834	0.003	0.005	0.047	0.133	0.212	1.000	1.000	0.995	0.868	0.591	0.377

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
9-1AE	184	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.405
9-1AMID	187	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.648	0.405
9-1AW	190	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.405
9-1BE	193	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.405
9-1BMIDE	196	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
9-1BMIDW	199	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
9-1BW	202	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
A1	205	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
B1	208	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
BB1	211	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BB2	214	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BB3	217	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437
BB4	220	12.132	0.002	0.004	0.039	0.111	0.179	1.000	1.000	0.996	0.912	0.664	0.437
BB5	223	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BB6	226	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
BB7	229	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
BB8-B	235	3.109	0.165	0.154	0.812	0.993	1.000	0.179	0.000	0.000	0.000	0.000	0.000
BD1	238	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BDL0	241	13.834	0.003	0.005	0.047	0.133	0.212	1.000	1.000	0.995	0.868	0.591	0.377
BDL1	244	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BDL2	247	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BDL3	250	13.834	0.003	0.005	0.047	0.133	0.212	1.000	1.000	0.995	0.868	0.591	0.377
BDL4	253	15.996	0.004	0.005	0.049	0.139	0.221	1.000	1.000	0.995	0.883	0.557	0.263
BDL4-B	256	3.137	0.812	0.809	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BDL5	259	13.834	0.003	0.005	0.047	0.133	0.212	1.000	1.000	0.995	0.868	0.591	0.377
BGC0	262	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
BGC1	265	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
BGC2	268	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
BGC3	271	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
BGC4	274	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
BL1	277	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
BL2	280	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
BL3	283	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
BL4	286	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
BL5	289	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BL6	292	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
BL7	295	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
BL89	298	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
BPC1	301	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
BPC2	304	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BPC3	307	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
BPC4	310	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.562	0.297
BPC5	313	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
BPC5-B	316	2.258	0.995	0.990	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT1	319	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
BT10	322	12.132	0.002	0.004	0.039	0.112	0.179	1.000	1.000	0.996	0.912	0.664	0.437
BT2	325	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
BT3	328	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.346
BT4	331	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
BT4-SA	334	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.571	0.327
BT5	337	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.346
BT5-B	340	3.254	0.935	0.932	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT6	343	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BT6A	346	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BT7	349	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BT8	352	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
BT9	355	12.132	0.002	0.004	0.039	0.112	0.179	1.000	1.000	0.997	0.913	0.664	0.437
C1	358	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
C1-LF	361	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437
CC1	364	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-01	367	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.571	0.327
D-06	370	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
D10	373	16.774	0.004	0.005	0.050	0.142	0.225	1.000	1.000	0.996	0.872	0.546	0.270
D-16N	376	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-16S	379	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-1732	382	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D1A	385	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.906	0.647	0.403
D1B	388	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.906	0.647	0.403
D1b-LF	391	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.906	0.649	0.406
D1C	394	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D1c-LF1	397	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D1c-LF2	400	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D1c-LF3	403	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-25	406	18.53	0.003	0.005	0.044	0.127	0.202	1.000	1.000	0.999	0.909	0.571	0.327
D-25-B	409	7	0.227	0.219	0.916	0.999	1.000	0.059	0.000	0.000	0.000	0.000	0.000
D-26	412	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-28	415	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-29	418	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-30	421	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-31	424	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-34N	427	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-34S	430	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-35	433	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-36	436	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
D-37	439	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
D-38	442	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-39-1	445	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-39-2	448	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-39-3	451	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-42	454	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-43	457	15.996	0.004	0.005	0.049	0.139	0.221	1.000	1.000	0.995	0.883	0.556	0.263
D-44	460	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-45	463	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-48	466	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-49	469	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.906	0.647	0.403
D-50	472	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-51	475	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
D-53	478	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
D-56	481	18.323	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.999	0.914	0.590	0.345
D-60	484	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-61	487	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.571	0.327
D-61-B	490	6	0.298	0.290	0.967	1.000	1.000	0.022	0.000	0.000	0.000	0.000	0.000
D-62-B	496	6	0.298	0.290	0.967	1.000	1.000	0.022	0.000	0.000	0.000	0.000	0.000
D-64	499	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
E1	502	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
E1-LF	505	11.432	0.003	0.004	0.040	0.116	0.185	1.000	1.000	1.000	0.906	0.647	0.404
E1-LF-B	508	3.323	0.150	0.141	0.782	0.990	1.000	0.232	0.000	0.000	0.000	0.000	0.000
E2	511	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.906	0.647	0.404
E2-B	514	2.18	0.786	0.784	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
E2-LF	517	11.432	0.003	0.004	0.040	0.116	0.186	1.000	1.000	1.000	0.905	0.649	0.406
E2-LF-B	520	5.4	0.109	0.109	0.686	0.969	0.997	0.627	0.006	0.000	0.000	0.000	0.000
FC	523	15.996	0.004	0.005	0.049	0.139	0.220	1.000	1.000	0.995	0.883	0.557	0.262
GW10	526	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
GW11	529	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
GW12	532	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
GW13	535	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.878	0.559	0.294
GW14	538	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.878	0.559	0.294
GW14-1	541	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
GW15	544	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
GW16	547	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
GW17	550	15.996	0.004	0.005	0.049	0.139	0.220	1.000	1.000	0.995	0.883	0.557	0.262
GW18	553	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
GW18-B	556	4.77	0.076	0.078	0.556	0.913	0.983	0.739	0.171	0.051	0.051	0.012	0.003
GW2	559	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
GW3	562	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
GW4	565	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.266
GW5	568	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
GW6	571	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
GW7	574	18.537	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.985	0.835	0.505	0.263
GW8	577	18.537	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.985	0.835	0.505	0.263
GW9	580	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.266
HC1	583	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
HC2	586	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
HC3	589	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
HC4	592	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
HNC0	595	15.996	0.004	0.005	0.049	0.139	0.220	1.000	1.000	0.995	0.883	0.557	0.263
HNC1	598	15.996	0.004	0.005	0.049	0.139	0.220	1.000	1.000	0.995	0.883	0.557	0.263
HNC10	601	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.562	0.297
HNC10-B	604	2.13	0.997	0.993	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC2	607	15.996	0.004	0.005	0.049	0.139	0.221	1.000	1.000	0.995	0.883	0.556	0.263

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
HNC3	610	15.996	0.004	0.005	0.049	0.139	0.221	1.000	1.000	0.995	0.883	0.556	0.263
HNC4	613	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
HNC5	616	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
HNC6	619	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.876	0.573	0.287
HNC7	622	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.573	0.287
HNC8	625	15.475	0.003	0.005	0.048	0.138	0.219	1.000	1.000	0.995	0.877	0.574	0.288
HNC9	628	16.774	0.004	0.005	0.050	0.143	0.227	1.000	1.000	0.996	0.871	0.543	0.266
HNC9-B	631	2.204	0.994	0.989	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-E	634	16.774	0.004	0.005	0.050	0.142	0.225	1.000	1.000	0.996	0.873	0.547	0.270
HNC9-W	637	16.774	0.004	0.005	0.050	0.142	0.225	1.000	1.000	0.996	0.872	0.547	0.270
LB1	640	17.123	0.003	0.005	0.047	0.135	0.215	1.000	1.000	0.997	0.900	0.561	0.298
LB2	643	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
LB3	646	17.123	0.003	0.005	0.046	0.132	0.210	1.000	1.000	0.998	0.902	0.561	0.295
LB4	649	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.563	0.297
LB5	652	17.123	0.003	0.005	0.046	0.131	0.209	1.000	1.000	0.998	0.902	0.562	0.297
LBB2	655	12.132	0.002	0.004	0.039	0.112	0.179	1.000	1.000	0.997	0.912	0.663	0.436
LBB3	658	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437
LBB4	661	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
LBB5	664	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
LBB6	667	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.663	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
LBC1	670	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.570	0.325
LBC2	673	18.53	0.003	0.005	0.044	0.127	0.203	1.000	1.000	0.999	0.909	0.570	0.325
LF1	676	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
LF2	679	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
LF-GB	682	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
LL1	685	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
LL2	688	18.537	0.004	0.006	0.056	0.158	0.250	1.000	1.000	0.985	0.836	0.509	0.268
LL3	691	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.836	0.506	0.265
MC1	694	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
OB1	697	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
OB2	700	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
OB3	703	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
OB4	706	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
PAC1	709	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.877	0.559	0.294
SL1	712	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.878	0.559	0.294
SL2	715	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.877	0.559	0.294
SL3	718	18.221	0.003	0.005	0.048	0.138	0.220	1.000	1.000	0.996	0.878	0.559	0.294
TS1	721	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS10	724	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS11	727	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
TS12	730	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS13	733	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS14	736	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS15	739	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS16	742	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS17	745	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS18	748	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS19	751	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS2	754	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS20	757	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS21	760	18.537	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.985	0.835	0.505	0.263
TS22	763	18.537	0.004	0.006	0.055	0.155	0.245	1.000	1.000	0.985	0.837	0.508	0.266
TS3	766	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS4	769	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS5	772	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS6	775	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS7	778	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
TS9	781	12.132	0.002	0.004	0.039	0.112	0.180	1.000	1.000	0.997	0.912	0.664	0.437
US1	784	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.266
GW11-B	787	1	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 28 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2035 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
E1-B	790	4.593	0.086	0.088	0.602	0.937	0.990	0.660	0.003	0.000	0.000	0.000	0.000
BB7-B	793	3.36	0.147	0.139	0.777	0.989	0.999	0.242	0.000	0.000	0.000	0.000	0.000
BD1-B	796	4.177	0.102	0.103	0.664	0.962	0.996	0.484	0.073	0.014	0.014	0.006	0.000
BC	799	17.123	0.003	0.005	0.046	0.132	0.210	1.000	1.000	0.998	0.901	0.559	0.294
L2L-A	802	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267
L2L-B	805	18.537	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.985	0.837	0.508	0.267

Table 29
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
1-1AB	1	5	0.502	0.500	0.999	1.000	1.000	0.012	0.000	0.001	0.000	0.000	0.000
1-1AN	4	5	0.503	0.499	0.999	1.000	1.000	0.012	0.000	0.000	0.000	0.000	0.000
11BE1	7	5.571	0.142	0.139	0.775	0.989	0.999	0.198	0.020	0.003	0.002	0.000	0.000
11BE2	10	4.555	0.269	0.258	0.949	1.000	1.000	0.030	0.002	0.000	0.000	0.000	0.000
11BE3	13	4.06	0.564	0.563	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
11BE4	16	6	0.233	0.227	0.924	1.000	1.000	0.117	0.012	0.002	0.002	0.000	0.000
11BE5	19	4	0.858	0.857	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
11BE6-E	22	3.472	0.856	0.854	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
11BE6-W	25	6	0.218	0.213	0.909	0.999	1.000	0.156	0.018	0.004	0.005	0.000	0.000
1-1BU3-U1	28	7.265	0.083	0.085	0.588	0.930	0.988	0.655	0.168	0.060	0.020	0.003	0.000
1-1BU3-U2	31	6.233	0.124	0.123	0.732	0.981	0.999	0.292	0.035	0.017	0.006	0.000	0.000
1-1BU3-U3	34	6.92	0.096	0.097	0.640	0.953	0.994	0.534	0.107	0.039	0.013	0.002	0.000
11BU4	37	7.407	0.061	0.065	0.487	0.865	0.965	0.856	0.260	0.080	0.034	0.000	0.000
11BW11	40	3	0.991	0.988	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
11BW2-W1	43	7.012	0.075	0.077	0.553	0.911	0.982	0.742	0.174	0.044	0.018	0.000	0.000
11BW2-W2	46	6.56	0.092	0.094	0.627	0.948	0.993	0.572	0.102	0.022	0.010	0.000	0.000
11BW4-W3	49	6.487	0.095	0.097	0.641	0.954	0.994	0.540	0.090	0.018	0.007	0.000	0.000
11BW4-W4	52	5.111	0.171	0.162	0.830	0.995	1.000	0.096	0.008	0.000	0.000	0.000	0.000
11BW4-W4A	55	3.452	0.867	0.865	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
11BW5	58	5.5	0.303	0.295	0.970	1.000	1.000	0.051	0.004	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
11BW6	61	5.5	0.303	0.296	0.970	1.000	1.000	0.051	0.004	0.000	0.000	0.000	0.000
11BW79	64	6	0.218	0.212	0.908	0.999	1.000	0.160	0.019	0.005	0.005	0.000	0.000
11BW79-W7	67	5.5	0.303	0.296	0.970	1.000	1.000	0.051	0.004	0.000	0.000	0.000	0.000
1-2MID	70	6.619	0.167	0.160	0.825	0.995	1.000	0.065	0.002	0.001	0.000	0.000	0.000
1-2N	73	7.599	0.132	0.132	0.757	0.986	0.999	0.213	0.016	0.003	0.003	0.000	0.000
1-2S	76	4	0.992	0.988	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
1-3	79	6.5	0.290	0.283	0.964	1.000	1.000	0.036	0.002	0.001	0.001	0.000	0.000
1-5	82	3	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
1-7_N3-4	85	5.5	0.333	0.327	0.981	1.000	1.000	0.033	0.002	0.001	0.002	0.000	0.000
1-7_N4-7	88	5.5	0.333	0.327	0.981	1.000	1.000	0.033	0.002	0.001	0.002	0.000	0.000
1-7_N7-10	91	5.5	0.333	0.327	0.981	1.000	1.000	0.033	0.002	0.001	0.002	0.000	0.000
1-7-N10-13	94	5.5	0.333	0.327	0.981	1.000	1.000	0.033	0.002	0.001	0.002	0.000	0.000
1-7N13-16	97	5.5	0.333	0.327	0.981	1.000	1.000	0.032	0.002	0.001	0.002	0.000	0.000
1-7N16-17	100	5.5	0.334	0.328	0.981	1.000	1.000	0.030	0.001	0.001	0.001	0.000	0.000
1-7N17-24	103	5.5	0.333	0.327	0.981	1.000	1.000	0.033	0.002	0.001	0.002	0.000	0.000
1-7N24-28	106	5.5	0.333	0.327	0.981	1.000	1.000	0.033	0.002	0.001	0.002	0.000	0.000
1-8	109	5.616	0.154	0.149	0.800	0.992	1.000	0.133	0.010	0.005	0.003	0.000	0.000
2-1A2	112	9.13	0.025	0.028	0.246	0.572	0.757	0.999	0.738	0.385	0.159	0.057	0.015
2-1B2-MID	115	5.896	0.117	0.117	0.710	0.976	0.998	0.358	0.053	0.011	0.000	0.000	0.000
2-1B2N	118	5.308	0.152	0.147	0.795	0.991	1.000	0.164	0.016	0.004	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
2-1B2S	121	4.551	0.243	0.231	0.928	1.000	1.000	0.041	0.003	0.000	0.000	0.000	0.000
3-1B	124	9.5	0.123	0.125	0.737	0.982	0.999	0.672	0.203	0.079	0.060	0.010	0.002
3-1C	127	6	0.329	0.321	0.979	1.000	1.000	0.026	0.001	0.001	0.001	0.000	0.000
4-1N	130	4	0.982	0.977	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
4-1S	133	7	0.256	0.249	0.943	1.000	1.000	0.060	0.003	0.001	0.000	0.000	0.000
4-2	136	4	0.996	0.993	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
4-2A	139	6	0.518	0.513	0.999	1.000	1.000	0.006	0.000	0.000	0.000	0.000	0.000
4-2B	142	6	0.682	0.681	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
4-2C	145	6	0.713	0.711	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
4-7	148	6	0.322	0.315	0.977	1.000	1.000	0.035	0.003	0.000	0.000	0.000	0.000
4MGT	151	6	0.292	0.284	0.965	1.000	1.000	0.043	0.002	0.002	0.002	0.000	0.000
5-1A	154	6	0.425	0.420	0.996	1.000	1.000	0.013	0.000	0.000	0.000	0.000	0.000
5-1B	157	6	0.562	0.560	1.000	1.000	1.000	0.005	0.000	0.000	0.000	0.000	0.000
6-1B1	160	6	0.225	0.218	0.914	0.999	1.000	0.148	0.017	0.011	0.004	0.000	0.000
6-1B1-B	163	6	0.224	0.218	0.914	0.999	1.000	0.148	0.017	0.011	0.004	0.000	0.000
8-1N	166	4	0.977	0.973	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
8-1N-B	169	4	0.977	0.972	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
8-1S-B	175	4	0.969	0.966	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
8-2C	178	6	0.292	0.286	0.965	1.000	1.000	0.041	0.002	0.002	0.000	0.000	0.000
8-2D	181	6	0.353	0.347	0.986	1.000	1.000	0.020	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00	
9-1AE	184	8	0.121	0.122	0.729	0.980	0.999	0.694	0.220	0.052	0.005	0.002	0.000	
9-1AMID	187	8	0.121	0.122	0.729	0.980	0.999	0.694	0.220	0.052	0.005	0.002	0.000	
9-1AW	190	8	0.121	0.122	0.729	0.980	0.999	0.694	0.220	0.052	0.005	0.002	0.000	
9-1BE	193	8	0.121	0.122	0.729	0.980	0.999	0.693	0.219	0.051	0.005	0.002	0.000	
9-1BMIDE	196	8	0.121	0.122	0.728	0.980	0.998	0.697	0.223	0.053	0.006	0.002	0.000	
9-1BMIDW	199	8	0.121	0.122	0.728	0.980	0.999	0.697	0.223	0.053	0.006	0.002	0.000	
9-1BW	202	8	0.121	0.122	0.729	0.980	0.999	0.694	0.220	0.052	0.005	0.002	0.000	
A1	205	2.625	0.990	0.985	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
B1	208	3.495	0.831	0.829	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
BB1	211	8.351	0.069	0.072	0.527	0.894	0.976	0.774	0.233	0.088	0.041	0.006	0.002	
BB2	214	7.324	0.080	0.083	0.578	0.925	0.987	0.676	0.176	0.060	0.023	0.002	0.000	
BB3	217	5.492	0.140	0.137	0.771	0.988	0.999	0.215	0.024	0.005	0.000	0.000	0.000	
BB4	220	9.051	0.026	0.029	0.254	0.586	0.770	0.999	0.720	0.364	0.145	0.051	0.013	
BB5	223	5.683	0.129	0.127	0.742	0.983	0.999	0.282	0.036	0.008	0.000	0.000	0.000	
BB6	226	2.676	0.988	0.983	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
BB7	229	3.502	0.828	0.825	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
BB8-B	235	4.031	0.547	0.547	1.000	1.000	1.000	0.000	0.001	0.000	0.000	0.000	0.000	
BD1	238	5.223	0.191	0.182	0.865	0.998	1.000	0.037	0.001	0.001	0.001	0.000	0.000	
BDL0	241	5.282	0.186	0.175	0.854	0.997	1.000	0.048	0.002	0.002	0.000	0.000	0.000	
BDL1	244	6.081	0.149	0.145	0.791	0.991	1.000	0.148	0.012	0.007	0.003	0.000	0.000	

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BDL2	247	4.352	0.790	0.788	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BDL3	250	4.224	0.816	0.813	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BDL4	253	3.03	0.996	0.993	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BDL4-B	256	3.312	0.986	0.981	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BDL5	259	3	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BGC0	262	4.12	0.951	0.947	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BGC1	265	3.679	0.987	0.982	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BGC2	268	3.402	0.997	0.994	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BGC3	271	3.087	0.995	0.991	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BGC4	274	3.083	0.987	0.982	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BL1	277	2	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BL2	280	6	0.253	0.245	0.940	1.000	1.000	0.074	0.005	0.004	0.003	0.000	0.000
BL3	283	6	0.239	0.232	0.929	1.000	1.000	0.092	0.007	0.005	0.004	0.000	0.000
BL4	286	5	0.505	0.502	0.999	1.000	1.000	0.012	0.000	0.000	0.000	0.000	0.000
BL5	289	5	0.503	0.500	0.999	1.000	1.000	0.010	0.001	0.000	0.000	0.000	0.000
BL6	292	5	0.503	0.499	0.999	1.000	1.000	0.011	0.000	0.000	0.000	0.000	0.000
BL7	295	6	0.267	0.259	0.950	1.000	1.000	0.065	0.005	0.002	0.000	0.000	0.000
BL89	298	5	0.443	0.437	0.997	1.000	1.000	0.016	0.001	0.001	0.001	0.000	0.000
BPC1	301	7.069	0.150	0.147	0.796	0.991	1.000	0.120	0.006	0.001	0.001	0.000	0.000
BPC2	304	3.439	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BPC3	307	6	0.682	0.681	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BPC4	310	6	0.713	0.711	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BPC5	313	2.305	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BPC5-B	316	2.617	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT1	319	4.787	0.774	0.771	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT10	322	10.162	0.020	0.024	0.212	0.511	0.697	0.999	0.808	0.492	0.271	0.062	0.011
BT2	325	5.985	0.187	0.177	0.857	0.997	1.000	0.036	0.000	0.000	0.000	0.000	0.000
BT3	328	3.15	0.988	0.983	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT4	331	6	0.601	0.599	1.000	1.000	1.000	0.003	0.000	0.000	0.000	0.000	0.000
BT4-SA	334	7	0.256	0.249	0.943	1.000	1.000	0.060	0.003	0.001	0.000	0.000	0.000
BT5	337	3.019	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT5-B	340	3.293	0.999	0.997	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT6	343	6.434	0.116	0.116	0.707	0.975	0.998	0.359	0.050	0.018	0.009	0.000	0.000
BT6A	346	5.689	0.150	0.146	0.793	0.991	1.000	0.148	0.012	0.006	0.003	0.000	0.000
BT7	349	7.205	0.085	0.087	0.597	0.935	0.989	0.634	0.156	0.051	0.020	0.002	0.000
BT8	352	8.545	0.045	0.049	0.392	0.775	0.917	0.944	0.435	0.188	0.081	0.010	0.001
BT9	355	9.247	0.032	0.035	0.301	0.658	0.833	0.988	0.612	0.304	0.145	0.023	0.003
C1	358	3.564	0.802	0.799	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
C1-LF	361	5.57	0.136	0.133	0.759	0.986	0.999	0.239	0.028	0.006	0.000	0.000	0.000
CC1	364	4.007	0.762	0.759	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-01	367	10	0.124	0.127	0.742	0.983	0.999	0.673	0.180	0.059	0.054	0.004	0.000
D-06	370	3.105	0.986	0.980	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D10	373	6	0.300	0.293	0.969	1.000	1.000	0.047	0.003	0.002	0.002	0.000	0.000
D-16N	376	3.343	0.884	0.882	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D-16S	379	4	0.839	0.837	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D-1732	382	3.295	0.898	0.896	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D1A	385	3.366	0.877	0.875	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D1B	388	3.167	0.930	0.927	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D1b-LF	391	4.489	0.274	0.264	0.954	1.000	1.000	0.032	0.002	0.000	0.000	0.000	0.000
D1C	394	3.122	0.939	0.936	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D1c-LF1	397	4.194	0.446	0.444	0.997	1.000	1.000	0.001	0.001	0.000	0.000	0.000	0.000
D1c-LF2	400	4.932	0.178	0.168	0.841	0.996	1.000	0.090	0.008	0.003	0.000	0.000	0.000
D1c-LF3	403	5.241	0.157	0.150	0.803	0.992	1.000	0.150	0.015	0.004	0.000	0.000	0.000
D-25	406	7	0.225	0.220	0.916	0.999	1.000	0.107	0.008	0.006	0.006	0.000	0.000
D-25-B	409	7	0.233	0.227	0.924	1.000	1.000	0.071	0.003	0.002	0.002	0.000	0.000
D-26	412	3.913	0.861	0.858	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D-28	415	4.165	0.463	0.463	0.998	1.000	1.000	0.001	0.001	0.000	0.000	0.000	0.000
D-29	418	6.5	0.190	0.187	0.873	0.998	1.000	0.264	0.040	0.009	0.000	0.000	0.000
D-30	421	4	0.839	0.837	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
D-31	424	4.49	0.273	0.263	0.952	1.000	1.000	0.034	0.002	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00	
D-34N	427	3.217	0.918	0.917	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-34S	430	2.68	0.987	0.982	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-35	433	2.779	0.981	0.976	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-36	436	9.5	0.146	0.147	0.797	0.992	1.000	0.508	0.119	0.039	0.037	0.006	0.000	
D-37	439	4.067	0.791	0.788	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-38	442	4.418	0.807	0.804	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-39-1	445	4.976	0.189	0.180	0.862	0.997	1.000	0.047	0.003	0.002	0.000	0.000	0.000	
D-39-2	448	5.196	0.177	0.167	0.840	0.996	1.000	0.070	0.004	0.003	0.002	0.000	0.000	
D-39-3	451	5.233	0.175	0.165	0.836	0.996	1.000	0.075	0.005	0.003	0.002	0.000	0.000	
D-42	454	3.276	0.904	0.902	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-43	457	3.684	0.984	0.978	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-44	460	3.295	0.898	0.897	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-45	463	2.991	0.960	0.955	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-48	466	4	0.839	0.837	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-49	469	3.433	0.855	0.852	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-50	472	3	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-51	475	2.785	0.981	0.975	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-53	478	5	0.503	0.499	0.999	1.000	1.000	0.012	0.000	0.000	0.000	0.000	0.000	
D-56	481	6	0.713	0.711	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
D-60	484	6	0.562	0.560	1.000	1.000	1.000	0.005	0.000	0.000	0.000	0.000	0.000	

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-61	487	6	0.390	0.385	0.992	1.000	1.000	0.017	0.001	0.000	0.000	0.000	0.000
D-61-B	490	6	0.390	0.386	0.992	1.000	1.000	0.016	0.001	0.000	0.000	0.000	0.000
D-62-B	496	6	0.286	0.278	0.962	1.000	1.000	0.047	0.003	0.002	0.002	0.000	0.000
D-64	499	5	0.502	0.499	0.999	1.000	1.000	0.012	0.000	0.000	0.000	0.000	0.000
E1	502	3.152	0.958	0.953	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
E1-LF	505	4.766	0.191	0.182	0.865	0.998	1.000	0.063	0.005	0.005	0.002	0.000	0.000
E1-LF-B	508	4.054	0.532	0.534	1.000	1.000	1.000	0.000	0.001	0.000	0.000	0.000	0.000
E2	511	2.679	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
E2-B	514	2.324	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
E2-LF	517	5.4	0.443	0.439	0.997	1.000	1.000	0.016	0.001	0.000	0.000	0.000	0.000
E2-LF-B	520	5.4	0.443	0.440	0.997	1.000	1.000	0.015	0.001	0.000	0.000	0.000	0.000
FC	523	5.279	0.196	0.195	0.886	0.999	1.000	0.028	0.001	0.001	0.001	0.000	0.000
GW10	526	5.283	0.186	0.175	0.854	0.997	1.000	0.048	0.003	0.002	0.002	0.000	0.000
GW11	529	5.94	0.155	0.150	0.803	0.992	1.000	0.124	0.009	0.004	0.004	0.000	0.000
GW12	532	7.035	0.091	0.093	0.622	0.946	0.992	0.577	0.128	0.043	0.018	0.002	0.000
GW13	535	4.687	0.206	0.205	0.899	0.999	1.000	0.045	0.003	0.001	0.001	0.000	0.000
GW14	538	5.493	0.179	0.169	0.843	0.996	1.000	0.082	0.006	0.001	0.001	0.000	0.000
GW14-1	541	3.271	0.973	0.967	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW15	544	5.325	0.171	0.162	0.829	0.995	1.000	0.097	0.008	0.002	0.001	0.000	0.000
GW16	547	5.337	0.183	0.173	0.850	0.997	1.000	0.051	0.002	0.002	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
GW17	550	3.202	0.999	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW18	553	6.016	0.148	0.144	0.789	0.991	1.000	0.154	0.013	0.007	0.007	0.000	0.000
GW18-B	556	5	0.200	0.204	0.898	0.999	1.000	0.028	0.001	0.001	0.001	0.000	0.000
GW2	559	3.6	0.943	0.940	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW3	562	3.086	0.991	0.986	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW4	565	5.489	0.190	0.184	0.869	0.998	1.000	0.035	0.001	0.000	0.000	0.000	0.000
GW5	568	5.137	0.331	0.326	0.981	1.000	1.000	0.009	0.000	0.000	0.000	0.000	0.000
GW6	571	4.051	0.895	0.893	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW7	574	2	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW8	577	2	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
GW9	580	3.224	0.991	0.987	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HC1	583	4.456	0.323	0.318	0.978	1.000	1.000	0.015	0.002	0.000	0.000	0.000	0.000
HC2	586	2.316	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HC3	589	3.47	0.907	0.905	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HC4	592	3.158	0.961	0.957	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC0	595	3.301	0.998	0.995	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC1	598	4.516	0.660	0.659	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC10	601	3.857	0.775	0.773	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC10-B	604	2.369	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC2	607	4.109	0.883	0.880	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
HNC3	610	3.68	0.960	0.955	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC4	613	3.211	0.993	0.989	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC5	616	4.726	0.680	0.678	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC6	619	3.537	0.992	0.987	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC7	622	3.827	0.971	0.965	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC8	625	3.534	0.945	0.942	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9	628	3.564	0.881	0.878	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-B	631	2.52	0.997	0.995	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-E	634	3.046	0.973	0.968	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-W	637	3.39	0.950	0.948	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB1	640	3	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB2	643	5.076	0.616	0.616	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB3	646	3	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB4	649	5.083	0.562	0.562	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LB5	652	2.833	0.998	0.997	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LBB2	655	10.053	0.022	0.025	0.221	0.527	0.713	0.999	0.790	0.469	0.254	0.056	0.010
LBB3	658	7.839	0.064	0.067	0.498	0.874	0.968	0.824	0.270	0.104	0.040	0.004	0.000
LBB4	661	7.284	0.061	0.063	0.480	0.859	0.962	0.868	0.301	0.074	0.008	0.002	0.000
LBB5	664	6.65	0.082	0.083	0.582	0.927	0.987	0.674	0.172	0.034	0.002	0.000	0.000
LBB6	667	7.093	0.067	0.069	0.510	0.882	0.972	0.820	0.262	0.059	0.005	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
LBC1	670	6	0.292	0.284	0.965	1.000	1.000	0.043	0.002	0.002	0.002	0.000	0.000
LBC2	673	6	0.469	0.465	0.998	1.000	1.000	0.010	0.000	0.000	0.000	0.000	0.000
LF1	676	2.767	0.990	0.985	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LF2	679	2.331	0.999	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LF-GB	682	4.063	0.805	0.803	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LL1	685	2.227	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LL2	688	2	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
LL3	691	2	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
MC1	694	4.334	0.473	0.473	0.998	1.000	1.000	0.005	0.000	0.000	0.000	0.000	0.000
OB1	697	8	0.059	0.062	0.473	0.854	0.959	0.861	0.304	0.122	0.049	0.005	0.000
OB2	700	6.521	0.112	0.113	0.698	0.972	0.997	0.385	0.056	0.019	0.008	0.000	0.000
OB3	703	3.925	0.729	0.728	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
OB4	706	4.52	0.353	0.351	0.987	1.000	1.000	0.019	0.001	0.001	0.000	0.000	0.000
PAC1	709	10	0.134	0.137	0.770	0.988	0.999	0.605	0.132	0.035	0.037	0.004	0.000
SL1	712	4.086	0.795	0.792	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
SL2	715	6.163	0.162	0.156	0.817	0.994	1.000	0.093	0.005	0.001	0.001	0.000	0.000
SL3	718	10	0.136	0.139	0.777	0.989	0.999	0.581	0.118	0.030	0.032	0.005	0.000
TS1	721	9.125	0.035	0.037	0.317	0.681	0.851	0.984	0.576	0.280	0.121	0.030	0.005
TS10	724	5.944	0.138	0.135	0.766	0.987	0.999	0.208	0.020	0.011	0.004	0.000	0.000
TS11	727	4.195	0.564	0.564	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
TS12	730	3.615	0.869	0.867	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
TS13	733	3.791	0.797	0.795	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
TS14	736	3.856	0.765	0.763	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
TS15	739	6.086	0.131	0.129	0.750	0.984	0.999	0.247	0.026	0.014	0.005	0.000	0.000
TS16	742	5.234	0.175	0.165	0.836	0.996	1.000	0.076	0.005	0.004	0.002	0.000	0.000
TS17	745	4.831	0.198	0.199	0.891	0.999	1.000	0.036	0.002	0.002	0.000	0.000	0.000
TS18	748	3.641	0.860	0.857	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
TS19	751	4.516	0.291	0.282	0.964	1.000	1.000	0.022	0.001	0.000	0.000	0.000	0.000
TS2	754	5.749	0.147	0.143	0.787	0.990	1.000	0.162	0.014	0.008	0.003	0.000	0.000
TS20	757	4.07	0.562	0.562	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
TS21	760	6.312	0.107	0.108	0.679	0.967	0.997	0.440	0.063	0.012	0.012	0.000	0.000
TS22	763	4.558	0.269	0.257	0.949	1.000	1.000	0.027	0.002	0.000	0.000	0.000	0.000
TS3	766	4.442	0.402	0.401	0.994	1.000	1.000	0.012	0.000	0.000	0.000	0.000	0.000
TS4	769	4.682	0.259	0.247	0.942	1.000	1.000	0.026	0.001	0.001	0.000	0.000	0.000
TS5	772	5.44	0.163	0.156	0.817	0.994	1.000	0.103	0.007	0.005	0.002	0.000	0.000
TS6	775	5.149	0.179	0.169	0.844	0.996	1.000	0.065	0.004	0.004	0.002	0.000	0.000
TS7	778	7.127	0.088	0.090	0.609	0.940	0.991	0.606	0.144	0.051	0.017	0.003	0.000
TS9	781	4.827	0.198	0.198	0.890	0.999	1.000	0.036	0.002	0.002	0.000	0.000	0.000
US1	784	6.04	0.133	0.131	0.755	0.985	0.999	0.234	0.024	0.013	0.005	0.000	0.000
GW11-B	787	2	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 Without Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
E1-B	790	4.877	0.195	0.192	0.881	0.998	1.000	0.048	0.003	0.003	0.000	0.000	0.000
BB7-B	793	3.56	0.804	0.801	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BD1-B	796	4.31	0.649	0.648	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BC	799	3	0.999	0.999	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
L2L-A	802	2.691	0.998	0.995	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
L2L-B	805	3.529	0.798	0.795	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
1-1AB	1	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
1-1AN	4	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BE1	7	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BE2	10	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BE3	13	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BE4	16	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BE5	19	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
11BE6-E	22	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.561	0.343
11BE6-W	25	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
1-1BU3-U1	28	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
1-1BU3-U2	31	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
1-1BU3-U3	34	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
11BU4	37	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW11	40	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW2-W1	43	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW2-W2	46	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW4-W3	49	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW4-W4	52	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW4-W4A	55	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW5	58	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
11BW6	61	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW79	64	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
11BW79-W7	67	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
1-2MID	70	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.327
1-2N	73	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-2S	76	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.327
1-3	79	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-5	82	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
1-7_N3-4	85	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-7_N4-7	88	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-7_N7-10	91	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-7-N10-13	94	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-7N13-16	97	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-7N16-17	100	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.544	0.328
1-7N17-24	103	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-7N24-28	106	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
1-8	109	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
2-1A2	112	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.848	0.563	0.344
2-1B2-MID	115	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
2-1B2N	118	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
2-1B2S	121	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
3-1B	124	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
3-1C	127	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.327
4-1N	130	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
4-1S	133	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
4-2	136	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
4-2A	139	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
4-2B	142	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
4-2C	145	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
4-7	148	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	1.000	0.946	0.627	0.311
4MGT	151	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
5-1A	154	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
5-1B	157	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
6-1B1	160	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
6-1B1-B	163	6	0.244	0.235	0.931	1.000	1.000	0.062	0.000	0.000	0.000	0.000	0.000
8-1N	166	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.887	0.629	0.417
8-1N-B	169	4	0.861	0.859	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
8-1S-B	175	4	0.861	0.858	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
8-2C	178	16.903	0.004	0.005	0.051	0.145	0.230	1.000	1.000	0.994	0.861	0.526	0.308
8-2D	181	16.903	0.004	0.005	0.051	0.145	0.230	1.000	1.000	0.994	0.860	0.525	0.308

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
9-1AE	184	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
9-1AMID	187	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
9-1AW	190	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
9-1BE	193	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
9-1BMIDE	196	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
9-1BMIDW	199	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
9-1BW	202	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
A1	205	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
B1	208	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
BB1	211	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BB2	214	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.561	0.343
BB3	217	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
BB4	220	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
BB5	223	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BB6	226	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
BB7	229	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
BB8-B	235	4.031	0.529	0.529	0.999	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BD1	238	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BDL0	241	16.903	0.004	0.005	0.051	0.145	0.230	1.000	1.000	0.994	0.860	0.525	0.308
BDL1	244	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BDL2	247	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BDL3	250	16.903	0.004	0.005	0.051	0.145	0.230	1.000	1.000	0.994	0.860	0.525	0.308
BDL4	253	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.887	0.629	0.417
BDL4-B	256	3.312	0.986	0.981	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BDL5	259	16.903	0.004	0.005	0.051	0.145	0.230	1.000	1.000	0.994	0.860	0.525	0.308
BGC0	262	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
BGC1	265	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
BGC2	268	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
BGC3	271	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
BGC4	274	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
BL1	277	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
BL2	280	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
BL3	283	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
BL4	286	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
BL5	289	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BL6	292	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
BL7	295	21.761	0.004	0.006	0.056	0.158	0.250	1.000	1.000	0.991	0.856	0.470	0.203
BL89	298	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
BPC1	301	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
BPC2	304	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
BPC3	307	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
BPC4	310	19.623	0.003	0.004	0.042	0.121	0.193	1.000	1.000	0.998	0.918	0.602	0.352
BPC5	313	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
BPC5-B	316	2.617	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT1	319	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
BT10	322	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BT2	325	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
BT3	328	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
BT4	331	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
BT4-SA	334	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
BT5	337	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
BT5-B	340	3.293	0.999	0.997	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BT6	343	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BT6A	346	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BT7	349	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BT8	352	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
BT9	355	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
C1	358	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
C1-LF	361	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
CC1	364	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-01	367	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
D-06	370	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
D10	373	17.971	0.004	0.005	0.052	0.149	0.236	1.000	1.000	0.991	0.845	0.540	0.280
D-16N	376	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-16S	379	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-1732	382	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D1A	385	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D1B	388	16.549	0.003	0.005	0.050	0.143	0.226	1.000	1.000	0.993	0.839	0.583	0.352
D1b-LF	391	16.549	0.003	0.005	0.050	0.143	0.226	1.000	1.000	0.993	0.839	0.583	0.354
D1C	394	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D1c-LF1	397	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D1c-LF2	400	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D1c-LF3	403	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-25	406	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
D-25-B	409	7	0.287	0.279	0.962	1.000	1.000	0.014	0.000	0.000	0.000	0.000	0.000
D-26	412	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-28	415	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-29	418	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-30	421	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-31	424	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-34N	427	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-34S	430	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-35	433	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-36	436	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
D-37	439	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
D-38	442	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-39-1	445	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-39-2	448	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-39-3	451	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-42	454	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-43	457	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.887	0.629	0.417
D-44	460	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-45	463	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-48	466	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-49	469	16.549	0.003	0.005	0.050	0.143	0.226	1.000	1.000	0.993	0.839	0.583	0.352
D-50	472	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-51	475	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
D-53	478	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
D-56	481	21.829	0.002	0.003	0.033	0.095	0.153	1.000	1.000	1.000	0.953	0.701	0.475
D-60	484	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
D-61	487	21.294	0.003	0.004	0.041	0.117	0.187	1.000	1.000	0.999	0.926	0.611	0.363
D-61-B	490	6	0.505	0.503	0.999	1.000	1.000	0.003	0.000	0.000	0.000	0.000	0.000
D-62-B	496	6	0.505	0.502	0.999	1.000	1.000	0.003	0.000	0.000	0.000	0.000	0.000
D-64	499	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
E1	502	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
E1-LF	505	16.549	0.003	0.005	0.050	0.142	0.225	1.000	1.000	0.993	0.840	0.584	0.354
E1-LF-B	508	4.054	0.516	0.515	0.999	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
E2	511	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
E2-B	514	2.324	0.994	0.989	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
E2-LF	517	16.549	0.003	0.005	0.050	0.142	0.226	1.000	1.000	0.993	0.839	0.584	0.355
E2-LF-B	520	5.4	0.321	0.315	0.977	1.000	1.000	0.032	0.000	0.000	0.000	0.000	0.000
FC	523	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.886	0.629	0.417
GW10	526	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
GW11	529	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
GW12	532	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
GW13	535	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	1.000	0.946	0.627	0.311
GW14	538	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	0.999	0.946	0.628	0.311
GW14-1	541	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
GW15	544	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
GW16	547	16.157	0.003	0.005	0.051	0.147	0.232	1.000	1.000	0.975	0.847	0.561	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00	
GW17	550	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.886	0.629	0.417	
GW18	553	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343	
GW18-B	556	5	0.183	0.179	0.861	0.997	1.000	0.032	0.001	0.000	0.000	0.000	0.000	
GW2	559	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203	
GW3	562	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203	
GW4	565	21.761	0.004	0.006	0.055	0.156	0.247	1.000	1.000	0.991	0.856	0.472	0.204	
GW5	568	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203	
GW6	571	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203	
GW7	574	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.852	0.467	0.202	
GW8	577	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.852	0.467	0.202	
GW9	580	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203	
HC1	583	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203	
HC2	586	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203	
HC3	589	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203	
HC4	592	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203	
HNC0	595	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.887	0.629	0.417	
HNC1	598	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.887	0.629	0.417	
HNC10	601	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352	
HNC10-B	604	2.369	0.997	0.993	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	
HNC2	607	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.886	0.628	0.416	

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project													
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
HNC3	610	18.496	0.003	0.004	0.043	0.123	0.196	1.000	1.000	0.996	0.886	0.628	0.416
HNC4	613	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
HNC5	616	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
HNC6	619	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.327
HNC7	622	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.328
HNC8	625	16.965	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.988	0.834	0.543	0.327
HNC9	628	17.971	0.004	0.005	0.053	0.150	0.237	1.000	1.000	0.991	0.844	0.539	0.278
HNC9-B	631	2.52	0.992	0.986	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
HNC9-E	634	17.971	0.004	0.005	0.052	0.149	0.236	1.000	1.000	0.991	0.845	0.541	0.281
HNC9-W	637	17.971	0.004	0.005	0.052	0.149	0.236	1.000	1.000	0.991	0.845	0.541	0.280
LB1	640	19.623	0.003	0.004	0.043	0.125	0.199	1.000	1.000	0.998	0.916	0.599	0.352
LB2	643	19.623	0.003	0.004	0.042	0.121	0.193	1.000	1.000	0.998	0.918	0.602	0.352
LB3	646	19.623	0.003	0.004	0.042	0.121	0.193	1.000	1.000	0.998	0.918	0.601	0.350
LB4	649	19.623	0.003	0.004	0.042	0.120	0.193	1.000	1.000	0.998	0.919	0.603	0.352
LB5	652	19.623	0.003	0.004	0.042	0.121	0.193	1.000	1.000	0.998	0.918	0.602	0.352
LBB2	655	16.157	0.003	0.005	0.051	0.147	0.232	1.000	1.000	0.975	0.847	0.561	0.343
LBB3	658	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
LBB4	661	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
LBB5	664	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
LBB6	667	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
LBC1	670	21.294	0.003	0.004	0.041	0.117	0.188	1.000	1.000	0.999	0.926	0.609	0.360
LBC2	673	21.294	0.003	0.004	0.041	0.117	0.188	1.000	1.000	0.999	0.926	0.609	0.360
LF1	676	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
LF2	679	21.761	0.004	0.006	0.055	0.156	0.246	1.000	1.000	0.991	0.857	0.472	0.204
LF-GB	682	21.761	0.004	0.006	0.055	0.157	0.248	1.000	1.000	0.991	0.856	0.472	0.204
LL1	685	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203
LL2	688	21.761	0.004	0.006	0.056	0.159	0.250	1.000	1.000	0.990	0.855	0.473	0.207
LL3	691	21.761	0.004	0.006	0.055	0.157	0.248	1.000	1.000	0.991	0.855	0.469	0.202
MC1	694	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
OB1	697	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
OB2	700	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
OB3	703	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
OB4	706	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
PAC1	709	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	1.000	0.946	0.627	0.311
SL1	712	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	1.000	0.946	0.627	0.311
SL2	715	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	1.000	0.946	0.627	0.311
SL3	718	22.587	0.003	0.004	0.039	0.113	0.182	1.000	1.000	0.999	0.946	0.628	0.311
TS1	721	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS10	724	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
TS11	727	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
TS12	730	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS13	733	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
TS14	736	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS15	739	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS16	742	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS17	745	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS18	748	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS19	751	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.974	0.847	0.561	0.343
TS2	754	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS20	757	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS21	760	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.852	0.467	0.202
TS22	763	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
TS3	766	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS4	769	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS5	772	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS6	775	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS7	778	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
TS9	781	16.157	0.003	0.005	0.051	0.146	0.232	1.000	1.000	0.975	0.847	0.562	0.343
US1	784	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
GW11-B	787	2	0.998	0.996	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 29 (continued)
Morganza to the Gulf Economic Update
Project Performance by Study Area Reach for HEC-FDA Categories

2085 With Project														
Reach	Station	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events						
			Median	Expected	10	30	50	0.10	0.04	0.02	0.01	0.00	0.00
E1-B	790	4.877	0.193	0.188	0.876	0.998	1.000	0.046	0.000	0.000	0.000	0.000	0.000
BB7-B	793	3.56	0.770	0.768	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BD1-B	796	4.31	0.648	0.647	1.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
BC	799	19.623	0.003	0.004	0.042	0.121	0.193	1.000	1.000	0.998	0.917	0.599	0.349
L2L-A	802	21.761	0.004	0.006	0.055	0.157	0.247	1.000	1.000	0.991	0.856	0.470	0.203
L2L-B	805	21.761	0.004	0.006	0.056	0.158	0.249	1.000	1.000	0.991	0.856	0.470	0.203

Appendix C—Cost Appendix & Certification

MORGANZA TO THE GULF OF MEXICO PAC

100 Year Protection Plan

(1% Annual Chance Surge Risk Reduction Plan)

COST ENGINEERING APPENDIX (040521)

Table of Contents

Cost Estimate

Section 1. Cost estimate development

a) The project cost estimate was developed in the TRACES MII cost estimating software and used the standard approaches for a feasibility estimate structure regarding labor, equipment, materials, crews, unit prices, quotes, sub- and prime contractor markups. This philosophy was taken wherever practical within the time constraints. It was supplemented with estimating information from other sources where necessary such as quotes, bid data, and A-E estimates. The intent was to provide or convey a "fair and reasonable" estimate that which depicts the local market conditions. The estimates assume a typical application of tiering subcontractors. Given the long time over which this project/program is to be constructed and the unknown economic status during that time, demands from non-governmental civil works projects were not considered to dampen the competition and increase prices.

Section 2. Estimate Structure:

a) The estimate is structured to reflect the projects performed. The estimates are subdivided by USACE feature codes and by local "reach" name.

Section 3. Bid competition:

a) It is assumed that there will not be an economically saturated market and that bidding competition will be present.

Section 4. Contract Acquisition Strategy:

a) It is assumed that the contract acquisition strategy will be similar to past projects with some negotiated contracts, focus and preference of small business/8(a), and large, unrestricted design/bid/build contracts. There is no declared contract acquisition plan/types at this time, so typical MVN goals for small business/set-aside contracts have been included on overall cost basis by assigning approximately 25% of construction dollars to the small business/set-aside contractor type.

Section 5. Labor Shortages:

a) It is assumed there will be a normal labor market.

Section 6. Labor Rates:

a) Local labor market wages are above the local Davis-Bacon Wage Determination and actual rates have been used. This is based upon local information and payroll data received from the New Orleans District Construction Representatives and estimators with experiences in past years.

Section 7. Materials:

a) Cost quotes are used on major construction items when available. Recent quotes may include borrow material, concrete, steel and concrete piling, rock, gravel and sand. Assumptions include:
   i) Materials will be purchased as part of the construction contract. The estimate does not anticipate government furnished materials. Prices include delivery of materials.

ii) Concrete - will be purchased from commercial batch plants.
iii) Borrow Material and Haul – Local have done one lift on most reaches for Morgazna to the Gulf. Also, borrow location and haul distances were able to be better defined. All borrow material is assumed Government furnished as it is a local sponsor responsibility. NO contractor furnished borrow source are used.

b) The borrow quantity calculations followed the MVN Geotechnical guidance:

c) Hauled Levee: 10 BCY of borrow material = 12 LCY hauled = 8 ECY compacted.

d) An assumed average one-way haul distance of 7 miles for 100yr was used due to a committed borrow source being confirmed available. Adjacent borrow was assumed for Reach Barrier, A, B, and Larose to Lockport and the one-way haul distance was reduced to 3 miles. This decision is based upon the existing lifts that have been built by the sponsors and discussions with the New Orleans District cost engineers and MtoG PDT.

e) Haul speeds are estimated using 40 mph speed average given the long distances and rural areas. Since adjacent borrow was designated for Reach Barrier, A, B and Larose to Lockport, average speed was reduced to 25 mph.

f) Rock and stone - The New Orleans delta area has no rock sources. Historically, rock is barged from northern sources on the Mississippi River. This decision is based upon local knowledge, experience and supported with cost quotes.

Section 8. Equipment:

a) Rates used are based from the latest USACE EP-1110-1-8, Region III. Adjustments are made for fuel and facility capital cost of money (FCCM). Judicious use of owned verses rental rates was considered based on typical contractor usage and local equipment availability. Only a few select pieces of marine \ marsh equipment are considered rental. Full FCCM/Cost of Money rate is latest available; Mii program takes EP recommended discount, no other adjustments have been made to the FCCM.

   i) Trucking: The estimate assumed independent self-employed trucking subcontractors due to the large numbers of trucks required.

   ii) Dozers: dozers of the D-5/D-6 variety were chosen based on historical knowledge. Heavier equipment gets mired in the mud and soft soils.

   iii) Rental Rates: Rental rates were used for various pieces of marine and marsh equipment where rental is typical such as marsh backhoes.

Section 9. Fuel:

a) Fuels (gasoline, on and off-road diesel) were based on local market prices for on-road and off-road for the Gulf Coast area. The Team found that fuels fluctuate irrationally; thus, used the current price and placed a risk on the risk register.

Section 10. Crews:

a) Major crew and productivity rates were developed and studied by senior USACE estimators familiar with the type of work. All of the work is typical to the New Orleans District. The crews and productivities were checked by local MVN estimators, discussions with contractors and comparisons with historical cost data. Major crews include haul, earthwork, piling, concrete, and deep soil mixing.

b) Most crew work hours are assumed to be 10 hrs 6 days/wk which is typical to the area. Marine based bucket excavation/dredging operations for levee construction are assumed to work 2-12 hours shifts 7 days / week.

c) A 10% "markup on labor for weather delay" is selectively applied to the labor in major earthwork placing detail items and associated items that would be affected by small amounts of weather making it unsafe or difficult to place (trying to run dump trucks on a wet levee) or be detrimental/non-compliant to the work being done (trying to place/compact material in the rain). The 10% markup is to cover the common practice of paying for labor "showing up" to the job site and then being sent home due to minor weather which is part of known average weather impacts as reflected within the standard contract specifications.

Section 11. Unit Prices:

a) The unit prices found within the various project estimates will fluctuate within a range between similar construction units such as floodwall concrete, earthwork, and piling. Variances are a result of differing haul distances (trucked or barged), small or large business markups, subcontracted items, designs and estimates by others.

Section 12. Relocation Cost:

a) Relocation costs are defined as the relocation of public roads, bridges, railroads, and utilities required for project purposes. In cases where potential significant impacts were known, costs were included within the cost estimate.

Section 13. Mobilization:

a) Contractor mobilization and demobilization are based on the assumption that most of the contractors will be coming from within the Gulf Coast/Southern region. Mob/demob costs are based on historical studies of detailed Government estimate mob/demobs which averaged 4.9 to 5% of the construction costs. With undefined acquisition strategies and assumed individual project limits for the large number of potential contracts in this program, the estimate utilizes a more comprehensive approx. 5% value applied at each contract rather than risking minimizing mob/demob costs by detailing costs based on an assumed number of contracts. The 5% value also matches well with the 5% value previously prescribed by Walla Walla District, which has studied historical rates.

Section 14. Field Office Overhead:

a) The estimate used a field office overhead rate of 12% for the prime contractors at budget level development. Based on historical studies and experience, Walla Walla District has recommended typical rates ranging from 9% to 11% for large civil works projects; however, the 9-11% rate does not consider possible incentives such as camps, allowances, travel trailers, meals, etc. which have been used previously to facilitate projects. With undefined acquisition strategies and assumed individual project limits for the large number of potential contracts in this program, the estimate utilizes a more comprehensive percentage based approach applied at each contract rather than risking minimizing overhead costs by detailing costs based on an assumed number of contracts. The applied rates were previously discussed among numerous USACE District cost engineers including Walla Walla, Vicksburg, Norfolk, Huntington, St. Paul and New Orleans.

Section 15. Overhead assumptions may include:

a) Superintendent, office manager, pickups, periodic travel, costs, communications, temporary offices (contractor and government), office furniture, office supplies, computers and software, as-built drawings and minor designs, tool trailers, staging setup, camp and kitchen maintenance and utilities, utility service, toilets, safety equipment, security and fencing, small hand and power tools, project signs, traffic control, surveys, temp fuel tank station, generators, compressors, lighting, and minor miscellaneous.

Section 16. Home Office Overhead:

a) Estimate percentages range based upon consideration of 8(a), small business and unrestricted prime contractors. The rates are based upon estimating and negotiating experience, and consultation with local construction representatives. Different percents are used when considering the contract acquisition strategy regarding small business 8(a), competitive small business and large business, high to low respectively. The applied rates were previously discussed among numerous USACE District cost engineers including Walla Walla, Vicksburg, Norfolk, Huntington, St. Paul and New Orleans.

Section 17. Taxes:

a) Local taxes will be applied, using an average between the parishes that contain the work. Reference the LA parish tax rate website: http://www.laota.com/pta.htm

Section 18. Bond:

a) Bond is assumed 1% applied against the prime contractor, assuming large contracts. No differentiation was made between large and small businesses.

Section 19. E&D and S&A:

a) USACE Costs to manage design (PED) and construction (S&A) are based on New Orleans District Programmatic Cost Estimate guidance:

   i) Planning, Engineering & Design (PED): The PED cost includes such costs as project management, engineering, planning, designs, investigations, studies, reviews, value engineering and engineering during construction (EDC). Historically New Orleans

District has used an approximate 12.828% rate for E&D/EDC, applied against the estimated construction costs. Other USACE civil works districts such as St. Paul, Memphis and St. Louis have reported values ranging from 10-15%. Additional costs were added for project management, engineering, planning, designs, investigations, studies, reviews, value engineering. Specific PED costs were originally calculated and then that same percentage was carried forward on all future updates.

ii) Supervision & Administration (S&A): Historically, New Orleans District used a range from 5% to 15% depending on project size and type applied against the estimated construction costs. Other USACE civil works districts such as St. Paul, Memphis and St. Louis report values ranging from 7.5-10%. Consideration includes that a portion of the S&A effort could be performed by contractors. Based on discussions with MVN Construction Division, an S&A cost based on contract durations was developed. Specific S&A costs were originally calculated and then that same percentage (8.044%) was carried forward on all future updates.

Section 20. Contingencies:

a) Contingencies were developed using the USACE Cost and Schedule Risk Analysis (CSRA) process and the Crystal Ball software that evaluates schedule and cost related risks. See summary in Risk Report.

Section 21. Escalation:

a) Escalation used in the TPCS is based upon the US Army Corps of Engineers Engineering Manual (EM) 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) revised 30 Sept 2020.

Section 22. HTRW:

a) The estimate includes no costs for any potential Hazardous, Toxic, and Radioactive Waste (HTRW) concerns. Phase 1 HTRW investigations are already complete and the result of this investigation is that no further investigation is recommended.

Schedule

The project schedule was developed based on the construction of the individual features of work to include the entire 1% AEP Morganza to the Gulf program which includes construction of earthen levees, floodwalls, floodgates, and other structures along a 98-mile alignment south of Houma. The alignment is sub-divided into 14 main reaches (Barrier, A, B, E, F, G, H, I, J, K, L, Larose C-North, and Lockport to Larose). Structures include a multi-purpose lock, 22 navigable floodgates, 23 environmental water control structures, 9 road / RR gates, and fronting protection for 4 existing pumping stations. The structures located on Federally maintained navigation channels include a 110-ft wide by 800-ft long lock with an adjacent 250-ft wide sector gate on the Houma Navigation Canal and two 125-ft sector gates on the GIWW east and west of Houma.

Fourteen 56-ft barge gates and five 20- to 30-ft stop log gates are located on various waterways that cross the levee system.

Total Project Cost Summary (TPCS)

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 323234

MVN – Morganza to the Gulf (MTG)

The Morganza to the Gulf Study, as presented by New Orleans District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of October 29, 2021, the Cost MCX certifies the estimated total project cost:

FY22 Project First Cost: $6,461,760,000
Fully Funded Amount: $10,148,239,000

Cost Certification assumes Efficient Implementation (Funding). It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal Participation.

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Morganza to the Gulf**
PROJECT NO: 323234
LOCATION: Morganza to the Gulf

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2022; Effective Price Level Date: 1 OCT 21									
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru ###### ($K)	TOTAL FIRST COST ($K) K	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
02	RELOCATIONS	$224,031	$53,768	24.0%	$277,799	7.1%	$239,896	$57,575	$297,471	$0	$297,471	18.1%	$283,344	$68,003	$351,347
05	LOCKS	$314,141	$75,394	24.0%	$389,534	8.9%	$342,034	$82,088	$424,122	$0	$424,122	0.8%	$344,644	$82,715	$427,359
06	FISH & WILDLIFE FACILITIES	$344,355	$82,645	24.0%	$427,000	8.6%	$374,103	$89,785	$463,888	$0	$463,888	44.5%	$540,601	$129,744	$670,345
06	FISH & WILDLIFE FACILITIES	$241,701	$58,008	24.0%	$299,709	8.6%	$262,581	$63,019	$325,600	$0	$325,600	35.7%	$356,225	$85,494	$441,720
11	LEVEES & FLOODWALLS	$980,510	$235,322	24.0%	$1,215,832	7.4%	$1,052,691	$252,646	$1,305,337	$0	$1,305,337	33.3%	$1,403,465	$336,832	$1,740,296
11	LEVEES & FLOODWALLS	$431,179	$103,483	24.0%	$534,662	7.4%	$462,921	$111,101	$574,022	$0	$574,022	106.5%	$955,987	$229,437	$1,185,424
11	LEVEES & FLOODWALLS	$295,907	$71,018	24.0%	$366,925	7.4%	$317,691	$76,246	$393,937	$0	$393,937	292.2%	$1,245,936	$299,025	$1,544,960
11	LEVEES & FLOODWALLS	$53,886	$12,933	24.0%	$66,818	7.4%	$57,852	$13,885	$71,737	$0	$71,737	37.1%	$79,337	$19,041	$98,378
11	LEVEES & FLOODWALLS	$172,671	$41,441	24.0%	$214,112	7.4%	$185,383	$44,492	$229,875	$0	$229,875	69.6%	$314,487	$75,477	$389,964
15	FLOODWAY CONTROL & DIVERSION STRUCTURE	$458,624	$110,070	24.0%	$568,694	8.6%	$498,244	$119,579	$617,822	$0	$617,822	20.5%	$600,576	$144,138	$744,714
15	FLOODWAY CONTROL & DIVERSION STRUCTURE	$221,702	$53,209	24.0%	$274,911	8.6%	$240,855	$57,805	$298,660	$0	$298,660	68.1%	$404,847	$97,163	$502,010
	CONSTRUCTION ESTIMATE TOTALS:	$3,738,706	$897,290		$4,635,996	7.9%	$4,034,250	$968,220	$5,002,470	$0	$5,002,470	61.9%	$6,529,450	$1,567,068	$8,096,518
01	LANDS AND DAMAGES	$334,426	$83,607	25.0%	$418,033	8.4%	$362,497	$90,624	$453,121	$0	$453,121	47.7%	$535,474	$133,869	$669,343
30	PLANNING, ENGINEERING & DESIGN	$479,526	$115,086	24.0%	$594,613	4.0%	$498,676	$119,682	$618,358	$0	$618,358	36.4%	$680,220	$163,253	$843,472
31	CONSTRUCTION MANAGEMENT	$300,742	$72,178	24.0%	$372,920	4.0%	$312,751	$75,060	$387,811	$0	$387,811	39.0%	$434,602	$104,304	$538,906
	PROJECT COST TOTALS:	$4,853,401	$1,168,160	24.1%	$6,021,561		$5,208,174	$1,253,587	**$6,461,760**	$0	**$6,461,760**	57.1%	$8,179,746	$1,968,494	$10,148,239

PETITBON.JOHN.BAPTISTE.1230865910 Digitally signed by PETITBON.JOHN.BAPTISTE.1230865910 Date: 2021.11.02 13:09:15 -05'00'
CHIEF, COST ENGINEERING, John Petitbon

PFAFF.LACY.SHAW.1385522343 Digitally signed by PFAFF.LACY.SHAW.1385522343 Date: 2021.11.01 12:39:35 -05'00'
PROJECT MANAGER, Lacy Shaw Pfaff

GUTIERREZ.JUDITH.YRMA.1230839561 Digitally signed by GUTIERREZ.JUDITH.YRMA.1230839561 Date: 2021.11.02 09:41:14 -05'00'
CHIEF, REAL ESTATE, Judith Gutierrez

CHIEF, PLANNING, Troy Constance CHIEF,

ENGINEERING, Christopher Dunn CHIEF,

OPERATIONS, Mike Park

CHIEF, CONSTRUCTION, Stuart Waits

CHIEF, CONTRACTING, Debbie Logan

CHIEF, PM-PB, Brad Inman

CHIEF, DPM, Mark Wingate

ESTIMATED TOTAL PROJECT COST: $10,148,239

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf
DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

WBS	Civil Works Work Breakdown Structure	ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			12-Apr-21 / 1-Oct-20	Program Year (Budget EC): / Effective Price Level Date:			2022 / 1 OCT 21					
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	RISK BASED CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$35,427	$8,503	24.0%	$43,930	7.1%	$37,936	$9,105	$47,041	2029Q2	24.9%	$47,376	$11,370	$58,746
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$68,282	$16,388	24.0%	$84,670	8.6%	$74,181	$17,803	$91,985	2034Q1	44.3%	$107,078	$25,699	$132,777
	LEVEES & FLOODWALLS	$71,340	$17,122	24.0%	$88,462	7.4%	$76,592	$18,382	$94,974	2033Q1	40.0%	$107,234	$25,736	$132,970
	LEVEES & FLOODWALLS	$29,198	$7,008	24.0%	$36,206	7.4%	$31,348	$7,523	$38,871	2047Q1	114.7%	$67,293	$16,150	$83,444
	LEVEES & FLOODWALLS	$32,747	$7,859	24.0%	$40,606	7.4%	$35,158	$8,438	$43,595	2068Q1	307.6%	$143,292	$34,390	$177,681
	LEVEES & FLOODWALLS	$17,591	$4,222	24.0%	$21,813	7.4%	$18,886	$4,533	$23,419	2033Q2	41.1%	$26,649	$6,396	$33,045
	LEVEES & FLOODWALLS	$10,118	$2,428	24.0%	$12,546	7.4%	$10,862	$2,607	$13,469	2032Q1	35.8%	$14,751	$3,540	$18,291
	RUCTURE	$81,163	$19,479	24.0%	$100,642	8.6%	$88,174	$21,162	$109,336	2033Q2	41.1%	$124,418	$29,860	$154,278
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$345,866	$83,008	24.0%	**$428,874**		$284,962	$68,391	$353,353			$638,090	$153,142	$791,232
	LANDS AND DAMAGES	$5,407	$1,352	25.0%	$6,759	8.4%	$5,861	$1,465	$7,326	2028Q2	21.1%	$7,099	$1,775	$8,874
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$3,459	$830	24.0%	$4,289	4.0%	$3,597	$863	$4,460	2032Q2	46.0%	$5,251	$1,260	$6,511
1.0%	Planning & Environmental Compliance	$3,459	$830	24.0%	$4,289	4.0%	$3,597	$863	$4,460	2032Q2	46.0%	$5,251	$1,260	$6,511
3.0%	Engineering & Design	$10,376	$2,490	24.0%	$12,866	4.0%	$10,790	$2,590	$13,380	2032Q2	46.0%	$15,752	$3,780	$19,532
1.0%	Reviews, ATRs, IEPRs, VE	$3,459	$830	24.0%	$4,289	4.0%	$3,597	$863	$4,460	2032Q2	46.0%	$5,251	$1,260	$6,511
1.0%		$3,459	$830	24.0%	$4,289	4.0%	$3,597	$863	$4,460	2032Q2	46.0%	$5,251	$1,260	$6,511
1.0%	Contracting & Reprographics	$3,459	$830	24.0%	$4,289	4.0%	$3,597	$863	$4,460	2032Q2	46.0%	$5,251	$1,260	$6,511
1.5%	Engineering During Construction	$5,188	$1,245	24.0%	$6,433	4.0%	$5,395	$1,295	$6,690	2032Q2	46.0%	$7,876	$1,890	$9,766
1.826%	Planning During Construction	$6,316	$1,516	24.0%	$7,831	4.0%	$6,568	$1,576	$8,144	2032Q2	46.0%	$9,588	$2,301	$11,889
1.0%	Adaptive Management & Monitoring	$3,459	$830	24.0%	$4,289	4.0%	$3,597	$863	$4,460	2038Q2	84.2%	$6,624	$1,590	$8,214
0.5%	Project Operations	$1,729	$415	24.0%	$2,144	4.0%	$1,798	$432	$2,230	2032Q2	46.0%	$2,625	$630	$3,255
5.0%	Construction Management	$17,293	$4,150	24.0%	$21,444	4.0%	$17,984	$4,316	$22,300	2032Q2	46.0%	$26,253	$6,301	$32,553
2.0%	Project Operation:	$6,917	$1,660	24.0%	$8,577	4.0%	$7,194	$1,726	$8,920	2032Q2	46.0%	$10,501	$2,520	$13,021
1.0%	Project Management	$3,611	$867	24.0%	$4,477	4.0%	$3,755	$901	$4,656	2032Q2	46.0%	$5,482	$1,316	$6,797
	CONTRACT COST TOTALS:	$423,455	$101,683		$525,139		$365,888	$87,872	**$453,760**			$756,142	$181,545	**$937,688**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf
DISTRICT: MVN District PREPARED: 4/12/2021
POC: CHIEF, COST ENGINEERING, John Petitbon

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			12-Apr-21 / 1-Oct-20	Program Year (Budget EC): / Effective Price Level Date:			2022 / 1 OCT 21					
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$9,527	$2,287	24.0%	$11,814	7.1%	$10,202	$2,448	$12,651	2025Q2	10.5%	$11,276	$2,706	$13,982
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$11,948	$2,867	24.0%	$14,815	8.6%	$12,980	$3,115	$16,095	2032Q1	35.8%	$17,626	$4,230	$21,856
	LEVEES & FLOODWALLS	$79,713	$19,131	24.0%	$98,844	7.4%	$85,581	$20,540	$106,121	2033Q1	40.0%	$119,820	$28,757	$148,576
	LEVEES & FLOODWALLS	$29,442	$7,066	24.0%	$36,508	7.4%	$31,610	$7,586	$39,196	2047Q1	114.7%	$67,856	$16,286	$84,142
	LEVEES & FLOODWALLS	$24,274	$5,826	24.0%	$30,099	7.4%	$26,061	$6,255	$32,315	2068Q1	307.6%	$106,216	$25,492	$131,707
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$103,105	$24,745	24.0%	$127,851	8.6%	$112,013	$26,883	$138,896	2030Q1	27.8%	$143,100	$34,344	$177,444
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$258,010	$61,922	24.0%	**$319,932**		$278,446	$66,827	$345,273			$465,893	$111,814	$577,708
	LANDS AND DAMAGES	$1,009	$252	25.0%	$1,261	8.4%	$1,093	$273	$1,367	2024Q2	7.2%	$1,172	$293	$1,465
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$2,580	$619	24.0%	$3,199	4.0%	$2,683	$644	$3,327	2029Q1	29.2%	$3,467	$832	$4,299
1.0%	Planning & Environmental Compliance	$2,580	$619	24.0%	$3,199	4.0%	$2,683	$644	$3,327	2029Q1	29.2%	$3,467	$832	$4,299
3.0%	Engineering & Design	$7,740	$1,858	24.0%	$9,598	4.0%	$8,049	$1,932	$9,981	2029Q1	29.2%	$10,400	$2,496	$12,897
1.0%	Reviews, ATRs, IEPRs, VE	$2,580	$619	24.0%	$3,199	4.0%	$2,683	$644	$3,327	2029Q1	29.2%	$3,467	$832	$4,299
1.0%		$2,580	$619	24.0%	$3,199	4.0%	$2,683	$644	$3,327	2029Q1	29.2%	$3,467	$832	$4,299
1.0%	Contracting & Reprographics	$2,580	$619	24.0%	$3,199	4.0%	$2,683	$644	$3,327	2029Q1	29.2%	$3,467	$832	$4,299
1.5%	Engineering During Construction	$3,870	$929	24.0%	$4,799	4.0%	$4,025	$966	$4,991	2030Q1	34.1%	$5,398	$1,295	$6,693
1.8%	Planning During Construction	$4,711	$1,131	24.0%	$5,842	4.0%	$4,899	$1,176	$6,075	2030Q1	34.1%	$6,571	$1,577	$8,148
1.0%	Adaptive Management & Monitoring	$2,580	$619	24.0%	$3,199	4.0%	$2,683	$644	$3,327	2034Q1	56.1%	$4,189	$1,005	$5,194
0.5%	Project Operations	$1,290	$310	24.0%	$1,600	4.0%	$1,342	$322	$1,664	2029Q1	29.2%	$1,733	$416	$2,149
5.0%	Construction Management	$12,900	$3,096	24.0%	$15,997	4.0%	$13,416	$3,220	$16,635	2030Q1	34.1%	$17,993	$4,318	$22,311
2.0%	Project Operation:	$5,160	$1,238	24.0%	$6,399	4.0%	$5,366	$1,288	$6,654	2030Q1	34.1%	$7,197	$1,727	$8,924
1.0%	Project Management	$2,694	$646	24.0%	$3,340	4.0%	$2,801	$672	$3,473	2030Q1	34.1%	$3,757	$902	$4,659
	CONTRACT COST TOTALS:	$312,865	$75,098		$387,963		$335,536	$80,540	**$416,076**			$541,638	$130,005	**$671,642**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf
DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: Effective Price Level:			12-Apr-21 1-Oct-20	Program Year (Budget EC): Effective Price Level Date:			2022 1 OCT 21					
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$2,131	$511	24.0%	$2,642	7.1%	$2,282	$548	$2,829	2028Q1	20.2%	$2,742	$658	$3,400
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$45,682	$10,964	24.0%	$56,645	7.4%	$49,045	$11,771	$60,815	2032Q2	36.9%	$67,123	$16,110	$83,233
	LEVEES & FLOODWALLS	$17,633	$4,232	24.0%	$21,865	7.4%	$18,931	$4,543	$23,474	2046Q2	109.8%	$39,726	$9,534	$49,260
	LEVEES & FLOODWALLS	$15,279	$3,667	24.0%	$18,946	7.4%	$16,403	$3,937	$20,340	2067Q2	298.4%	$65,354	$15,685	$81,039
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$48,579	$11,659	24.0%	$60,238	8.6%	$52,776	$12,666	$65,442	2030Q1	27.8%	$67,423	$16,181	$83,604
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$129,303	$31,033	24.0%	**$160,336**		$139,436	$33,465	$172,901			$242,368	$58,168	$300,536
	LANDS AND DAMAGES	$1,203	$301	25.0%	$1,504	8.4%	$1,304	$326	$1,630	2024Q2	7.2%	$1,398	$350	$1,748
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$1,293	$310	24.0%	$1,603	4.0%	$1,345	$323	$1,667	2029Q1	29.2%	$1,737	$417	$2,154
1.0%	Planning & Environmental Compliance	$1,293	$310	24.0%	$1,603	4.0%	$1,345	$323	$1,667	2029Q1	29.2%	$1,737	$417	$2,154
3.0%	Engineering & Design	$3,879	$931	24.0%	$4,810	4.0%	$4,034	$968	$5,002	2029Q1	29.2%	$5,212	$1,251	$6,463
1.0%	Reviews, ATRs, IEPRs, VE	$1,293	$310	24.0%	$1,603	4.0%	$1,345	$323	$1,667	2029Q1	29.2%	$1,737	$417	$2,154
1.0%		$1,293	$310	24.0%	$1,603	4.0%	$1,345	$323	$1,667	2029Q1	29.2%	$1,737	$417	$2,154
1.0%	Contracting & Reprographics	$1,293	$310	24.0%	$1,603	4.0%	$1,345	$323	$1,667	2029Q1	29.2%	$1,737	$417	$2,154
1.5%	Engineering During Construction	$1,940	$465	24.0%	$2,405	4.0%	$2,017	$484	$2,501	2030Q1	34.1%	$2,705	$649	$3,354
1.8%	Planning During Construction	$2,361	$567	24.0%	$2,928	4.0%	$2,455	$589	$3,045	2030Q1	34.1%	$3,293	$790	$4,083
1.0%	Adaptive Management & Monitoring	$1,293	$310	24.0%	$1,603	4.0%	$1,345	$323	$1,667	2035Q1	62.2%	$2,181	$523	$2,704
0.5%	Project Operations	$647	$155	24.0%	$802	4.0%	$672	$161	$834	2029Q1	29.2%	$869	$208	$1,077
5.0%	Construction Management	$6,465	$1,552	24.0%	$8,017	4.0%	$6,723	$1,614	$8,337	2030Q1	34.1%	$9,017	$2,164	$11,181
2.0%	Project Operation:	$2,586	$621	24.0%	$3,207	4.0%	$2,689	$645	$3,335	2030Q1	34.1%	$3,607	$866	$4,473
1.0%	Project Management	$1,350	$324	24.0%	$1,674	4.0%	$1,404	$337	$1,741	2030Q1	34.1%	$1,883	$452	$2,335
	CONTRACT COST TOTALS:	$157,492	$37,810		**$195,302**		$168,803	$40,526	**$209,329**			$281,220	$67,507	**$348,727**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

DISTRICT: MVN District PREPARED: 4/12/2021
POC: CHIEF, COST ENGINEERING, John Petitbon

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			12-Apr-21 / 1-Oct-20	Program Year (Budget EC): / Effective Price Level Date:			2022 / 1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$223	$54	24.0%	$277	7.1%	$239	$57	$296	2028Q2	21.1%	$289	$69	$359
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$12,209	$2,930	24.0%	$15,139	8.6%	$13,264	$3,183	$16,447	2029Q1	23.9%	$16,435	$3,945	$20,380
	LEVEES & FLOODWALLS	$42,935	$10,304	24.0%	$53,240	7.4%	$46,096	$11,063	$57,159	2032Q2	36.9%	$63,088	$15,141	$78,229
	LEVEES & FLOODWALLS	$17,534	$4,208	24.0%	$21,742	7.4%	$18,825	$4,518	$23,343	2046Q1	108.2%	$39,196	$9,407	$48,603
	LEVEES & FLOODWALLS	$11,623	$2,790	24.0%	$14,413	7.4%	$12,479	$2,995	$15,474	2067Q2	298.4%	$49,718	$11,932	$61,651
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$84,525	$20,286	24.0%	**$104,811**		$90,903	$21,817	$112,719			$168,727	$40,494	$209,221
	LANDS AND DAMAGES	$1,794	$449	25.0%	$2,243	8.4%	$1,945	$486	$2,431	2024Q1	6.4%	$2,069	$517	$2,586
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$845	$203	24.0%	$1,048	4.0%	$879	$211	$1,090	2029Q1	29.2%	$1,136	$273	$1,408
1.0%	Planning & Environmental Compliance	$845	$203	24.0%	$1,048	4.0%	$879	$211	$1,090	2029Q1	29.2%	$1,136	$273	$1,408
3.0%	Engineering & Design	$2,536	$609	24.0%	$3,144	4.0%	$2,637	$633	$3,270	2029Q1	29.2%	$3,407	$818	$4,225
1.0%	Reviews, ATRs, IEPRs, VE	$845	$203	24.0%	$1,048	4.0%	$879	$211	$1,090	2029Q1	29.2%	$1,136	$273	$1,408
1.0%		$845	$203	24.0%	$1,048	4.0%	$879	$211	$1,090	2029Q1	29.2%	$1,136	$273	$1,408
1.0%	Contracting & Reprographics	$845	$203	24.0%	$1,048	4.0%	$879	$211	$1,090	2029Q1	29.2%	$1,136	$273	$1,408
1.5%	Engineering During Construction	$1,268	$304	24.0%	$1,572	4.0%	$1,319	$316	$1,635	2030Q1	34.1%	$1,768	$424	$2,193
1.8%	Planning During Construction	$1,543	$370	24.0%	$1,914	4.0%	$1,605	$385	$1,990	2030Q1	34.1%	$2,153	$517	$2,669
1.0%	Adaptive Management & Monitoring	$845	$203	24.0%	$1,048	4.0%	$879	$211	$1,090	2034Q1	56.1%	$1,372	$329	$1,702
0.5%	Project Operations	$423	$101	24.0%	$524	4.0%	$440	$105	$545	2029Q1	29.2%	$568	$136	$704
5.0%	Construction Management	$4,226	$1,014	24.0%	$5,241	4.0%	$4,395	$1,055	$5,450	2030Q1	34.1%	$5,894	$1,415	$7,309
2.0%	Project Operation:	$1,690	$406	24.0%	$2,096	4.0%	$1,758	$422	$2,180	2030Q1	34.1%	$2,358	$566	$2,924
1.0%	Project Management	$882	$212	24.0%	$1,094	4.0%	$918	$220	$1,138	2030Q1	34.1%	$1,231	$295	$1,526
	CONTRACT COST TOTALS:	$103,960	$24,968		**$128,928**		$111,192	$26,706	**$137,898**			$195,226	$46,875	**$242,100**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

DISTRICT: MVN District PREPARED: 4/12/2021
POC: CHIEF, COST ENGINEERING, John Petitbon

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			12-Apr-21 / 1-Oct-20	Program Year (Budget EC): / Effective Price Level Date:			2022 / 1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$5,704	$1,369	24.0%	$7,073	7.1%	$6,108	$1,466	$7,574	2028Q2	21.1%	$7,398	$1,776	$9,174
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$12,226	$2,934	24.0%	$15,161	8.6%	$13,283	$3,188	$16,470	2030Q1	27.8%	$16,969	$4,073	$21,041
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$23,320	$5,597	24.0%	$28,917	8.6%	$25,335	$6,080	$31,416	2031Q1	31.7%	$33,370	$8,009	$41,379
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$41,251	$9,900	24.0%	**$51,151**		$44,726	$10,734	$55,460			$57,737	$13,857	$71,594
	LANDS AND DAMAGES		$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$413	$99	24.0%	$512	4.0%	$429	$103	$532	2028Q2	25.6%	$539	$129	$668
1.0%	Planning & Environmental Compliance	$413	$99	24.0%	$512	4.0%	$429	$103	$532	2028Q2	25.6%	$539	$129	$668
3.0%	Engineering & Design	$1,238	$297	24.0%	$1,535	4.0%	$1,287	$309	$1,596	2028Q2	25.6%	$1,617	$388	$2,005
1.0%	Reviews, ATRs, IEPRs, VE	$413	$99	24.0%	$512	4.0%	$429	$103	$532	2028Q2	25.6%	$539	$129	$668
1.0%		$413	$99	24.0%	$512	4.0%	$429	$103	$532	2028Q2	25.6%	$539	$129	$668
1.0%	Contracting & Reprographics	$413	$99	24.0%	$512	4.0%	$429	$103	$532	2028Q2	25.6%	$539	$129	$668
1.5%	Engineering During Construction	$619	$149	24.0%	$767	4.0%	$643	$154	$798	2029Q1	29.2%	$831	$200	$1,031
1.8%	Planning During Construction	$753	$181	24.0%	$934	4.0%	$783	$188	$971	2029Q1	29.2%	$1,012	$243	$1,255
1.0%	Adaptive Management & Monitoring	$413	$99	24.0%	$512	4.0%	$429	$103	$532	2033Q2	51.7%	$651	$156	$807
0.5%	Project Operations	$206	$50	24.0%	$256	4.0%	$214	$51	$266	2028Q2	25.6%	$269	$65	$334
5.0%	Construction Management	$2,063	$495	24.0%	$2,558	4.0%	$2,145	$515	$2,660	2029Q1	29.2%	$2,771	$665	$3,437
2.0%	Project Operation:	$825	$198	24.0%	$1,023	4.0%	$858	$206	$1,064	2029Q1	29.2%	$1,109	$266	$1,375
1.0%	Project Management	$431	$103	24.0%	$534	4.0%	$448	$107	$555	2029Q1	29.2%	$579	$139	$718
	CONTRACT COST TOTALS:	$49,860	$11,966		**$61,826**		$53,678	$12,883	**$66,561**			$69,271	$16,625	**$85,896**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

DISTRICT: MVN District PREPARED: 4/12/2021
POC: CHIEF, COST ENGINEERING, John Petitbon

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			12-Apr-21 / 1-Oct-20	Program Year (Budget EC): / Effective Price Level Date:			2022 / 1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LOCKS	$314,141	$75,394	24.0%	$389,534	8.9%	$342,034	$82,088	$424,122	2022Q2	0.8%	$344,644	$82,715	$427,359
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$19,505	$4,681	24.0%	$24,186	7.4%	$20,941	$5,026	$25,967	2033Q1	40.0%	$29,319	$7,037	$36,355
	LEVEES & FLOODWALLS	$17,876	$4,290	24.0%	$22,166	7.4%	$19,192	$4,606	$23,798	2047Q2	116.4%	$41,522	$9,965	$51,487
	LEVEES & FLOODWALLS	$12,470	$2,993	24.0%	$15,463	7.4%	$13,388	$3,213	$16,601	2068Q1	307.6%	$54,567	$13,096	$67,663
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$37,719	$9,053	24.0%	$46,772	8.6%	$40,978	$9,835	$50,812	2037Q1	58.2%	$64,823	$15,557	$80,380
	CONSTRUCTION ESTIMATE TOTALS:	$401,711	$96,411	24.0%	**$498,121**		$436,532	$104,768	$541,300			$534,874	$128,370	$663,244
	LANDS AND DAMAGES	$1,349	$337	25.0%	$1,686	8.4%	$1,462	$366	$1,828	2040Q2	74.7%	$2,554	$639	$3,193
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$4,017	$964	24.0%	$4,981	4.0%	$4,178	$1,003	$5,180	2029Q1	29.2%	$5,398	$1,295	$6,693
1.0%	Planning & Environmental Compliance	$4,017	$964	24.0%	$4,981	4.0%	$4,178	$1,003	$5,180	2029Q1	29.2%	$5,398	$1,295	$6,693
3.0%	Engineering & Design	$12,051	$2,892	24.0%	$14,944	4.0%	$12,533	$3,008	$15,540	2029Q1	29.2%	$16,193	$3,886	$20,079
1.0%	Reviews, ATRs, IEPRs, VE	$4,017	$964	24.0%	$4,981	4.0%	$4,178	$1,003	$5,180	2029Q1	29.2%	$5,398	$1,295	$6,693
1.0%		$4,017	$964	24.0%	$4,981	4.0%	$4,178	$1,003	$5,180	2029Q1	29.2%	$5,398	$1,295	$6,693
1.0%	Contracting & Reprographics	$4,017	$964	24.0%	$4,981	4.0%	$4,178	$1,003	$5,180	2029Q1	29.2%	$5,398	$1,295	$6,693
1.5%	Engineering During Construction	$6,026	$1,446	24.0%	$7,472	4.0%	$6,266	$1,504	$7,770	2030Q1	34.1%	$8,404	$2,017	$10,421
1.8%	Planning During Construction	$7,335	$1,760	24.0%	$9,096	4.0%	$7,628	$1,831	$9,459	2030Q1	34.1%	$10,231	$2,455	$12,686
1.0%	Adaptive Management & Monitoring	$4,017	$964	24.0%	$4,981	4.0%	$4,178	$1,003	$5,180	2034Q1	56.1%	$6,521	$1,565	$8,087
0.5%	Project Operations	$2,009	$482	24.0%	$2,491	4.0%	$2,089	$501	$2,590	2029Q1	29.2%	$2,699	$648	$3,347
5.0%	Construction Management	$20,086	$4,821	24.0%	$24,906	4.0%	$20,888	$5,013	$25,901	2030Q1	34.1%	$28,014	$6,723	$34,737
2.0%	Project Operation:	$8,034	$1,928	24.0%	$9,962	4.0%	$8,355	$2,005	$10,360	2030Q1	34.1%	$11,206	$2,689	$13,895
1.0%	Project Management	$4,194	$1,007	24.0%	$5,200	4.0%	$4,361	$1,047	$5,408	2030Q1	34.1%	$5,849	$1,404	$7,253
	CONTRACT COST TOTALS:	$486,896	$116,869		**$603,765**		$525,179	$126,058	**$651,237**			$653,534	$156,874	**$810,408**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 12-Apr-21 Effective Price Level: 1-Oct-20				Program Year (Budget EC): 2022 Effective Price Level Date: 1 OCT 21				FULLY FUNDED PROJECT ESTIMATE				
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0
	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Planning & Environmental Compliance	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
3.0%	Engineering & Design	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%		$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Contracting & Reprographics	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.5%	Engineering During Construction	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.8%	Planning During Construction	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Adaptive Management & Monitoring	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.5%	Project Operations	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
5.0%	Construction Management	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
2.0%	Project Operation:	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$0	$0		**$0**		$0	$0	**$0**			$0	$0	**$0**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

DISTRICT: MVN District PREPARED: 4/12/2021
POC: CHIEF, COST ENGINEERING, John Petitbon

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21					
WBS	Civil Works n	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
	RELOCATIONS	$583	$140	24.0%	$724	7.1%	$625	$150	$775	2030Q2	28.8%	$804	$193	$998
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$38,264	$9,183	24.0%	$47,448	7.4%	$41,081	$9,859	$50,941	2033Q1	40.0%	$57,516	$13,804	$71,320
	LEVEES & FLOODWALLS	$16,481	$3,955	24.0%	$20,436	7.4%	$17,694	$4,246	$21,940	2040Q1	73.4%	$30,675	$7,362	$38,036
	LEVEES & FLOODWALLS	$10,954	$2,629	24.0%	$13,583	7.4%	$11,760	$2,822	$14,583	2068Q1	307.6%	$47,932	$11,504	$59,435
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$66,282	$15,908	24.0%	**82,190**		$71,160	$17,078	$88,238			$136,927	$32,862	$169,789
	LANDS AND DAMAGES	$552	$138	25.0%	$ 690	8.4%	$598	$150	$748	2041Q2	80.1%	$1,078	$269	$1,347
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$663	$159	24.0%	$822	4.0%	$689	$165	$855	2029Q1	29.2%	$891	$214	$1,104
1.0%	Planning & Environmental Compliance	$663	$159	24.0%	$822	4.0%	$689	$165	$855	2029Q1	29.2%	$891	$214	$1,104
3.0%	Engineering & Design	$1,988	$477	24.0%	$2,466	4.0%	$2,068	$496	$2,564	2029Q1	29.2%	$2,672	$641	$3,313
1.0%	Reviews, ATRs, IEPRs, VE	$663	$159	24.0%	$822	4.0%	$689	$165	$855	2029Q1	29.2%	$891	$214	$1,104
1.0%		$663	$159	24.0%	$822	4.0%	$689	$165	$855	2029Q1	29.2%	$891	$214	$1,104
1.0%	Contracting & Reprographics	$663	$159	24.0%	$822	4.0%	$689	$165	$855	2029Q1	29.2%	$891	$214	$1,104
1.5%	Engineering During Construction	$994	$239	24.0%	$1,233	4.0%	$1,034	$248	$1,282	2030Q1	34.1%	$1,387	$333	$1,719
1.8%	Planning During Construction	$1,210	$290	24.0%	$1,501	4.0%	$1,259	$302	$1,561	2030Q1	34.1%	$1,688	$405	$2,093
1.0%	Adaptive Management & Monitoring	$663	$159	24.0%	$822	4.0%	$689	$165	$855	2034Q1	56.1%	$1,076	$258	$1,334
0.5%	Project Operations	$331	$80	24.0%	$411	4.0%	$345	$83	$427	2029Q1	29.2%	$445	$107	$552
5.0%	Construction Management	$3,314	$795	24.0%	4,109	4.0%	$3,446	$827	$4,274	2030Q1	34.1%	$4,622	$1,109	$5,732
2.0%	Project Operation:	$1,326	$318	24.0%	1,644	4.0%	$1,379	$331	$1,709	2030Q1	34.1%	$1,849	$444	$2,293
1.0%	Project Management	$692	$166	24.0%	858	4.0%	$720	$173	$892	2030Q1	34.1%	$965	$232	$1,197
	CONTRACT COST TOTALS:	$80,667	$19,366		**100,033**		$86,144	$20,681	**$106,824**			$157,162	$37,730	**$194,892**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

DISTRICT: MVN District PREPARED: 4/12/2021
POC: CHIEF, COST ENGINEERING, John Petitbon

Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**				
		Estimate Prepared:			**12-Apr-21**	Program Year (Budget EC):			2022	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21					
WBS	Civil Works n	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	TOTAL ($K) *J*	Mid-Point Date *P*	INFLATED (%) *L*	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*
	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	FISH & WILDLIFE FACILITIES	$21,177	$5,082	24.0%	$26,259	8.6%	$23,006	$5,521	$28,527	2026Q1	13.1%	$26,012	$6,243	$32,255
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$15,659	$3,758	24.0%	$19,417	8.6%	$17,012	$4,083	$21,094	2026Q2	14.0%	$19,385	$4,653	$24,038
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$36,835	$8,841	24.0%	**$45,676**		$40,018	$9,604	$49,622			$45,398	$10,895	$56,293
	LANDS AND DAMAGES		$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$368	$88	24.0%	$457	4.0%	$383	$92	$475	2024Q1	7.6%	$412	$99	$511
1.0%	Planning & Environmental Compliance	$368	$88	24.0%	$457	4.0%	$383	$92	$475	2024Q1	7.6%	$412	$99	$511
3.0%	Engineering & Design	$1,105	$265	24.0%	$1,370	4.0%	$1,149	$276	$1,425	2024Q1	7.6%	$1,236	$297	$1,533
1.0%	Reviews, ATRs, IEPRs, VE	$368	$88	24.0%	$457	4.0%	$383	$92	$475	2024Q1	7.6%	$412	$99	$511
1.0%		$368	$88	24.0%	$457	4.0%	$383	$92	$475	2024Q1	7.6%	$412	$99	$511
1.0%	Contracting & Reprographics	$368	$88	24.0%	$457	4.0%	$383	$92	$475	2024Q1	7.6%	$412	$99	$511
1.5%	Engineering During Construction	$553	$133	24.0%	$685	4.0%	$575	$138	$712	2026Q1	15.7%	$665	$160	$824
1.8%	Planning During Construction	$673	$161	24.0%	$834	4.0%	$699	$168	$867	2026Q1	15.7%	$809	$194	$1,003
1.0%	Adaptive Management & Monitoring	$368	$88	24.0%	$457	4.0%	$383	$92	$475	2029Q1	29.2%	$495	$119	$614
0.5%	Project Operations	$184	$44	24.0%	$228	4.0%	$192	$46	$237	2024Q1	7.6%	$206	$49	$255
5.0%	Construction Management	$1,842	$442	24.0%	$2,284	4.0%	$1,915	$460	$2,375	2026Q1	15.7%	$2,215	$532	$2,747
2.0%	Project Operation:	$737	$177	24.0%	$914	4.0%	$766	$184	$950	2026Q1	15.7%	$886	$213	$1,099
1.0%	Project Management	$385	$92	24.0%	$477	4.0%	$400	$96	$496	2026Q1	15.7%	$463	$111	$574
	CONTRACT COST TOTALS:	$44,523	$10,686		**$55,209**		$48,012	$11,523	**$59,535**			$54,433	$13,064	**$67,497**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			**12-Apr-21**	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH G-3													
02	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$11,125	$2,670	24.0%	$13,795	8.6%	$12,086	$2,901	$14,987	2026Q1	13.1%	$13,666	$3,280	$16,946
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
13	PUMPING PLANT	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$11,125	$2,670	24.0%	**$13,795**		$12,086	$2,901	$14,987			$13,666	$3,280	$16,946
01	LANDS AND DAMAGES		$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$111	$27	24.0%	$138	4.0%	$116	$28	$143	2024Q1	7.6%	$124	$30	$154
1.0%	Planning & Environmental Compliance	$111	$27	24.0%	$138	4.0%	$116	$28	$143	2024Q1	7.6%	$124	$30	$154
3.0%	Engineering & Design	$334	$80	24.0%	$414	4.0%	$347	$83	$430	2024Q1	7.6%	$373	$90	$463
1.0%	Reviews, ATRs, IEPRs, VE	$111	$27	24.0%	$138	4.0%	$116	$28	$143	2024Q1	7.6%	$124	$30	$154
1.0%		$111	$27	24.0%	$138	4.0%	$116	$28	$143	2024Q1	7.6%	$124	$30	$154
1.0%	Contracting & Reprographics	$111	$27	24.0%	$138	4.0%	$116	$28	$143	2024Q1	7.6%	$124	$30	$154
1.5%	Engineering During Construction	$167	$40	24.0%	$207	4.0%	$174	$42	$215	2025Q1	11.5%	$194	$46	$240
1.8%	Planning During Construction	$203	$49	24.0%	$252	4.0%	$211	$51	$262	2025Q1	11.5%	$236	$57	$292
1.0%	Adaptive Management & Monitoring	$111	$27	24.0%	$138	4.0%	$116	$28	$143	2029Q1	29.2%	$149	$36	$185
0.5%	Project Operations	$56	$13	24.0%	$69	4.0%	$58	$14	$72	2024Q1	7.6%	$62	$15	$77
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$556	$134	24.0%	$690	4.0%	$578	$139	$717	2025Q1	11.5%	$645	$155	$800
2.0%	Project Operation:	$223	$53	24.0%	$276	4.0%	$231	$56	$287	2025Q1	11.5%	$258	$62	$320
1.0%	Project Management	$116	$28	24.0%	$144	4.0%	$121	$29	$150	2025Q1	11.5%	$135	$32	$167
	CONTRACT COST TOTALS:	$13,447	$3,227		**$16,675**		$14,501	$3,480	**$17,981**			$16,340	$3,922	**$20,262**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
			Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
			Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER		Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A		*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
		REACH H-1													
02		RELOCATIONS	$1,886	$453	24.0%	$2,338	7.1%	$2,019	$485	$2,504	2022Q2	0.8%	$2,035	$488	$2,523
05		LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$20,374	$4,890	24.0%	$25,264	8.6%	$22,134	$5,312	$27,446	2023Q2	4.0%	$23,015	$5,524	$28,539
11		LEVEES & FLOODWALLS	$107,606	$25,825	24.0%	$133,431	7.4%	$115,527	$27,727	$143,254	2033Q2	41.1%	$163,014	$39,123	$202,138
11		LEVEES & FLOODWALLS	$41,902	$10,056	24.0%	$51,958	7.4%	$44,986	$10,797	$55,783	2048Q1	121.3%	$99,566	$23,896	$123,461
11		LEVEES & FLOODWALLS	$31,397	$7,535	24.0%	$38,932	7.4%	$33,708	$8,090	$41,798	2068Q2	310.8%	$138,462	$33,231	$171,693
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$295	$71	24.0%	$365	8.6%	$320	$77	$397	2031Q2	32.7%	$425	$102	$527
15		RUCTURE	$37,030	$8,887	24.0%	$45,917	8.6%	$40,229	$9,655	$49,884	2039Q1	68.2%	$67,646	$16,235	$83,880
		CONSTRUCTION ESTIMATE TOTALS:	$240,489	$57,717	24.0%	**$298,207**		$258,925	$62,142	$321,067			$494,162	$118,599	$612,761
01		LANDS AND DAMAGES	$2,426	$607	25.0%	$3,033	8.4%	$2,630	$658	$3,288	2039Q2	69.5%	$4,457	$1,114	$5,571
30		PLANNING, ENGINEERING & DESIGN													
	1.0%	Project Management	$2,405	$577	24.0%	$2,982	4.0%	$2,501	$600	$3,101	2028Q1	24.5%	$3,113	$747	$3,860
	1.0%	Planning & Environmental Compliance	$2,405	$577	24.0%	$2,982	4.0%	$2,501	$600	$3,101	2028Q1	24.5%	$3,113	$747	$3,860
	3.0%	Engineering & Design	$7,215	$1,732	24.0%	$8,946	4.0%	$7,503	$1,801	$9,303	2028Q1	24.5%	$9,339	$2,241	$11,581
	1.0%	Reviews, ATRs, IEPRs, VE	$2,405	$577	24.0%	$2,982	4.0%	$2,501	$600	$3,101	2028Q1	24.5%	$3,113	$747	$3,860
	1.0%		$2,405	$577	24.0%	$2,982	4.0%	$2,501	$600	$3,101	2028Q1	24.5%	$3,113	$747	$3,860
	1.0%	Contracting & Reprographics	$2,405	$577	24.0%	$2,982	4.0%	$2,501	$600	$3,101	2028Q1	24.5%	$3,113	$747	$3,860
	1.5%	Engineering During Construction	$3,607	$866	24.0%	$4,473	4.0%	$3,751	$900	$4,652	2029Q1	29.2%	$4,847	$1,163	$6,010
	1.8%	Planning During Construction	$4,391	$1,054	24.0%	$5,445	4.0%	$4,567	$1,096	$5,663	2029Q1	29.2%	$5,901	$1,416	$7,317
	1.0%	Adaptive Management & Monitoring	$2,405	$577	24.0%	$2,982	4.0%	$2,501	$600	$3,101	2033Q1	50.2%	$3,758	$902	$4,659
	0.5%	Project Operations	$1,202	$289	24.0%	$1,491	4.0%	$1,250	$300	$1,551	2028Q1	24.5%	$1,557	$374	$1,930
31		CONSTRUCTION MANAGEMENT													
	5.0%	Construction Management	$12,024	$2,886	24.0%	$14,910	4.0%	$12,505	$3,001	$15,506	2029Q1	29.2%	$16,157	$3,878	$20,035
	2.0%	Project Operation:	$4,810	$1,154	24.0%	$5,964	4.0%	$5,002	$1,200	$6,202	2029Q1	29.2%	$6,463	$1,551	$8,014
	1.0%	Project Management	$2,511	$603	24.0%	$3,113	4.0%	$2,611	$627	$3,238	2029Q1	29.2%	$3,374	$810	$4,183
		CONTRACT COST TOTALS:	$293,106	$70,370		**$363,475**		$313,749	$75,326	**$389,075**			$565,579	$135,784	**$701,363**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf — DISTRICT: MVN District — PREPARED: 4/12/2021
LOCATION: Morganza to the Gulf — POC: CHIEF, COST ENGINEERING, John Petitbon
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH H-2													
02	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$324	$78	24.0%	$402	8.6%	$352	$85	$437	2029Q2	24.9%	$440	$106	$546
15	RUCTURE	$36,672	$8,801	24.0%	$45,473	8.6%	$39,840	$9,562	$49,402	2039Q1	68.2%	$66,992	$16,078	$83,070
	CONSTRUCTION ESTIMATE TOTALS:	$36,996	$8,879	24.0%	**$45,876**		$40,193	$9,646	$49,839			$67,432	$16,184	$83,615
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$370	$89	24.0%	$459	4.0%	$385	$92	$477	2027Q1	19.9%	$461	$111	$572
1.0%	Planning & Environmental Compliance	$370	$89	24.0%	$459	4.0%	$385	$92	$477	2027Q1	19.9%	$461	$111	$572
3.0%	Engineering & Design	$1,110	$266	24.0%	$1,376	4.0%	$1,154	$277	$1,431	2027Q1	19.9%	$1,384	$332	$1,717
1.0%	Reviews, ATRs, IEPRs, VE	$370	$89	24.0%	$459	4.0%	$385	$92	$477	2027Q1	19.9%	$461	$111	$572
1.0%		$370	$89	24.0%	$459	4.0%	$385	$92	$477	2027Q1	19.9%	$461	$111	$572
1.0%	Contracting & Reprographics	$370	$89	24.0%	$459	4.0%	$385	$92	$477	2027Q1	19.9%	$461	$111	$572
1.5%	Engineering During Construction	$555	$133	24.0%	$688	4.0%	$577	$139	$716	2028Q2	25.6%	$725	$174	$899
1.8%	Planning During Construction	$676	$162	24.0%	$838	4.0%	$703	$169	$871	2028Q2	25.6%	$883	$212	$1,094
1.0%	Adaptive Management & Monitoring	$370	$89	24.0%	$459	4.0%	$385	$92	$477	2032Q2	46.0%	$562	$135	$696
0.5%	Project Operations	$185	$44	24.0%	$229	4.0%	$192	$46	$239	2027Q1	19.9%	$231	$55	$286
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$1,850	$444	24.0%	$2,294	4.0%	$1,924	$462	$2,385	2028Q2	25.6%	$2,417	$580	$2,997
2.0%	Project Operation:	$740	$178	24.0%	$918	4.0%	$769	$185	$954	2028Q2	25.6%	$967	$232	$1,199
1.0%	Project Management	$386	$93	24.0%	$479	4.0%	$402	$96	$498	2028Q2	25.6%	$505	$121	$626
	CONTRACT COST TOTALS:	$44,718	$10,732		**$55,450**		$48,222	$11,573	**$59,795**			$77,412	$18,579	**$95,990**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH H-3													
02	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$397	$95	24.0%	$492	8.6%	$431	$104	$535	2027Q2	17.5%	$507	$122	$628
15	RUCTURE	$44,229	$10,615	24.0%	$54,843	8.6%	$48,049	$11,532	$59,581	2037Q1	58.2%	$76,010	$18,242	$94,253
	CONSTRUCTION ESTIMATE TOTALS:	$44,626	$10,710	24.0%	**$55,336**		$48,481	$11,635	$60,116			$76,517	$18,364	$94,881
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$446	$107	24.0%	$553	4.0%	$464	$111	$575	2026Q1	15.7%	$537	$129	$666
1.0%	Planning & Environmental Compliance	$446	$107	24.0%	$553	4.0%	$464	$111	$575	2026Q1	15.7%	$537	$129	$666
3.0%	Engineering & Design	$1,339	$321	24.0%	$1,660	4.0%	$1,392	$334	$1,726	2026Q1	15.7%	$1,610	$386	$1,997
1.0%	Reviews, ATRs, IEPRs, VE	$446	$107	24.0%	$553	4.0%	$464	$111	$575	2026Q1	15.7%	$537	$129	$666
1.0%		$446	$107	24.0%	$553	4.0%	$464	$111	$575	2026Q1	15.7%	$537	$129	$666
1.0%	Contracting & Reprographics	$446	$107	24.0%	$553	4.0%	$464	$111	$575	2026Q1	15.7%	$537	$129	$666
1.5%	Engineering During Construction	$669	$161	24.0%	$830	4.0%	$696	$167	$863	2027Q2	21.0%	$842	$202	$1,045
1.8%	Planning During Construction	$815	$196	24.0%	$1,010	4.0%	$847	$203	$1,051	2027Q2	21.0%	$1,026	$246	$1,272
1.0%	Adaptive Management & Monitoring	$446	$107	24.0%	$553	4.0%	$464	$111	$575	2031Q1	39.2%	$646	$155	$801
0.5%	Project Operations	$223	$54	24.0%	$277	4.0%	$232	$56	$288	2026Q1	15.7%	$268	$64	$333
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$2,231	$536	24.0%	$2,767	4.0%	$2,320	$557	$2,877	2027Q2	21.0%	$2,808	$674	$3,482
2.0%	Project Operation:	$893	$214	24.0%	$1,107	4.0%	$928	$223	$1,151	2027Q2	21.0%	$1,123	$270	$1,393
1.0%	Project Management	$466	$112	24.0%	$578	4.0%	$484	$116	$601	2027Q2	21.0%	$586	$141	$727
	CONTRACT COST TOTALS:	$53,939	$12,945		**$66,884**		$58,166	$13,960	**$72,126**			$88,112	$21,147	**$109,259**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf | DISTRICT: MVN District | PREPARED: 4/12/2021
LOCATION: Morganza to the Gulf | POC: CHIEF, COST ENGINEERING, John Petitbon

This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
			Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
			Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER		Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A		*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
		REACH I-1													
02		RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05		LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$108,144	$25,955	24.0%	$134,099	7.4%	$116,105	$27,865	$143,971	2032Q2	36.9%	$158,904	$38,137	$197,041
11		LEVEES & FLOODWALLS	$30,714	$7,371	24.0%	$38,085	7.4%	$32,975	$7,914	$40,889	2048Q1	121.3%	$72,982	$17,516	$90,497
11		LEVEES & FLOODWALLS	$20,564	$4,935	24.0%	$25,500	7.4%	$22,078	$5,299	$27,377	2067Q2	298.4%	$87,962	$21,111	$109,073
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$30,405	$7,297	24.0%	$37,702	8.6%	$33,031	$7,928	$40,959	2025Q1	9.7%	$36,225	$8,694	$44,919
15		RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		CONSTRUCTION ESTIMATE TOTALS:	$189,827	$45,558	24.0%	**$235,386**		$204,190	$49,006	$253,195			$356,072	$85,457	$441,530
01		LANDS AND DAMAGES	$2,643	$661	25.0%	$3,304	8.4%	$2,865	$716	$3,581	2041Q2	80.1%	$5,161	$1,290	$6,451
30		PLANNING, ENGINEERING & DESIGN													
	1.0%	Project Management	$1,898	$456	24.0%	$2,354	4.0%	$1,974	$474	$2,448	2028Q1	24.5%	$2,457	$590	$3,047
	1.0%	Planning & Environmental Compliance	$1,898	$456	24.0%	$2,354	4.0%	$1,974	$474	$2,448	2028Q1	24.5%	$2,457	$590	$3,047
	3.0%	Engineering & Design	$5,695	$1,367	24.0%	$7,062	4.0%	$5,922	$1,421	$7,344	2028Q1	24.5%	$7,372	$1,769	$9,141
	1.0%	Reviews, ATRs, IEPRs, VE	$1,898	$456	24.0%	$2,354	4.0%	$1,974	$474	$2,448	2028Q1	24.5%	$2,457	$590	$3,047
	1.0%		$1,898	$456	24.0%	$2,354	4.0%	$1,974	$474	$2,448	2028Q1	24.5%	$2,457	$590	$3,047
	1.0%	Contracting & Reprographics	$1,898	$456	24.0%	$2,354	4.0%	$1,974	$474	$2,448	2028Q1	24.5%	$2,457	$590	$3,047
	1.5%	Engineering During Construction	$2,847	$683	24.0%	$3,531	4.0%	$2,961	$711	$3,672	2029Q1	29.2%	$3,826	$918	$4,744
	1.8%	Planning During Construction	$3,466	$832	24.0%	$4,298	4.0%	$3,605	$865	$4,470	2029Q1	29.2%	$4,658	$1,118	$5,775
	1.0%	Adaptive Management & Monitoring	$1,898	$456	24.0%	$2,354	4.0%	$1,974	$474	$2,448	2033Q1	50.2%	$2,966	$712	$3,678
	0.5%	Project Operations	$949	$228	24.0%	$1,177	4.0%	$987	$237	$1,224	2028Q1	24.5%	$1,229	$295	$1,524
31		CONSTRUCTION MANAGEMENT													
	5.0%	Construction Management	$9,491	$2,278	24.0%	$11,769	4.0%	$9,870	$2,369	$12,239	2029Q1	29.2%	$12,753	$3,061	$15,814
	2.0%	Project Operation:	$3,797	$911	24.0%	$4,708	4.0%	$3,948	$948	$4,896	2029Q1	29.2%	$5,101	$1,224	$6,326
	1.0%	Project Management	$1,982	$476	24.0%	$2,457	4.0%	$2,061	$495	$2,556	2029Q1	29.2%	$2,663	$639	$3,302
		CONTRACT COST TOTALS:	$232,087	$55,727		**$287,815**		$248,254	$59,610	**$307,863**			$414,087	$99,433	**$513,520**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	REACH I-2													
02	RELOCATIONS	$1,703	$409	24.0%	$2,112	7.1%	$1,824	$438	$2,261	2032Q2	36.9%	$2,496	$599	$3,095
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$16,468	$3,952	24.0%	$20,420	7.4%	$17,680	$4,243	$21,924	2035Q1	48.8%	$26,312	$6,315	$32,627
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$18,171	$4,361	24.0%	**$22,532**		$19,504	$4,681	$24,185			$28,808	$6,914	$35,722
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$182	$44	24.0%	$225	4.0%	$189	$45	$234	2033Q1	50.2%	$284	$68	$352
1.0%	Planning & Environmental Compliance	$182	$44	24.0%	$225	4.0%	$189	$45	$234	2033Q1	50.2%	$284	$68	$352
3.0%	Engineering & Design	$545	$131	24.0%	$676	4.0%	$567	$136	$703	2033Q1	50.2%	$852	$204	$1,056
1.0%	Reviews, ATRs, IEPRs, VE	$182	$44	24.0%	$225	4.0%	$189	$45	$234	2033Q1	50.2%	$284	$68	$352
1.0%		$182	$44	24.0%	$225	4.0%	$189	$45	$234	2033Q1	50.2%	$284	$68	$352
1.0%	Contracting & Reprographics	$182	$44	24.0%	$225	4.0%	$189	$45	$234	2033Q1	50.2%	$284	$68	$352
1.5%	Engineering During Construction	$273	$65	24.0%	$338	4.0%	$283	$68	$351	2034Q1	56.1%	$442	$106	$549
1.8%	Planning During Construction	$332	$80	24.0%	$411	4.0%	$345	$83	$428	2034Q1	56.1%	$539	$129	$668
1.0%	Adaptive Management & Monitoring	$182	$44	24.0%	$225	4.0%	$189	$45	$234	2038Q1	82.4%	$345	$83	$427
0.5%	Project Operations	$91	$22	24.0%	$113	4.0%	$94	$23	$117	2033Q1	50.2%	$142	$34	$176
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$909	$218	24.0%	$1,127	4.0%	$945	$227	$1,172	2034Q1	56.1%	$1,475	$354	$1,829
2.0%	Project Operation:	$363	$87	24.0%	$451	4.0%	$378	$91	$469	2034Q1	56.1%	$590	$142	$732
1.0%	Project Management	$190	$46	24.0%	$235	4.0%	$197	$47	$245	2034Q1	56.1%	$308	$74	$382
	CONTRACT COST TOTALS:	$21,963	$5,271		**$27,234**		$23,448	$5,627	**$29,075**			$34,920	$8,381	**$43,301**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	REACH I-3													
02	RELOCATIONS	$43,688	$10,485	24.0%	$54,173	7.1%	$46,781	$11,228	$58,009	2022Q2	0.8%	$47,138	$11,313	$58,452
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$29,430	$7,063	24.0%	$36,494	8.6%	$31,973	$7,673	$39,646	2023Q1	3.2%	$32,987	$7,917	$40,904
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$73,118	$17,548	24.0%	**$90,666**		$78,754	$18,901	$97,655			$80,125	$19,230	$99,356
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$731	$175	24.0%	$907	4.0%	$760	$182	$943	2022Q1	0.0%	$760	$182	$943
1.0%	Planning & Environmental Compliance	$731	$175	24.0%	$907	4.0%	$760	$182	$943	2022Q1	0.0%	$760	$182	$943
3.0%	Engineering & Design	$2,194	$526	24.0%	$2,720	4.0%	$2,281	$547	$2,829	2022Q1	0.0%	$2,281	$547	$2,829
1.0%	Reviews, ATRs, IEPRs, VE	$731	$175	24.0%	$907	4.0%	$760	$182	$943	2022Q1	0.0%	$760	$182	$943
1.0%		$731	$175	24.0%	$907	4.0%	$760	$182	$943	2022Q1	0.0%	$760	$182	$943
1.0%	Contracting & Reprographics	$731	$175	24.0%	$907	4.0%	$760	$182	$943	2022Q1	0.0%	$760	$182	$943
1.5%	Engineering During Construction	$1,097	$263	24.0%	$1,360	4.0%	$1,141	$274	$1,414	2022Q2	0.9%	$1,151	$276	$1,427
1.8%	Planning During Construction	$1,335	$320	24.0%	$1,656	4.0%	$1,388	$333	$1,722	2022Q2	0.9%	$1,401	$336	$1,738
1.0%	Adaptive Management & Monitoring	$731	$175	24.0%	$907	4.0%	$760	$182	$943	2027Q1	19.9%	$912	$219	$1,131
0.5%	Project Operations	$366	$88	24.0%	$453	4.0%	$380	$91	$471	2022Q1	0.0%	$380	$91	$471
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$3,656	$877	24.0%	$4,533	4.0%	$3,802	$912	$4,714	2022Q2	0.9%	$3,837	$921	$4,758
2.0%	Project Operation:	$1,462	$351	24.0%	$1,813	4.0%	$1,521	$365	$1,886	2022Q2	0.9%	$1,535	$368	$1,903
1.0%	Project Management	$763	$183	24.0%	$947	4.0%	$794	$191	$984	2022Q2	0.9%	$801	$192	$993
	CONTRACT COST TOTALS:	$88,378	$21,211		**$109,589**		$94,623	$22,710	**$117,333**			$96,226	$23,094	**$119,320**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH J-1													
02	RELOCATIONS	$17,572	$4,217	24.0%	$21,789	7.1%	$18,816	$4,516	$23,332	2025Q2	10.5%	$20,797	$4,991	$25,789
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$124,785	$29,948	24.0%	$154,733	7.4%	$133,971	$32,153	$166,124	2027Q1	16.6%	$156,174	$37,482	$193,655
11	LEVEES & FLOODWALLS	$56,249	$13,500	24.0%	$69,748	7.4%	$60,390	$14,494	$74,883	2048Q1	121.3%	$133,657	$32,078	$165,734
11	LEVEES & FLOODWALLS	$33,288	$7,989	24.0%	$41,277	7.4%	$35,738	$8,577	$44,315	2069Q1	320.2%	$150,174	$36,042	$186,215
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$231,894	$55,654	24.0%	**$287,548**		$248,915	$59,740	$308,655			$460,801	$110,592	$571,394
01	LANDS AND DAMAGES	$2,488	$622	25.0%	$3,110	8.4%	$2,697	$674	$3,371	2042Q2	85.7%	$5,009	$1,252	$6,261
30	PLANNING, ENGINEERING & DESIGN													
	1.0% Project Management	$2,319	$557	24.0%	$2,875	4.0%	$2,412	$579	$2,990	2024Q1	7.6%	$2,594	$623	$3,216
	1.0% Planning & Environmental Compliance	$2,319	$557	24.0%	$2,875	4.0%	$2,412	$579	$2,990	2024Q1	7.6%	$2,594	$623	$3,216
	3.0% Engineering & Design	$6,957	$1,670	24.0%	$8,626	4.0%	$7,235	$1,736	$8,971	2024Q1	7.6%	$7,782	$1,868	$9,649
	1.0% Reviews, ATRs, IEPRs, VE	$2,319	$557	24.0%	$2,875	4.0%	$2,412	$579	$2,990	2024Q1	7.6%	$2,594	$623	$3,216
	1.0%	$2,319	$557	24.0%	$2,875	4.0%	$2,412	$579	$2,990	2024Q1	7.6%	$2,594	$623	$3,216
	1.0% Contracting & Reprographics	$2,319	$557	24.0%	$2,875	4.0%	$2,412	$579	$2,990	2024Q1	7.6%	$2,594	$623	$3,216
	1.5% Engineering During Construction	$3,478	$835	24.0%	$4,313	4.0%	$3,617	$868	$4,485	2026Q1	15.7%	$4,184	$1,004	$5,188
	1.8% Planning During Construction	$4,234	$1,016	24.0%	$5,251	4.0%	$4,403	$1,057	$5,460	2026Q1	15.7%	$5,093	$1,222	$6,316
	1.0% Adaptive Management & Monitoring	$2,319	$557	24.0%	$2,875	4.0%	$2,412	$579	$2,990	2029Q1	29.2%	$3,116	$748	$3,864
	0.5% Project Operations	$1,159	$278	24.0%	$1,438	4.0%	$1,206	$289	$1,495	2024Q1	7.6%	$1,297	$311	$1,608
31	CONSTRUCTION MANAGEMENT													
	5.0% Construction Management	$11,595	$2,783	24.0%	$14,377	4.0%	$12,058	$2,894	$14,952	2026Q1	15.7%	$13,947	$3,347	$17,294
	2.0% Project Operation:	$4,638	$1,113	24.0%	$5,751	4.0%	$4,823	$1,158	$5,981	2026Q1	15.7%	$5,579	$1,339	$6,918
	1.0% Project Management	$2,421	$581	24.0%	$3,002	4.0%	$2,518	$604	$3,122	2026Q1	15.7%	$2,912	$699	$3,611
	CONTRACT COST TOTALS:	$282,778	$67,892		**$350,669**		$301,941	$72,493	**$374,434**			$522,690	$125,496	**$648,185**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH J-2													
02	RELOCATIONS	$50,379	$12,091	24.0%	$62,469	7.1%	$53,946	$12,947	$66,893	2029Q2	24.9%	$67,370	$16,169	$83,539
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$39,072	$9,377	24.0%	$48,450	8.6%	$42,448	$10,187	$52,635	2033Q1	40.0%	$59,430	$14,263	$73,693
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$89,451	$21,468	24.0%	**$110,919**		$96,394	$23,135	$119,528			$126,800	$30,432	$157,231
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$895	$215	24.0%	$1,109	4.0%	$930	$223	$1,153	2031Q1	39.2%	$1,295	$311	$1,606
1.0%	Planning & Environmental Compliance	$895	$215	24.0%	$1,109	4.0%	$930	$223	$1,153	2031Q1	39.2%	$1,295	$311	$1,606
3.0%	Engineering & Design	$2,684	$644	24.0%	$3,328	4.0%	$2,791	$670	$3,460	2031Q1	39.2%	$3,885	$932	$4,817
1.0%	Reviews, ATRs, IEPRs, VE	$895	$215	24.0%	$1,109	4.0%	$930	$223	$1,153	2031Q1	39.2%	$1,295	$311	$1,606
1.0%		$895	$215	24.0%	$1,109	4.0%	$930	$223	$1,153	2031Q1	39.2%	$1,295	$311	$1,606
1.0%	Contracting & Reprographics	$895	$215	24.0%	$1,109	4.0%	$930	$223	$1,153	2031Q1	39.2%	$1,295	$311	$1,606
1.5%	Engineering During Construction	$1,342	$322	24.0%	$1,664	4.0%	$1,395	$335	$1,730	2033Q1	50.2%	$2,096	$503	$2,600
1.8%	Planning During Construction	$1,633	$392	24.0%	$2,025	4.0%	$1,699	$408	$2,106	2033Q1	50.2%	$2,552	$613	$3,165
1.0%	Adaptive Management & Monitoring	$895	$215	24.0%	$1,109	4.0%	$930	$223	$1,153	2036Q1	68.6%	$1,569	$377	$1,945
0.5%	Project Operations	$447	$107	24.0%	$555	4.0%	$465	$112	$577	2031Q1	39.2%	$648	$155	$803
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$4,473	$1,073	24.0%	$5,546	4.0%	$4,651	$1,116	$5,767	2033Q1	50.2%	$6,988	$1,677	$8,666
2.0%	Project Operation:	$1,789	$429	24.0%	$2,218	4.0%	$1,860	$447	$2,307	2033Q1	50.2%	$2,795	$671	$3,466
1.0%	Project Management	$934	$224	24.0%	$1,158	4.0%	$971	$233	$1,204	2033Q1	50.2%	$1,459	$350	$1,809
	CONTRACT COST TOTALS:	$108,119	$25,949		**$134,068**		$115,808	$27,794	**$143,602**			$155,267	$37,264	**$192,532**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH J-3													
02	RELOCATIONS	$6,621	$1,589	24.0%	$8,210	7.1%	$7,090	$1,702	$8,791	2026Q2	14.0%	$8,079	$1,939	$10,018
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$19,827	$4,758	24.0%	$24,585	7.4%	$21,286	$5,109	$26,395	2029Q1	23.9%	$26,376	$6,330	$32,706
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$324	$78	24.0%	$402	8.6%	$352	$85	$437	2025Q2	10.5%	$389	$93	$483
15	RUCTURE	$28,834	$6,920	24.0%	$35,754	8.6%	$31,325	$7,518	$38,843	2037Q1	58.2%	$49,554	$11,893	$61,447
	CONSTRUCTION ESTIMATE TOTALS:	$55,606	$13,345	24.0%	**$68,952**		$60,054	$14,413	$74,466			$84,398	$20,256	$104,654
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$556	$133	24.0%	$690	4.0%	$578	$139	$717	2024Q1	7.6%	$622	$149	$771
1.0%	Planning & Environmental Compliance	$556	$133	24.0%	$690	4.0%	$578	$139	$717	2024Q1	7.6%	$622	$149	$771
3.0%	Engineering & Design	$1,668	$400	24.0%	$2,069	4.0%	$1,735	$416	$2,151	2024Q1	7.6%	$1,866	$448	$2,314
1.0%	Reviews, ATRs, IEPRs, VE	$556	$133	24.0%	$690	4.0%	$578	$139	$717	2024Q1	7.6%	$622	$149	$771
1.0%		$556	$133	24.0%	$690	4.0%	$578	$139	$717	2024Q1	7.6%	$622	$149	$771
1.0%	Contracting & Reprographics	$556	$133	24.0%	$690	4.0%	$578	$139	$717	2024Q1	7.6%	$622	$149	$771
1.5%	Engineering During Construction	$834	$200	24.0%	$1,034	4.0%	$867	$208	$1,076	2025Q1	11.5%	$968	$232	$1,200
1.8%	Planning During Construction	$1,015	$244	24.0%	$1,259	4.0%	$1,056	$253	$1,309	2025Q1	11.5%	$1,178	$283	$1,460
1.0%	Adaptive Management & Monitoring	$556	$133	24.0%	$690	4.0%	$578	$139	$717	2029Q1	29.2%	$747	$179	$926
0.5%	Project Operations	$278	$67	24.0%	$345	4.0%	$289	$69	$359	2024Q1	7.6%	$311	$75	$386
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$2,780	$667	24.0%	$3,448	4.0%	$2,891	$694	$3,585	2025Q1	11.5%	$3,225	$774	$3,999
2.0%	Project Operation:	$1,112	$267	24.0%	$1,379	4.0%	$1,157	$278	$1,434	2025Q1	11.5%	$1,290	$310	$1,600
1.0%	Project Management	$581	$139	24.0%	$720	4.0%	$604	$145	$749	2025Q1	11.5%	$673	$162	$835
	CONTRACT COST TOTALS:	$67,211	$16,131		**$83,342**		$72,122	$17,309	**$89,431**			$97,766	$23,464	**$121,230**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf | DISTRICT: MVN District | PREPARED: 4/12/2021
LOCATION: Morganza to the Gulf | POC: CHIEF, COST ENGINEERING, John Petitbon
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
			Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
			Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER		Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A		B	C	D	E	F	G	H	I	J	P	L	M	N	O
		REACH K													
02		RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05		LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$20,031	$4,808	24.0%	$24,839	8.6%	$21,762	$5,223	$26,985	2040Q2	74.7%	$38,023	$9,126	$47,149
11		LEVEES & FLOODWALLS	$148,858	$35,726	24.0%	$184,584	7.4%	$159,816	$38,356	$198,172	2033Q1	40.0%	$223,753	$53,701	$277,454
11		LEVEES & FLOODWALLS	$39,785	$9,548	24.0%	$49,333	7.4%	$42,713	$10,251	$52,965	2048Q2	123.1%	$95,276	$22,866	$118,143
11		LEVEES & FLOODWALLS	$16,739	$4,017	24.0%	$20,757	7.4%	$17,971	$4,313	$22,285	2069Q1	320.2%	$75,517	$18,124	$93,641
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		CONSTRUCTION ESTIMATE TOTALS:	$225,413	$54,099	24.0%	**$279,512**		$242,263	$58,143	$300,406			$432,570	$103,817	$536,387
01		LANDS AND DAMAGES	$2,260	$565	25.0%	$2,825	8.4%	$2,450	$612	$3,062	2029Q2	24.9%	$3,059	$765	$3,824
30		PLANNING, ENGINEERING & DESIGN													
	1.0%	Project Management	$2,254	$541	24.0%	$2,795	4.0%	$2,344	$563	$2,907	2032Q1	44.6%	$3,390	$814	$4,203
	1.0%	Planning & Environmental Compliance	$2,254	$541	24.0%	$2,795	4.0%	$2,344	$563	$2,907	2032Q1	44.6%	$3,390	$814	$4,203
	3.0%	Engineering & Design	$6,762	$1,623	24.0%	$8,385	4.0%	$7,032	$1,688	$8,720	2032Q1	44.6%	$10,170	$2,441	$12,610
	1.0%	Reviews, ATRs, IEPRs, VE	$2,254	$541	24.0%	$2,795	4.0%	$2,344	$563	$2,907	2032Q1	44.6%	$3,390	$814	$4,203
	1.0%		$2,254	$541	24.0%	$2,795	4.0%	$2,344	$563	$2,907	2032Q1	44.6%	$3,390	$814	$4,203
	1.0%	Contracting & Reprographics	$2,254	$541	24.0%	$2,795	4.0%	$2,344	$563	$2,907	2032Q1	44.6%	$3,390	$814	$4,203
	1.5%	Engineering During Construction	$3,381	$811	24.0%	$4,193	4.0%	$3,516	$844	$4,360	2033Q1	50.2%	$5,283	$1,268	$6,551
	1.8%	Planning During Construction	$4,116	$988	24.0%	$5,104	4.0%	$4,280	$1,027	$5,308	2033Q1	50.2%	$6,431	$1,544	$7,975
	1.0%	Adaptive Management & Monitoring	$2,254	$541	24.0%	$2,795	4.0%	$2,344	$563	$2,907	2037Q1	75.4%	$4,111	$987	$5,098
	0.5%	Project Operations	$1,127	$270	24.0%	$1,398	4.0%	$1,172	$281	$1,453	2032Q1	44.6%	$1,695	$407	$2,102
31		CONSTRUCTION MANAGEMENT													
	5.0%	Construction Management	$11,271	$2,705	24.0%	$13,976	4.0%	$11,721	$2,813	$14,534	2033Q1	50.2%	$17,610	$4,226	$21,837
	2.0%	Project Operation:	$4,508	$1,082	24.0%	$5,590	4.0%	$4,688	$1,125	$5,813	2033Q1	50.2%	$7,044	$1,691	$8,735
	1.0%	Project Management	$2,353	$565	24.0%	$2,918	4.0%	$2,447	$587	$3,035	2033Q1	50.2%	$3,677	$882	$4,560
		CONTRACT COST TOTALS:	$274,717	$65,955		**$340,672**		$293,635	$70,497	**$364,132**			$508,600	$122,095	**$630,695**

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DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

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		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH L													
02	RELOCATIONS	$12,311	$2,955	24.0%	$15,265	7.1%	$13,182	$3,164	$16,346	2022Q2	0.8%	$13,283	$3,188	$16,471
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$11,908	$2,858	24.0%	$14,766	8.6%	$12,936	$3,105	$16,041	2031Q1	31.7%	$17,039	$4,089	$21,128
11	LEVEES & FLOODWALLS	$114,676	$27,522	24.0%	$142,198	7.4%	$123,118	$29,548	$152,666	2026Q1	13.1%	$139,207	$33,410	$172,616
11	LEVEES & FLOODWALLS	$37,923	$9,101	24.0%	$47,024	7.4%	$40,714	$9,771	$50,486	2033Q3	42.2%	$57,897	$13,895	$71,792
11	LEVEES & FLOODWALLS	$23,540	$5,650	24.0%	$29,190	7.4%	$25,273	$6,066	$31,338	2043Q3	93.0%	$48,770	$11,705	$60,474
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$125,622	$30,149	24.0%	$155,771	8.6%	$136,474	$32,754	$169,228	2023Q2	4.0%	$141,907	$34,058	$175,965
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$325,979	$78,235	24.0%	**$404,214**		$351,699	$84,408	$436,106			$418,102	$100,345	$518,447
01	LANDS AND DAMAGES	$329	$82	25.0%	$411	8.4%	$356	$89	$445	2036Q2	54.6%	$551	$138	$689
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$3,260	$782	24.0%	$4,042	4.0%	$3,390	$814	$4,204	2025Q1	11.5%	$3,781	$907	$4,689
1.0%	Planning & Environmental Compliance	$3,260	$782	24.0%	$4,042	4.0%	$3,390	$814	$4,204	2025Q1	11.5%	$3,781	$907	$4,689
3.0%	Engineering & Design	$9,779	$2,347	24.0%	$12,126	4.0%	$10,170	$2,441	$12,611	2025Q1	11.5%	$11,344	$2,722	$14,066
1.0%	Reviews, ATRs, IEPRs, VE	$3,260	$782	24.0%	$4,042	4.0%	$3,390	$814	$4,204	2025Q1	11.5%	$3,781	$907	$4,689
1.0%		$3,260	$782	24.0%	$4,042	4.0%	$3,390	$814	$4,204	2025Q1	11.5%	$3,781	$907	$4,689
1.0%	Contracting & Reprographics	$3,260	$782	24.0%	$4,042	4.0%	$3,390	$814	$4,204	2025Q1	11.5%	$3,781	$907	$4,689
1.5%	Engineering During Construction	$4,890	$1,174	24.0%	$6,063	4.0%	$5,085	$1,220	$6,305	2026Q1	15.7%	$5,882	$1,412	$7,293
1.8%	Planning During Construction	$5,952	$1,429	24.0%	$7,381	4.0%	$6,190	$1,486	$7,676	2026Q1	15.7%	$7,160	$1,718	$8,878
1.0%	Adaptive Management & Monitoring	$3,260	$782	24.0%	$4,042	4.0%	$3,390	$814	$4,204	2030Q1	34.1%	$4,547	$1,091	$5,638
0.5%	Project Operations	$1,630	$391	24.0%	$2,021	4.0%	$1,695	$407	$2,102	2025Q1	11.5%	$1,891	$454	$2,344
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$16,299	$3,912	24.0%	$20,211	4.0%	$16,950	$4,068	$21,018	2026Q1	15.7%	$19,606	$4,705	$24,311
2.0%	Project Operation:	$6,520	$1,565	24.0%	$8,084	4.0%	$6,780	$1,627	$8,407	2026Q1	15.7%	$7,842	$1,882	$9,724
1.0%	Project Management	$3,403	$817	24.0%	$4,220	4.0%	$3,539	$849	$4,389	2026Q1	15.7%	$4,094	$982	$5,076
	CONTRACT COST TOTALS:	$394,340	$94,645		**$488,985**		$422,804	$101,476	**$524,280**			$499,924	$119,987	**$619,911**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022	FULLY FUNDED PROJECT ESTIMATE					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21						
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	ALL REACHES MtoG - No Breakdown													
02	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$98,413	$23,619	24.0%	$122,032	8.6%	$106,915	$25,659	$132,574	2024Q2	7.2%	$114,617	$27,508	$142,125
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$98,413	$23,619	24.0%	**$122,032**		$106,915	$25,659	$132,574			$114,617	$27,508	$142,125
01	LANDS AND DAMAGES	$81,360	$20,340	25.0%	$101,700	8.4%	$88,189	$22,047	$110,236	2024Q2	7.2%	$94,543	$23,636	$118,178
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$984	$236	24.0%	$1,220	4.0%	$1,023	$246	$1,269	2023Q1	3.7%	$1,062	$255	$1,316
1.0%	Planning & Environmental Compliance	$984	$236	24.0%	$1,220	4.0%	$1,023	$246	$1,269	2023Q1	3.7%	$1,062	$255	$1,316
3.0%	Engineering & Design	$2,952	$709	24.0%	$3,661	4.0%	$3,070	$737	$3,807	2023Q1	3.7%	$3,185	$764	$3,949
1.0%	Reviews, ATRs, IEPRs, VE	$984	$236	24.0%	$1,220	4.0%	$1,023	$246	$1,269	2023Q1	3.7%	$1,062	$255	$1,316
1.0%		$984	$236	24.0%	$1,220	4.0%	$1,023	$246	$1,269	2023Q1	3.7%	$1,062	$255	$1,316
1.0%	Contracting & Reprographics	$984	$236	24.0%	$1,220	4.0%	$1,023	$246	$1,269	2023Q1	3.7%	$1,062	$255	$1,316
1.5%	Engineering During Construction	$1,476	$354	24.0%	$1,830	4.0%	$1,535	$368	$1,904	2024Q2	8.5%	$1,666	$400	$2,066
1.8%	Planning During Construction	$1,797	$431	24.0%	$2,228	4.0%	$1,869	$449	$2,317	2024Q2	8.5%	$2,028	$487	$2,515
1.0%	Adaptive Management & Monitoring	$984	$236	24.0%	$1,220	4.0%	$1,023	$246	$1,269	2025Q3	13.6%	$1,162	$279	$1,441
0.5%	Project Operations	$492	$118	24.0%	$610	4.0%	$512	$123	$635	2023Q1	3.7%	$531	$127	$658
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$4,921	$1,181	24.0%	$6,102	4.0%	$5,117	$1,228	$6,345	2024Q2	8.5%	$5,554	$1,333	$6,887
2.0%	Project Operation:	$1,968	$472	24.0%	$2,441	4.0%	$2,047	$491	$2,538	2024Q2	8.5%	$2,221	$533	$2,755
1.0%	Project Management	$1,027	$247	24.0%	$1,274	4.0%	$1,068	$256	$1,325	2024Q2	8.5%	$1,160	$278	$1,438
	CONTRACT COST TOTALS:	$200,312	$48,888		**$249,200**		$216,463	$52,833	**$269,296**			$231,974	$56,619	**$288,594**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon
PREPARED: 4/12/2021

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
			Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
			Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER		Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A		*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
		ALL REACHES MtoG - No Breakdown													
02		RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05		LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$245,942	$59,026	24.0%	$304,968	8.6%	$267,189	$64,125	$331,314	2037Q2	59.4%	$425,984	$102,236	$528,220
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
		CONSTRUCTION ESTIMATE TOTALS:	$245,942	$59,026	24.0%	**$304,968**		$267,189	$64,125	$331,314			$425,984	$102,236	$528,220
01		LANDS AND DAMAGES	$218,450	$54,613	25.0%	$273,063	8.4%	$236,786	$59,197	$295,983	2038Q2	64.4%	$389,216	$97,304	$486,520
30		PLANNING, ENGINEERING & DESIGN													
	1.0%	Project Management	$2,459	$590	24.0%	$3,050	4.0%	$2,558	$614	$3,171	2036Q1	68.6%	$4,313	$1,035	$5,349
	1.0%	Planning & Environmental Compliance	$2,459	$590	24.0%	$3,050	4.0%	$2,558	$614	$3,171	2036Q1	68.6%	$4,313	$1,035	$5,349
	3.0%	Engineering & Design	$7,378	$1,771	24.0%	$9,149	4.0%	$7,673	$1,841	$9,514	2036Q1	68.6%	$12,940	$3,106	$16,046
	1.0%	Reviews, ATRs, IEPRs, VE	$2,459	$590	24.0%	$3,050	4.0%	$2,558	$614	$3,171	2036Q1	68.6%	$4,313	$1,035	$5,349
	1.0%		$2,459	$590	24.0%	$3,050	4.0%	$2,558	$614	$3,171	2036Q1	68.6%	$4,313	$1,035	$5,349
	1.0%	Contracting & Reprographics	$2,459	$590	24.0%	$3,050	4.0%	$2,558	$614	$3,171	2036Q1	68.6%	$4,313	$1,035	$5,349
	1.5%	Engineering During Construction	$3,689	$885	24.0%	$4,575	4.0%	$3,836	$921	$4,757	2037Q2	77.1%	$6,794	$1,631	$8,425
	1.8%	Planning During Construction	$4,491	$1,078	24.0%	$5,569	4.0%	$4,670	$1,121	$5,791	2037Q2	77.1%	$8,271	$1,985	$10,256
	1.0%	Adaptive Management & Monitoring	$2,459	$590	24.0%	$3,050	4.0%	$2,558	$614	$3,171	2040Q1	97.4%	$5,050	$1,212	$6,262
	0.5%	Project Operations	$1,230	$295	24.0%	$1,525	4.0%	$1,279	$307	$1,586	2036Q1	68.6%	$2,157	$518	$2,674
31		CONSTRUCTION MANAGEMENT													
	5.0%	Construction Management	$12,297	$2,951	24.0%	$15,248	4.0%	$12,788	$3,069	$15,857	2037Q2	77.1%	$22,647	$5,435	$28,082
	2.0%	Project Operation:	$4,919	$1,181	24.0%	$6,099	4.0%	$5,115	$1,228	$6,343	2037Q2	77.1%	$9,059	$2,174	$11,233
	1.0%	Project Management	$2,568	$616	24.0%	$3,184	4.0%	$2,670	$641	$3,311	2037Q2	77.1%	$4,729	$1,135	$5,864
		CONTRACT COST TOTALS:	$515,720	$125,957		**$641,678**		$557,353	$136,133	**$693,485**			$908,412	$221,911	**$1,130,323**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH LGM C-North/GIWW area 2035													
02	RELOCATIONS	$11,228	$2,695	24.0%	$13,923	7.1%	$12,023	$2,886	$14,909	2031Q1	31.7%	$15,836	$3,801	$19,637
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$21,493	$5,158	24.0%	$26,651	7.4%	$23,075	$5,538	$28,613	2032Q1	35.8%	$31,335	$7,520	$38,855
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$32,721	$7,853	24.0%	**$40,574**		$35,098	$8,424	$43,522			$47,171	$11,321	$58,492
01	LANDS AND DAMAGES	$9,640	$2,410	25.0%	$12,050	8.4%	$10,449	$2,612	$13,061	2029Q2	24.9%	$13,049	$3,262	$16,312
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$327	$79	24.0%	$406	4.0%	$340	$82	$422	2029Q1	29.2%	$440	$106	$545
1.0%	Planning & Environmental Compliance	$327	$79	24.0%	$406	4.0%	$340	$82	$422	2029Q1	29.2%	$440	$106	$545
3.0%	Engineering & Design	$982	$236	24.0%	$1,217	4.0%	$1,021	$245	$1,266	2029Q1	29.2%	$1,319	$317	$1,636
1.0%	Reviews, ATRs, IEPRs, VE	$327	$79	24.0%	$406	4.0%	$340	$82	$422	2029Q1	29.2%	$440	$106	$545
1.0%		$327	$79	24.0%	$406	4.0%	$340	$82	$422	2029Q1	29.2%	$440	$106	$545
1.0%	Contracting & Reprographics	$327	$79	24.0%	$406	4.0%	$340	$82	$422	2029Q1	29.2%	$440	$106	$545
1.5%	Engineering During Construction	$491	$118	24.0%	$609	4.0%	$510	$122	$633	2030Q1	34.1%	$685	$164	$849
1.8%	Planning During Construction	$597	$143	24.0%	$741	4.0%	$621	$149	$770	2030Q1	34.1%	$833	$200	$1,033
1.0%	Adaptive Management & Monitoring	$327	$79	24.0%	$406	4.0%	$340	$82	$422	2034Q1	56.1%	$531	$127	$659
0.5%	Project Operations	$164	$39	24.0%	$203	4.0%	$170	$41	$211	2029Q1	29.2%	$220	$53	$273
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$1,636	$393	24.0%	$2,029	4.0%	$1,701	$408	$2,110	2030Q1	34.1%	$2,282	$548	$2,829
2.0%	Project Operation:	$654	$157	24.0%	$811	4.0%	$681	$163	$844	2030Q1	34.1%	$913	$219	$1,132
1.0%	Project Management	$342	$82	24.0%	$424	4.0%	$355	$85	$441	2030Q1	34.1%	$476	$114	$591
	CONTRACT COST TOTALS:	$49,190	$11,902		**$61,092**		$52,649	$12,740	**$65,389**			$69,678	$16,853	**$86,531**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
			Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
			Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER		Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A		B	C	D	E	F	G	H	I	J	P	L	M	N	O
		REACH LGM C-North/GIWW area 2085													
02		RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05		LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06		FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$29,386	$7,053	24.0%	$36,439	7.4%	$31,549	$7,572	$39,121	2048Q2	123.1%	$70,374	$16,890	$87,264
11		LEVEES & FLOODWALLS	$31,164	$7,479	24.0%	$38,644	7.4%	$33,459	$8,030	$41,489	2068Q2	310.8%	$137,436	$32,985	$170,421
11		LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11		LEVEES & FLOODWALLS	$135,555	$32,533	24.0%	$168,088	7.4%	$145,534	$34,928	$180,462	2041Q1	78.7%	$260,125	$62,430	$322,555
15		RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15		RUCTURE	$37,218	$8,932	24.0%	$46,151	8.6%	$40,434	$9,704	$50,138	2044Q2	97.4%	$79,823	$19,158	$98,980
		CONSTRUCTION ESTIMATE TOTALS:	$233,324	$55,998	24.0%	**$289,321**		$250,975	$60,234	$311,209			$547,758	$131,462	$679,219
01		LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30		PLANNING, ENGINEERING & DESIGN													
	1.0%	Project Management	$2,333	$560	24.0%	$2,893	4.0%	$2,426	$582	$3,009	2039Q1	89.7%	$4,603	$1,105	$5,708
	1.0%	Planning & Environmental Compliance	$2,333	$560	24.0%	$2,893	4.0%	$2,426	$582	$3,009	2039Q1	89.7%	$4,603	$1,105	$5,708
	3.0%	Engineering & Design	$7,000	$1,680	24.0%	$8,680	4.0%	$7,279	$1,747	$9,026	2039Q1	89.7%	$13,809	$3,314	$17,123
	1.0%	Reviews, ATRs, IEPRs, VE	$2,333	$560	24.0%	$2,893	4.0%	$2,426	$582	$3,009	2039Q1	89.7%	$4,603	$1,105	$5,708
	1.0%		$2,333	$560	24.0%	$2,893	4.0%	$2,426	$582	$3,009	2039Q1	89.7%	$4,603	$1,105	$5,708
	1.0%	Contracting & Reprographics	$2,333	$560	24.0%	$2,893	4.0%	$2,426	$582	$3,009	2039Q1	89.7%	$4,603	$1,105	$5,708
	1.5%	Engineering During Construction	$3,500	$840	24.0%	$4,340	4.0%	$3,640	$874	$4,513	2042Q2	116.1%	$7,865	$1,888	$9,752
	1.8%	Planning During Construction	$4,260	$1,023	24.0%	$5,283	4.0%	$4,431	$1,063	$5,494	2042Q2	116.1%	$9,574	$2,298	$11,872
	1.0%	Adaptive Management & Monitoring	$2,333	$560	24.0%	$2,893	4.0%	$2,426	$582	$3,009	2044Q1	131.9%	$5,626	$1,350	$6,976
	0.5%	Project Operations	$1,167	$280	24.0%	$1,447	4.0%	$1,213	$291	$1,504	2039Q1	89.7%	$2,301	$552	$2,854
31		CONSTRUCTION MANAGEMENT													
	5.0%	Construction Management	$11,666	$2,800	24.0%	$14,466	4.0%	$12,132	$2,912	$15,044	2042Q2	116.1%	$26,215	$6,292	$32,507
	2.0%	Project Operation:	$4,666	$1,120	24.0%	$5,786	4.0%	$4,853	$1,165	$6,017	2042Q2	116.1%	$10,486	$2,517	$13,003
	1.0%	Project Management	$2,436	$585	24.0%	$3,021	4.0%	$2,533	$608	$3,141	2042Q2	116.1%	$5,474	$1,314	$6,788
		CONTRACT COST TOTALS:	$282,018	$67,684		**$349,703**		$301,614	$72,387	**$374,002**			$652,123	$156,510	**$808,632**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Morganza to the Gulf | DISTRICT: MVN District | PREPARED: 4/12/2021
LOCATION: Morganza to the Gulf | POC: CHIEF, COST ENGINEERING, John Petitbon
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022					
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH Larose to Lockport Reach													
02	RELOCATIONS	$25,048	$6,012	24.0%	$31,060	7.1%	$26,822	$6,437	$33,259	2032Q1	35.8%	$36,423	$8,742	$45,165
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$13,348	$3,203	24.0%	$16,551	8.6%	$14,501	$3,480	$17,981	2034Q1	44.3%	$20,932	$5,024	$25,955
11	LEVEES & FLOODWALLS	$62,488	$14,997	24.0%	$77,485	7.4%	$67,088	$16,101	$83,189	2034Q1	44.3%	$96,839	$23,241	$120,080
11	LEVEES & FLOODWALLS	$28,408	$6,818	24.0%	$35,225	7.4%	$30,499	$7,320	$37,819	2048Q2	123.1%	$68,031	$16,327	$84,358
11	LEVEES & FLOODWALLS	$31,868	$7,648	24.0%	$39,516	7.4%	$34,214	$8,211	$42,425	2068Q2	310.8%	$140,538	$33,729	$174,267
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$5,506	$1,322	24.0%	$6,828	7.4%	$5,912	$1,419	$7,331	2033Q1	40.0%	$8,277	$1,986	$10,263
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$166,665	$40,000	24.0%	**$206,665**		$179,035	$42,968	$222,003			$371,039	$89,049	$460,089
01	LANDS AND DAMAGES	$3,515	$879	25.0%	$4,394	8.4%	$3,810	$953	$4,763	2031Q2	32.7%	$5,058	$1,264	$6,322
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$1,667	$400	24.0%	$2,067	4.0%	$1,733	$416	$2,149	2029Q1	29.2%	$2,239	$537	$2,777
1.0%	Planning & Environmental Compliance	$1,667	$400	24.0%	$2,067	4.0%	$1,733	$416	$2,149	2029Q1	29.2%	$2,239	$537	$2,777
3.0%	Engineering & Design	$5,000	$1,200	24.0%	$6,200	4.0%	$5,200	$1,248	$6,448	2029Q1	29.2%	$6,718	$1,612	$8,331
1.0%	Reviews, ATRs, IEPRs, VE	$1,667	$400	24.0%	$2,067	4.0%	$1,733	$416	$2,149	2029Q1	29.2%	$2,239	$537	$2,777
1.0%		$1,667	$400	24.0%	$2,067	4.0%	$1,733	$416	$2,149	2029Q1	29.2%	$2,239	$537	$2,777
1.0%	Contracting & Reprographics	$1,667	$400	24.0%	$2,067	4.0%	$1,733	$416	$2,149	2029Q1	29.2%	$2,239	$537	$2,777
1.5%	Engineering During Construction	$2,500	$600	24.0%	$3,100	4.0%	$2,600	$624	$3,224	2030Q1	34.1%	$3,487	$837	$4,324
1.8%	Planning During Construction	$3,043	$730	24.0%	$3,774	4.0%	$3,165	$760	$3,924	2030Q1	34.1%	$4,245	$1,019	$5,263
1.0%	Adaptive Management & Monitoring	$1,667	$400	24.0%	$2,067	4.0%	$1,733	$416	$2,149	2034Q1	56.1%	$2,706	$649	$3,355
0.5%	Project Operations	$833	$200	24.0%	$1,033	4.0%	$867	$208	$1,075	2029Q1	29.2%	$1,120	$269	$1,388
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$8,333	$2,000	24.0%	$10,333	4.0%	$8,666	$2,080	$10,746	2030Q1	34.1%	$11,623	$2,789	$14,412
2.0%	Project Operation:	$3,333	$800	24.0%	$4,133	4.0%	$3,466	$832	$4,298	2030Q1	34.1%	$4,649	$1,116	$5,765
1.0%	Project Management	$1,740	$418	24.0%	$2,158	4.0%	$1,809	$434	$2,244	2030Q1	34.1%	$2,427	$582	$3,009
	CONTRACT COST TOTALS:	$204,963	$49,226		**$254,190**		$219,017	$52,602	**$271,619**			$424,268	$101,875	**$526,143**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf | DISTRICT: MVN District | PREPARED: 4/12/2021
LOCATION: Morganza to the Gulf | POC: CHIEF, COST ENGINEERING, John Petitbon
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

Civil Works Work Breakdown Structure			ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022						
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21	FULLY FUNDED PROJECT ESTIMATE					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	REACH LGM inducements C-South/B-North & South/A-West													
02	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$16,513	$3,963	24.0%	$20,477	7.4%	$17,729	$4,255	$21,984	2028Q2	21.1%	$21,475	$5,154	$26,629
11	LEVEES & FLOODWALLS	$38,650	$9,276	24.0%	$47,926	7.4%	$41,496	$9,959	$51,455	2040Q1	73.4%	$71,939	$17,265	$89,204
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
15	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$55,164	$13,239	24.0%	**$68,403**		$59,225	$14,214	$73,439			$93,413	$22,419	$115,833
01	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.0%	Project Management	$552	$132	24.0%	$684	4.0%	$574	$138	$711	2025Q1	11.5%	$640	$154	$793
1.0%	Planning & Environmental Compliance	$552	$132	24.0%	$684	4.0%	$574	$138	$711	2025Q1	11.5%	$640	$154	$793
3.0%	Engineering & Design	$1,655	$397	24.0%	$2,052	4.0%	$1,721	$413	$2,134	2025Q1	11.5%	$1,920	$461	$2,380
1.0%	Reviews, ATRs, IEPRs, VE	$552	$132	24.0%	$684	4.0%	$574	$138	$711	2025Q1	11.5%	$640	$154	$793
1.0%		$552	$132	24.0%	$684	4.0%	$574	$138	$711	2025Q1	11.5%	$640	$154	$793
1.0%	Contracting & Reprographics	$552	$132	24.0%	$684	4.0%	$574	$138	$711	2025Q1	11.5%	$640	$154	$793
1.5%	Engineering During Construction	$827	$199	24.0%	$1,026	4.0%	$860	$207	$1,067	2028Q1	24.5%	$1,071	$257	$1,328
1.8%	Planning During Construction	$1,007	$242	24.0%	$1,249	4.0%	$1,048	$251	$1,299	2028Q1	24.5%	$1,304	$313	$1,617
1.0%	Adaptive Management & Monitoring	$552	$132	24.0%	$684	4.0%	$574	$138	$711	2030Q1	34.1%	$769	$185	$954
0.5%	Project Operations	$276	$66	24.0%	$342	4.0%	$287	$69	$356	2025Q1	11.5%	$320	$77	$397
31	CONSTRUCTION MANAGEMENT													
5.0%	Construction Management	$2,758	$662	24.0%	$3,420	4.0%	$2,868	$688	$3,557	2028Q1	24.5%	$3,570	$857	$4,427
2.0%	Project Operation:	$1,103	$265	24.0%	$1,368	4.0%	$1,147	$275	$1,423	2028Q1	24.5%	$1,428	$343	$1,771
1.0%	Project Management	$576	$138	24.0%	$714	4.0%	$599	$144	$743	2028Q1	24.5%	$746	$179	$924
	CONTRACT COST TOTALS:	$66,676	$16,002		**$82,679**		$71,197	$17,087	**$88,284**			$107,741	$25,858	**$133,599**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Morganza to the Gulf
LOCATION: Morganza to the Gulf
This Estimate reflects the scope and schedule in report; Morganza to the Gulf of Mexico, Louisiana Level 3 Econ Reevaluation Report

DISTRICT: MVN District
POC: CHIEF, COST ENGINEERING, John Petitbon

PREPARED: 4/12/2021

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared:			12-Apr-21	Program Year (Budget EC):			2022	FULLY FUNDED PROJECT ESTIMATE				
		Effective Price Level:			1-Oct-20	Effective Price Level Date:			1 OCT 21					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
02	RELOCATIONS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
05	LOCKS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
06	FISH & WILDLIFE FACILITIES	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
11	LEVEES & FLOODWALLS	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	RUCTURE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$0	$0	0.0%	**$0**		$0	$0	$0			$0	$0	$0
	LANDS AND DAMAGES	$0	$0	25.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Planning & Environmental Compliance	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
3.0%	Engineering & Design	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Reviews, ATRs, IEPRs, VE	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%		$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Contracting & Reprographics	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.5%	Engineering During Construction	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.8%	Planning During Construction	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Adaptive Management & Monitoring	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0.5%	Project Operations	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
5.0%	Construction Management	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
2.0%	Project Operation:	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
1.0%	Project Management	$0	$0	24.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$0	$0		**$0**		$0	$0	**$0**			$0	$0	**$0**

Mii Cost Estimate

Morganza to the Gulf PAC - 100 yr Protection incl extended reaches
Post Authorization Change Report
Terrebonne and Lafourche Parishes, LA

Estimated by	
Designed by	New Orleans District
Prepared by	Steven Lowrie, John Petitbon
Preparation Date	4/5/2021
Effective Date of Pricing	4/5/2021
Estimated Construction Time	Days

Date	Author	Note
1/4/2021	SPL	Cost EstimateSection 1.Cost estimate developmenta)The project cost estimate was developed in the TRACES MII cost estimating software and used the standard approaches for a feasibility estimate structure regarding labor, equipment, materials, crews, unit prices, quotes, sub- and prime contractor markups. This philosophy was taken wherever practical within the time constraints. It was supplemented with estimating information from other sources where necessary such as quotes, bid data, and A-E estimates. The intent was to provide or convey a “fair and reasonable” estimate that which depicts the local market conditions. The estimates assume a typical application of tiering subcontractors. Given the long time over which this project/program is to be constructed and the unknown economic status during that time, demands from non-governmental civil works projects were not considered to dampen the competition and increase prices.Section 2.Estimate Structure: a)The estimate is structured to reflect the projects performed. The estimates are subdivided by USACE feature codes and by local "reach" name.Section 3.Bid competition: a)It is assumed that there will not be an economically saturated market and that bidding competition will be present. Section 4.Contract Acquisition Strategy: a)It is assumed that the contract acquisition strategy will be similar to past projects with some negotiated contracts, focus and preference of small business/8(a), and large, unrestricted design/bid/build contracts. There is no declared contract acquisition plan/types at this time, so typical MVN goals for small business/set-aside contracts have been included on overall cost basis by assigning approximately 25% of construction dollars to the small business/set-aside contractor type. Section 5.Labor Shortages: a)It is assumed there will be a normal labor market. Section 6.Labor Rates: a)Local labor market wages are above the local Davis-Bacon Wage Determination and actual rates have been used. This is based upon local information and payroll data received from the New Orleans District Construction Representatives and estimators with experiences in past years. Section 7.Materials: a)Cost quotes are used on major construction items when available. Recent quotes may include borrow material, concrete, steel and concrete piling, rock, gravel and sand. Assumptions include:i)Materials will be purchased as part of the construction contract. The estimate does not anticipate government furnished materials. Prices include delivery of materials.ii)Concrete - will be purchased from commercial batch plants.iii)Borrow Material and Haul - Local have done one lift on most reaches for Morgazna to the Gulf. Also, borrow location and haul distances were able to be better defined. All borrow material is assumed Government furnished as it is a local sponsor responsibility. NO contractor furnished borrow source are used. b)The borrow quantity calculations followed the MVN Geotechnical guidance: c)Hauled Levee: 10 BCY of borrow material = 12 LCY hauled = 8 ECY compacted.d)An assumed average one-way haul distance of 7 miles for 100yr was used due to a committed borrow source being confirmed available. Adjacent borrow was assumed for Reach Barrier, A, B, and Larose to Lockport and the one-way haul distance was reduced to 3 miles. This decision is based upon the existing lifts that have been built by the sponsors and discussions with the New Orleans District cost engineers and MtoG PDT.e)Haul speeds are estimated using 40 mph speed average given the long distances and rural areas. Since adjacent borrow was designated for Reach Barrier, A, B and Larose to Lockport, average speed was reduced to 25 mph.f)Rock and stone - The New Orleans delta area has no rock sources. Historically, rock is barged from northern sources on the Mississippi River. This decision is based upon local knowledge, experience and supported with cost quotes.Section 8.Equipment: a)Rates used are based from the latest USACE EP-1110-1-8, Region III. Adjustments are made for fuel and facility capital cost of money (FCCM). Judicious use of owned verses rental rates was considered based on typical contractor usage and local equipment availability. Only a few select pieces of marine \ marsh equipment are considered rental. Full FCCM/Cost of Money rate is latest available; Mii program takes EP recommended discount, no other adjustments have been made to the FCCM. i)Trucking: The estimate assumed independent self-employed trucking subcontractors due to the large numbers of trucks required. ii)Dozers: dozers of the D-5/D-6 variety were chosen based on historical knowledge. Heavier equipment gets mired in the mud and soft soils.iii)Rental Rates: Rental rates were used for various pieces of marine and marsh equipment where rental is typical such as marsh backhoes. Section 9.Fuel: a)Fuels (gasoline, on and off -road diesel) were based on local market averages for on-road and off-road for the Gulf Coast area. The Team found that fuels fluctuate irrationally; thus, used an average.Section 10.Crews: a)Major crew and productivity rates were developed and studied by senior USACE estimators familiar with the type of work. All of the work is typical to the New Orleans District. The crews and productivities were checked by local MVN estimators, discussions with contractors and comparisons with historical cost data. Major crews include haul, earthwork, piling, concrete, and deep soil mixing.b)Most crew work hours are assumed to be 10 hrs 6 days/wk which is typical to the area. Marine based bucket excavation/dredging operations for levee construction are assumed to work 2-12 hours shifts 7 days / week.c)A 10% “markup on labor for weather delay” is selectively applied to the labor in major earthwork placing detail items and associated items that would be affected by small amounts of weather making it unsafe or difficult to place (trying to run dump trucks on a wet levee) or be detrimental/non-compliant to the work being done (trying to place/compact material in the rain). The 10% markup is to cover the common practice of paying for labor “showing up” to the job site and then being sent home due to minor weather which is part of known average weather impacts as reflected within the standard contract specifications. Section 11.Unit Prices: a)The unit prices found within the various project estimates will fluctuate within a range between similar construction units such as floodwall concrete, earthwork, and piling. Variances are a result of differing haul distances (trucked or barged), small or large business markups, subcontracted items, designs and estimates by others.Section 12.Relocation Cost: a)Relocation costs are defined as the relocation of public roads, bridges, railroads, and utilities required for project purposes. In cases where potential significant impacts were known, costs were included within the cost estimate. Section 13.Mobilization: a)Contractor mobilization and demobilization are based on the assumption that most of the contractors will be coming from within the Gulf Coast/Southern region. Mob/demob costs are based on historical studies of detailed Government estimate mob/demobs which averaged 4.9 to 5% of the construction costs. With undefined acquisition strategies and assumed individual project limits for the large number of potential contracts in this program, the estimate utilizes a more comprehensive approx. 5% value applied at each contract rather than risking minimizing mob/demob costs by detailing costs based on an assumed number of contracts. The 5% value also matches well with the 5% value previously prescribed by Walla Walla District, which has studied historical rates.Section 14.Field Office Overhead: a)The estimate used a field office overhead rate of 12% for the prime contractors at budget level development.

Currency in US dollars

Date	Author	Note
1/4/2021	SPL	Based on historical studies and experience, Walla Walla District has recommended typical rates ranging from 9% to 11% for large civil works projects; however, the 9-11% rate does not consider possible incentives such as camps, allowances, travel trailers, meals, etc. which have been used previously to facilitate projects. With undefined acquisition strategies and assumed individual project limits for the large number of potential contracts in this program, the estimate utilizes a more comprehensive percentage based approach applied at each contract rather than risking minimizing overhead costs by detailing costs based on an assumed number of contracts. The applied rates were previously discussed among numerous USACE District cost engineers including Walla Walla, Vicksburg, Norfolk, Huntington, St. Paul and New Orleans. Section 15.Overhead assumptions may include: a)Superintendent, office manager, pickups, periodic travel, costs, communications, temporary offices (contractor and government), office furniture, office supplies, computers and software, as-built drawings and minor designs, tool trailers, staging setup, camp and kitchen maintenance and utilities, utility service, toilets, safety equipment, security and fencing, small hand and power tools, project signs, traffic control, surveys, temp fuel tank station, generators, compressors, lighting, and minor miscellaneous.Section 16.Home Office Overhead: a) Estimate percentages range based upon consideration of 8(a), small business and unrestricted prime contractors. The rates are based upon estimating and negotiating experience, and consultation with local construction representatives. Different percents are used when considering the contract acquisition strategy regarding small business 8(a), competitive small business and large business, high to low respectively. The applied rates were previously discussed among numerous USACE District cost engineers including Walla Walla, Vicksburg, Norfolk, Huntington, St. Paul and New Orleans.Section 17.Taxes: a)Local taxes will be applied, using an average between the parishes that contain the work. Reference the LA parish tax rate website: http://www.laota.com/pta.htmSection 18.Bond: a)Bond is assumed 1% applied against the prime contractor, assuming large contracts. No differentiation was made between large and small businesses.Section 19.E&D and S&A: a)USACE Costs to manage design (PED) and construction (S&A) are based on New Orleans District Programmatic Cost Estimate guidance: i)Planning, Engineering & Design (PED): The PED cost includes such costs as project management, engineering, planning, designs, investigations, studies, reviews, value engineering and engineering during construction (EDC). Historically New Orleans District has used an approximate 12.828% rate for E&D/EDC, applied against the estimated construction costs. Other USACE civil works districts such as St. Paul, Memphis and St. Louis have reported values ranging from 10-15%. Additional costs were added for project management, engineering, planning, designs, investigations, studies, reviews, value engineering. Specific PED costs were originally calculated and then that same percentage was carried forward on all future updates.ii) Supervision & Administration (S&A): Historically, New Orleans District used a range from 5% to 15% depending on project size and type applied against the estimated construction costs. Other USACE civil works districts such as St. Paul, Memphis and St. Louis report values ranging from 7.5-10%. Consideration includes that a portion of the S&A effort could be performed by contractors. Based on discussions with MVN Construction Division, an S&A cost based on contract durations was developed. Specific S&A costs were originally calculated and then that same percentage (8.044%) was carried forward on all future updates. Section 20.Contingencies: a)Contingencies were developed using the USACE Cost and Schedule Risk Analysis (CSRA) process and the Crystal Ball software that evaluates schedule and cost related risks. See summary in Cost Schedule Risk Analysis (CSRA) section.Section 21.Escalation: a)Escalation used in the TPCS is based upon the US Army Corps of Engineers Engineering Manual (EM) 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) revised 30 Sept 2020. Section 22.HTRW: a) The estimate includes no costs for any potential Hazardous, Toxic, and Radioactive Waste (HTRW) concerns. Phase 1 HTRW investigations are already complete and the result of this investigation is that no further investigation is recommended.ScheduleThe project schedule was developed based on the construction of the individual features of work to include the entire 1% AEP Morganza to the Gulf program which includes construction of earthen levees, floodwalls, floodgates, and other structures along a 98-mile alignment south of Houma. The alignment is sub-divided into 14 main reaches (Barrier, A, B, E, F, G, H, I, J, K, L, Larose C-North, and Lockport to Larose). Structures include a multi-purpose lock, 22 navigable floodgates, 23 environmental water control structures, 9 road / RR gates, and fronting protection for 4 existing pumping stations. The structures located on Federally maintained navigation channels include a 110-ft wide by 800-ft long lock with an adjacent 250-ft wide sector gate on the Houma Navigation Canal and two 125-ft sector gates on the GIWW east and west of Houma. Fourteen 56-ft barge gates and five 20- to 30-ft stop log gates are located on various waterways that cross the levee system.

Currency in US dollars

Description	Quantity	UOM	ContractCost	Contingency	Escalation	ProjectCost
bid schedule summary			**3,696,814,285.12**	**0.00**	**0.00**	**3,738,706,325.25**
02 Relocations	**1.0000**	**LS**	**182,139,304.93**	**0.00**	**0.00**	**224,031,345.06**
			15,188,015.83			*18,681,259.47*
02 01 Roads - MtoG	**1.0000**	**JOB**	**15,188,015.83**	**0.00**	**0.00**	**18,681,259.47**
			12,816,167.32			*15,763,885.80*
Barrier-R Barrier Reach	**1.0000**	**EA**	**12,816,167.32**	**0.00**	**0.00**	**15,763,885.80**
			474,369.70			*583,474.74*
ReachE2-R Reach E2	**1.0000**	**EA**	**474,369.70**	**0.00**	**0.00**	**583,474.74**
			474,369.70			*583,474.74*
ReachG1-R Reach G1	**1.0000**	**EA**	**474,369.70**	**0.00**	**0.00**	**583,474.74**
			474,369.70			*583,474.74*
ReachH1-R Reach H1	**1.0000**	**EA**	**474,369.70**	**0.00**	**0.00**	**583,474.74**
			474,369.70			*583,474.74*
ReachI2-R Reach I2	**1.0000**	**EA**	**474,369.70**	**0.00**	**0.00**	**583,474.74**
			474,369.70			*583,474.74*
ReachJ3-R Reach J3	**1.0000**	**EA**	**474,369.70**	**0.00**	**0.00**	**583,474.74**
			137,458,260.35			*169,073,660.24*
02 03 Cementeries, Utilities, and Structures - MtoG	**1.0000**	**JOB**	**137,458,260.35**	**0.00**	**0.00**	**169,073,660.24**
			15,986,499.16			*19,663,393.96*
Barrier-R Barrier Reach	**1.0000**	**EA**	**15,986,499.16**	**0.00**	**0.00**	**19,663,393.96**
			7,745,836.86			*9,527,379.33*
ReachA-R Reach A	**1.0000**	**EA**	**7,745,836.86**	**0.00**	**0.00**	**9,527,379.33**
ReachB-R Reach B	**1.0000**	**LS**	**1,732,250.57**	**0.00**	**0.00**	**2,130,668.20**
ReachE1-R Reach E-1	**1.0000**	**LS**	**181,447.18**	**0.00**	**0.00**	**223,180.03**
			4,162,967.92			*5,120,450.55*
ReachE2-R Reach E-2	**1.0000**	**EA**	**4,162,967.92**	**0.00**	**0.00**	**5,120,450.55**
ReachF1-R Reach F-1	**1.0000**	**LS**	**0.00**	**0.00**	**0.00**	**0.00**
			0.00			*0.00*
ReachF2-R Reach F-2	**1.0000**	**EA**	**0.00**	**0.00**	**0.00**	**0.00**
ReachG1-R Reach G-1	**1.0000**	**LS**	**0.00**	**0.00**	**0.00**	**0.00**
ReachG2-R Reach G-2	**1.0000**	**LS**	**0.00**	**0.00**	**0.00**	**0.00**
ReachG3-R Reach G-3	**1.0000**	**LS**	**0.00**	**0.00**	**0.00**	**0.00**
			1,058,832.75			*1,302,364.29*
ReachH1-R Reach H-1	**1.0000**	**EA**	**1,058,832.75**	**0.00**	**0.00**	**1,302,364.29**
ReachH2-R Reach H-2	**1.0000**	**LS**	**0.00**	**0.00**	**0.00**	**0.00**

Currency in US dollars

Description	Quantity	UOM	ContractCost	Contingency	Escalation	ProjectCost
ReachI1-R Reach I-1	**1.0000**	**LS**	**0.00**	**0.00**	**0.00**	**0.00**
			910,153.89			*1,119,489.29*
ReachI2-R Reach I-2	**1.0000**	**EA**	**910,153.89**	**0.00**	**0.00**	**1,119,489.29**
			35,518,489.40			*43,687,741.96*
ReachI3-R Reach I-3	**1.0000**	**EA**	**35,518,489.40**	**0.00**	**0.00**	**43,687,741.96**
			14,286,272.84			*17,572,115.59*
ReachJ1-R Reach J-1	**1.0000**	**EA**	**14,286,272.84**	**0.00**	**0.00**	**17,572,115.59**
ReachJ2-R Reach J-2	**1.0000**	**LS**	**40,958,203.76**	**0.00**	**0.00**	**50,378,590.63**
			4,908,573.38			*6,037,545.26*
ReachJ3-R Reach J-3	**1.0000**	**EA**	**4,908,573.38**	**0.00**	**0.00**	**6,037,545.26**
			10,008,732.63			*12,310,741.13*
ReachL-R Reach L	**1.0000**	**EA**	**10,008,732.63**	**0.00**	**0.00**	**12,310,741.13**
			20,364,330.84			*25,048,126.93*
02 03 Cementeries, Utilities, and Structures - Lockport to Larose reach	**1.0000**	**JOB**	**20,364,330.84**	**0.00**	**0.00**	**25,048,126.93**
			20,364,330.84			*25,048,126.93*
ReachLockport Lockport to Larose reach	**1.0000**	**EA**	**20,364,330.84**	**0.00**	**0.00**	**25,048,126.93**
			9,128,697.91			*11,228,298.43*
02 03 Cementeries, Utilities, and Structures - Larose to Golden Meadow C-North reach	**1.0000**	**JOB**	**9,128,697.91**	**0.00**	**0.00**	**11,228,298.43**
			9,128,697.91			*11,228,298.43*
ReachLGM Larose to Golden Meadow C-North reach	**1.0000**	**EA**	**9,128,697.91**	**0.00**	**0.00**	**11,228,298.43**
05 Locks	**1.0000**	**LS**	**314,140,514.00**	**0.00**	**0.00**	**314,140,514.00**
			314,140,514.00			*314,140,514.00*
05 01 Houma Navigational Canal	**1.0000**	**EA**	**314,140,514.00**	**0.00**	**0.00**	**314,140,514.00**
			314,140,514.00			*314,140,514.00*
05 01 Reach F-1/G-1	**1.0000**	**EA**	**314,140,514.00**	**0.00**	**0.00**	**314,140,514.00**
			344,354,839.00			*344,354,839.00*
06 Fish and Wildlife Facilities	**1.0000**	**EA**	**344,354,839.00**	**0.00**	**0.00**	**344,354,839.00**
			241,700,745.04			*241,700,745.04*
06 Fish and Wildlife Facilities	**1.0000**	**JOB**	**241,700,745.04**	**0.00**	**0.00**	**241,700,745.04**
			228,352,930.79			*228,352,930.79*
06 01 Environmental Control Structures - MtoG	**1.0000**	**EA**	**228,352,930.79**	**0.00**	**0.00**	**228,352,930.79**
			68,282,272.13			*68,282,272.13*
1 Barrier Alignment	**1.0000**	**EA**	**68,282,272.13**	**0.00**	**0.00**	**68,282,272.13**
			11,947,508.33			*11,947,508.33*
2 Reach A	**1.0000**	**EA**	**11,947,508.33**	**0.00**	**0.00**	**11,947,508.33**

Labor ID: NOLA2021 EQ ID: EP20R03 Currency in US dollars TRACES MII Version 4.4

Description	Quantity	UOM	ContractCost	Contingency	Escalation	ProjectCost
			12,226,348.28			*12,226,348.28*
3 Reach E-2	**1.0000**	**EA**	**12,226,348.28**	**0.00**	**0.00**	**12,226,348.28**
			12,209,090.17			*12,209,090.17*
4 Reach E-1	**1.0000**	**EA**	**12,209,090.17**	**0.00**	**0.00**	**12,209,090.17**
			21,176,587.79			*21,176,587.79*
5 Reach G-2	**1.0000**	**EA**	**21,176,587.79**	**0.00**	**0.00**	**21,176,587.79**
			11,125,387.69			*11,125,387.69*
6 Reach G-3	**1.0000**	**EA**	**11,125,387.69**	**0.00**	**0.00**	**11,125,387.69**
			20,374,084.92			*20,374,084.92*
6 Reach H-1	**1.0000**	**EA**	**20,374,084.92**	**0.00**	**0.00**	**20,374,084.92**
			39,072,419.66			*39,072,419.66*
7 Reach J-2	**1.0000**	**JOB**	**39,072,419.66**	**0.00**	**0.00**	**39,072,419.66**
			20,031,455.50			*20,031,455.50*
8 Reach K	**1.0000**	**EA**	**20,031,455.50**	**0.00**	**0.00**	**20,031,455.50**
			11,907,776.32			*11,907,776.32*
10 Reach L	**1.0000**	**EA**	**11,907,776.32**	**0.00**	**0.00**	**11,907,776.32**
			13,347,814.25			*13,347,814.25*
06 02 Environmental Control Structures - Lockport to Larose	**1.0000**	**EA**	**13,347,814.25**	**0.00**	**0.00**	**13,347,814.25**
			13,347,814.25			*13,347,814.25*
7 Lockport to Larose	**1.0000**	**EA**	**13,347,814.25**	**0.00**	**0.00**	**13,347,814.25**
			1,707,595,566.01			*1,707,595,566.01*
11 Levees	**1.0000**	**JOB**	**1,707,595,566.01**	**0.00**	**0.00**	**1,707,595,566.01**
			1,652,431,885.63			*1,652,431,885.63*
11 01 Levee - MtoG 100 yr	**1.0000**	**JOB**	**1,652,431,885.63**	**0.00**	**0.00**	**1,652,431,885.63**
			1,604.28			*1,604.28*
1 Reach Barrier Alignment	**83,081.0000**	**LF**	**133,284,923.16**	**0.00**	**0.00**	**133,284,923.16**
			3,089.79			*3,089.79*
2 Reach A	**43,184.0000**	**LF**	**133,429,291.35**	**0.00**	**0.00**	**133,429,291.35**
			2,934.11			*2,934.11*
3 Reach B	**26,786.0000**	**LF**	**78,593,133.58**	**0.00**	**0.00**	**78,593,133.58**
			3,139.10			*3,139.10*
4 Reach E-1, E-2	**22,966.0000**	**LF**	**72,092,518.46**	**0.00**	**0.00**	**72,092,518.46**
			2,207.46			*2,207.46*
5 Reach F	**22,583.0000**	**LF**	**49,851,140.81**	**0.00**	**0.00**	**49,851,140.81**
			2,693.90			*2,693.90*
6 Reach G-1, G-2, G-3	**24,388.0000**	**LF**	**65,698,712.05**	**0.00**	**0.00**	**65,698,712.05**

Currency in US dollars

Description	Quantity	UOM	ContractCost	Contingency	Escalation	ProjectCost
			4,373.27			*4,373.27*
7 Reach H-1, H-2, H-3	**41,366.0000**	**LF**	**180,904,514.75**	**0.00**	**0.00**	**180,904,514.75**
			5,284.49			*5,284.49*
8 Reach I	**30,168.0000**	**LF**	**159,422,358.66**	**0.00**	**0.00**	**159,422,358.66**
			4,342.27			*4,342.27*
9 Reach J-1, J-2, J-3	**49,357.0000**	**LF**	**214,321,449.09**	**0.00**	**0.00**	**214,321,449.09**
			205,381,824.37			*205,381,824.37*
10 Reach K	**1.0000**	**EA**	**205,381,824.37**	**0.00**	**0.00**	**205,381,824.37**
			176,138,706.36			*176,138,706.36*
11 Reach L	**1.0000**	**LF**	**176,138,706.36**	**0.00**	**0.00**	**176,138,706.36**
			1,638.27			*1,638.27*
12 Larose to Golden Meadow C North Reach	**36,960.0000**	**LF**	**60,550,421.83**	**0.00**	**0.00**	**60,550,421.83**
			1,583.40			*1,583.40*
13 Lockport to Larose Reach	**77,531.0000**	**LF**	**122,762,891.15**	**0.00**	**0.00**	**122,762,891.15**
			55,163,680.39			*55,163,680.39*
11 01 Levee - LGM Induced flooding reach	**1.0000**	**JOB**	**55,163,680.39**	**0.00**	**0.00**	**55,163,680.39**
			55,163,680.39			*55,163,680.39*
1 Levee - LGM Induced flooding reach	**1.0000**	**EA**	**55,163,680.39**	**0.00**	**0.00**	**55,163,680.39**
			226,556,876.20			*226,556,876.20*
11 Floodwall	**1.0000**	**JOB**	**226,556,876.20**	**0.00**	**0.00**	**226,556,876.20**
			64,003,123.30			*64,003,123.30*
11 02 Floodwalls - MtoG	**1.0000**	**JOB**	**64,003,123.30**	**0.00**	**0.00**	**64,003,123.30**
			53,885,612.80			*53,885,612.80*
11 02 01 Pump Station Fronting Protection	**1.0000**	**JOB**	**53,885,612.80**	**0.00**	**0.00**	**53,885,612.80**
			10,117,510.50			*10,117,510.50*
11 02 02 T-Wall	**1.0000**	**EA**	**10,117,510.50**	**0.00**	**0.00**	**10,117,510.50**
			5,506,402.72			*5,506,402.72*
11 02 Floodwalls - Lockport to Larose reach	**1.0000**	**JOB**	**5,506,402.72**	**0.00**	**0.00**	**5,506,402.72**
			5,506,402.72			*5,506,402.72*
11 02 02 T-Wall	**1.0000**	**EA**	**5,506,402.72**	**0.00**	**0.00**	**5,506,402.72**
			157,047,350.18			*157,047,350.18*
11 02 Floodwalls - Larose to Golden Meadow reach	**1.0000**	**JOB**	**157,047,350.18**	**0.00**	**0.00**	**157,047,350.18**
11 02 02 T-Wall	**1.0000**	**LS**	**157,047,350.18**	**0.00**	**0.00**	**157,047,350.18**
			680,326,439.93			*680,326,439.93*
15 Floodway Control and Diversion Structures	**1.0000**	**JOB**	**680,326,439.93**	**0.00**	**0.00**	**680,326,439.93**
15 01 56' Barge Gates - MtoG	**1.0000**	**LS**	**417,955,007.10**	**0.00**	**0.00**	**417,955,007.10**

Currency in US dollars

Description	Quantity	UOM	ContractCost	Contingency	Escalation	ProjectCost
			416,614,721.83			*416,614,721.83*
56' Barge Gates - MtoG	**1.0000**	**JOB**	**416,614,721.83**	**0.00**	**0.00**	**416,614,721.83**
			1,340,285.27			*1,340,285.27*
56' Barge Gates - MtoG - Retrofit	**1.0000**	**JOB**	**1,340,285.27**	**0.00**	**0.00**	**1,340,285.27**
			159,274,873.29			*159,274,873.29*
15 02 125' Sector Gates - MtoG	**1.0000**	**EA**	**159,274,873.29**	**0.00**	**0.00**	**159,274,873.29**
			83,474,865.85			*83,474,865.85*
1 Reach A	**1.0000**	**EA**	**83,474,865.85**	**0.00**	**0.00**	**83,474,865.85**
			75,800,007.44			*75,800,007.44*
2 Reach L	**1.0000**	**EA**	**75,800,007.44**	**0.00**	**0.00**	**75,800,007.44**
			65,878,226.42			*65,878,226.42*
15 03 Stop Log Gates - MtoG	**1.0000**	**EA**	**65,878,226.42**	**0.00**	**0.00**	**65,878,226.42**
			36,081,929.49			*36,081,929.49*
Barrier Alignment	**1.0000**	**EA**	**36,081,929.49**	**0.00**	**0.00**	**36,081,929.49**
			14,137,400.33			*14,137,400.33*
Reach B	**1.0000**	**EA**	**14,137,400.33**	**0.00**	**0.00**	**14,137,400.33**
			15,658,896.60			*15,658,896.60*
Reach G-2	**1.0000**	**EA**	**15,658,896.60**	**0.00**	**0.00**	**15,658,896.60**
15 01 56' Barge Gates - LGM	**1.0000**	**LS**	**37,218,333.13**	**0.00**	**0.00**	**37,218,333.13**
			37,218,333.13			*37,218,333.13*
1 LGM reach	**1.0000**	**EA**	**37,218,333.13**	**0.00**	**0.00**	**37,218,333.13**

Currency in US dollars

Appendix D—2019 MTG Adaptive Criteria Assessment Report

USACE

New Orleans District (CEMVN)

Morganza to the Gulf (MTG)

Adaptive Criteria Assessment (ACA)

April 2019

Prepared For

Mississippi Valley Division (CEMVD)
Vicksburg, Mississippi

Prepared By

USACE, New Orleans District
New Orleans, Louisiana

In Coordination with

Terrebonne Levee and Conservation District (TLCD)
Louisiana Coastal Restoration and Protection Authority Board (CPRAB)
North Lafourche Levee District (NLLD)
South Lafourche Levee District (SLLD)

Questions or Comments Contact:
CEMVN Commander

CEMVN Senior Leadership Signature Page

for 4/16/19
JEAN S. VOSSEN, P.E. Date
Chief, Engineering Division

Mark R Wingate 4/16/19
MARK R. WINGATE, P.E. Date
Deputy District Engineer for
Programs and Project Management

16 Apr 19
MICHAEL N. CLANCY Date
COL, EN
Commanding

Executive Summary

Vicinity Map

The Morganza to the Gulf (MTG) hurricane and storm damage risk reduction project is a southern Louisiana levee alignment predominately situated in Terrebonne Parrish and partially in Lafourche Parish. The project consists of approximately 98 miles of levee including associated navigation, roadway, pump station fronting protection, and environmental structures. The approximate location of the project relative to New Orleans and other towns in the vicinity can be seen in the figure above. MTG was originally authorized in 2007 at a cost of $886,700,000 prior to updated hydraulic modeling in accordance with Hurricane and Storm Damage Risk Reduction System (HSDRRS) criteria. The project was redesigned in a Post Authorization Change Report (PACR) report and subsequently re-authorized in 2014 at a cost of approximately $10.3B. Major changes to project features are reflected in the PACR reauthorized cost. In summary, changes include an increase of approximately 35% in total levee length, an increase of approximately 100% in structures, increased levee/structure elevations/widths, and increased costs for hydraulic mitigation to address potential indirect environmental impacts. However, MTG has not been Federally funded to date for construction and is unlikely to be funded for construction at the PACR cost level moving forward.

This Adaptive Criteria Assessment (ACA) resulted from a tasker from the 14 Nov 2018 meeting with Rep. Graves, Stakeholders, HQUSACE, CEMVD, and CEMVN to perform an assessment in collaboration with local stakeholders to potentially reduce the MTG Total Project Cost (TPC). Adaptive criteria would be utilized in conjunction with elimination of costs for NFS constructed project components. The objective was a 4-6 month effort (from the 14 Nov 2018 meeting) to produce a technical report with potential cost savings. A primary goal was to retain the 1 Percent Annual Exceedance Probability (1% AEP) or 100-year level of risk reduction (LORR), consistent with the PACR. Note this ACA is limited to potential cost savings and due to the limited time, scope, and funding, does not include economic analysis or any discussion on project credits, specific cost-sharing, or operation, maintenance, repair, rehabilitation and replacement (OMRR&R) costs.

Therefore, the US Army Corps of Engineers, New Orleans District (CEMVN) in coordination with State and local stakeholders (CPRAB, TCLD, NLLD and SLLD – collectively referred to as NFS in this report) developed an "Adaptive Criteria" to apply to construction of MTG project features. The objective of this limited scope effort is to lower TPC by applying the adaptive criteria and other cost savings. The three major cost saving components of this report include eliminating the non-Federal Sponsor (NFS) completed features from the TPC, increasing the overtopping rate to 1.0cfs/ft and incorporating other adaptive criteria, and potentially limiting the Federal investment for a 1% AEP to the year 2035 project horizon as an option where the NFS would be responsible to maintain a 1% AEP beyond 2035. **Please note that this effort was limited to a 4-6 month timeframe. The intent of the analysis was to investigate the potential to reduce TPC. As stated in the report, there are many caveats and limitations to the analysis (Reference Section 10.0).**

Notably in the 2013 Issue Evaluation Study on Design Criteria Site-Adaptation Report for the Proposed MTG Levee System, the USACE Risk Management Center (RMC) and CEMVN jointly evaluated the proposed MTG levee system to assess whether HSDRRS criteria could be "site-adapted" to reduce project costs without significantly increasing risk. The following recommendations resulted: reducing the Factor of Safety, increasing the overtopping rate, and eliminating structural superiority. Therefore the concept of the adaptive criteria is rooted in the 2013 RMC MTG report, which endorses the changing of these parameters. Furthermore, the MTG PACR and corresponding Chief's Report also specifies that potential "site adaptations" would be investigated in Preconstruction Engineering and Design (PED).

Due to the limitation in schedule and budget, traditional USACE processes to study projects was not performed. CEMVN is attempting to capitalize on millions of dollars' worth of past studies and analysis completed by CEMVN and the RMC as well as capitalize on the current USACE direction of making risk informed decisions. The goal of the effort was to perform a limited scope assessment and subsequently report on TPC savings, including potential of criteria adaptations and associated level of risk as described herein.

Therefore, this ACA documents a limited technical rationale for application of the adaptive criteria defined herein to the 2035 project horizon, as well as, the 2085 horizon in a much more summary fashion. In summary, the cost factor results (including contingency) of this ACA are illustrated in the table below.

Cost Factor	PACR (2085)	ACA (2035)	ACA (2085)
Relocations	$291 M	$232 M	
HNC Lock	$622 M	$460 M	
Fish & Wildlife facilities	$514 M	$129 M	
Mitigation	$427 M	$150 M	
Levees	$5 B	$1,075 M	
Floodwalls	$409 M	$221 M	
Floodway Control & Diversions	$1 B	$225 M	
Land & Damages	$355 M	$190 M	
PED (12.826%)	$1 B	$320 M	
S&A (8.044%)	$631 M	$201 M	
Estimated Total Project Cost (TPC)	**$10.27 B**	**$3.20 B**	**$5.5B-$6.0B**

Please note that the 2085 TPC in the table above is not in addition to the 2035 estimate. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of $5.5B-$6B. This estimate can be compared similarly to the PACR TPC of $10.27B. The estimate of $3.2B is for a potential option of a reduced Federal investment to the project horizon of 2035, with the NFS also responsible for the costs to achieve the 2085 1% AEP for the project (estimated at an additional $2.8B - difference between $3.2B and $6.0B). The NFS has expressed support for this potential option (See Section 1.1) and also provided a Letter of Intent (See Appendix E).

The results of this ACA indicate the remainder of the MTG project can be constructed at a cost of approximately $3.2B to the 1% AEP for the 2035 horizon for a potential reduced Federal investment option. Federal involvement in the project would potentially end in 2035 with the NFS also maintaining the 1% AEP beyond 2035. The $3.2B estimate is limited to the 2035 horizon and does not include costs for future structural adaptations to a project life beyond 2035.

A cost range was also investigated for the 2085 horizon utilizing the adaptive criteria defined herein while constructing to 2085 elevation requirements. The 2085 assessment was much more limited in application as compared to 2035. The 2085 assessment limitations, as compared to 2035, are discussed further in the body of this document (See Section 8.0). The estimated 2085 TPC range is $5.5B-6.0B. The PACR estimate, which was also for the 2085 horizon, can be compared more directly to the 2085 cost range developed herein. The normal 50-year project life remains the same as in the PACR (from 2035-2085).

In summary, an estimated Federal participation project cost savings of $7.07B for an option of a reduced Federal investment appears attainable for the 2035 project horizon via application of the adaptive criteria developed for this assessment in conjunction with a greater financial role for the NFS beyond 2035. The overall TPC savings of $4.27B appears attainable for the 2085 project horizon (using the higher range estimate of $6B for the TPC). Please note, this assessment was limited in scope, time, and funding. More detailed data collection, analysis and design are required in PED to confirm these findings. Guidance is needed to determine the path forward on how to proceed to design and construction utilizing these results as an option to deliver the MTG project more efficiently at a reduced TPC.

Contents

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List of Acronyms

ACB - Articulated Concrete Block
ACA – Adaptive Criteria Assessment
AEP – Annual Exceedance Probability
CEMVN – USACE New Orleans District
CPRAB – State of Louisiana Coastal Protection Restoration Association Board
CPT – Cone Penetrometer Test
CSU - Colorado State University
E&D – Engineering and Design
FOS – Factor of Safety
FPEIS - Final Programmatic MTG EIS
GIWW – Gulf Intercoastal Waterway
HNC – Houma Navigation Canal
HPTRM - High Performance Turf Reinforcement Mat
HSDRRS – Hurricane and Storm Damage Risk Reduction System
HQUSACE- Headquarter USACE
LAMP -Levee Analysis Mapping Process
LORR – Level of Risk Reduction

LSP – Levee Safety Program
LWL - Low Water Level
MTG – Morganza to the Gulf
NAVD – North American Vertical Datum
NLLD – North Lafourche Levee District
NFS – non-Federal Sponsor
OMRR&R - Operation, Maintenance, Repair, Rehabilitation and Replacement
PACR – Post Authorization Change Report
PED – Preconstruction Engineering and Design
PDT - Project Delivery Team
RMC – Risk Management Center
S&A – Supervision and Administration
SLLD – South Lafourche Levee District
SWL - Still Water Level
TLCD – Terrebonne Levee and Conservation District
TOW - Top of Wall
TPC - Total Project Cost
TRM – Turf Reinforcement Mat
USFWS – US Fish & Wildlife Service
WIFIA - Water Infrastructure Finance and Innovation Act
WOS - Wave Overtopping Simulator
WRDA – Water Resources Development Act
WRRDA – Water Resources Reform and Development Act

1.0 INTRODUCTION

The MTG hurricane and storm damage risk reduction project is a southern Louisiana levee alignment predominately situated in Terrebonne Parrish and partially in Lafourche Parish, consisting of approximately 98 miles including associated navigation, roadway, pump station fronting protection, and environmental structures. MTG was authorized by the Water Resources Development Act (WRDA) of 2007 at a cost of $886,700,000. However, due to the implementation of HSDRRS design criteria following the devastating impacts of Hurricane Katrina on the New Orleans metropolitan area, the MTG project was redesigned based on updated hydraulic modeling and to the new HSDRRS design criteria. Resulting costs exceeded the 20 percent cost increase limit specified in WRDA 1986, Section 902.

Subsequently, a PACR was completed in 2013 seeking Congressional re-authorization of the MTG construction and operation, maintenance, repair, rehabilitation and replacement (OMRR&R). The PACR was successfully completed and subsequently served as the basis for the Congressional re-authorization of the MTG project in the Water Resources Reform and Development Act (WRRDA) of 2014, at an estimated cost of $10.3B. Major changes to the project features included increasing the total levee length from 72 miles to 98 miles, increasing levee/structure elevations and levee widths, increasing the number of floodgates and environmental control structures from 9 to 19 and 12 to 23 respectively, increasing the sill depth and floodgate width for the Houma Navigation Canal (HNC) lock complex, and including costs for hydraulic mitigation to address potential indirect impacts. Additionally, one of the two GIWW sector gates near Houma was eliminated. The PACR also included the RMC's Issue Evaluation Study on Design Criteria Site-Adaptation Report for the Proposed MTG Levee System. However, due to the resulting significant increase in project cost, MTG has not been Federally funded to date for construction and is unlikely to be funded for construction at the PACR cost level moving forward.

This ACA resulted from a tasker from the 14 Nov 2018 meeting with Rep. Graves, Stakeholders, HQUSACE, CEMVD, and CEMVN to perform an assessment in collaboration with local stakeholders to potentially reduce the MTG TPC. Adaptive criteria would be utilized in conjunction with elimination of costs for NFS constructed project components. The objective was a 4-6 month effort (from the 14 Nov 2018 meeting) to produce a technical report with potential cost saving findings. A primary goal was to retain the 1% AEP or 100-year, consistent with the PACR. Note this ACA is limited to potential cost savings and due to the limited time, scope, and funding, does not include economic analysis or any discussion on project credits, benefits, specific cost-sharing, or OMRR&R costs.

To date, the Terrebonne Levee and Conservation District (TLCD) has designed and constructed approximately 47 miles of the authorized levee alignment to an elevation of 12 feet (NAVD88) (existing elevations range from 10.0 to 11.5 feet due to settlement) as well as a total of 23 structures in the alignment consisting of barge floodgates, environmental structures, and pump stations fronting protection. The HNC Lock Complex is also planned for construction beginning in 2019 at a cost of approximately $400M. The Lock Complex is estimated to take 2 years to complete. In total, the NFS investment in the project consists of approximately $814M ($414M in levee/structures work and $400M for the HNC Lock Complex).

Therefore, CEMVN in coordination with the CPRAB, TLCD, NLLD, and SLLD have developed "Adaptive Criteria" which can be applied to the remaining construction of the authorized MTG levee alignment. The primary objective of this effort is to capitalize on the NFS investment to date and lower the cost of remaining construction to a potentially fundable level. A new TPC shall be developed by:

a. Eliminating costs of NFS features that have completed construction to date (or are nearing completion) from the total project cost. (*Please note that although the NFS is proceeding with design and construction of the HNC Lock complex utilizing local funding, this assessment shall include the cost of the HNC lock complex in the TPC as construction on this feature has yet to begin.*)
b. Developing Adaptive Criteria which more closely reflects the level of risk associated with the infrastructure investment of landside adjacent communities.
c. Applying this Adaptive Criteria to remaining construction features required to achieve a 1% AEP or 100-year level of risk reduction (LORR), same LORR as the PACR, at the 2035 project horizon.
d. Perform the same (c. above) for the 2085 project horizon in a much more limited fashion.

1.1 NFS PERSPECTIVE OF THE ADAPTIVE CRITERIA ASSESSMENT (ACA)

The NFS provided their perspective of the ACA for inclusion in the report, which is quoted below in its entirety. Additionally the NFS provided a Letter of Intent, which is included in Appendix E and a Local Stakeholder Historical Perspective, which is included in Appendix F.

"The State of Louisiana through the Coastal Protection and Restoration Authority Board (CPRAB), the Terrebonne Levee and Conservation District (TLCD), and the residents of Terrebonne and Lafourche parishes fully support the authorized Morganza to the Gulf Project (MTG Project). The residents of Terrebonne and Lafourche parishes have demonstrated their support for the project by voting tax levies upon themselves to raise funds necessary to advance project construction ahead of Federal funding. To date, the State and TLCD have expended $414 million designing and constructing approximately 47 miles of the approximately 98 miles of authorized levee alignment for the MTG Project to an elevation of 12 feet (NAVD88). Twenty-three structures (11 navigation structures, 10 environmental structures) and 2 pump stations fronting protection have been constructed to date. The construction of the Houma Navigation Canal Lock Complex (HNC Lock) is scheduled to begin in 2019 at a cost of approximately $400M. In total, the State's and TLCD's funds committed to the project consists of approximately $814M, including $414M in levee and structure construction and $400M for HNC Lock.

As the State and TLCD have expended non-federal funds to advance the MTG Project ahead of the Federal funding, it has become apparent to CPRAB, TLCD, and other project stakeholders that the MTG Project is facing challenges to obtain new start federal funding for the authorized estimated total project cost (TPC) of $10.3B. At the same time, it is the opinion of project stakeholders that the project can be constructed for substantially less while still providing the storm surge protection so desperately needed in this vulnerable region. Stakeholders believe that the MTG Project Post Authorization Change Report (PACR) estimated cost of $10.3B is a result of the levees and structures being designed to the standards of the Hurricane Storm Damage Risk

Reduction System (HSDRRS) located in the densely populated and infrastructure-heavy Greater New Orleans Area, standards which are not necessarily appropriate for the less densely populated areas to be behind the MTG Project alignment. In addition, the authorized costs do not take into account the cost savings that could be realized by levee reaches providing strength gains for future work and the geotechnical data obtained during the State's and TLCD's construction of over $400 million in levees and structures.

By letter dated April 11, 2016, the Assistant Secretary of the Army/Civil Works (ASA/CW) indicated that site adaptation criteria would be utilized in future efforts to reduce TPC, while still providing approved project benefits. Therefore, in order to reduce the MTG Project TPC, CPRAB, TLCD and other project stakeholders encouraged USACE to perform an assessment, in collaboration with local stakeholders, using site adaptation criteria to potentially reduce the MTG Project TPC. Project stakeholders believe that by employing criteria more appropriate to the region, in conjunction with removing the costs for the components of the system that have already been constructed by the State and TLCD, the TPC could be greatly reduced.

In short, CPRAB believes that the Adaptive Criteria developed by USACE, in coordination with the CPRAB, TLCD, North Lafourche Levee District (NLLD), and South Lafourche Levee District (SLLD), as reflected in this ACA document, can be applied to the remaining construction of the authorized MTG levee alignment, allowing the project to capitalize on the Non-Federal Sponsor (NFS) and local stakeholder investment to date and lower the cost of remaining construction to a potentially fundable level.

CPRAB believes that cost savings can be achieved while still providing a 1% Annual Exceedance Probability (AEP) due to several factors. The levee alignments constructed by the State and TLCD provide some soil foundation shear strength gain that may reduce the cost of future lifts. The large hydraulic interior storage capacity within the system gives some flexibility in overtopping design that was not afforded in the HSDRRS. In addition, independent utility has been realized by constructing this system in phases; all components completed to date provide tangible benefits.

As the NFS for the MTG Project, CPRAB has participated in the development of and has reviewed the findings of the technical assessment, as reported in this ACA document. CPRAB supported the undertaking of this assessment and fully supports its findings. CPRAB concurs with the ACA technical assessment which confirms construction potential of a 1% AEP system for the MTG study area, inclusive of the HNC Lock structure, through the year 2035, and identifies the cost to perform future levee lifts and structure alterations through the year 2085. The 1% AEP 2035 construction costs, as defined in the ACA, is estimated at $3.2B. The TPC, through 2085, is estimated in the range of $5.5 to $6B, a significant cost reduction compared to the authorized TPC of over $10.3B. Although the level of analysis performed for the future levee lifts and structure alterations to year 2085 was not as detailed as the analysis performed for the construction of the 1% AEP system to year 2035, CPRAB generally concurs with the technical findings of the ACA to year 2085.

CPRAB acknowledges that in an effort to lower the MTG TPC, this assessment evaluated the application of Adaptive Criteria to three major cost saving components, namely eliminating the non-Federal Sponsor (NFS) completed features from the TPC, increasing the overtopping rate to

1.0 cfs/ft, and limiting the 1% AEP to the year 2035 project horizon as an option where the NFS would have 100% responsibility to maintain a 1% AEP beyond 2035 to 2085."

2.0 REFERENCES

a. US Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries (Chief of Engineers Report), August 2002.
b. US Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries Supplemental Report (Chief of Engineers Report), July 2003.
c. US Army Corps of Engineers, New Orleans District Engineering Division, Hurricane and Storm Damage Risk Reduction System Design Guidelines (Interim), October 2007 (Includes 12 June 2008 Revisions).
d. US Army Corps of Engineers, Louisiana Coastal Protection and Restoration (LACPR) Final Technical Report, August 2009.
e. US Army Corps of Engineers, New Orleans District Engineering Division, Hurricane and Storm Damage Risk Reduction System Design Guidelines, New Orleans District Engineering Division, February 2011.
f. US Army Corps of Engineers, Post Authorization Change Report, Morganza to the Gulf of Mexico Project, LA, May 2013.
g. US Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries (Chief of Engineers Report), July 2013.
h. US Army Corps of Engineers, Risk Management Center, Issue Evaluation Study, Design Criteria Site-Adaptation Report for the Proposed Morganza to the Gulf Levee System, July 2013, which includes as an Appendix the Morganza to the Gulf Sensitivity Analysis from October 2012.
i. Morganza to the Gulf Cost Assessment, November 2018

These reports are incorporated by reference into this report. A summary of past authorizations and report results are included in Sections 3.0 and 5.0, respectively.

3.0 AUTHORITY HISTORY AND CURRENT STATUS

The MTG project was authorized by WRDA 2007 (PL 110-114, Sec 1001(24)) at a total cost of $886.7 million as follows:

"(24) MORGANZA TO THE GULF OF MEXICO, LOUISIANA.— (A) IN GENERAL.—The project for hurricane and storm damage reduction, Morganza to the Gulf of Mexico, Louisiana: Reports of the Chief of Engineers dated August 23, 2002, and July 22, 2003, at a total cost of $886,700,000, with an estimated Federal cost of $576,355,000 and an estimated non-Federal cost of $310,345,000. (B) OPERATION AND MAINTENANCE.—The operation, maintenance, repair, rehabilitation, and replacement of the Houma Navigation Canal lock complex and the Gulf Intracoastal Waterway floodgate features of the project described in subparagraph (A) that provide for inland waterway transportation shall be a Federal responsibility in accordance with section 102 of the Water Resources Development Act of 1986 (33 U.S.C.2212)."

In accordance with the 2002 and 2003 reports of the Chief of Engineers, the MTG project is authorized as a feature of the Mississippi River and Tributaries (MR&T).

Following redesign, the cost estimate exceeded the 20% cost increase limit. Therefore a PACR was completed in 2013. The MTG project was re-authorized by Section 7002(3)5 of WRRDA 2014, PL 113-121, at a total cost of approximately $10.3B as follows:

"SEC. 7002. AUTHORIZATION OF FINAL FEASIBILITY STUDIES.

The following final feasibility studies for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plan, and subject to the conditions, described in the respective reports designated in this section:

(3) HURRICANE AND STORM DAMAGE RISK REDUCTION.—"

A. ***State***	***B.*** ***Name***	***C.*** ***Date of Report of Chief of Engineers***	***D.*** ***Estimated Initial Costs and Estimated Renourishment Costs***
5. LA	*Morganza to the Gulf*	*July 8, 2013*	*Federal: $6,695,400,000* *Non-Federal: $3,604,600,000* *Total: $10,300,000,000*

A MTG project history timeline of authorizations, studies, and tropical storm events from 1985 through 2012 is provided in the table below:

Table 3-1 Timeline of MTG Authorizations & Studies

1985	Hurricane Juan caused extensive flooding in Terrebonne and Lafourche parishes.
1992	Reconnaissance study authorized by resolution adopted April 1992 by the Committee of Public Works and Transportation of the U.S. House of Representatives. In August, Hurricane Andrew caused extensive flooding in Terrebonne and Lafourche parishes.
1994	USACE completed the Morganza to the Gulf reconnaissance report (USACE, 1994).
1995	In the Energy and Water Development Appropriation Act of 1995 (PL 103-316), Congress directed the USACE to consider the interrelationship of studies and projects that impact the coastal area of Louisiana, including the Morganza feasibility study, the Lower Atchafalaya Basin reevaluation study, and several projects being pursued under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) program, and directed the USACE to consider improvements at and/or within the HNC. The Feasibility Cost Share Agreement was executed in June 1995.
1996	Section 425 of WRDA 96 (PL 104-303) required the USACE to develop a study of the HNC lock as an independent feature of the Morganza to the Gulf project.
1997	USACE completed the HNC lock study, which recommended a 200-ft wide lock in the HNC south of Bayou Grand Caillou and concluded that a lock structure would provide direct and indirect benefits to the environmental (marsh) habitat in the study area (USACE, 1997). The report recommended that

	the HNC lock continue to be investigated as part of comprehensive Morganza to the Gulf hurricane and storm damage reduction plans and that the detailed design phase of the lock be expedited and proceed concurrently with the feasibility study.
1998	Congress authorized the USACE to initiate detailed design of the multipurpose HNC lock.
2000	The Morganza to the Gulf of Mexico project was conditionally authorized in WRDA 2000 at a cost of $550 million subject to having a favorable Chief of Engineer's report completed by December 2000; the terms of this conditional authorization were not met. The PED phase on the HNC lock complex was initiated in advance of the PED phase for the Morganza to the Gulf of Mexico hurricane and storm damage reduction project. The PED Agreement for the HNC lock was signed in January 2000.
2002	The Morganza to the Gulf feasibility study and PEIS were completed in March 2002 (USACE, 3/2002). The PED Agreement for the overall project was signed in May 2002. In August 2002, the USACE issued a Chief of Engineers report (USACE, 9/2002). In September and October, Tropical Storm Isidore and Hurricane Lili impacted the study area.
2003	In July 2003, the USACE issued a supplemental Chief of Engineers report (USACE, 2003), which made changes to the non-Federal sponsor's in-kind services.
2004	Section 158 of the Energy and Water Development Appropriations Act, 2004 (Public Law 108-137) authorized construction on Reach J-1, which had been previously identified as work-in-kind.
2005	The PED Amendment 1 executed in March 2005 combined the two PED efforts into one and allowed the non-Federal sponsor to advance funds on the combined PED effort. In August and September, Hurricanes Katrina and Rita impacted the study area.
2007	WRDA 2007 authorized the Morganza to the Gulf of Mexico, Louisiana project for hurricane and storm damage reduction at a total cost of $886.7 million.
2008	A recon-level analysis and programmatic cost estimate (ARCADIS, 2008) was completed to determine whether or not there would still be a Federal interest in the project with post-Katrina interim criteria (USACE, 2007) incorporated and whether a feasibility-level PAC report should be initiated. Based on an analysis of four alternatives, the general alignment strategy for the PAC report was determined, but not the final level of risk reduction. Phase I Design for the HNC lock and floodgate was finalized in a 50 percent Design Documentation Report (URS, 2008). In September, Hurricanes Gustav and Ike impacted the study area.
2011	The PED Amendment 2 executed in January 2011 increased the funding ceiling and changed the name of the non-Federal sponsor from Louisiana Department of Transportation and Development (DOTD) to the Louisiana Coastal Protection and Restoration Authority.
2012	Legislation changed the former Office of Coastal Protection and Restoration (OCPR) to the Coastal Protection and Restoration Authority (CPRA) and changed the former Coastal Protection and Restoration Authority (CPRA) to the Coastal Protection and Restoration Authority Board (CPRAB).

4.0 SYSTEM DESCRIPTION

The authorized MR&T MTG project is designed to provide hurricane and storm damage risk reduction benefits to a 1% AEP (or 100-year) (otherwise known as 1% or 100-year LORR) while ensuring navigational passage and tidal exchange. MTG is located in the state of Louisiana about 60 miles southwest of New Orleans and includes Terrebonne Parish and the portion of Lafourche Parish between the eastern boundary of Terrebonne Parish and Bayou Lafourche. The study area extends south to the saline marshes bordering the Gulf of Mexico and encompasses approximately 1,900 square miles. The Gulf Intracoastal Waterway (GIWW) and the HNC are major waterways in the area. The GIWW passes through Houma in an east-west direction. The HNC extends due south from Houma to the Gulf of Mexico. Bayou Lafourche runs along the northeastern boundary of the project/study area. Figure 4-1 illustrates the currently authorized MTG levee alignment (in red) relative to New Orleans and other towns/landmarks as well as water bodies in the southeast Louisiana vicinity. The authorized MTG levee alignment primarily follows existing hydrologic barriers, such as natural ridges, roads, and existing local levees.

Figure 4-1 Vicinity Map

Figure 4-2 on the next page illustrates the status of construction as of November 2018. Green highlighted alignments have been constructed by the NFS to an elevation of 12.0 feet (with corresponding settlement throughout the alignment that has resulted in current elevations ranging for 10.0 to 11.5 feet). Yellow highlighted reaches are currently under construction by the NFS. Red highlighted reaches have not yet begun construction. Otherwise the location of structures throughout the alignment are labeled following the same color scheme to illustrate construction status.

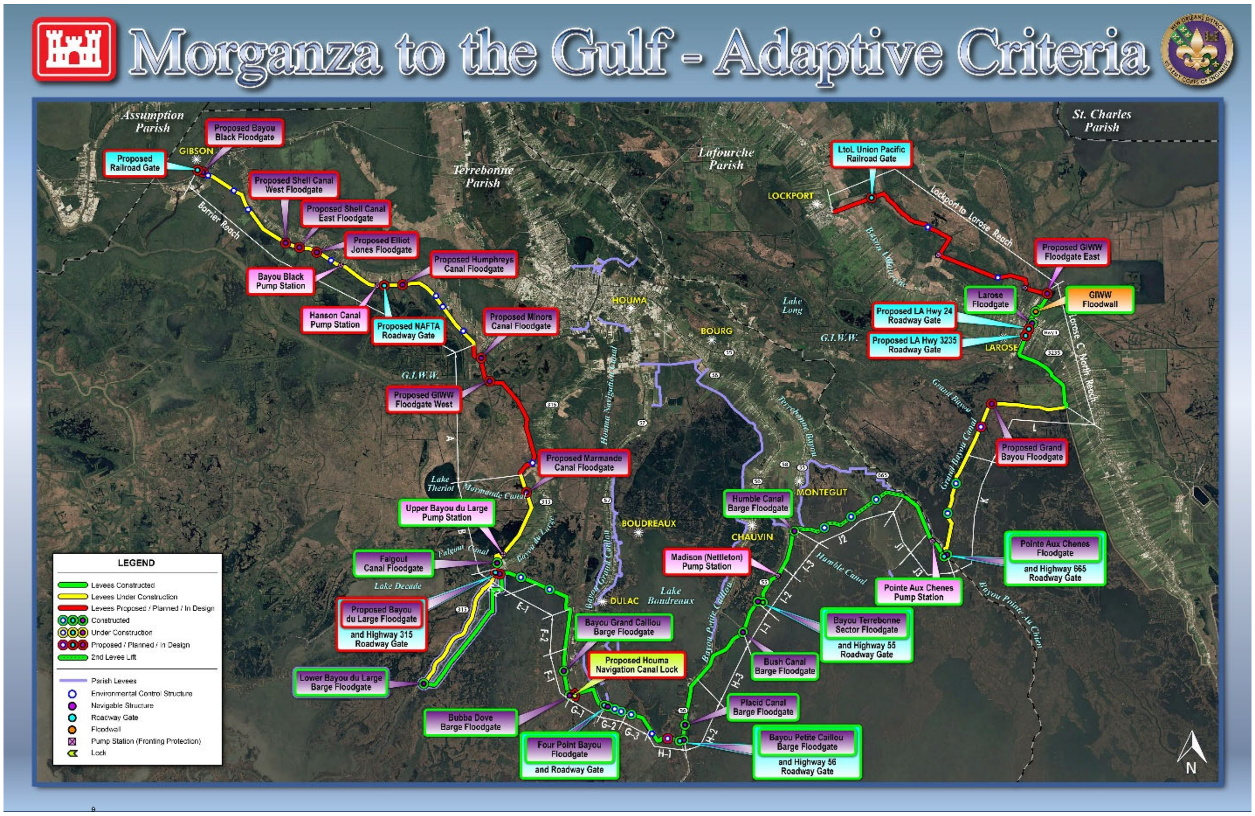


Figure 4-2 – MTG Levee Alignment (See Appendix A for larger version)

There are a total of approximately 98 miles of earthen levee, 22 navigation structures (includes 2 at GIWW and “Bubba Dove” at HNC), 12 roadway gates, 23 environmental structures, 5 pump stations (which require construction of fronting protection), and the HNC Lock Complex in the currently authorized alignment. To date, approximately 47 miles of earthen levee have been constructed by the NFS to an elevation of 12 feet (**NAVD88 – all elevations throughout this document are referenced to this datum**). Due to settlement, existing elevations range from 10.0 to 11.5 feet throughout the NFS constructed alignments based on data provided by the NFS. Additionally, 11 navigation structures, 10 environmental structures, and 2 pump stations fronting protection have been constructed. The NFS funded HNC Lock Complex is scheduled to begin construction in 2019. Therefore, the HNC Lock Complex cost estimate from the NFS is included in this assessment and is further discussed in Section 6.5.

A tabular listing of the levee quantities by reach and associated estimated costs (based on the adaptive criteria described herein) is provided in Appendix C for 2035. Appendix C also includes a tabular listing of the structures (by Reach) in the authorized alignment. The structures table indicates which structures have been built to date by the NFS and an estimated cost for the remaining structures (based on adaptive criteria). A larger version of Figure 4-2 project map is included in Appendix A. Please note that quantities for 2085 project horizon have not been included in Appendix A because the 2085 analysis is much more limited in scope. Rather a range for 2085 estimated cost is provided. See Section 8.0 for further discussion.

5.0 SUMMARY OF PAST REPORTS/ANALYSIS

5.1 PACR

The PACR report for MTG was completed in 2013. The 2013 PACR estimated cost of the project was approximately $10.27B (w/contingencies) resulting in over $9B cost increase as compared to the originally authorized project. The cost increase is predominately attributable to updated hydraulic modeling which capitalized on modern hydraulic modeling software as well as updated geometry (bathymetry and LIDAR) to compute new 1% hydraulic elevation requirements. MTG was subsequently re-authorized, however the project has not been funded for construction to date and is unlikely to be funded for construction at the PACR cost level moving forward.

5.2 RMC HISTORICAL EFFORTS

In 2013 the Risk Management Center (RMC) and CEMVN completed the Issue Evaluation Study for Design Criteria Site-Adaptation Report for the Proposed MTG Levee System. This report is mentioned in the MTG Chief's Report (paragraph 7), dated 8 July 2013 and states "While the estimated project costs in the district's report are the best available and compliant with current post-Katrina design criteria, the U.S. Army Corps of Engineers Risk Management Center and the New Orleans District jointly evaluated the proposed MTG project to assess whether the post-Katrina design criteria, specifically in the areas of global stability and overtopping and structural superiority, could be site adapted to reduce project cost without significantly increasing risk. Based on the results of this effort, site adaptations of the criteria were identified for consideration during the next phase of implementation, preconstruction, engineering and design." Part of that report (in an Appendix), included performing a Sensitivity Analysis (conducted in 2012) on one reach (J-2) of the proposed MTG alignment to investigate potential cost savings. As this RMC report is the original basis for the MTG adaptive criteria, a summary of those results from 2013 are detailed in the below paragraphs.

These RMC efforts were comprehensive, consisting of a multi-disciplined engineering, PM, economics, and environmental team including 10 RMC staff assisted by an additional 14 CEMVN staff. RMC efforts included performing a site visit and meeting with local stakeholders. The RMC analysis included performance of potential failure mode analysis in which screening of a wide variety of failure modes was conducted to determine the most significant for further analysis. Overtopping erosion leading to breach was found to be the only credible, significant failure mode. Subsequently overtopping failure modes were fleshed out leading to descriptions of the events resulting in breach and inundation. A multi-node event tree with associated estimates of probabilities for the each event node on the tree was then developed.

Various engineering analyses were then performed to support assessments of probabilities of events on the event tree, as well as assessments of times and depths for inundation when breaching occurs and associated consequences. These results were then compiled in a risk model used to evaluate and portray risk for the existing conditions, risks for HSDRRS criteria proposed system, and risks for site-adapted HSDRRS criteria system. Based on these results, the team developed recommendations for potential site-adaptation of HSDRRS criteria.

Under the "Major Findings and Understandings" section on page 73 of the RMC Issue Evaluation Study, the three primary design parameters recommended for adjustment include increasing the allowable overtopping rate to 0.5 cfs/ft (0.1 cfs/ft required for HSDRRS criteria), lowering the allowable factor of safety for global stability from 1.5 to 1.3, and eliminating structural superiority. Specifically the recommendations are quoted as follows:

"1. Reduce the Factor of Safety (FoS) for end of construction global stability from 1.5 to 1.3. The risk assessment team concluded that there is inconsequential change in post-project residual risk for a levee 800 ft wide (associated with global stability FoS = 1.5) versus a 600 ft wide (associated with a global stability FoS = 1.3). This reduction in end of construction factor of safety does increase the likelihood of slope stability failures during construction, which is often unacceptable in an urban environment. However, for the non-urban setting of this project, slope stability failures during construction can be mitigated during construction at relatively low costs and are unlikely to cause loss of life or significant property damage.

2. Change the Design Overtopping Rate for well-maintained grass covered levee slopes from 0.1 to 0.5 cfs/ft. This change could result in reduction of levee and structure elevations by several feet. Based on tests conducted to assess USACE HSDRRs designs, the grass cover on clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft.

3. Elimination of the structural superiority requirement. Reducing top elevations of structures to match adjacent levee heights would lead to significantly shorter structures, i.e. reducing structure elevations by 2 ft in addition to the reductions in elevation resulting in the change in design overtopping rate." (Note, As defined in the HSDRRS Design Guidelines on page 5-2 under Section 5.1.3, structural superiority is 2 feet added to structure elevations above the required design grade of adjacent levee alignments. Intent of structural superiority is to provide additional elevation for difficult to construct features such as sector gates, utility crossing, etc. in an effort to minimize the need for future adjustment should design grades increase due to greater than expected subsidence or sea level rise. In addition, structure superiority lowers the potential for overtopping at critical infrastructure).

Subsequently, overall section width was reduced from 685 feet to 446 feet (for J-2). The levee crown elevation was reduced from 23.5' to 22'. The resulting 2012 Sensitivity Analysis cost savings for levee construction is approximately $1.521B. Corresponding reductions in real estate and mitigation costs amounted to $131M. Construction of structures to the revised elevations of adjacent levees and eliminating structural superiority added a $259M reduction. The total reduction in costs for the MTG project amounted to $1.911B in the 2012 Sensitivity Analysis. This resulted in a revised TPC of approximately $8B.

This ACA report carried forward two of the RMC recommendations verbatim; FOS 1.3 and elimination of structural superiority. CEMVN felt that the favorable language used in the overtopping recommendation (i.e. grass cover on clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft.) justified use of a 1.0 cfs/ft overtopping rate for the purposes of performing this ACA. Reference Section 6.0 for discussion of other criteria parameter changes employed by CEVMN for this assessment.

5.3 2018 COST ASSESSMENT

Subsequently, late in 2018, a Cost Assessment was performed by CEMVN to further assess if any additional cost saving measures could be employed in addition to those identified in the 2012 Sensitivity Analysis. In addition to the 2012 Sensitivity Analysis criteria changes, the 2018 Cost Assessment considered side cast material for each lift with a hauled in clay cap except for the final lift which is entirely hauled in. Haul distances assumed were 25 miles one way. Additionally, NFS constructed elements were considered at no cost to the Federal project. The revised TPC from the 2018 Cost Assessment is approximately $6.9B.

5.4 PATH TO ACA

Beginning in November 2018, CEMVN was tasked to investigate further potential cost savings for the project, resulting in this ACA. CEMVN, in coordination with NFS stakeholders, has developed "Adaptive Criteria" and applied this criteria to the proposed MTG alignment in conjunction with eliminating costs for NFS constructed features from the TPC. Another cost savings component is potentially limiting the Federal investment for a 1% AEP to the year 2035 project horizon as an option where the NFS would be responsible to maintain a 1% AEP beyond 2035. This 4-6 month assessment was limited in scope to identify potential cost savings to reduce the MTG TPC. The adaptive approach and methodology to compute 2035 horizon costs is further discussed in Section 6.0. The more limited approach used to compute 2085 horizon costs is further discussed in Section 8.0.

6.0 ADAPTIVE CRITERIA APPROACH

The Adaptive Criteria developed for this effort is focused on reducing the levee cross section and footprint. Levee construction constitutes approximately 50% of the TPC. Reductions in levee quantities generate a corresponding "ripple" effect to other projects costs. Parameters such as mitigation and real estate will also see cost savings as the levee sections and footprints are reduced. As costs of construction features are reduced, cost for Supervision and Administration (S&A), Engineering and Design (E&D), and contingency are likewise reduced as these parameters are typically a percentage of construction costs.

In summary, the Adaptive Criteria consists of:

- Maintaining 1% LORR with 2 feet of overbuild to account for settlement. Federal involvement would potentially continue to 2035 with NFS maintaining 1% beyond 2035. CEMVN also investigated constructing to a 1% LORR 2085 horizon. See Section 8.0 for further discussion.
- Adjust overtopping rate to 1.0 cfs/ft and evaluation of in-system storage and overtopping scour failure mode to determine if allowable
- Levee global stability utilized a Factor of Safety (FoS) of 1.3 instead of 1.5.
- Geotechnical analysis to investigate foundation strength gains through soil consolidation was based on NFS provided data of the existing levees as well as new Cone Penetrometer Test (CPT) data. Increased strength gains enable the levee to

be constructed higher with minimal increase in footprint size thereby saving cost in material placement
- Tailoring haul distances to align with NFS input on actual pits used to date as well as potential pit locations
- Subtracting NFS furnished quantities (for completed sections) from revised design sections.
- Re-assessing structures to subtract out completed structures from 2035 horizon costs and pro-rating remaining structures to align with revised hydraulic elevations
- Re-assessing structures construction methodology and sequencing to the 2085 project horizon to determine cost saving potential verses PACR costs
- Eliminating structural superiority requirements
- Re-assessing Mitigation, Real Estate, Relocation, contingency, E&D, and S&A costs based on new design sections

6.1 PROJECT HORIZON

The MTG project, as currently authorized, was designed to have a project life to year 2085. As such, the alignment would require a total of four lifts to maintain a 1% LORR 2085 horizon in consideration of factors such as levee settlement, subsidence, relative sea level rise over the project life, as well as the resulting construction methodology required to mitigate these factors. For the purpose of this assessment, CEMVN investigated an option to limit Federal involvement in the project to the year 2035. The NFS would potentially be responsible for maintaining the project to a 1% LORR beyond the year 2035. The normal 50-year project life would remain the same as in the PACR (from 2035-2085). As such, CEMVN has determined that the design sections can be constructed in one remaining lift (instead of four) throughout the entire alignment to achieve a 2035 1% LORR. Approximately 50% of the total MTG alignment has been constructed to date to an elevation of 12 feet (10.5 to 11.5 with settlement). Therefore the final elevations on the NFS constructed reaches as well as the unconstructed reaches shall be built in one remaining lift. Cost saving potential of this criteria adaptation is anticipated to be significant, perhaps larger than any other single parameter associated with this analysis. However, risks to this approach are twofold:

1. CEMVN is not evaluating whether construction of a 2035 alignment could be easily augmented to achieve an eventual 2085 design level. Installation of geotextile fabric, quality of fill material used, and/or size of available footprint may become factors to achieve height and stability at a 2085 level. Therefore, engineering design factors typically considered for short term (2035) building toward long term (2085) have not been incorporated into this assessment and are potentially NFS responsibility within the context of the 2035 horizon assessment.
2. Height of structures in the alignment will be lowered to match a 2035 time horizon, 1.0 cfs/ft overtopping rate, and no structural superiority. If structures are ultimately constructed to 2085 elevations, significant and costly augmentation of the structures may be required to achieve an eventual 2085 project horizon and this effort is likewise potentially a NFS responsibility.

Please note that the majority of the time spent on this ACA was focused on the 2035 horizon for adaptive criteria application. Once this effort was complete, CEMVN also performed an investigation to the 2085 project horizon, however the 2085 analysis is more limited than the 2035 assessment. See Section 8.0 for further discussion. **Throughout Section 7.0, discussion of adaptive criteria application is limited to the 2035 project horizon.**

6.2 1.0 CFS/FT INTERIOR STORAGE CAPACITY ANALYSIS

CEMVN evaluated the effects of higher allowable overtopping rates on interior water levels. One of the primary design constraints for local levees and floodwalls is the allowable wave overtopping rate. For HSDRRS, the allowable overtopping rate was set to 0.1cfs/ft at 90% level of assurance. For MTG, CPRAB has explored the possibility of increasing the allowable overtopping rate to 1.0 cfs/ft at 50% confidence. This increase in the allowable overtopping rate results in lower required design elevations and lower project cost. Typically, wave overtopping volumes are insignificant when compared to free-flow overtopping or breaching. Free-flow overtopping occurs when the still water level is greater than the levee crest elevation. In the design of HSDRRS, the allowable wave overtopping rate (0.1cfs/ft) was selected to prevent damage and possible failure of the levee. With an allowable overtopping rate of 1.0 cfs/ft, the volume of overtopping increases and may have impacts to interior water levels.

To evaluate the possibility of increased interior stages associated with an allowable overtopping rate of 1.0 cfs/ft at the peak of a storm for the MTG project, overtopping volumes were estimated and then applied to a stage-storage curve of the protected area. The overtopping event was assumed to last 5 hours. The overtopping rate at the peak hour was assumed to 1.0 cfs/ft. Two overtopping lengths were evaluated. A 350,000-foot overtopping length, which equals the entire length of the MTG project, was assumed as a worst case event. This scenario is highly unlikely as different parts of the system will experience different surge levels. A more realistic 60,000-foot overtopping length was also evaluated. Figure 6-1 displays the stage-storage curve extracted from the LIDAR and bathymetry.

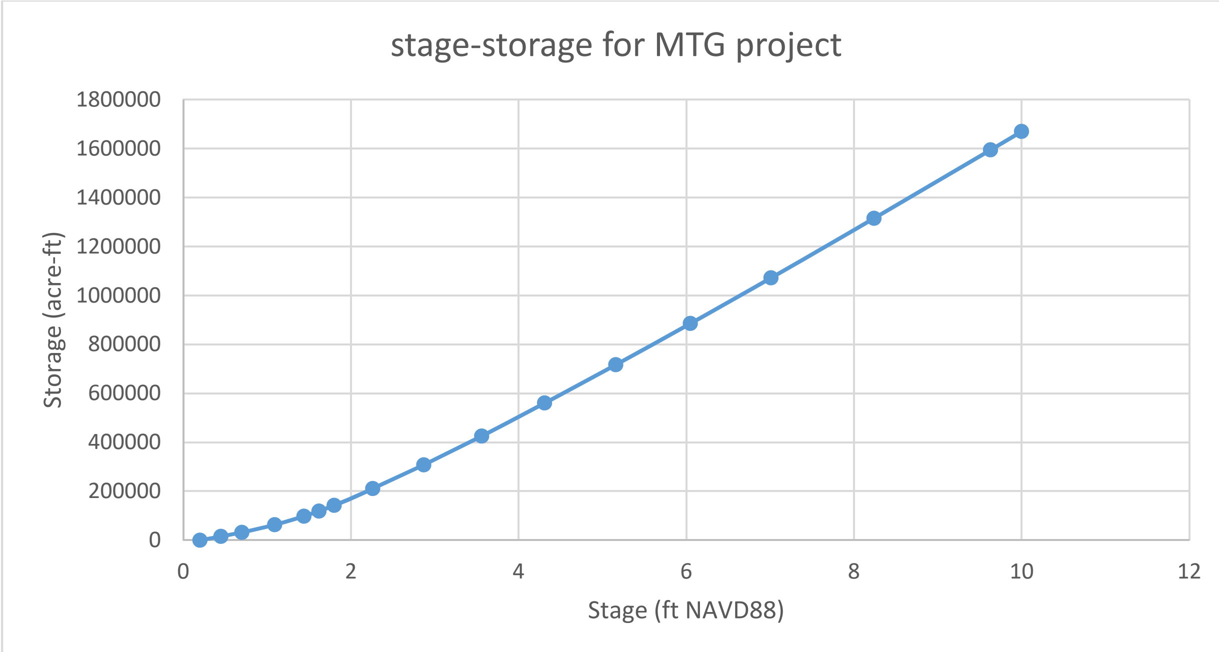


Figure 6-1 - Stage-storage curve associated with Morganza to Gulf Project

The results show a 0.25-foot increase in interior stage for the more realist scenario, and a 1.1-foot increase for the extreme and unrealistic case. Therefore, allowing an overtopping rate of 1.0 cfs/ft appears to have an insignificant impact on interior drainage storage capacity in consideration of existing interior storage capacity as well as interior features (levees and drainage features).

6.3 1.0 CFS/FT OVERTOPPING SCOUR FAILURE MODE ANALYSIS

Levee overtopping is a key design parameter in consideration of scour failure mode. HSDRRS was designed for the 1% AEP event meeting overtopping criteria of 0.1 cfs/ft at 90% level of assurance and 0.01 cfs/ft at 50% level of assurance for grass-covered levees. This criteria was primarily based on Dutch research for grass covered slopes with limited applicability to the HSDRRS. Further review of existing design criteria and testing showed that steady state overtopping criteria was readily available. What was lacking is an understanding of wave overtopping and how grass covered earthen levees would perform under wave overtopping conditions in consideration of scour. In order to provide resilience to the HSDRRS, overtopping performance criteria needed to be established for grass covered earthen levees and for the various armoring materials being considered for the HSDRRS. These armoring materials included unreinforced grass (grass species included Bermuda Grass and Bahia Grass) covered earthen levees, grass reinforced with Turf Reinforcement Mat (TRM), grass reinforced with High Performance Turf Reinforcement Mat (HPTRM), and Articulated Concrete Block (ACB). In order to better understand the effects of wave overtopping and gain insight to performance of these different materials under wave overtopping conditions, USACE undertook several research initiatives in conjunction with the armoring program. The major component of this research is the full scale Wave Overtopping Simulator (WOS) at Colorado State University (CSU) in Ft. Collins, Colorado.

Full scale wave overtopping testing was conducted to determine the erosion resistance and performance of the various armoring materials and included; unreinforced Bermuda grass, unreinforced Bahia grass, TRM and HPTRM reinforced Bermuda grass, and ACB. These materials were subjected to wave overtopping associated with a 0.2% a.c.e. (500-year) storm surge, up to a maximum WOS flow capability of 4.0 cfs/ft, with 8 feet waves and 9 second periods to determine their performance ranges and ability to provide erosion resistance for earthen levees. A summary of results from the CSU WOS are presented in table below.

Results of CSU Testing in the Wave Overtopping Simulator are presented in Table 6-1

Table 6-1 – Results of CSU Wave Overtopping Simulator

Material No.	Material Description	Max. Tested Discharge, cfs/ft	Hours @Max Flow	Total Hrs	Notes
1	Bare Clay	0.2	0.3	1.3	Failed after 1 hr 20 m
2	Bermuda Grass	4.0	4	24	No visible erosion
3	Bahia Grass	3.0	4	17	No visible erosion
4	TRM/Bermuda	4.0	3	9.0	No visible erosion
5	HPTRM/Bermuda	4.0	3	9.0	No visible erosion
6	Bermuda Grass w/ruts	4.0	3	6.0	No propagation
7	Bermuda w/ruts & bare spot	4.0	3	9.0	No propagation
8	Lime-Stabilized Clay				Failure at 1.0 cfs/ft
9	ACB	4.0	3	3.0	Successful
10	Unreinforced Dormant Bermuda Grass	2.5	1	3.2	Failed at 2.0 cfs/ft
11	Dormant Bermuda Grass w/HPTRM	4.0	3	6.0	Slight visible erosion
12	Dormant Bermuda Grass w/TRM	1.5	2	5.0	Failed at 1.5 cfs/ft

Results of the wave overtopping tests at CSU demonstrated that increasing grass quality (from dormant grass to healthy green grass) and that the addition of HPTRM to distressed grass (similar in root quality to > 2-year old actual levee grass) increased their resiliency such that both could withstand at least double the wave overtopping flow rate (from 2.0 cfs/ft to 4.0 cfs/ft with no failures) from a 0.2% AEP storm surge.

Based on the above results, some additional analysis to determine the actual quality of Bermuda grass between the living and growing condition and the dormant condition was undertaken by Louisiana State University. Grass root analysis was completed on both the living and growing condition and the dormant condition, as well as Bermuda grass root samples from levees in and around the New Orleans metropolitan area. Comparing these root analyses indicated that the actual Bermuda grass root quality from the samples from levees in and around the New Orleans metropolitan area were similar to the root quality of the dormant Bermuda grass from the CSU overtopping testing. Using these results and the fact that the CSU overtopping testing showed that dormant Bermuda grass could withstand overtopping flows of 2.0 cfs/ft, it was concluded that living and growing Bermuda grass could withstand an overtopping flow rate of 1.0 cfs/ft on an earthen levee with an adequate factor of safety which aligns with an RMC conclusion further discussed in Section 5.2.

6.4 LEVEE GLOBAL STABILITY FACTOR OF SAFETY (FoS) REDUCTION RATIONALE

According to RMC's Issue Evaluation Study dated 24 July 2013, end of construction global stability FoS may be reduced from 1.5 designated in HSDRRS criteria to 1.3. The risk assessment team concluded that there is inconsequential change in post-project residual risk. This reduction in end of construction FoS does increase the likelihood of slope stability failures during construction, which is often unacceptable in an urban environment. However, for the non-urban setting of this project, slope stability failures during construction can be mitigated during construction at relatively low costs and are unlikely to cause loss of life or significant property damage.

6.5 HOUMA NAVIGATION CANAL (HNC) LOCK COMPLEX

The HNC lock complex is currently in the final stages of design and is due to begin construction by the NFS in 2019. Based on NFS cost estimates the complex will cost approximately $400M to construct. The NFS has stated that the HNC Lock complex shall be constructed to the 2085 1% LORR horizon following all HSDRRS criteria. The PACR report estimated a cost of $622M, however for the purpose of this ACA, the NFS cost estimate of $400M is accepted for the Lock cost factor and shall be utilized to compute costs for both 2035 and 2085.

7.0 ADAPTIVE CRITERIA APPLICATION

Please note that throughout Section 7.0, discussion of adaptive criteria application is focused on the 2035 1% LORR project horizon. Discussion of the more limited investigation into the 2085 1% LORR is included in Section 8.0.

7.1 HYDRAULICS

The ACA began with CEMVN developing new hydraulic levee sections based on a 1.0 cfs/ft overtopping rate for levee reaches and structures for the 2035 horizon only. Appendix D provides the methodology write-up and corresponding results for the hydraulic engineering performed for this effort. In summary, the hydraulic boundary conditions for each hydraulic reach for the 1% return period and year 2035 condition were obtained and tabulated. The hydraulic boundary conditions were then input into the MATLAB script for overtopping of levees and structures using an overtopping threshold of 1 cfs/ft for the "with wave berm" and "without wave berm" scenarios. For the "with wave berm" scenario, a berm factor of 0.75 was used as was done in the MTG Feasibility Study. The resulting elevations ranged from 11.5 to 20 feet without wave berms and 11 to 19 feet with wave berms. Structural elevations ranged from 11.5 to 20 feet. Without the wave berms, the levee heights increased approximately 1 foot. See Appendix D for hydraulic engineering analysis.

7.2 GEOTECHNICAL

With CEMVN hydraulic sections complete, CEMVN geotechnical engineers developed new design sections for Reaches J2, B, Barrier Reach and Reach F for the 2035 1% LORR project horizon. Due to time constraints, new design sections were limited to four. Additionally a section developed by CPRAB for Reach E was evaluated. Section 7.2.4 includes further discussion on the design sections completed. The geotechnical engineers then performed an assessment of how to apply the design sections to the remaining reaches (i.e. which sections best fit the remaining undersigned reaches). Civil Engineers subsequently developed quantities throughout the alignment by using the newly designed sections and geotechnical engineering guidance to match analyzed cross sections to similar reaches.

As stated earlier, CEMVN reviewed design sections developed by CPRAB for Reach E. The NFS furnished levee section data including construction plans and specifications for various MTG levee reaches constructed to date. Additionally, the NFS provided geotechnical reports, boring/CPT logs, and soil parameters for each design Reach. Reaches E and G were constructed with geotextile fabric reinforcement. Otherwise the NFS only utilized fabric adjacent to structures in the remaining reaches. The CPRAB design section has been applied to Reaches E and G only.

7.2.1 NEW CPT DATA POINTS

MTG soil data obtained by CEMVN was collected before the NFS began levee construction. Since the first stage of levee construction for some of the levee reaches have already been constructed, consolidation and strength gain of foundation soils have taken place. CEMVN and the CPRAB performed theoretical foundation strength gain calculations, but these calculations were not verified by field data. Consequently, as part of this assessment, the NFS collected 10 new CPT data points to assess validity of the strength gains assumed in NFS and CEMVN geotechnical analyses. Two CPTs per reach were collected adjacent to existing soil borings or CPTs performed for previous CEMVN studies/investigations prior to levee construction in reaches J2, H, F, E, and Larose C North. The CPT data validated the methodology used to estimate the strength increase in foundation soils. The CPTs are considered representative of subsurface conditions at the CPT locations on the date completed. Though the CPT results are used to inform our engineering design for the rest of the MTG alignment, no guarantee is given that the CPTs will be representative of subsurface conditions or strength gains at other locations or times within the overall alignment. The nature and extent of variations in subsurface conditions between and away from the proposed CPT locations may not align. Therefore, further data collection points may be required to validate strength gain estimates throughout the alignment. Designs may require significant adjustment if more detailed investigations are conducted. For final design of levee reaches with existing construction, additional field investigation will be performed to verify foundation strength gains.

7.2.2 GEOTECHNICAL DESIGN METHODOLOGY AND ASSUMPTIONS

The NFS has either completed construction or has begun construction on reaches B, E, F, G, H, J, K, and L to initial elevations of approximate 12 feet. Subsequent settlement of these reaches ranges from 0.5 feet to 1.5 feet over approximately two years. Because large amounts of settlement were observed and predicted during the first two years after levee construction, strength gain of foundation soils was incorporated into the design. Only gains in strength occurring during the initial two years after levee construction were considered. Geotechnical engineers developed the initial effective overburden for a reach with no levee present and then determined the levee section from the NFS's P&S that was likely constructed. Using Rocscience's Settle3D software, geotechnical engineers modeled this section to determine the induced stress with depth resulting from the constructed section at a time stage of two years.

The geotechnical engineers have found that cohesive soils in Southeastern Louisiana typically have an undrained shear strength to vertical effective stress ratio equal to approximately 0.22. Therefore, the engineers multiplied the induced change in stress at approximately two years by the correlation factor of 0.22 to estimate the increase in shear strength gain at the centerline and toe of the existing levee.

This method being utilized to calculate strength gain is approximate and will be verified prior to construction of the 2nd levee stage in the field by additional soil borings, laboratory testing, and CPTs.

Geotechnical engineers then applied these strength gain values to slope stability using the 2016 version of GeoStudio's Slope/W program to perform slope stability analyses using the Spencer Method for Still Water Level (SWL), Low Water Level (LWL) and Top of Wall (TOW) water loadings. Required global stability factor of safety is 1.3 for SWL and LWL. Geotechnical engineers assumed that additional shear strength gains in the soft clay soils encountered throughout the project would improve the global stability factor of safety during levee construction to the 2nd stage ranging from El 13 to El 21. A global stability FOS of 1.2 was utilized to capture foundation strength gains of soft soils during initial levee construction in our geotechnical analyses for all reaches analyzed. Additionally, for levee reaches where the 1st lift has already been constructed, foundation strength gains will continue to increase. Only strength gains from two years of consolidation are accounted for in our analyses. However, additional strength gain will be realized before construction to the 2nd levee lift. Typically, foundation strength gains are not considered for levee enlargement of existing levees. However, the timing between levee lifts, the large size of the typical enlargement, and additional foundation consolidation and strength gains justify this approach. Therefore, the factor of safety was designed to 1.2 for this assessment. After construction of these lifts, a field investigation program will be developed to document and verify foundation strength gains have occurred and a FOS of 1.3 was obtained.

The cross section for cost estimation for Reach E was provided to USACE by CPRAB. CEMVN openly shared design methodologies with CPRAB to ensure consistency in design and engineering analyses.

In addition to slope stability analyses, geotechnical engineers analyzed reaches J2, F, B, and the Barrier Reach for settlement using Settle3D. Each reach was designed with a two-foot overbuild to account for settlement after construction. With this two-foot overbuild, each of the levee crowns analyzed remained above the 1% design elevation for at least seven years.

Geotechnical engineers considered a levee cross section with and without a wave berm as designed by hydraulic engineers. After preliminary analyses, the "without wave berm" case was decided to be the smaller, more cost efficient levee section required for stability. The large wave berm developed by hydraulic engineers was not necessary for stability, particularly the low water case. Therefore, quantity calculations made in the current analyses were performed for the "without wave berm" case.

7.2.3 SEEPAGE

Seepage analyses were not performed for the ACA. Notably, a difference in cross section is noted between the ACA sections and previously developed sections (PACR report dated October 2011 and the "Morganza to the Gulf Sensitivity Analysis, Levee Reach J-2" report dated October 2012) Nevertheless, based on geotechnical engineering experience, the difference in cross section between the current proposed cross section and the cross sections previously developed does not significantly impact seepage performance under a flood load due to a reduced levee crown height for the current analysis and the similar foundation conditions. In the PACR, seepage analyses were analyzed for the foundation of reach F and reach I and indicated satisfactory seepage FOS for SWL and Top of Levee (TOL). Reach F is believed to be the most vulnerable to seepage due to the presence of near surface sands and will represent a worst case seepage condition for the western portion of the project. Reach I represents a typical eastern reach in regards to seepage. Additionally, borrow pits constructed to provide side cast material for future levee construction will be designed to be far enough away from the levee to ensure an adequate seepage FOS.

7.2.4 CONSTRUCTION METHODOLOGY ASSUMPTIONS

Since USACE was not involved during initial levee construction along the MTG alignment, geotechnical engineers assumed quality control testing such as soil classification, moisture content, organic content, and sand content were performed to ensure proper embankment material was used for construction. Embankment materials should be classified in accordance with ASTM D 2487 as CL or CH with less than 35% sand content. Geotechnical engineers assume typical embankment construction methods including clearing, grubbing, and proper drainage were performed. CEMVN understands that the first lift primarily served to preload the foundation of the levees and that minimal compaction effort took place (i.e., three passes of a dozer). As such, soil properties included in the analyses assumed semi-compacted levee fill with a unit weight of 110 pcf and cohesion of 400 psf. To account for settlement of foundation soils, geotechnical engineers designed each levee Reach with a two foot overbuild of the levee crown. Per information provided by the NFS, the first lifts of reaches E and G were constructed with geotextile reinforcement. All other levee reaches constructed to date do not have geotextile reinforcement fabric in the section.

Levee cross sections were designed and analyzed for slope stability and settlement for reaches J-2, B, F, E, and the Barrier Reach. The 1% design elevation for MTG levees varies across reaches from El. 11 to El. 19. The reaches that the geotechnical engineers analyzed represent good coverage with respect to varying levee crown elevations as they apply to engineering analyses. Therefore, appropriate levee cross sections that CEMVN analyzed were applied to MTG Reaches that we did not analyze. Projection of design sections were assumed as follows: Reach J2 was projected to reaches H2, H3, I1, I2, I3, J1, K, and L; reach B was projected to reach A; reach E was projected to reach G; the Barrier Reach was projected to the Lockporte to Larose Reach; and reach F was not projected onto any other reach.

In summary, the geotechnical engineers submitted to civil engineers; 1. four new design sections, 2. CPRAB's reach E design section, and 3. instructions on how to apply the new design sections to the remaining reaches throughout the alignment. Design sections developed utilizing the adaptive criteria for the without wave berm condition are illustrated in Figures 7-2 thru 7-6.

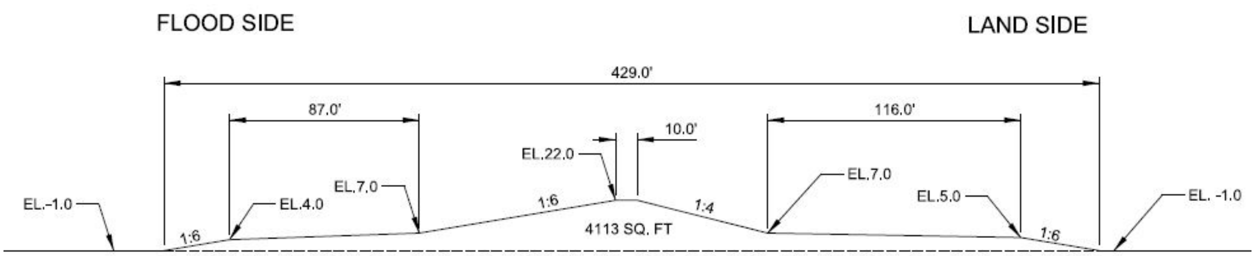


Figure 7-2 - Typical Section Reach J-2 – Not to Scale (NTS)

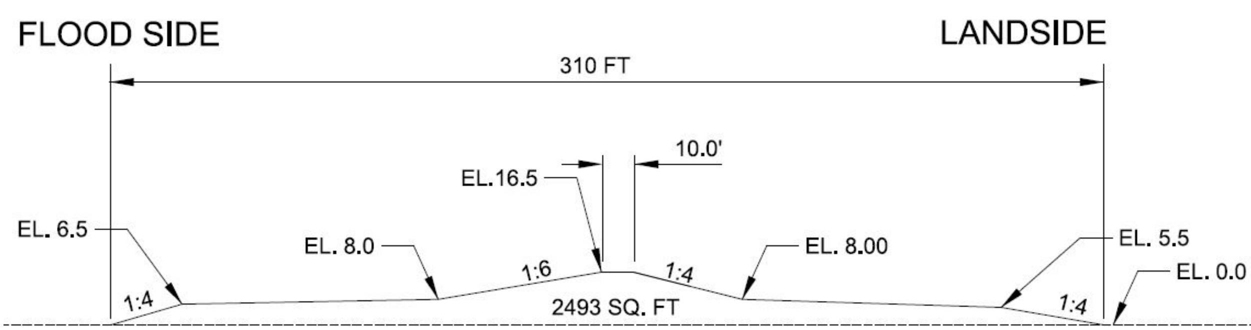


Figure 7-3 - Typical Section Reach B – NTS

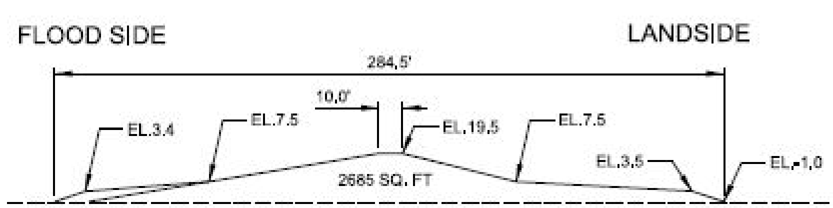


Figure 7-4 - Typical Section Reach E (CPRAB) – Not to Scale (NTS)

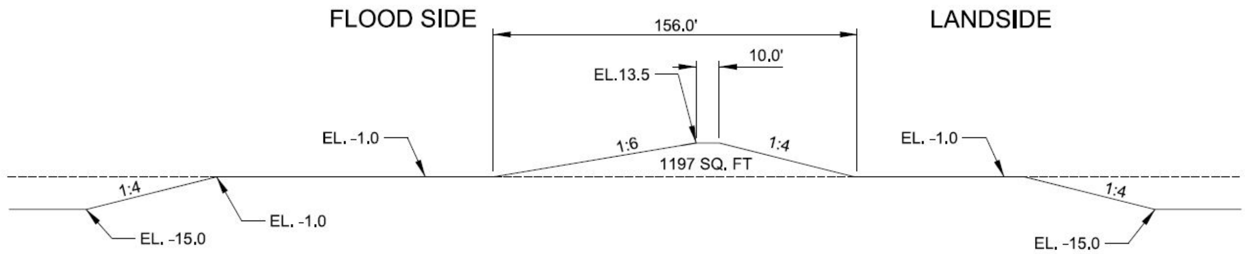


Figure 7-5 - Typical Section Barrier Reach – NTS

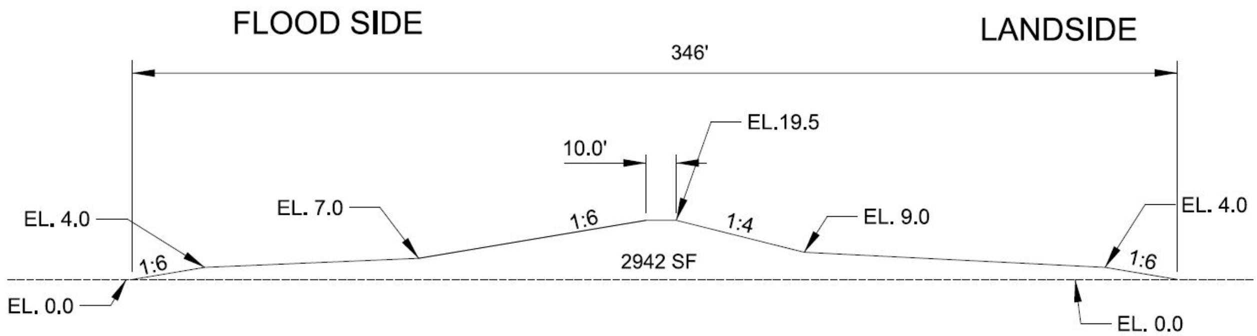


Figure 7-6 - Typical Section Reach F– NTS

7.3 CIVIL ENGINEERING

With geotechnical engineering design sections complete, civil engineers developed cross-sectional areas multiplied by reach lengths to develop neat line embankment quantities for the 2035 1% adaptive criteria LORR. Quantities of borrow placed to date were provided by the NFS. Since quantity of borrow was provided (verses quantity of embankment), NFS quantities were reduced by 20% to account for compaction during material placement. New design section quantities less the NFS quantities placed to date provided cost engineers with the additional quantities needed (by reach) to attain the 2035 1% LORR.

For levee reaches that construction of the 1st lift has not begun, the difference in design section quantities was increased by 20% to account for lateral spread. For levee reaches that initial construction to approximate EL 12 has been completed, the difference in design section quantities was increased by 35% to account for lateral spread and foundation settlement that has occurred since construction. CEMVN also furnished the levee area acreage for computing clearing/grubbing and fertilizing/seeding/mulching costs.

Figure 7-7 illustrates the magnitude of reduction for the adaptive criteria design cross sectional area by overlaying sections from prior design efforts. CEMVN developed the overlay for reach F to compare PACR, adaptive criteria, and NFS constructed existing sections.

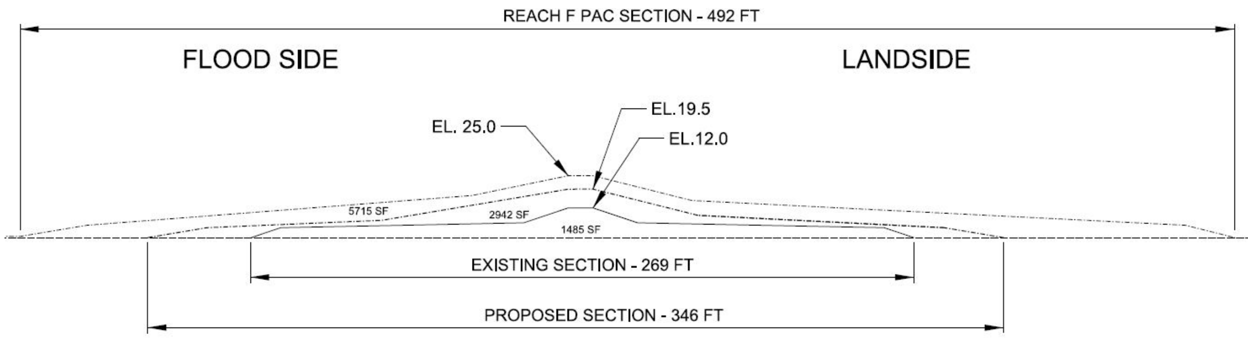


Figure 7-7 - Typical Section Reach F with overlays – NTS

As seen in Figure 7-7, the levee crown elevation requirement for reach F was reduced from an elevation of 25 feet to 19.5 feet, the section width was reduced from 492 feet to 346 feet, and the cross sectional area was reduced to 5,715 square feet to 2,942 square feet (neat line).

7.4 COST

Cost engineering developed new unit costs for the revised levee designs and worked with structural engineers to prorate new costs for the revised structures. Only the costs for currently unconstructed features are included in this effort. Any feature that has been constructed is assumed to be acceptable and has been removed from the TPC. All future levee construction is assumed to be built following typical New Orleans District levee construction techniques using truck hauled embankment with the exception of reach K which requires barge delivery for the majority of the length.

The embankment construction unit cost ($/CY) for the revised levee design sections was based on an average 7-mile one-way truck haul distance. The haul distance was provided by TCLD based on the haul distances they have been experiencing for the alignments constructed to date. This appears to be a reasonable assumption based on a review of mileage arcs on the NFS furnished borrow map, which is provided in Appendix B. The unit cost for levee embankment includes basic assumptions for borrow pit development (i.e. pit management, excavation, on-site processing/moisture control), loading, truck hauling, spreading, compacting, testing, and truck wash racks. The cost for truck wash racks was removed from the Barrier Reach, reach A, reach B, and the Lockport to Larose reach, where it is assumed the levee is directly accessible without transiting on highways. The overall levee construction cost also includes parameters such as mobilization/demobilization, levee clearing, embankment construction, and fertilizing, seeding, and mulching.

The costs for the revised structures were based on the 35 year LORR structures developed for the PACR, which were similar to the ACA structure heights required. All NFS completed structures, including environmental control structures, were removed from the TPC. The 35 year LORR PACR structure costs were prorated down based on the revised hydraulic elevation requirements. This reduction was applied to the foundation, structural concrete, and structural steel for all structures including floodgates, roadway gates, and corresponding floodwalls. In addition, it is assumed that all unconstructed sector gates will be constructed as barge gates. The structural engineers did not have a design for the barge gates, therefore a cost savings percentage was assumed from comparisons done in the past and applied to the remaining foundation, concrete, steel, and phase 1 cofferdam costs of the sector gates. The cost development assumes unrestricted solicitations as the contracting method.

Based on NFS input, relocations identified in the PACR have predominately not been completed in compliance with criteria for reaches constructed to date. Approximately 47 miles of the PACR alignment (98 miles in total) have been constructed by the NFS to elevation 12. Due to the limited time and scope of this assessment, the PDT was unable to go through the entire alignment with the NFS to determine which utility relocations have been performed in compliance with criteria. Ultimately the PDT concluded that it is reasonable to prorate the PACR utility relocation costs based on the NFS input. Therefore PACR relocation cost was reduced by 20% for this ACA.

7.5 STRUCTURES

Hydraulic engineers furnished structural engineers new hydraulic design elevations for the structures. Due to time constraints, structural engineers worked with cost engineers to prorate the cost of all of the structures based on the revised hydraulic elevation requirements. As stated earlier, this reduction was applied to the foundation, structural concrete, and structural steel for all structures including floodgates, roadway gates, and corresponding floodwalls. See Section 7.4 for further discussion. In addition to proration, structural engineers further reduced the cost of floodgates by assuming all sector gates included in the PACR would be constructed as barge gates. The structural engineers do not have a design for the barge gates therefore, sector gates were prorated based on elevations and then applied an assumed cost savings percentage for the barge gates received from previous comparisons done in the past.

7.6 ENVIRONMENTAL MITIGATION

The total PACR environmental cost was approximately $1B; however, approximately half of this cost was for environmental control structures. Approximately $427M makes up the PACR mitigation cost. Given the limited time to perform the ACA, the CEMVN Planning Team was not able to follow their typical processes to compute a new mitigation cost based on the newly developed ACA design sections and associated project footprint. However, based on a reduced project footprint, potential environmental mitigation savings can be assumed.

The Final Programmatic MTG EIS (FPEIS) assumed 3,743 acres of mostly marsh impacts. So, if the project footprint impacts are reduced by 50%, there would be 1,871.5 acres of direct impacts to marsh wetlands. The average cost for marsh is $80,000/acre. This would result in a cost of approximately $150 million to mitigate direct impacts to marsh wetlands. In the FPEIS, USFWS stated that further refinement of both direct and indirect impacts would not be possible until a more refined design was developed and other measures associated with the levee system were better understood. This information would be needed to conduct a hydrologic model analysis of the entire project to determine system-wide effects on the flow and distribution across the project area. Information taken from the hydrologic analysis would be used to conduct a wetland value assessment for indirect impacts to wetlands. USACE agreed to conduct the hydrologic analysis once the project was further defined to provide a better estimate of direct and indirect impacts to wetlands. Other resources studied in the FPEIS may also require mitigation; however, a more refined project design would be required to identify any impacts. In summary the PACR environmental mitigation cost could potentially be reduced to a total of $150M based on a 50% reduction in project footprint.

7.7 REAL ESTATE

PACR real estate costs exceeded $350M. The CEMVN Real Estate (RE) Division was consulted to determine what if any real estate saving could be achieved based on the reduced project footprint as well as acreage of potential future borrow pits. Upon review, RE determined that the majority of the real estate costs (approximately $300M) estimated in the PACR are attributable to homeowner buyouts on the flood side of the system resulting from anticipated project-induced flooding. Since completion of the PACR, the NFS has built a ring levee (Bayou du Large Ring Levee) around an area in which approximately 50% of the buyout homes are situated. Therefore the project should no longer induce flooding on this community.

Due to the time constraint associated with this effort, RE did not have time to perform a detailed analysis and develop revised real estate costs based on changes that have occurred in respect to the number of anticipated homeowner buyouts and changes in project footprint. However, based on input from the NFS with respect to the Bayou du Large Ring Levee, as well as the reduction in project footprint, real estate PACR costs are potentially reduced by 50% for buyouts and 25% for all other RE costs due to the reduced project footprint (including borrow areas) needed to construct the ACA sections. This is a very generalized approach to RE cost adjustments. RE costs could be significantly higher or lower based on detailed investigations that would be performed at a later date. Ultimately, the CEMVN PDT concluded that it is reasonable to assume real estate cost reductions at these levels based on NFS input and reduction in project footprint. Therefore, the total ACA real estate cost could potentially be reduced to $190M from the PACR amount of $355M.

7.8 CONTINGENCY, E&D, S&A

As new costs for all PACR parameters were completed, Cost Engineering then applied the PACR percentages for S&A and E&D to the TPC. No reduction in these percentages can be justified; however, the overall cost of these parameters is reduced based on a reduction of the TPC. Contingency was reduced to 15% based on NFS input. Based on construction completed to date, many PACR unknowns no longer exist. Therefore a contingency reduction to 15% is considered reasonable.

7.9 RESIDUAL RISK

The criteria adaptations made for this ACA are not expected to significantly impact the residual risk identified during RMC assessment efforts (See Section 5.2). Frequency of potential inundation will decrease, whereas loss of life in an event may increase due to less evacuation due to the existence of a new risk reduction system. This risk can be mitigated by local communities strictly enforcing hurricane evacuation requirements. Although there is an increase in water volume entering the system in an event, CEMVN evaluated the interior storage capacity and determined that allowing an overtopping rate of 1.0 cfs/ft appears to have an insignificant impact on interior drainage storage capacity in consideration of existing interior storage capacity as well as interior features (levees and drainage features). See Section 6.2 for further discussion. Also, CEMVN determined that the increased overtopping rate should not have a significant impact on levee section reliability. Based on the CSU study of scour failure mode (see Section 6.3), CEVMN concludes there is acceptable risk associated with an increased overtopping rate relative to a potential breach due to scour.

8.0 POTENTIAL 2085 1% HORIZON

As part of this assessment, CEMVN evaluated the potential to achieve a 1% LORR 2085 project horizon utilizing the adaptive criteria approach defined herein but in a much more limited and broad brush application. Hydraulic engineers developed elevations for the 2085 levee alignment and associated structures utilizing modeling results as was done for the 2035 project horizon. However due to time constraints, CEMVN assessment was then limited to application of the 2085 elevations (plus 2 feet of overbuild) to the 2035 cross sections to compute new levee quantities. Increases in levee elevations ranged from 4.5 to 2 feet with a 2.0 foot increase predominant throughout the alignment. Again, due to time constraints, no geotechnical design or stability analysis was performed to develop 2085 cross sectional designs. Moreover, the iterative process between hydraulic, geotechnical, and civil engineering disciplines that occurs to dial in cross section side slope and berm design requirements did not occur. Levee footprints increased somewhat but not significantly.

2085 structure elevation requirements are equivalent to levee elevation requirement due to the fact that the levees were designed without wave berms. To develop 2085 costs for structures, 1% 2085 ACA hydraulic elevations were compared to the structure elevations for the 35 year LORR from the PACR. As discussed in Section 7.4, these elevations predominately aligned. Therefore, structures costs from the PACR 35 year LORR alternative were utilized. Floodgate PACR costs were reduced an additional 30% because sector gates were assumed in the PACR and barge gates are assumed in this ACA. A key assumption is that existing structures will have to be demolished and rebuilt to obtain the 2085 1% LORR standard. An increase of 15% in cost was included to account for required demolition and removal of existing barge gates and environmental control structures.

The final parameter considered in development of the 2085 1% LORR cost is the application of contingency. The number of unknowns with respect to 2085 as compared to 2035 is higher. Unknowns include factors such as detailed levee and structure designs, location of borrow, demolition, and future costs of structures, real estate/mitigation costs, etc. Therefore in development of the 2085 1% LORR cost the CEMVN PDT concluded that a 25% contingency should be applied to the 2085 1% LORR TPC. Notably, project footprint increases were predominately minor (2035 to 2085) within the context of this assessment. Therefore, real estate and environmental costs for the 2035 horizon were not changed for the 2085 horizon. The only cost difference for these two cost factors is the application of contingency from 15% to 25%.

In summary, the 2085 project horizon cost reported herein reflects construction of all features to the long term 2085 horizon. The 2035 cost reflects (as described in Sections 6.0 and 7.0) building to the short term (2035) without including adaptably in the designs of unbuilt structures to augment them to a 2085 elevation.

For structures, CEMVN considered the concept of using 2085 design criteria while constructing to 2035 elevations. Where feasible and cost-effective, structures initially built to the 2035 design height may be designed with the ability to be later augmented to attain a 2085 1% LORR design height. For example, floodgates would be built to the 2085 design height and the adjacent tie-in walls would have the 2035 design height. Existing structures built to 2035 design height would need to be demolished and rebuilt. This assumes existing structures were not designed/built with 2085 features.

In consideration of the concept of "2035 structure designs building toward 2085", a reasonable cost basis to adapt a 2035 system to 2085 could not be developed due to time constraint. Ultimately, a design strategy for the unconstructed structural features that allows augmentation to a future design height requirement may prove beneficial to the project in the long term. CEMVN recommends further investigation of this scenario given appropriate time and funding to assess. In conclusion, this assessment shall report two costs:

1. 2035 project horizon w/o adaptability of structures to the 2085 project horizon
2. 2085 project horizon

The 2085 project horizon cost is reported as a range only. 2085 sections lack geotechnical analysis and the iterative process typically followed to maximize section efficiency and balance engineering requirements with cost. Therefore, CEMVN feels a cost range is more appropriate to report for the 2085 project horizon. As such, the 2085 project horizon cost range developed by CEMVN for this assessment is $5.5B to $6.0B.

9.0 OTHER COST FACTORS

The following cost factors were also considered as part of this effort.

a. Project alignment
b. Redundant back levees
c. Relative sea level rise
d. FEMA LAMP Program
e. Borrow site depth

Each of these cost factors have been determined to have little or no impact to overall cost savings. NFS previously investigated changes to the project alignment, however no significant cost savings could be determined. Redundant back levees are a moot issue. Based on the available interior storage capacity determined by hydraulic engineers, a 1.0 cfs/ft overtopping rate is allowable and justified for both interior storage and scour. Relative sea level rise is a long term estimated parameter. Since the project life considered for this assessment is held to a 2035 horizon, relative sea level rise is an irrelevant parameter within the construct of the hydraulics models in terms of reducing required hydraulic design heights.

For this ACA effort, CEMVN coordinated with the local Levee Safety Team (LST) who in turn coordinated with the Risk Management Center (RMC). The LST and RMC coordinated a call with FEMA representatives to discuss the Levee Analysis and Mapping Procedures (LAMP) being conducted in the MTG area. The FEMA LAMP program is simply intended to map risk for a levee system that are not accreditable in current condition. Therefore the LAMP program may be beneficial to the project in terms of insurance rates based on a lower risk, however the area will not receive insurance rates at the 1% LORR for an accredited system until the FEMA accreditation standard has been achieved. Ultimately the FEMA LAMP program will not impact the project cost either positively or negatively. However, tangible insurance benefits to local communities may be realized based on NFS constructed features completed to date.

The discussion with FEMA also included the 100-year LORR begin utilized by FEMA. Objective was to ensure that USACE and FEMA are both using the same 100 year LORR elevations in their respective analysis. The 100 year LORR was confirmed to be the same as used by FEMA in their mapping process.

Based on input from the NFS, borrow site depth is limited to between 20 to 24 feet in the project areas. Beyond this depth, the material mainly consists of sand. Therefore excavating deeper borrow pits is not a feasible parameter to consider for reducing costs.

10.0 RISKS – ASSUMPTIONS, CAVEATS, LIMITATIONS

This assessment documents major changes from the currently authorized project with significant assumptions and heavy reliance on NFS provided data/analysis. The objective is to furnish a defensible technical rationale for potential overall reduced project cost. Significant data collection, re-design, and detailed cost analysis shall be required to verify the findings in this ACA moving forward. The following provides a listing of assumptions, caveats, and limitations associated with development of this effort.

- 1% LORR was maintained. CEMVN investigated both 2035 and 2085 project horizons in a limited fashion, however the 2085 investigation was much more limited. See Sections 6.1 and 8.0 for further discussion.
- Reach E was designed by CPRAB. This reach is accepted without further analysis and applied to reach G (the only other reach constructed with geotextile fabric).
- A seven (7) mile one way haul distance was used for calculating levee construction cost. A seven mile haul distance (on average) has been utilized by NFS based on the levee construction to date.
- No borings of borrow site locations were provided or obtained for this effort.
- USACE is significantly relying on NFS furnished data and assumptions. Data, assumptions, and calculations have not been independently verified.
- No field visits were conducted for this assessment.
- The lengths of structures in the alignment were not subtracted out for levee quantity calculations.
- Full levee sections were assumed all the way to the end of the east and west alignments. (not tapered down).
- Borrow sources used for construction on initial levee lifts for MTG included adjacent side cast and hauled-in fill. Borrow boring data is either not available or insufficient to ensure that borrow material meets embankment specifications. Borrow boring data

should include soil classification, water content, organic content, and materials finer than No. 200 testing.

- Because levee cross sections that were analyzed were applied to MTG reaches that were not analyzed, it may be necessary to reevaluate designs in this assessment at a later date because of varying subsoil conditions.
- Existing structures were not evaluated by CEMVN. For this effort, existing structures are assumed to meet appropriate criteria and USACE construction practices without further actions, remedial or otherwise are required. PACR costs for structures completed have been eliminated from the TPC. Further evaluation of the structures will be required to determine compliance with USACE criteria if Federal construction funding is approved for the project.
- Assumption is made that structures designed with 2085 foundations can be cost effectively augmented to meet 2085 design heights beyond 2035.
- Geotechnical analyses were not performed to design levee cross sections for the 2085 1% horizon.
- CEMVN applied 2 feet of overbuild to the 2085 hydraulic crown elevations. However, settlement analyses were not performed. Therefore, no level of assurance can be given as to how long it will take for this overbuild to settle below the 2085 hydraulic elevations.

11.0 SUMMARY OF RESULTS

The following table provides a cost summary of the major cost line items associated with the MTG levee project **for the 2035 1% LORR horizon**. Discussion of 2085 results is included in Section 8.0. **Please note that the 2085 assessment is much more limited than 2035.**

Table 10-1 MTG ACA Cost Summary

Cost Factor	PACR (2085)	ACA (2035)	ACA (2085)
Relocations	$291 M	$232 M	
HNC Lock	$622 M	$460 M	
Fish & Wildlife facilities	$514 M	$129 M	
Mitigation	$427 M	$150 M	
Levees	$5 B	$1,075 M	
Floodwalls	$409 M	$221 M	
Floodway Control & Diversions	$1 B	$225 M	
Land & Damages	$355 M	$190 M	
PED (12.826%)	$1 B	$320 M	
S&A (8.044%)	$631 M	$201 M	
Estimated Total Project Cost (TPC)	**$10.27 B**	**$3.20 B**	**$5.5B-$6.0B**

Please note that the 2085 TPC in the table above is not in addition to the 2035 estimate. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of $5.5B-$6B. This estimate can be compared similarly to the PACR TPC of $10.27B. The estimate of $3.2B is for a potential option of a reduced Federal investment to the project horizon of 2035, with the NFS also responsible for the costs to achieve the 2085 1% AEP for the project (estimated at an additional $2.8B - difference between $3.2B and $6.0B). The NFS has expressed support for this potential option (See Section 1.1) and also provided a Letter of Intent (See Appendix E).

The results of this ACA indicate the remainder of the MTG project can be constructed at a cost of approximately $3.2B to the 1% AEP for the 2035 horizon for a potential reduced Federal investment option. Federal involvement in the project would potentially end in 2035 with the NFS also maintaining the 1% AEP beyond 2035. The $3.2B estimate is limited to the 2035 horizon and does not include costs for future structural adaptations to a project life beyond 2035.

A cost range was also investigated for the 2085 horizon utilizing the adaptive criteria defined herein while constructing to 2085 elevation requirements. The 2085 assessment was much more limited in application as compared to 2035. The 2085 assessment limitations, as compared to 2035, are discussed further in the body of this document (See Section 8.0). The estimated 2085 TPC range is $5.5B-6.0B. The PACR estimate, which was also for the 2085 horizon, can be compared more directly to the 2085 cost range developed herein. The normal 50-year project life remains the same as in the PACR (from 2035-2085).

In summary, an estimated Federal participation project cost savings of $7.07B (difference between $10.27B and $3.2B) for an option of a reduced Federal investment appears attainable for the 2035 project horizon via application of the adaptive criteria developed for this assessment in conjunction with a greater financial role for the NFS beyond 2035. The overall TPC savings of $4.27B (difference between $10.27B and $6B) appears attainable for the 2085 project horizon (using the higher range estimate of $6B for the TPC). Please note, this assessment was limited in scope, time, and funding, therefore, significant assumptions and heavy reliance on NFS furnished data are factors that may impact reliability of these findings. Please reference Section 9.0 for further discussion regarding risks and limitations associated with this assessment. More detailed data collection, analysis and design are required in PED to confirm these estimated cost savings. Specifically:

1. Collection of new survey and boring data to assess what has been built to date
2. Application of the Adaptive Criteria throughout the alignment tailored to the geometry of each reach
3. Investigation of borrow locations and haul roads
4. Detailed investigation of relocations completed to date to determine compliance with criteria and potential application of cost saving via lessons learned to remaining relocations throughout the alignment
5. Detailed evaluation of the NFS constructed structures to determine compliance with criteria and potential application of cost saving via lessons learned to remaining structures throughout the alignment
6. Detailed evaluation of Real Estate requirements based on 1 and 2 above
7. Detailed evaluation of Environmental requirements (mitigation) based on 1 and 2 above

12.0 PATH FORWARD

Guidance is needed to determine the path forward on how to proceed with PED and construction of the MTG project utilizing these results as an option to deliver the MTG project more efficiently with a reduced TPC. Although a potential estimated Federal participation project cost savings of \$7.07B for an option of a reduced Federal investment appears attainable for the 2035 project horizon via application of the adaptive criteria developed for this assessment in conjunction with a greater financial role for the NFS beyond 2035, and an overall TPC savings of \$4.27B appears attainable for the 2085 project horizon (using the higher range estimate of \$6B for the TPC), significantly more analysis is required to confirm these findings in PED.

If the determination is made to proceed to PED, CEMVN could further refine these site adaptations as stated in the 2013 Chief's Report. Key points are listed below:

- A 1% LORR is maintained
- NFS design and construction efforts to date have eliminated multiple unknowns from the PACR thereby substantiating the cost saving potential of the ACA
- Changes in the ACA do not change the overall MTG project's purpose
- NFS funded design and construction to date have reduced costs and also demonstrates strong commitment to the project thus providing USACE with a strong local partner
- NFS is willing to accept responsibility to maintain the project at a 1% LORR beyond the year 2035

Other potential options for the path forward could possibly be:

1. Specific Authority – Legislation could be pursued to provide specific authority to proceed in accordance with this ACA report if HQUSACE determines we cannot utilize the Chief's discretionary authority.
2. Sec. 7001, WRRDA 2014 – Section 7001 of WRRDA 2014 requires that the Secretary of the Army annually submit to the Congress a report (Annual Report on Future Water Resources Development) that identifies for potential congressional authorization completed feasibility reports, proposed feasibility studies, and proposed modifications to authorized projects or studies. The report is to be based, in part, upon responses to an annual notice for proposals from non-Federal interests published in the Federal Register. A proposed modification to the authorized MTG project could be a potential option under Sec. 7001 if additional authority is needed.
3. Split Delivery – The project could be adapted to a format where the Federal shared involvement is only for the remaining structures and levees to the 2035 horizon and the NFS involvement is for the structures and levees they have built along with the future levee lifts and structure adaptations to the 2085 horizon or some form of a split delivery.
4. PACR - The ACA performed herein does not satisfy any USACE standard for project investigation or study. However, this project has been studied extensively to date (Feasibility level, PACR, as well as smaller studies) at a cost of over \$50M. Therefore, initiation of a further study action or another PACR is not recommended by the stakeholders.
5. Water Infrastructure Finance and Innovation Act (WIFIA) - The Water Infrastructure Finance and Innovation Reauthorization Act of 2017 extends and doubles the funding authorization for a critical credit assistance program designed to accelerate investment

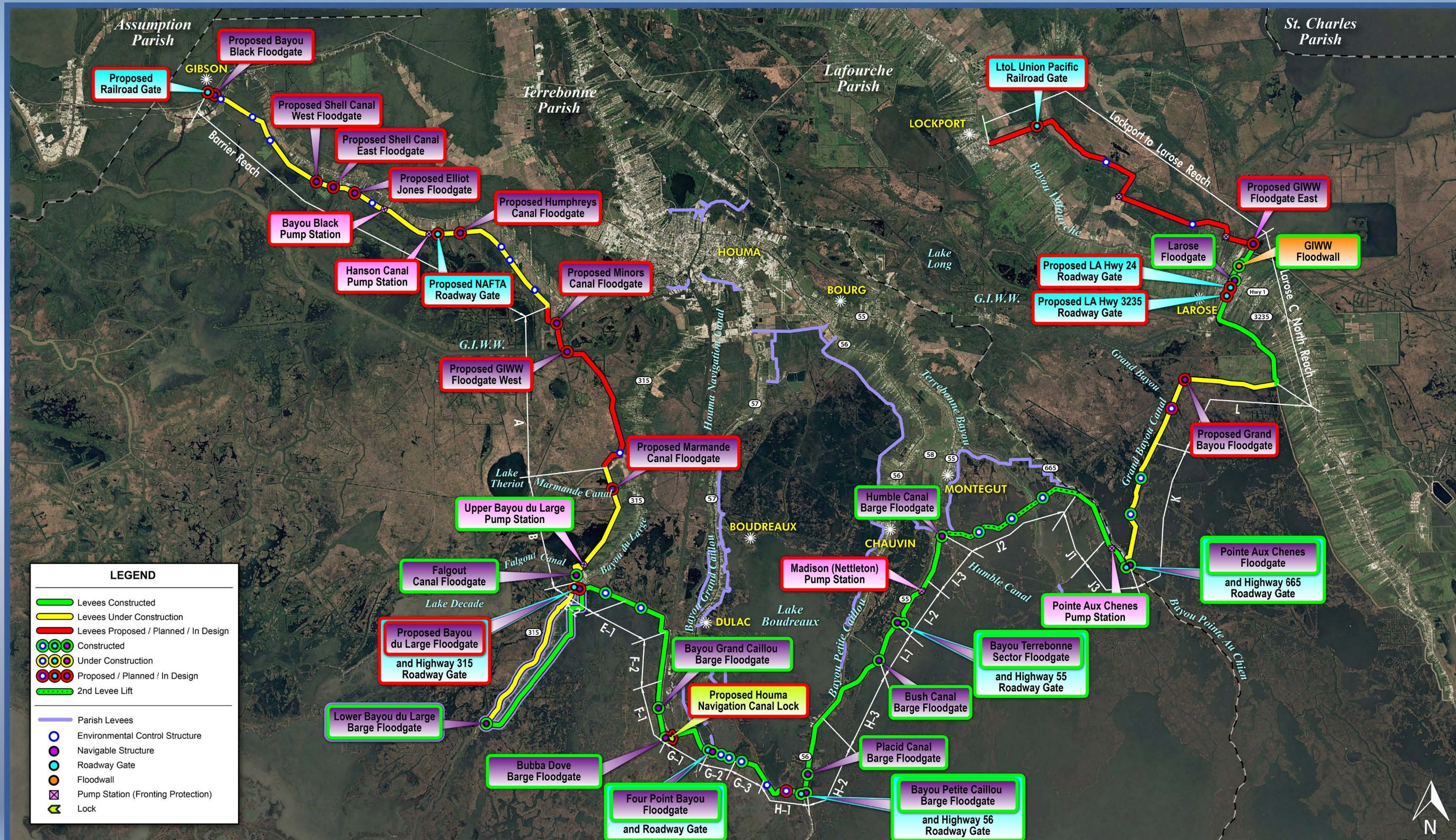
in our nation's water infrastructure. Established as part of the 2014 Water Resources Reform and Development Act, the WIFIA program is a federal loan and guarantee pilot program that aims to accelerate investment in our nation's water infrastructure by providing long-term, low-cost supplemental credit assistance for regionally and nationally significant projects. WIFIA offers greater financial flexibility to utilities, municipalities, nonprofits and other eligible entities who may lack the capacity to fund water infrastructure upgrades by helping cover up to 49% of the project costs.

The results of this ACA indicate the remainder of the MTG project can be constructed at a cost of approximately \$3.2B to the 1% AEP for the 2035 horizon for a potential reduced Federal investment option. Federal involvement in the project would potentially end in 2035 with the NFS also maintaining the 1% AEP beyond 2035. The \$3.2B estimate is limited to the 2035 horizon and does not include costs for future structural adaptations to a project life beyond 2035. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of \$5.5B-\$6B.

Appendix A

Project Map

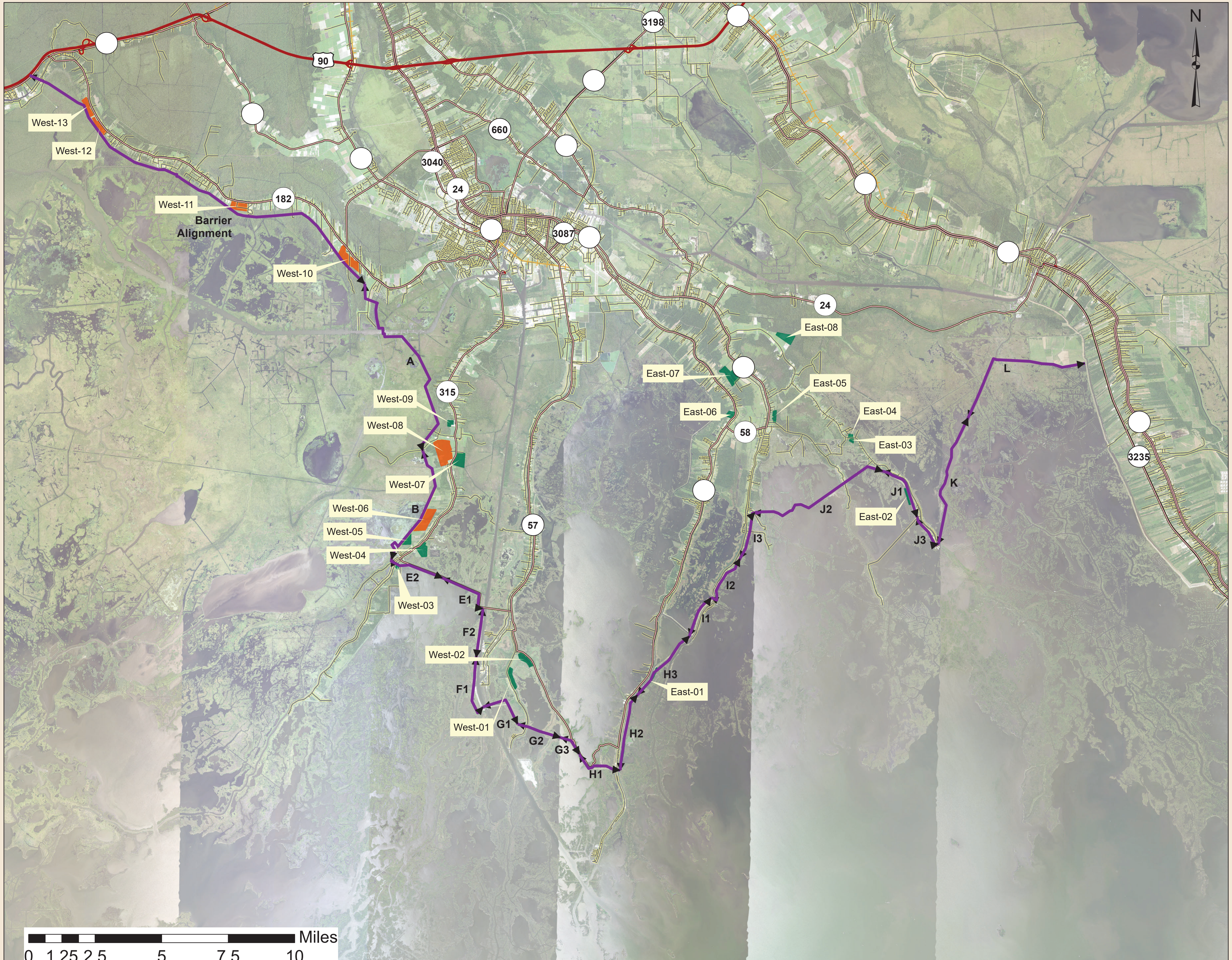
Morganza to the Gulf - Adaptive Criteria



Appendix B

Borrow Map

Morganza to Gulf Borrow Pits Map

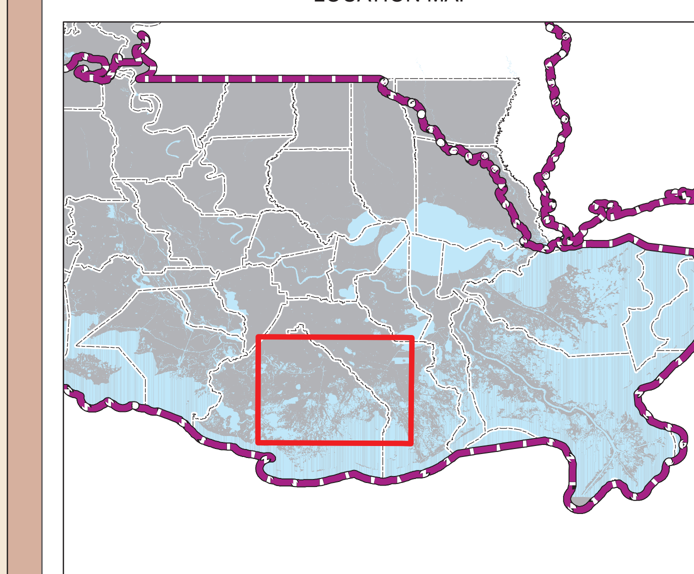


U.S. Army Corps of Engineers
New Orleans District
Engineering Office

Legend

- Morganza to the Gulf Construction Reaches
- Interstate Highways
- Highway Interchanges
- US Highways
- Louisiana Highways
- Local Highways
- Rail Roads
- Streets
- Existing Dirt Pit
- Potential Dirt Pit

LOCATION MAP



Last Modified: 2/14/2019

EGIS-19-026

Appendix C

Levee & Structures Quantities & Costs

Morganza to the Gulf Borrow and Fabric Quantities Without Wave Berms

Project/Reach	Fabric (SY)	Borrow (CY)	Conversion to embankment (CY)	Total Reach Length (FT)	Cross sectional area (SF)	1% Design Section (CY)	Difference (CY)	Adjusted Difference (CY)	Unit Cost ($/CY)	Embankment Subtotal ($)	Section width (FT)	Levee Area (AC)	Clear/Grub Unit Cost ($/AC)	Fert/Seed/Much Unit Cost ($/AC)	Mob & Demob 5%	Total ($)
Barrier Reach	0	0	0	83,081	1,197	3,683,258	3,683,258	4,419,909	$ 15.11	$ 66,784,828.01	156.00	298	$ 3,500.00	$ 4,000.00	$ 3,450,817.12	$ 72,467,159.60
Reach A	0	0	0	43,184	2,493	3,987,323	3,987,323	4,784,787	$ 15.11	$ 72,298,134.59	310.00	307	$ 3,500.00	$ 4,000.00	$ 3,730,153.29	$ 78,333,219.01
Reach B	0	0	0	26,786	2,493	2,473,241	2,473,241	2,967,889	$ 15.11	$ 44,844,799.77	310.00	191	$ 3,500.00	$ 4,000.00	$ 2,313,724.66	$ 48,588,217.96
Reach E	221,824	932,944	746,355	22,966	2,893	2,460,764	1,714,409	2,314,452	$ 16.11	$ 37,285,827.84	284.50	150	$ 2,000.00	$ 4,000.00	$ 1,909,290.20	$ 40,095,094.21
Reach F (Lower)	11,364	367,700	294,160	22,583	2,942	2,460,711	1,234,668	1,666,802	$ 16.11	$ 26,852,181.19	346.00	179	$ 2,000.00	$ 4,000.00	$ 1,396,422.54	
Reach F (Upper)	2,960	1,164,853	931,882													$ 29,324,873.43
Reach G-2A	0	188,831	151,065	24,388	2,893	2,613,129	1,725,917	2,329,988	$ 16.11	$ 37,536,106.68	284.50	159	$ 2,000.00	$ 4,000.00	$ 1,924,590.36	$ 40,416,397.59
Reach G-2B	93,030	503,468	402,774													
Reach G-2C	722	175,240	140,192													
Reach G-1	11,098	241,476	193,181													
Reach H-3	0	757,116	605,693	41,366	4,113	6,301,421	4,941,181	6,670,595	$ 16.11	$ 107,463,285.13	429.00	407	$ 2,000.00	$ 4,000.00	$ 5,495,381.98	$ 115,403,021.66
Reach H-2	23,260	675,965	540,772													
Reach H-1	27,166	267,218	213,774													
Reach I	0	362,732	290,186	30,168	4,113	4,595,592	4,305,406	5,812,299	$ 16.11	$ 93,636,131.09	429.00	297	$ 2,000.00	$ 4,000.00	$ 4,770,939.28	$ 100,189,724.92
Reach J-3	0	1,631,900	1,305,520	49,357	4,113	7,518,716	4,526,521	6,110,804	$ 16.11	$ 98,445,044.87	429.00	486	$ 2,000.00	$ 4,000.00	$ 5,068,079.74	$ 106,429,674.61
Reach J-1	0	1,374,000	1,099,200													
Reach J-2	17,400	734,344	587,475													
Reach K	0	0	0	26,961	4,113	4,107,059	4,107,059	4,928,471	$ 25.02	$ 123,310,339.42	429.00	266	$ 5,500.00	$ 4,000.00	$ 6,291,641.35	$ 132,124,468.26
Reach L	0	364,834	291,867	31,143	4,113	4,744,117	4,452,250	6,010,537	$ 16.11	$ 96,829,754.78	429.00	307	$ 2,000.00	$ 4,000.00	$ 4,933,501.15	$ 103,603,524.10
Larose C North Reach	0	0	0	36,960		0	0	0		$ -		0	$ 2,000.00	$ 4,000.00	$ -	$ -
Lockport to Larose Reach	0	0	0	77,531	1,197	3,437,208	3,437,208	4,124,649	$ 15.11	$ 62,323,449.41	156.00	278	$ 3,500.00	$ 4,000.00	$ 3,220,294.68	$ 67,626,188.31
			7,794,097			48,382,538	40,588,441			$ 867,609,882.77		3,325				$ 934,601,563.66

Notes:

Per LS - M. Marmande 2/21/19 - For reaches Barrier, A, B, LtoL will be adjacent pits and haul offroad so no need for truck wash down racks - JP removed $1/cy

Per LS - M. Marmande 2/21/19 - For reach K will need to barge in.

Embankment unit costs DO NOT include wasting of unsuitable borrow material.

Adjusted difference includes 20% increase in quantity to account for lateral spread in reaches in which NFS has yet to complete any alignment.

Adjusted difference includes 35% increase in quanity to account for lateral spread and settlement during construction in which NFS has completed alignment.

Morganza to the Gulf Structures Quantities

Structure	Constructed (Y/N)	Cost
Barrier Reach		
Bayou Black Floodgate	N	18,066,918
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Shell Canal West Floodgate-Stoplog	N	12,123,873
Shell Canal East Floodgate	N	18,384,780
Elliot Jones Floodgate-Stoplog	N	11,700,818
Environmental Control Structure	N	9,363,485
Bayou Black Pump Station FP	N	8,280,035
Hanson Canal Pump Station FP	N	8,319,436
NAFTA Roadway Gate	N	8,531,435
Humphreys Canal Floodgate-Stoplog	N	11,754,740
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Reach A		
Minors Canal Floodgate	N	16,995,182
GIWW Floodgate West	N	68,932,597
Environmental Control Structure	N	10,683,137
Reach B		
Marmande Canal Floodgate-Stoplog	N	13,935,095
Upper Bayou du Large Pump Station	Y	------------
Falgout Canal Floodgate	Y	------------
Reach E		
Bayou du Large Floodgate	N	19,361,905
Highway 315 Roadway Gate	N	incl
Environmental Control Structure	Y	------------
Environmental Control Structure	Y	------------
Reach F		
Grand Caillou Barge Floodgate	Y	------------
Houma Navigation Canal Lock*	N	------------
Bubba Dove Barge Floodgate	Y	------------
Reach G		
Four Point Bayou Floodgate	Y	------------
Four Point Bayou Roadwaygate	Y	------------
Environmental Control Structure	Y	------------
Environmental Control Structure	Y	------------
Environmental Control Structure	Y	------------
Reach H		
Environmental Control Structure	N	8,499,334
Environmental Control Structure	N	10,890,953
Bayou Petite Caillou Barge Floodgate	Y	------------
Hwy 56 Roadway Gate	Y	------------
Placid Canal Barge Gate	Y	------------
Reach I		
Bush Canal Barge Gate	Y	------------
Bayou Terrebonne Sector Floodgate	Y	------------
Hwy 55 Roadway Gate	Y	------------
Madison (Nettleton) Pump Station FP	N	14,817,712
Humble Canal Barge Gate	Y	------------

Reach J		
Environmental Control Structure	Y	------------
Environmental Control Structure	Y	------------
Environmental Control Structure	Y	------------
Pointe Aux Chenes Pump Station FP	Y	------------
Pointe Aux Chenes Floodgate	Y	------------
Hwy 665 Roadway Gate	Y	------------
Reach K		
Environmental Control Structure	Y	------------
Environmental Control Structure	Y	------------
Reach L		
Environmental Control Structure	N	11,206,781
Grand Bayou Floodgate	N	37,887,553
Larose C North Reach		
LA Hwy 3235 Roadway Gate	Y	------------
LA Hwy 24 Roadway Gate	Y	------------
GIWW Floodwall	N	164,991,532
Gulf South PPL Fldwl	Y	------------
Enbridge/Am Midstream PPL Fldwl	Y	------------
Williams PPL Fldwl	Y	------------
Larose Floodgate	Y	------------
GiWW Floodgate East	N	63,542,679
Lockport to Larose Reach		
LtoL - Union Pacific RR gate	N	5,150,929
Environmental Control Structure	N	8,873,031
Environmental Control Structure	N	7,732,006
	Total	**$626,206,851**

structures		**292,686,139**
floodwalls		**$210,091,078**
environmental control structures		**$123,429,633**
	Total	**$626,206,851**

Notes:

Costs based on PAC 2013 35yr structures costs adjusted for elevation then discounted to barge gate structure

*Although the HNC Lock complex is not yet constructed, the cost has been included idependently of the other structures

Therefore a cost is not shown in this table because it would add the cost of the Lock twice.

2035 1% AEP LORR Morganza to the Gulf - Cost Summary Table

Cost Factor	PAC	PAC contingency (varies 25% to 35%)	PAC TOTAL In millions	ACA	ACA contingency 15%	ACA TOTAL 1% 2035	Reduction 2035
Relocations	$ 231 M	$ 60 M	$291 M	$202 M	$30 M	$232 M	$59 M
HNC Lock	$ 460 M	$ 161 M	$622 M	$400 M	$60 M	$460 M	$162 M
Fish & Wildlife facilities - ECS	$ 381 M	$ 133 M	$514 M	$112 M	$17 M	$129 M	$385 M
Fish & Wildlife facilities - Mitigation	$339 M	$ 88 M	$427 M	$130 M	$20 M	$150 M	$277 M
Levees	$3,920 M	$1,020 M	$4,940 M	$935 M	$140 M	$1,075 M	$3,865 M
Floodwalls	$303 M	$106 M	$409 M	$192 M	$29 M	$221 M	$188 M
Floodway Control & Diversions	$791 M	$277 M	$1,000 M	$196 M	$29 M	$225 M	$775 M
Land & Damages	$282 M	$72 M	$355 M	$152 M	$38 M	$190 M	$165 M
PED (12.826%)	$ 781 M	$ 225 M	$1,000 M	$278 M	$42 M	$320 M	$680 M
S&A (8.044%)	$490 M	$141 M	$631 M	$175 M	$26 M	$201 M	$430 M
Total Cost	**~$7.981 B**	**~$2.284 B**	**$10.265 B**	**$2.772 B**	**$0.431 B**	**$3.203 B**	**$7.062 B**

PED and S&A calculated on all cost except Lands and Damages
ACA ONLY includes un-constructed features

Appendix D

Hydraulics Input

Morganza to the Gulf		1% 2035 1cfs/ft Overtopping Threshold Analysis
Designer:	Whitney Hickerson	
Reviewed by:		
Date:	8-February-2019	
Subject:	Morganza to the Gulf 1% 2035 1cfs/ft Overtopping	
Files:	\\mvd\mvn\H&H1\Hurricane_Protection\Designs\Alternative_analysis\MTG Alt Analysis\20190208-MTG 1cfs Overtopping Design	

Description of Required Support:
Hydraulics, Hydrology and Coastal Branch has been requested to provide design elevations for the 1% (100-year) return period in year 2035 using an overtopping threshold of 1 cfs/ft for the Morganza to the Gulf alignment. Figure 1 below shows the Morganza to Gulf alignment and Figure 2 shows the hydraulic reaches for the northern reaches on the east side of the alignment.

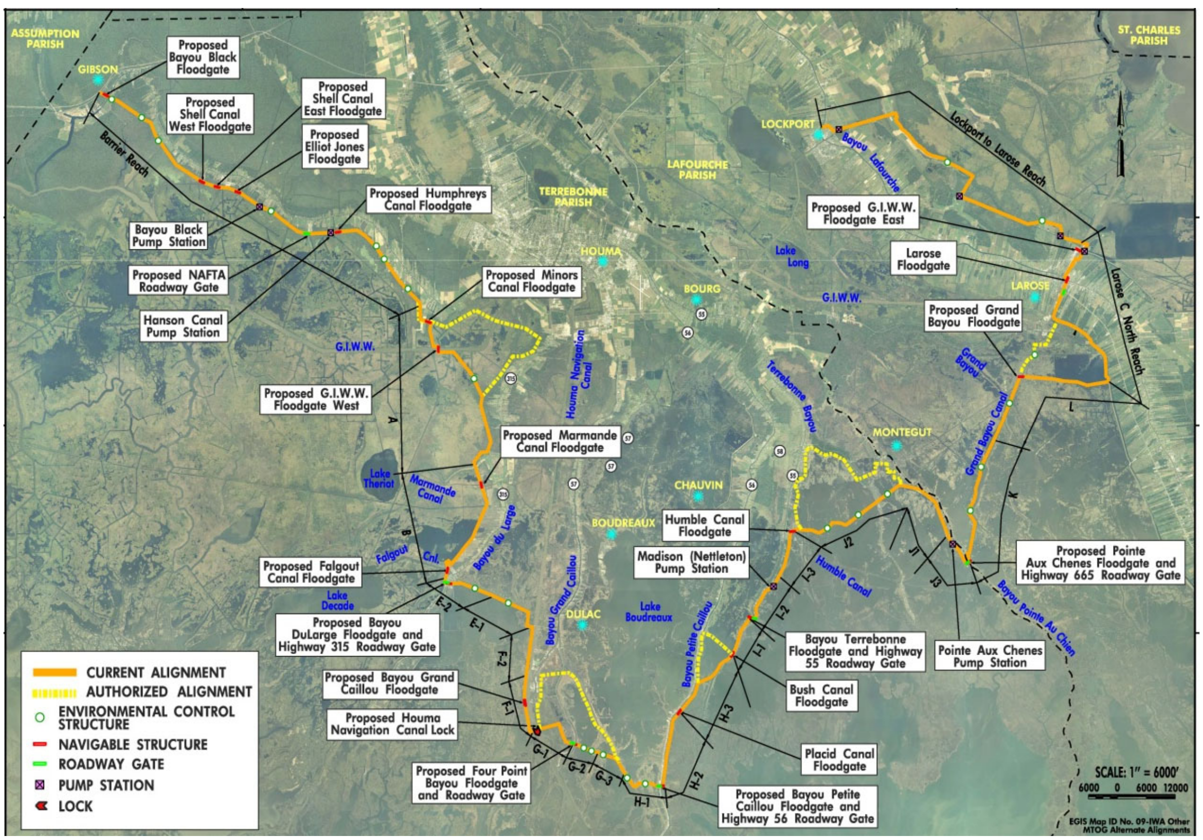


Figure 1– Morganza to the Gulf Levee Reaches

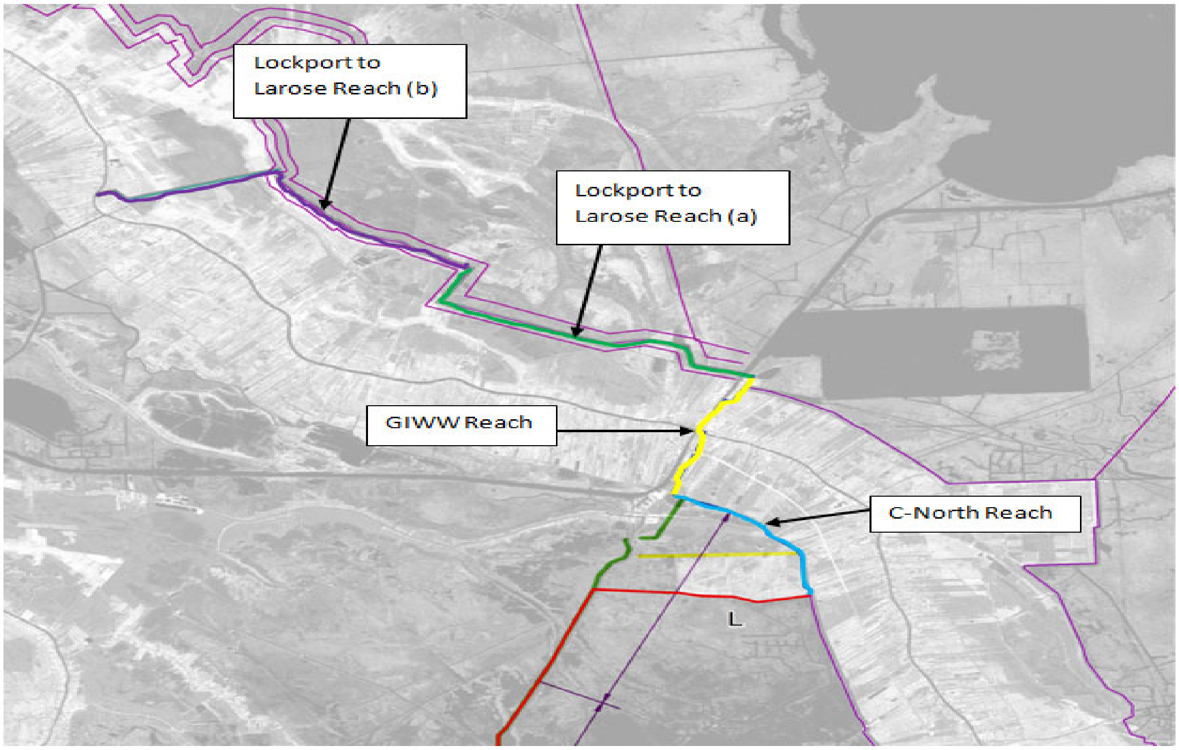


Figure 2– Northern Hydraulic Reaches East Side

Methodology:
The hydraulic boundary conditions for each hydraulic reach for the 1% return period and year 2035 condition were obtained and tabulated in Table 1 below.

Morganza to the Gulf 2035 1% Hydraulic Boundary Conditions					
Segment	Condition	Surge Level (ft)		Significant Height (ft)	Peak Period (s)
		Mean	Std. Dev.		
A-North	2035	10.4	1.19	3.0	5.2
A-South	2035	12.4	1.00	3.6	7.0
B	2035	12.4	1.00	3.6	7.0
E2	2035	15.2	1.23	3.6	7.0
E1	2035	15.2	1.23	3.6	7.0
F2	2035	15.2	1.23	3.6	7.0
F1	2035	15.2	1.23	3.6	7.0
G1	2035	14.8	1.10	6.5	7.3
G2	2035	14.8	1.10	6.5	7.3
G3	2035	14.8	1.10	6.5	7.3
H1	2035	14.8	1.10	6.5	7.3

Morganza to the Gulf 2035 1% Hydraulic Boundary Conditions					
Segment	Conditio n	Surge Level (ft)		Significant Height (ft)	Peak Period (s)
		Mean	Std. Dev.		
H2	2035	15.2	1.18	6.6	8.0
H3	2035	16.3	1.35	6.9	7.2
I1	2035	16.3	1.35	6.9	7.2
I2	2035	16.3	1.35	6.9	7.2
I3	2035	16.3	1.35	6.9	7.2
J2	2035	16.3	1.35	6.9	7.2
J1	2035	16.3	1.35	6.9	7.2
J3	2035	16.3	1.35	6.9	7.2
K	2035	16.1	1.52	4.9	6.9
L	2035	16.1	1.52	4.9	6.9
C-North	2035	14.0	1.50	2.7	5.9
GIWW	2035	9.2	0.50	1.9	3.4
Lockport-A	2035	8.7	0.50	4.4	5.0
Lockport-B	2035	7.5	0.50	2.9	5.4
Barrier	2035	10.4	1.19	3.0	5.2

Table 1– 1% Hydraulic Boundary Conditions

Results:
The hydraulic boundary conditions were then input into the MATLAB script for overtopping of levees and structures using an overtopping threshold of 1 cfs/ft. The resulting design elevations for the 1cfs/ft overtopping threshold for levees and structures are contained in Table 2 and Table 3 respectively below.

Morganza to the Gulf 2035 1% Design Elevation 1 cfs/ft Overtopping Threshold					
Hydraulic Reach	**Feature Type**	**Condition (year)**	**Levee Slope**	**Wave Berm (Y/N)**	**Design Elevation in feet NAVD88(2004.65)** **@ 1.0 (cfs per ft) Overtopping Rate**
A-North	Levee	2035	1:6	N	11.5
A-South	Levee	2035	1:6	N	14.5
B	Levee	2035	1:6	N	14.5
E2	Levee	2035	1:6	N	17.5
E1	Levee	2035	1:6	N	17.5
F2	Levee	2035	1:6	N	17.5
F1	Levee	2035	1:6	N	17.5
G1	Levee	2035	1:6	N	18.0
G2	Levee	2035	1:6	N	18.0
G3	Levee	2035	1:6	N	18.0
H1	Levee	2035	1:6	N	18.0
H2	Levee	2035	1:6	N	19.0
H3	Levee	2035	1:6	N	20.0
I1	Levee	2035	1:6	N	20.0
I2	Levee	2035	1:6	N	20.0
I3	Levee	2035	1:6	N	20.0
J2	Levee	2035	1:6	N	20.0
J1	Levee	2035	1:6	N	20.0
J3	Levee	2035	1:6	N	20.0
K	Levee	2035	1:6	N	19.0
L	Levee	2035	1:6	N	19.0
C-North	Levee	2035	1:6	N	15.0
GIWW	Levee	2035	1:6	N	9.5
Lockport-A	Levee	2035	1:6	N	10.0
Lockport-B	Levee	2035	1:6	N	8.5
Barrier	Levee	2035	1:6	N	11.5

Table 2– 1% Levee Design Elevations

Morganza to the Gulf 2035 1% Design Elevation 1 cfs/ft Overtopping Threshold			
Hydraulic Reach	Feature Type	Condition (year)	Design Elevation in feet NAVD88(2004.65) @ 1.0 (cfs per ft) Overtopping Rate
A-North	Structure	2035	11.5
A-South	Structure	2035	14.5
B	Structure	2035	14.5
E2	Structure	2035	17.5
E1	Structure	2035	17.5
F2	Structure	2035	17.5
F1	Structure	2035	17.5
G1	Structure	2035	18
G2	Structure	2035	18
G3	Structure	2035	18
H1	Structure	2035	18
H2	Structure	2035	19
H3	Structure	2035	20
I1	Structure	2035	20
I2	Structure	2035	20
I3	Structure	2035	20
J2	Structure	2035	20
J1	Structure	2035	20
J3	Structure	2035	20
K	Structure	2035	19
L	Structure	2035	19
C-North	Structure	2035	15
GIWW	Structure	2035	9.5
Lockport-A	Structure	2035	10
Lockport-B	Structure	2035	8.5
Barrier	Structure	2035	11.5

Table 3– 1% Structure Design Elevations

Appendix E

NFS Letter of Intent

March 27, 2019

Mr. Mark Wingate
Deputy District Engineer, Programs and Project Management
U.S. Army Corps of Engineers
New Orleans District
7400 Leake Avenue
New Orleans, LA 70118

RE: Letter of Intent
Morganza to the Gulf
Hurricane and Storm Damage Reduction Project

Dear Mr. Wingate:

The Coastal Protection and Restoration Authority Board of Louisiana (CPRAB) has reviewed the draft Adaptive Criteria Assessment (ACA) Report for the Morganza to the Gulf (MTG), Louisiana, Project. The ACA technical assessment confirms construction potential of a 1 percent Annual Exceedance Probability (AEP) system for the MTG study area, inclusive of the Houma Navigation Canal Lock structure, through the year 2035, and identifies the cost to perform future levee lifts and structure alterations through the year 2085. The 1% AEP 2035 construction costs, as defined in the ACA, is estimated at $3.2 billion. The total project cost, through 2085, is estimated in the range of $5.5 – 6 billion, a significant cost reduction compared to the authorized total project cost of over $10.2 billion. Although the level of analysis performed for the future levee lifts and structure alterations was not as detailed as the analysis performed for the construction of the 1 percent AEP system, CPRAB generally concurs with the technical findings of the ACA.

This letter, while not legally binding on the State of Louisiana, acting by and through the CPRAB, as an obligation of future funds, declares the State of Louisiana's full support for this effort. By this letter, CPRAB also expresses its willingness to serve as a non-Federal sponsor to advance design and construction of the MTG Project. CPRAB's assessment of the approach described in the ACA is that it falls within the existing MTG authority as described in the Post Authorization Change Report (PACR), and therefore, advancement of MTG project will, as it currently stands, only require construction funds and no further re-authorization or PACR. However, since the project is within the jurisdictional boundaries of the Terrebonne Levee and Conservation District, the North Lafourche Levee District, and the South Lafourche Levee District, which are the delegated local statutory entities with responsibility for flood control and hurricane protection in the project area, the State notes its intent to request that these levee districts be included as a co-sponsors for the project. Additionally, the CPRAB plans to enter into cooperative agreements or other sub-agreements, in accordance with the Constitution and laws of the State of Louisiana, with these non-Federal governmental entities, for performance of all or part of the Non-Federal Sponsor's obligations under this Agreement, including but not limited to performance of future levee lifts and structure alterations through the year 2085.

Furthermore, CPRAB is willing to accept a larger role of responsibility in delivering the project. CPRAB understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with non-Federal interests being responsible for the costs of performing all future work required including lifts for the project through 2085.

CPRAB reiterates that it fully supports the MTG Project and looks forward to continuing to work with the USACE to provide integrated coastal protection to Louisiana's coastal communities through the implementation of this important project.

Sincerely,

Kyle R. "Chip" Kline, Jr.
Executive Assistant to the Governor for Coastal Activities
and
Chairman, Coastal Protection & Restoration Authority Board of Louisiana

cc: Col. Michael N. Clancy, Commander and District Engineer, USACE
Durund Elzey, Assistant Deputy District Engineer, Programs and Project Management, USACE
Reggie Dupre, Executive Director, Terrebonne Levee and Conservation District
Dwayne Bourgeois, Executive Director, North Lafourche Levee District
Windell Curole, General Manager, South Lafourche Levee District
Bren Haase, CPRA, Executive Director
Ignacio Harrouch, CPRA, Operations Chief
David Peterson, CPRA, General Counsel

Appendix F

Local Stakeholder Historical Perspective

“Following is a local stakeholder historical perspective of how we began the new push of finding a path forward on the Morganza to the Gulf Project.

The prospects of receiving federal construction funds for the Morganza to the Gulf Project were clearly stalled. The Terrebonne Levee and Conservation District, Terrebonne Parish, the State’s Coastal Protection and Restoration Authority, the Morganza Action Coalition and the Louisiana State and Congressional delegations along with many others have all tried diligently for many years to find a way to get this project funded. The project was wrapped up and ready to go already having a sizeable federal investment in determining its feasibility. It was authorized by Congress. All that was needed was the funding, which never came. We had to find another way to get there.

With the publication of the Post Authorization Change Report, the project now extended deeply into Lafourche Parish which brought the North Lafourche Levee District into the quest for new start funding for the project. But, we needed the Corps of Engineers to help us find another way to get there. Conversations about finding a new way to get money for this project without it having to be called a “New Start” began while on board the MV Mississippi on August 23rd Low Water Inspection trip. This MRC event brought together ASA-CW R.D. James, Major General Kaiser, Col Clancy, Mark Wingate and Jim Bodron and others. It provided a good opportunity to have detailed discussions as to why the project was in the predicament it was. At the end of the day, Major General Kaiser suggested, and we agreed, we needed to look at this closer to see if we could find another way. At the MRC public hearings on August 24th, numerous Morganza to the Gulf advocates gave impassioned speeches on the urgent need for the project. We met first with Major General Kaiser on September 14th 2018 in New Orleans, along with Col Clancy, Mark Wingate from MVN and others from the Corps.

Our ask was simple. We did not need all of the funds at once; but, we simply could not accept getting nothing. So, we asked: Is there a way that the Corps can complete some parts of the project now without having to complete the entire project? That started all of the great discussions that lead to this report.

Imbedded in that discussion were several key points.

- The admission that we would never get new start funding with the current project cost estimate being so high.

- The estimated cost of the project was clearly too high given the empirical data we now have based on the near $400M spent by the State and Terrebonne Levee and Conservation District on the project to date. Further, the work already completed reduces the future scope and its cost can be removed from the project estimate. Finally, the completed work likely provided some soil strengthening that would reduce the cost of future lifts.

- The MR&T program might or might not be the best place for this project.

- The huge Basin within the system gives some flexibility in design not afforded in the HSDRRS.

- There was independent utility to be realized by constructing this system in phases. Every bit of work along the way provided tangible benefits. This was demonstrated in the 3% AEP evaluation alternative in the PAC itself. Subsequent to the decision by the then Director of Civil Works to use the 1% AEP level of protection, we now have the release and pilot of the new Levee Analysis Mapping Procedure (LAMP) by FEMA giving the ability to get some credit to the flood protection provided by levees not to the final elevation in a Flood Insurance Study and mapping.

- There was an opportunity, as outlined in the PAC report, to sight adapt the HSDRRS standards that were used in the cost estimate that would have huge implications on the cost of the project.

- There was clearly a Navigation interest in completing the project that was never captured.

That meeting was filled with helpful and very frank discussion about the limitations that the Corps finds itself operating within. We clearly recognized the post Hurricane Katrina world from which the PAC report came. But, it was time to move past all of that and everyone in the room was willing and committed to find a way.

The Corps was on it. At a MVFCA Breakfast in DC on October 3rd, we spoke to ASA-CW Mr. R.D. James, Mr. James Dalton, Mr. Jim Bodron and others with the Corps who were clearly engaged in the effort to find a way forward on this project. We heard Major General Kaiser clearly explain our effort to Lt General Semonite. It was not the first time they had spoken about this project. This "let's find a way" approach to projects is exactly the type of thinking that we heard Lt General Semonite and Major General Kaiser call for. It also matches the "focus on the results and not the process" mantra of ASA R.D. James. During this same meeting, Mr. James Dalton asked to meet with us and Major General Kaiser as soon as possible as he and General Kaiser had already scheduled a meeting on the subject. Excited about the unprecedented level of collaboration, whatever it might yield, we had meetings with members of our Congressional Delegation to keep them apprised of the ongoing effort and discussions.

That next meeting with the Corps occurred in New Orleans on October 31st and it included Mr. James Dalton, Major General Kaiser, Col Clancy, Mark Wingate and along with others from the Corps. Actually, by the time we joined the meeting, the Corps had spent considerable time bringing Mr. Dalton up to speed on the details of the project and our ask. We were confident that Mr. Dalton left New Orleans with a clear understanding of our predicament and that he too, was committed to find a way forward.

All of this leads to the meeting arranged by Congressman Graves in DC on November 14th. All of the same players were in the room, this time augmented by several more from Corps HQ. We even had a quick visit from Congressmen Steve Scalise and Cedric Richmond during the meeting. It was clear that we are all on the same page. We all knew what we were trying to accomplish. Without any preconceived notions about the outcome or if and how the project might eventually be funded, the Corps agreed to begin work on this report. It was agreed that we would need the CPRA as the local sponsor to the project involved and that the entire effort would be completed within 6 months.

On December 4th we had a re-cap meeting in New Orleans with Major General Kaiser, Col Clancy and others with the Corps along with Johnny Bradberry and Ignacio Harrouch with CPRA. This meeting also included members of the Morganza Action Coalition and Terrebonne Parish President Gordy Dove. Everyone was appreciative of the Corps effort to find a way to move forward with this project.

Rev 3/13/2019"

MTG Review Comments/MVN Responses
April 17, 2019 (Rev. April 19, 2019)

John Lucyshyn

C-1. It would have been nice to have seen incrementally how each of the factors reduces the cost of the project. If I understand correctly some of the cost reduction is associated with assuming the NFS constructed work into the without project conditions. How does this effect cost? On top of that what would the cost impact be of implementing the RMC recommended site adaptation criteria (Reduced factor of safety; Increased overtopping rate; eliminate structural Superiority), etc.

R-1. Assuming "factors" in the first sentence above is meant to be the cost factors as defined in the ACA, a table is provided in the executive summary and again in Section 11 in which the PACR costs and ACA 2035 costs are itemized by cost factor. Furthermore, Appendix C provides costs by levee reach, costs for structures, as well as a cost summary table illustrating how contingency was applied. ACA 2085 costs were not itemized by cost factor due to a much more limited approach (see Section 8.0 of the report for further discussion) and MVN felt it best to report 2085 cost as a holistic range.

If "factors" in the comment above is defined as criteria factors, the analysis is not that granular. Criteria adaptations were applied as a whole to individual "cost factors" to compute ACA costs.

The NFS constructed features reduces the project cost. The ACA accepted the NFS constructed features as existing conditions and essentially is building on top of or adding to what has already been built by the NFS. As discussed in Section 8.0, some of the existing structures will have to be demolished and rebuilt for 2085. Cost to accomplish demolition and reconstruction has been included in the 2085 cost.

Essentially the ACA is implementing the RMC recommended site adaptations. This is the fundamental objective of this analysis. FOS was reduced from 1.5 to 1.3, OT rate was increased from 0.1 to 1.0 CFS/FT, and structural superiority was eliminated. A full description of the ACA approach and application are provided in Sections 6.0 and 7.0, respectively.

C-2. The RMC report noted that clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft but only recommended increasing the overtopping rate to 0.5 cf/ft. I see that the District increased the overtopping rate to 1.0 cfs/ft which is greater than the RMC recommendation. Has the district coordinated this with the RMC to determine if this would be an issue?

R-2. During initial scoping discussion of the ACA effort, the RMC was engaged in meetings. MVN was informed that to accomplish the coordination identified in this comment, RMC alone would require $500K and a minimum six months of effort. MVN was funded a total of $500K and provided a schedule of 4 months (once funding was received) to finalize to MVD the ACA. Therefore, based on the favorable language in the prior RMC report (as cited in the comment) as well as interior storage capacity analysis which demonstrated and abundance of interior storage capacity, MVN felt that a 1.0 CFS/FT OT rate is acceptable. Detailed discussion of the 1.0 CFS/FT criteria adaptation and the logic MVN used to support its use can be found in Sections 5.2 (added since the comment was made), 6.2 and 6.3 of the ACA.

ENCL 3

C-3. Not sure what limiting Federal participation has to do with Adaptive Criteria or how this is view as a project cost saving. This would just be a cost transfer to the NFS.

R-3. Concur. Limiting the Federal participation is a Federal cost savings and this clarification has been added to the report. The team looked at savings from the adaptive criteria along with other savings such as reducing the costs from the NFS already constructed work and also the option of a reduced Federal investment (transfer of costs from Federal to NFS). The NFS cost transfer cited in the comment is supported by the NFS per Appendix E, which results in Federal cost savings. An objective of this effort is to investigate potential savings in which MTG can be constructed with Federal involvement at a funding level OMB will support. Limiting Federal involvement to 2035 is a potential option. Another potential option, similar to the PACR, is including Federal involvement to 2085 at a cost of $5.5-$6B (in total, not added to the 2035 cost).

C-4. It wasn't clear to me form the explanation provided how we went from four levee lifts to one.

R-4. For the 47 NFS constructed miles that is one lift. Another lift will be placed to achieve 2035 elevation. Beyond 2035 lifts will be placed to maintain a 1% system based on settlement curves, relative sea level rise, subsidence forecasts, etc. Therefore for the 47 NFS-constructed miles there are essentially 3 lifts. For the remaining alignment reaches, a lift will be placed to achieve 2035. Similarly, beyond 2035 lifts will be placed to maintain 1% up to 2085. Therefore the unconstructed reaches of the alignment are projected to have two lifts. These are northern reaches and will be constructed to a lower elevation. Please note that CPT data results obtained (since the initial writing of the report have been reviewed and validated the strength gain assumptions made during the ACA analysis. Therefore the current plan for constructing the project in the lifts described in this comment appears to have been substantiated.

C-5. Regardless of the cost responsibilities, not sure why we would recommend that the height of structures be constructed to the 2035 time horizon when we know the project will be O&M'd to the 2085 elevations as part of the project. What is most cost effective?

R-5. A good comment/point. MVN investigated building the unconstructed structures to either 2085 conditions and/or constructing substructure and superstructure components in a manner in which the structures could be augmented in the future to achieve 2085 elevations. However, due to time constraints MVN could not complete this analysis. Further discussion/explanation of this topic can be found in Section 8.0 of the report. The report currently does not provide a recommendation.

C-6. How much confidence do we have in the NFS $400M cost estimate for the HNC lock Complex versus the $622M PACR report estimate.

R-6. MVN accepted the cost estimate as provided by the NFS (they provided their estimate from a developed set of plans/specs). MVN did not review the HNC lock designs or cost estimates. Please note, a 15% contingency was applied to the $400M NFS furnished estimate, along with the appropriate E&D and S&A percents.

C-7. A contingency reduction to 15% was considered reasonable. This is significant compared to the 25-35% contingency rates used in the 27 Feb 2013 certified cost estimate. Were there any discussions with Cost MCX to see if this is reasonable?

R-7. No. A formal cost risk analysis utilizing Crystal Ball software was not performed due to time constraint. The Cost MCX would require this to perform an analysis. 15% contingency was provided by the NFS based on their experience to date building the levees and structures in the alignment. There is much better understanding of borrow sources, haul routes, and other feasibility level cost factors that impact contingency. Therefore MVN accepted the NFS furnished 15% contingency for calculating the 2035 TPC. However, contingency applied to the 2085 cost range is 25%.

C-8. In this case why Is the NFS willing to accept responsibility to maintain the project at a 1% LORR beyond 2035 when in other instances was not?

R-8. MVN assumes that there is an evolving understanding with the NFS regarding what OMB perceives to be a fundable level for a Risk Reduction project in the MTG geographical setting. Please note the NFS has invested over $400M to date in a needed risk reduction project in which no Federal construction funding has been provided to date. They also provided a letter of intent/support for this option that is included in Appendix E.

Charlie Hanneken

C-9. What are the ramifications of not counting the costs of the segments of the project that the Nonfederal sponsor already built? The non-fed sponsor is not seeking credit for those segment, but will we have segments of the system that are treated as a nonfederal system and other segments that are part of the Federal project?

R.9. The project will not have system segments that are non-Federal. The NFS constructed features are considered existing conditions (within the context of the ACA). If Federal involvement is funded, USACE would build on top of or add to the existing NFS construction existing conditions. Per Appendix E of the report, NFS does not plan to seek credit for the MTG features constructed by them to date.

C-10. I am concerned that we are overstating the cost savings. If we are shifting responsibility for lifts after 2035 to the non-fed sponsor, the costs do not necessarily go away. The total project cost remains the same, it is the federal share that has been reduced. It is appropriate to talk about total project costs savings in regards to changes resulting from applying adapted criteria. When talking about savings resulting from limited Corps participation to 2035, it is more appropriate to cite the reduction in the federal share.

C-10. Concur. Report was revised to clarify that the cost savings for the 2035 horizon is just a reduced Federal investment and that the 2085 horizon is TPC savings. Refer to C-3 & R-3 above. There is TPC savings (from $10.3B in PACR to estimated $5.5-6B in ACA) from applying the adaptive criteria and also removing the NFS constructed work from the TPC. The 2035 option is not a TPC reduction, but a reduction in Federal costs for the 2035 elevations. This potential concept is supported by the NFS per Appendix E letter.

C-11. If shifting the burden to the sponsor reduces the federal share and not the total project cost, it is important to understand what those costs are out to 2085. I would like to see these looked at in more detail.

R-11. Refer to Section 8.0 for a good discussion relative to this comment. Costs out to 2085 were investigated in a much more limited fashion and reported as a range. The 2085 TPC is estimated to be between \$5.5-6B in total (not in addition to the 2035 cost). Therefore the TPC after applying the criteria adaptations discussed in Section 6.0 of the report result in a TPC reduction from \$10.3B (PACR) to \$5.5-6B (ACA) (approximately 40 -45% TPC reduction).

C-12. If the total project costs are really being limited to the period up to 2035, the benefits should be limited to this time period only too. What would this potentially do to the BCR?

R-12. Total project costs are not being limited to 2035, just a transfer of costs to the NFS for 2035-2085, therefore the BCR would remain for the entire project period (2085). The TPC to 2085 is the TPC whether or not there is Federal involvement beyond 2035 or not. Regardless the BCR will go up because the TPC is reduced from \$10.3B to a maximum of \$6B with equivalent benefits.

Jennifer Chambers

C-13. Section 1.0 - the second paragraph of this section mentions increasing the number of floodgates from 9 to 19. Other sections of the report mention 22 floodgates. Please resolve.

R-13. Section 4.0 (page 8) calls out 22 “navigation structures”. Section 1.0 calls out 9 to 19 “floodgates”. The discrepancy is that the PACR included two gates at GIWW and another “Bubba Dove Floodgate” at HNC as one structure (see note in parentheses after 22 navigation structures on page 8). There are 3 additional navigation structures (3 + 19 = 22). Therefore the total number of 22 navigation structures is correct. Additionally, the increase of 9-19 specified in the PACR is also correct because these features (2 GIWW gates and Bubba Dove at HNC) were combined with other structures. After a search, these structures were not quantified in any other place in the report that MVN could find.

C-14. The report addresses endorsement of the Coastal Protection and Restoration Authority throughout but, never mentions the endorsement of the Terrebonne Levee and Conservation District. Please add verbiage addressing their endorsement.

R-14. Verbiage was added to the report to clarify. Reference the cover page (In Coordination With) and the executive summary on page iii paragraph 2, (CPRAB, TCLD, NLLD, SLLD) was added after the word stakeholders in the first sentence. Also page 2 “Therefore, CEMVN in coordination with the CPRAB, TLCD, NLLD, and SLLD have developed “Adaptive Criteria”….” Otherwise it was the author’s intent that in any place in which NFS and local/state stakeholders was used, this is a reference to each entity (CPRAB, TLCD, NLLD, and SLLD) as a whole – this was also clarified in the report. Furthermore, in the Letter of Intent provided in Appendix F (added since this comment was made), the following language appears, “However, since the project is within the jurisdictional boundaries of the Terrebonne Levee and Conservation District, the North Lafourche Levee District and the South Lafourche Levee District, which are the delegated local statutory entities with a responsibility for flood control and hurricane protection in the project area, the State notes its intent to request that these levee districts be included as a co-sponsors for the project.”

C-15. Since some of the project area is in Lafourche Parish, is endorsement of that levee district required (I assume the Lafourche Parish Levee District will be responsible for O&M like Terrebonne Levee District)?

R-15. Refer to R-14.

C-16. Section 1.0 b - this mentions adapting the criteria to reflect the level of risk associated with the adjacent communities. It would be helpful to know exactly what this means. Please explain how is the level of risk is changing... FROM what TO what?

R-16. Based on MVN's current understanding, the direction that USACE is going is toward risk informed decision making. Therefore in consideration of the level of population and infrastructure investment on the landside of the MTG system, a higher level of risk is deemed appropriate when compared to an area such as New Orleans, LA. MVN's position is that risk based analysis and decision making provides support and reinforcement of criteria adaptations such as 1.3 FOS vs. 1.5 and 1.0 CFS/FT vs. 0.1, etc. The intent of this statement is to convey to the reader that the HSDRRS criteria is too conservative to apply to this geographic area in consideration of relative risk of other areas more densely populated with much higher infrastructure investment that may impact regional, national, and/or international commerce in which HSDRRS criteria was developed for in the aftermath of Hurricane Katrina.

C-17. Table 6-1 - the results for material no. 10, 11, and 12 do not make sense. The same material failed at a discharge of 1.5cfs and 2.0cfs but was fine at 4.0cfs? Please verify that this is correct.

R-17.   The table was edited to make it fit better on the page. Item No. 10 is unreinforced dormant Bermuda grass. Item No. 11 is dormant Bermuda grass reinforced with High Performance Turf Reinforcement Mat. Item No. 12 is dormant Bermuda grass reinforced with Turf Reinforcement Mat. This information will be added back in.

C-18. Section 7.5 - Please add discussion on how the costs were reduced to structures other than the sector gates. i.e. It is unclear if the roadway/railway gates were reduced. I assume the height of the floodwalls were also reduced?

R-18. Yes, all were reduced and we clarified in Sec 7.4 & 7.5. Section 7.4 also states, "The 35 year LORR PACR structure costs were prorated down based on the revised hydraulic elevation requirements. This reduction was applied to the foundation, structural concrete, and structural steel." So the ACA states "structure cost" (not just sector gates). All structures including floodgates, roadway gates, and corresponding floodwalls were reduced to reflect a lower required design height. Further reduction at the flood gates were applied to switch to barge gates instead of sector gates.

C-19. What if subsidence occurs earlier than expected (before 2035) who will be liable for maintaining the 100-year LORR?

R-19. This would be a parameter covered by contingency. However, based on experience, regional subsidence is not a parameter that changes quickly enough to have a meaningful impact to short term project goals and their expected cost. Settlement (during construction, uniform, and differential) is a larger concern particularly for alignments that have not yet been built. However, settlement is forecast based on boring data and knowledge of the regional geology. Therefore estimated costs take into account these parameters.

C-20. Appendix C - It was mentioned throughout the report that the cost of the HNC was included because it was not constructed yet. However, the table of structural quantities contained in Appendix C shows this item to be constructed with no cost associated with it. Does this need to be added back in?

R-20. The HNC Lock cost is a stand alone cost factor in the summary table. It was shown in the Appendix C table to be constructed so that no cost would be included in the table of structures in Appendix C. The Intent was to ensure that all the structures throughout the alignment were accounted for in the Appendix C table; however, since the HNC Lock is a stand alone cost factor, to add it to the Appendix C Table would be adding that cost in twice. A footnote will be added to the Appendix C table to clarify.

C-21. Appendix C - the note below the table has been cut off. Please resolve.

R-21. Concur. Has been corrected.

Sean Smith

C-22. Page 5 as well as other locations throughout the report indicate additional guidance is necessary to enact the changes suggested within the subject report and more specifically on how to address these suggested design changes in PED. This begs the question of what sort of design guidance is necessary if these items of consideration were developed in accordance with existing USACE guidance. The District would need to clarify the necessary variances from existing USACE design guidance that are warranted.

R-22. The additional guidance requested has more to do with what the path forward should be to fund this project as authorized at the ACA estimated lower TPC without further study outside of PED. Some potential options have been developed and put forth by MVN for consideration in Section 12.0 of the report. MVN enumerates the variances in Section 6.0 to HSDRRS design criteria that WAS applied to develop the ACA costs included in this assessment. MVN also caveats the analysis performed in Section 10 among other places in the ACA. Ultimately guidance is needed to develop the path forward to advance this authorized project to PED and construction in conformance with the direction provided to MVN by MVD and HQ staff.

C-23. The major premise associated with the potential reduction in cost is directly attributed to the project life evaluations being limited to the year 2035 versus 2085. This is a significant departure from USACE policy (ER 1105-2-100, ER 1105-2-101 and ER 1110-2-8159). The project planning horizon within the associated planning/engineering guidance is defined as the 50-year project life whereas the engineering design aspects specify a 100-yr design life for certain infrastructure). It would appear that the report is being configured in a manner consistent with an Engineering Documentation Report (EDR). Though the design change considerations may be perceived to fall in-line with an EDR, the planning horizon changes would suggest this assessment should be submitted for consideration consistent with a General Reevaluation Report (GRR). Reason being, if the planning horizon was permitted to be on the order of something less than policy dictates, there is the potential that other alternatives may be considered to be deemed more viable and/or cost effective than the current plan.

R-23. Non-concur. The assessment is not departing from the normal 50-year project life. Refer to C-3 and R-3 and C-10 and R-10. Also reference added language in Section 11.0 that clarifies the $3.2B estimate for the 1% AEP for the 2035 horizon is for a potential reduced Federal investment option, whereas the NFS would continue maintaining the 1% AEP beyond 2035. So this option still goes to the 50-year project life, just with a reduction in the Federal cost share. A cost range was also investigated for the 2085 horizon utilizing the adaptive criteria while constructing to 2085 elevation requirements. The estimated 2085 TPC range is $5.5B-6.0B. The PACR estimate, which was also for the 2085 horizon, can be compared more directly to the 2085 cost range developed. The normal 50-year project life remains the same as in the PACR (from 2035-2085).

Also, the project has been studied extensively to date (Feasibility level, PACR, as well as smaller studies) beyond which the NFS has taken upon themselves to construct over $400M worth of project features to date. Therefore, initiation of a further study action or another PACR is not recommended by the stakeholders. More detailed data collection, analysis and design could be performed in PED in which P&S contracts are developed for the overall alignment. CEMVN is hoping to capitalize on the new USACE direction of risk informed decision making to make adaptive criteria adjustments.

C-24. The executive summary suggests the allowable overtopping rate may be increased to 1.0 cfs/lf. The original design overtopping rate was established at 0.1 cfs/lf whereas the RMC report cited 0.5 cfs/lf. There appears to be some additional leeway being exercised in the increased overtopping rate; yet there does not appear to be any documentation that this additional 0.5 cfs/lf (going from 0.5 to 1.0 cfs/lf) has been codified with the original RMC consultation team.

R-24. Refer to C-2 and R-2.

C-25. Section 5, (bulleted list on page 9 of 27) denotes eliminating structural superiority requirements. With the reduction of any superiority requirements, this would suggest the engineers have assessed and reduced all uncertainty associated with the establishment of the crest elevation of the levee system and any appurtenances. In addition, it would be assumed that any reduced crest elevation may/could result in increased capacity needs associated with interior drainage and/or associated pump stations due to the increased overtopping that may be experienced. To what degree has any of this increased overtopping rate impacted the plan selection or up-sizing of other features to accommodate the increased overtopping? Later in the report, it indicates that these changes result in insignificant cost increases, yet the report heavily caveats the level of effort/analysis placed on these findings. Similar to comment 3 (above), would this reduction in superiority (coupled with the reduced design life) have any effect on the plan selection thus warranting a re-evaluation of the project as a whole?

R-25. Structural superiority requirements were eliminated based on the RMC recommendation in their Sensitivity Analysis, a very large effort and expensive effort. MVN defers to their analysis in defense of structural superiority elimination and therefore feels more analysis as described in this comment would be redundant. Regarding interior drainage analysis refer to Section 6.2 of the ACA. As stated in R-23 a key objective for both CEMVN and NFS is to avoid further study of MTG and purse PED as authorized capitalizing on USACE's new direction of risk informed decision making.

C-26. Page 10 of 27 denotes the increase in allowable overtopping rate results in lowered required design elevation and lower project costs. To what degree were these lowed design elevations considered in the context of increased risk as a result of a more frequent overtopping failure scenario (as would be considered within a probable failure modes analysis)? Presumably, reducing (as eliminating the superiority) associated with the levee system, would/may result in the potential for catastrophic failure of the system.

R-26. Refer to Section 6.3 for detailed discussion. CEMVN is referencing the CSU study that was performed during development of the HSDRRS criteria.

C-27. It could not be determined as to whether there was any sort of trade-off analysis conducted for a controlled or managed overtopping scenario as defined within ECB 2017-15? Utilizing this guidance may yield alternatives and potential cost reductions by simply assessing the system in a manner to identify lower impact zones that could be appropriately identified as an area or areas that would be ideal for consideration as a managed or controlled locations to offset any increased surge levels while still affording more robust sections of levee in the high impact areas.

R-27. Such an analysis would be appropriate given more time. Given the time constraint CEMVN simply evaluated the increase OT rate impact on interior storage capacity. See Section 6.2 for more detailed discussion and analysis results.

C-28. A great deal is placed on the emphasis to relax the overtopping rate of 0.1 cfs/lf. Though is can certainly be understood as a viable area for consideration, the question of viable with respect to performance is key to understand. The laboratory testing conducted through CSU outlines the various soil types and vegetative cover. This testing seems very similar to CSU testing conducted for work conducted for the Jacksonville District for work in South Florida. Are the site conditions and materials considered through this laboratory testing consistent with those that would be experienced within this region? In addition, do the overtopping rates outlined in the table adequately represent the loading conditions that might be experience for this region? The durations denoted within the report would seem to indicate the region would only be susceptible to periods on the order of 3 hours (for a maximum flow rate); it would seem that this region could easily be exposed to durations well in excess of 3 hours. This assumes the line of protection is able to sustain the loading up to that crest elevation for this exposed period of time without breach. A rigorous analysis of the characteristics of this region to account for the land-fall direction and wind durations would be warranted to determine if the CSU testing is indicative of the region.

R-28. It is important to note that all of the armoring effort has been fully vetted, reviewed, and scrutinized, before any implementation.

1) As shown in the report(s), CSU testing for HSDRRS overtopping was completed in 2009 / 2010 time frame. Experts from the Netherlands collaborated with Dr. Chris Thornton and Dr. Steve Hughes (formerly of ERDC) to construct the overtopping testing facility for the HSDRRS overtopping testing.

2) Yes, site conditions and materials considered through this laboratory testing consistent with those that would be experienced within this region. Southern grass species including Bermuda and Bahaia were used in the testing along with actual clay soil from south Louisiana.

3) The overtopping rates outlined in the table are in excess of loading conditions that might be experience for this region. There is uncertainty built into the hydraulic modeling so that estimates of water elevations and overtopping are conservative. Additionally, the overtopping test apparatus at CSU was designed to model the highest overtopping rate based on the hydraulic modeling for the HSDRRS. Materials tested out performed expectations and no failure was noted for live Bermuda grass, in any case. As presented in the CSU report, testing time durations were well in excess of estimates of storm durations impacting the HSDRRS. Also, at the time that the 0.1 cfs/ft overtopping rate was established for the HSDRRS, there was no published information regarding acceptable wave overtopping rates and acceptable materials to provide resiliency to earthen levees. As such, the established overtopping rates were conservative.

4) Analysis of region characteristics accounting for the land-fall direction and wind durations were included in the hydraulic analysis for the HSDRRS and are reflected in the design for the different levee reaches, that being different crown elevations and geometry, including wave berms. Resiliency was also built into these design analysis, including design to the 500-yr Stillwater level.

5) The assumption that the line of protection is able to sustain the loading up to that crest elevation for this exposed period of time without breach is valid. Note that there were no failures/breaches of levees constructed of clay soil or capped with clay soil during Katrina, so this is a valid assumption. Failures during Katrina included I-Walls and levees constructed of dredged fill material that were not properly capped with clay soil. Additionally, since live Bermuda grass showed no damage from the overtopping testing for periods exceeding those that may be expected from a tropical event impacting the area, there is further confidence that levees will maintain their integrity.

C-29. Page 22 of 27 discusses the potential to retrofit designed features (considering the 2035 planning) to the requirement of those same features if 2085 is later considered. This section in particular talks to augmenting the 2035 design. There is significant caveat language in this paragraph denoted by "where feasible" which can lead to significant cost growth later if not well understood now. How does the phrase "where feasible" play out in the overall cost growth for the 2085 condition and would this cost growth fully attributed to the Non-Federal Sponsor? This question is raised to determine what sort of cost deferral is being proposed and what sort of cost share implications may surface. The phrases "where feasible" and "a reasonable cost basis to adapt a 2035 to 2085 could not be developed due to time constraints" provides for a great deal of uncertainty in the overall cost growth. If this sort of assessment was not conducted, then how can USACE attest for the overall cost savings being proposed. Again, additional caveat language appears later in Section 12 the text "[a]lthough a potential MTG total cost savings of $7.06B appears attainable via application of the adaptive criteria developed for this assessment, significantly more investigation and analysis is required to confirm these findings in PED". With this disclaimer, it would appear the findings may not be fully substantiated, therefore the overall question of cost reduction is suspect.

R-29. CEMVN concurs. The ACA simply states that CEMVN considered the potential of constructing 2035 structures that could be augmented to meet 2085 elevation requirements. The concept is that structural features (substructure and superstructure) components would be built to meet 2085 requirements (loads) and other structural components (i.e. the gates, floodwalls) would initially be built to meet 2035 elevations and later augmented to meet 2085 elevation requirements where feasible and cost effective. However a reasonable cost basis could not be developed in large part due to the issues enumerated in the comment and limited time. USACE can attest to the overall 2085 cost savings ($5.5-$6B) proposed because the 2085 cost estimate is based on constructing all new structures from existing conditions to 2085 elevations and demolishing all existing structures and rebuilding to 2085 elevations without a 2035 interim condition (for structural features).

C-30. The intent of the assessment is well understood but a basic understanding of where the original criteria is overly restrictive (aside from cost) is not well founded. The general assessment is cost can be reduced by relaxing criteria but it was not evident in this report that the criteria is overly conservative in an manner that is subject to relaxation and one could consider if such risks are being considered, would there not be other alternatives (non-structural for example) that may be viewed as more viable than reduced levels of assurance on structural alternatives. The planning horizon, again, is a major deviation from USACE policy which may have long-term implications and be deemed as precedent setting as well.

R-30. CEMVN's position is that it is not appropriate to apply the HSDRRS criteria to MTG based on level of risk to population and infrastructure investment as compared to the Metropolitan New Orleans area for which the HSDRRS criteria was developed. The amount of risk the MTG project is willing to accept drives cost. The two cannot be separated. It is this risk informed decision process that drives the ACA proposed HSDRRS criteria changes which appears to lower TPC to a level that OMB may hopefully fund for construction in a PED setting.

Tammy Conforti

C-31. I would like to see a paragraph or brief section added about incremental/residual risk, including something added about population at risk/life safety. I was looking for that somewhere. I didn't dig into the risk assessment, but the summary you sent had the information in there. I think for the leadership it would be good to briefly describe the risk associated with the levee between the $10B versus this project, even if there is assumed to be little to no change.

R-31. Section 7.9 "Residual Risk" was added to the report. Please note that a scientific approach to risk analysis was beyond the scope of this effort. Risk is discussed largely based on study analysis conducted by others (RMC, CSU). Risks associated with Interior storage capacity as well as scour failure mode (due to increase overtopping) are discussed in more depth in Section 6.2 and 6.3 of the report.

C-32. Somewhat related, I would like to see a little more description about superiority. Would Mr. Graves know what that is? I'm sure this report will get around externally. This report focuses only on cost and technical aspects mainly. Granted, most may only look at the bottomline cost. All we can do is try to make the information available. When I see "no superiority", that means we won't be designing for a controlled overtopping point for the system. Maybe that's fine because it doesn't change the risk. I recommend we at least describe it and say what the result of not incorporating it does.

R-32. The following language was added to Section 5.2 the item 3 paragraph on page 10,

"(Note, As defined in the HSDRRS Design Guidelines on page 5-2 under Section 5.1.3, structural superiority is 2 feet added to structure elevations above the required design grade of adjacent levee alignments. Intent of structural superiority is to provide additional elevation for difficult to construct features such as sector gates, utility crossing, etc. in an effort to minimize the need for future adjustment should design grades increase due to greater than expected subsidence or sea level rise. In addition structure superiority lowers the potential for overtopping at critical infrastructure)."

C-33. I recommend removing the discussion about FEMA's LAMP program and the discussion about insurance benefits (which is saying not having to buy flood insurance is a benefit). I understand this is what the locals want. USACE promotes that people should buy flood insurance. FEMA's program doesn't impact project costs at all. The discussion about insurance rates and LAMP confuses things; sends mixed messages, and I'm not sure why that discussion is in this report. By the way, you should know USACE accredits levees via risk assessments now using the 1% AEP. It's not in accordance to 65.10.

R-33. Just for points of clarification relative to semantics, CEMVN understands that FEMA accredits (not USACE). If the concept of "positive finding" under the LSER EC has been abandoned by USACE, then we assume USACE now "certifies" levees via risk assessments using the 1% AEP. 65.10 still used by FEMA should a local entity decide to pursue FEMA "accreditation" without USACE involvement. If anything in this paragraph is stated incorrectly, please provide feedback as understanding of USACE levee evaluation requirements for certification (positive finding, etc.) have evolved and are evolving and we would like to stay abreast of the current policy and corresponding language used to accurately describe it (for consistency).

This comment is a challenge to address because this topic is coming from NFS. CEMVN originally developed the language and then it was tweaked by NFS to the current version. Removal would require coordination with NFS. NFS angle is that the work they have done to date offers tangible benefit and they are looking for that to be stated.

Reference the following statement in the comment, "…..which is saying not having to buy flood insurance is a benefit." It is unclear what specific language in the LAMP discussion states this. The discussion simply states that "……. LAMP program is simply intended to map risk for a levee system that are not accreditable in current condition." and that there "may be" insurance benefits". Which is accurate as explained to CEMVN via coordination call with FEAM Region VI. FEMA is not able to quantify the benefits as the LAMP in this region is only a pilot at this stage. However, the object of the program is to provide some type of insurance benefits for areas situated adjacent to flood risk reduction systems that are not accreditable. NFS considers this a significant point. Upon review, the discussion does not advocate in any fashion not buying flood insurance, only that a benefit to insurance rates "may be" possible via the LAMP program/process.

Jim Lewis

C-34. How about "considerations" instead of "recommendations"? It doesn't sound good that USACE recommends reducing a Factor of Safety.

R-34. The RMC report states "Based on the preliminary results from the evaluation, the RMC and MVN are recommending the following site-adaptations of the HSDRRS criteria be considered for the Morganza to the Gulf alternatives:". We expanded on the RMC information in its own section in the report (Sec 5.2) on pages 9-10.

C-35. Is there any way to cite or reference this report? Was it published? If not, consider including it as an appendix? I haven't seen it; did it actually "endorse" the changes or just show the results of the changes?

R-35. The report cite is listed in the references on page 4. Sec 2.h. See also R-34 above.

C-36. Please clarify somehow whether this range includes the $3.2B or is in addition to it.

R-36. The TPC range of $5.5-6B is not in addition to the $3.2B estimate. Clarification has been added under the table "Please note that the 2085 TPC in the table above is not in addition to the 2035 estimate. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of $5.5B-$6B."

C-37. There seems to be a difference between this plan and the perspective given in the 3rd paragraph of Appendix E. There, it makes it seem as if they expect the federal government to do the work in phases. Here, we are shooting for 2035 and the NFS is responsible for the other $6.0B. There is a question of expectations.

R-37. This option was discussed with the NFS/stakeholders in our collaboration meetings and they have also recently submitted a letter of support/intent, which is now included in the report in Appendix E.

C-38. Here would be a spot to clarify with either:
"..., in addition to the $3.2B" or "..., where this TPC includes the cost of meeting the 2035 criteria."

R-38. Clarification has been added. See R-36 above.

C-39. I'm not familiar with this term predominate for levee increases, so I wonder if it should be predominant?

R-39. A Google of the word predominate returns, " verb -be the strongest or main element; be greater in number or amount." A Google of the word predominant returns "adjective - present as the strongest or main element." Definitions are nearly identical with one a verb and one an adjective.
As we did not change this in the final report submitted to MVD, will request MVD to change the word before it is submitted to HQ to go along with the adjective spelling of "predominant".

C-40. It needs to be clearer whether this amount includes the $3.2B or is in addition to it.

R-40. Clarification added (see R-36 above).

C-41. 7.07 for consistency with previous page

R-41. The typo has been corrected to $7.07

C-42. This legend is odd. I don't see any orange or dark blue lines/arrows/cirlce labels. The green arrow says "HNC Lock Complex". Is that right? It looks like there are two types of yellow/light green boxes. I don't see an explanation for the gray boxes. If a callout does not have an outline color, what does that mean?

R-42. This is not a legend, just a summary of information we have used in the past on a large-scale map. The box below it is the legend as so labeled. Will include something to explain the grey color and will also remove the summary as it is confusing on a small map. Will revise the map and request MVD to change it out before it is submitted to HQ.

C-43. I think you need to add a gray circle icon to this list.

R-43. Concur, legend will be corrected. See R-42 above.

C-44. I think this should just be cfs per ft, not cfs/s.

R-44. Concur, will be corrected. As we did not change this in the final report submitted to MVD, will request MVD to change out the pages before it is submitted to HQ.

C-45. Is this written by MVN? Unsure who the "We" is.
At a minimum, maybe at the top you can add a parenthesis "(A summary written by xx)"? Or can there

be a signature block at the end so that it looks more like a letter?

R-45. This was written by the local stakeholders. We have moved it into Appendix F, put it in quotes, and started it with "Following is a local stakeholder historical perspective of how we began the new push of finding a path forward on the Morganza to the Gulf Project."

C-46. This paragraph implies that the 2035 design is Phase 1, and that they expect the federal government to perform future phases.

R-46. See R-37 above.

C-47. Not sure whether to suggest editorial comments here, but the "and" is not needed.

R-47. This perspective was provided by the local stakeholders and quoted as submitted.

-----Original Message-----
From: Chewning, Daniel B (Brian) CIV USARMY CEMVD (US)
Sent: Monday, April 15, 2019 10:36 AM
To: Bodron, James A SES USARMY HQDA OCE (USA) <James.A.Bodron@usace.army.mil>; Robinson, Charles L (Lee) JR CIV CEMVD CEMVD (USA) <Lee.Robinson@usace.army.mil>
Cc: Turner, Renee N CIV USARMY CEMVD (US) <Renee.N.Turner@usace.army.mil>; LeBlanc, Julie Zitzmann CIV USARMY CEMVD (USA) <Julie.Z.Leblanc@usace.army.mil>; Harris, Nicole M CIV USARMY CEMVD (US) <Nicole.M.Harris@usace.army.mil>; Young, Gary L CIV USARMY CEMVD (USA) <Gary.L.Young@usace.army.mil>
Subject: FW: M2G Net Benefit Revisions

Jim,

As discussed see attached, numbers are encouraging but need Lee to provide his assessment. Again, this information will not be included in the ACA Report that we expect to be delivered tomorrow but can be provided as supplemental information that MR. Dalton specifically requested.

Bottom Line:

2.875% (FY19) @ $6.0B = 4.97 BCR
7% @ $6.0B = 2.95 BCR

3.5% (FY13) @ $10.5B = 1.54 BCR
7% @ $10.5B = 0.70 BCR

-----Original Message-----
From: Wingate, Mark R CIV USARMY CEMVN (USA)
Sent: Sunday, April 14, 2019 6:36 PM
To: Chewning, Daniel B (Brian) CIV USARMY CEMVD (US) <Brian.Chewning@usace.army.mil>
Cc: Burdine, Carol S CIV USARMY CEMVN (US) <Carol.S.Burdine@usace.army.mil>; Elzey, Durund F CIV USARMY CEMVN (US) <Durund.Elzey@usace.army.mil>
Subject: FW: M2G Net Benefit Revisions

Brian,

As you and I discussed late last week, please see the B/C ratio update on subject matter. This should answer Mr. Dalton's question WRT changes to the B/C as a result of a reduced project cost from 10.3B to 5.5 to 6.0B. Note this analysis was completed for a NEW TPC of 6.0B.

Also, I do not intend to incorporate this language into the ACAR but rather it is provided separately under this email.

Also, we anticipate sending you the latest ACAR on Tuesday of this week. Carol has lead on this and is completing final touches and will submit over COL Clancy's signature.

Thanks
mark

____

Mark Wingate, P.E.
Deputy District Engineer for Programs and Project Management Executive Office New Orleans District United States Army Corps of Engineers

504-862-2204 (w)
504-858-8122 (c)

Updated to Oct. 2018 (FY19) price and interest rates

1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ATERNATIVE
(2019 PRICE LEVEL, 2.875 % INTEREST RATE)
($ Millions)

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)	Equiv Annual Benefits During Construction (2024-2034)	Total Equiv Annual Benefits	Results FY19
Damage Category						
Residential & Commercial - Structure/Content/Vehicles	875.2	130.4	744.8	191.9	936.7	
Industrial - Structure/Contents	17.6	1.3	16.2	4.4	20.6	
Highways	7.0	2.4	4.5	1.3	5.8	
Streets	16.7	2.4	14.3	3.5	17.8	
Debris Removal & Cleanup	26.8	4.1	22.7	6.1	28.8	
Water Supply	0.1	0.1	0.1	0.1	0.2	
Boats	0.0	0.0	0.0	0.0	0.0	
Sub-Total	**943**	**141**	**803**	**207**	**1,010**	
Avoided Structure Raising Costs	**5.1**	**-**	**5.1**	**4.3**	**9.4**	
	949	**141**	**808**	**212**	**1,019**	
Total Equivalent Annual Benefits (converted from 2013 to 2019 price level using RS Means)						**1,118**
First Costs						**6,000**
Annual Operation & Maintenance Costs						**7.6**
Total Annual Costs						**225**
B/C Ratio						**4.97**
Equivalent Annual Net Benefits - Base Year 2035						**893**

Updated to Oct. 2018 (FY19) price and interest rates

1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ATERNATIVE
(2019 PRICE LEVEL, 7% INTEREST RATE)
($ Millions)

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)
Damage Category			
Residential & Commercial - Structure/Content/Vehicles	807.8	125.8	682.0
Industrial - Structure/Contents	16.3	1.3	15.0
Highways	6.5	2.3	4.2
Streets	15.0	2.3	12.7
Debris Removal & Cleanup	24.9	4.0	21.0
Water Supply	0.1	0.1	0.1
Boats	0.0	0.0	0.0
Sub-Total	**871**	**136**	**735**
Avoided Structure Raising Costs	**5.3**	**-**	**5.3**
	876	**136**	**740**
Total Equivalent Annual Benefits (converted from 2013 to 2019 price level using RS Means)			
First Costs			
Annual Operation & Maintenance Costs			
Total Annual Costs			
B/C Ratio			
Equivalent Annual Net Benefits - Base Year 2035			

Equiv Annual Benefits During Construction (2024-2034)	Total Equiv Annual Benefits	
454.4	1,136.4	
10.4	25.3	
3.0	7.2	
8.4	21.1	
14.4	35.4	
0.3	0.4	
0.0	0.0	
491	**1,226**	
10.1	**15.4**	
501	**1,241**	
		1,361
		6,000
		7.6
		462
		2.95
		899

1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ATERNATIVE
(2013 PRICE LEVEL, 3.5% INTEREST RATE)
($ Millions)

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)	Equiv Annual Benefits During Construction (2024-2034)	Total Equiv Annual Benefits	Results FY19
Damage Category						
Residential & Commercial - Structure/Content/Vehicles	863.1	129.5	733.6	222.6	956.2	
Industrial - Structure/Contents	17.3	1.3	16.0	5.1	21.1	
Highways	6.9	2.4	4.5	1.5	5.9	
Streets	16.4	2.4	14.0	4.1	18.1	
Debris Removal & Cleanup	26.5	4.1	22.4	7.1	29.4	
Water Supply	0.1	0.1	0.1	0.1	0.2	
Boats	0.0	0.0	0.0	0.0	0.0	
Sub-Total	**930**	**140**	**791**	**240**	**1,031**	
Avoided Structure Raising Costs	**5.2**	**-**	**5.2**	**5.6**	**10.7**	
	936	**140**	**796**	**246**	**1,042**	
Total Equivalent Annual Benefits						**1,042**
First Costs						**10,458**
Annual Operation & Maintenance Costs						**7.6**
Total Annual Costs						**678**
B/C Ratio						**1.54**
Equivalent Annual Net Benefits - Base Year 2035						**364**

1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ATERNATIVE
(2013 PRICE LEVEL, 7% INTEREST RATE)
($ Millions)

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)
Damage Category			
Residential & Commercial - Structure/Content/Vehicles	807.8	125.8	682.0
Industrial - Structure/Contents	16.3	1.3	15.0
Highways	6.5	2.3	4.2
Streets	15.0	2.3	12.7
Debris Removal & Cleanup	24.9	4.0	21.0
Water Supply	0.1	0.1	0.1
Boats	0.0	0.0	0.0
Sub-Total	**871**	**136**	**735**
Avoided Structure Raising Costs	**5.3**	**-**	**5.3**
	876	**136**	**740**
Total Equivalent Annual Benefits			
First Costs			
Annual Operation & Maintenance Costs			
Total Annual Costs			
B/C Ratio			
Equivalent Annual Net Benefits - Base Year 2035			

Equiv Annual Benefits During Construction (2024-2034)	Total Equiv Annual Benefits	
454.4	1,136.4	
10.4	25.3	
3.0	7.2	
8.4	21.1	
14.4	35.4	
0.3	0.4	
0.0	0.0	
491	**1,226**	
10.1	**15.4**	
501	**1,241**	
		1,241
		10,458
		7.6
		1,780
		0.70
		(538)

Engineering Documentation Report (EDR), Morganza to the Gulf of Mexico, LA (MTG)

Hurricane and Storm Damage Risk Reduction

100% Review

DQC Certification of EDR for the MTG Project

The District Quality Control (DQC) has been completed for the subject report. Open comment period began on 29 October 2021 and concluded on 26 November 2021.

The DQC was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-217, 1 May 2021. The following DQC team members met the discipline requirements in the Review Plan.

DQC Team Member	Discipline	Organization
Lesley Prochaska	Plan Formulation & Policy	CEMVN
Ben Logan	Economics	CEMVN
Ralph Scheid	Civil Design	CEMVN

During the DQC, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the needs consistent with law and existing US Army Corps of Engineers policy.

A total of 12 DQC comments were recorded, resolved, and closed in DrChecks. There was one critical comment flagged, but it was resolved by the PDT and closed by the reviewer.

____

Brandon Davis, DQC Lead
Section Chief, Quality Control Branch
CEMVN-PDQ

____

Lacy Shaw Pfaff
Project Manager
CEMVN-PM-O

Leslie Nuccio
Engineering Deputy Chief
CEMVK-ED~~-Q~~

Shawn Vicknair
Deputy Chief, Regional Planning &
Environment Division South
CEMVN-PDQ

Comment Report: All Comments
Project: Mo to the Gulf EDR Oct 2021
Review: Mo to the Gulf EDR 2021
Displaying 12 comments for the criteria specified in this report.

Id	Discipline	Section/Figure	Page Number	Line Number
9479530	Economics	n/a	n/a	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

The economics results shown in the EDR do accurately reflect the most recent iteration of the results presented in the economics appendix.

Submitted By: John Logan (504-862-1910). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**
The EDR will be updated to FY 2022 Price Levels, once analysis is complete.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 22 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: John Logan (504-862-1910) Submitted On: Nov 23 2021
Current Comment Status: **Comment Closed**

Id	Discipline	Section/Figure	Page Number	Line Number
9479543	Economics	n/a	n/a	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Although the economics results shown are accurate, at this point in the study, they are dated. The costs, damages, and benefits should be escalated to the FY22 price level, and the results should be recalculated using the FY22 discount rate.

Submitted By: John Logan (504-862-1910). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**
The Economic Models are currently being updated and the final version will reflect FY 2022 Price levels.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 22 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: John Logan (504-862-1910) Submitted On: Nov 23 2021
Current Comment Status: **Comment Closed**

9479702	Planning - Plan Formulation	2	4	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150, Appendix E, E-4, Section 2 on Pertinent Data does currently meet the following: "tabular summary of essential data on the project cost, benefit-to-cost ratio, physical features, project
purpose, and controlling elevations (e.g., for design flood, real estate acquisition, relocations, etc.) shall be
provided." Suggest deleting sections 2.1 and 2. and replacing with guidance requested table.

Submitted By: Lesley Prochaska ((504) 862-1454). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**

Will remove the current section 2.1 and replace with table of "Pertinent Data". The information that is requested to be in tabular summary is contained within the EDR. The information (project cost, benefit-to-cost ratio, physical features, project
purpose) that is fairly straight-forward will be listed in the table and the controlling elevation, which is different per reach, so isn't appropriate for table format will be referenced per section.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 22 2021

1-1 Backcheck Recommendation **Close Comment**

Closed without comment.

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

9479704	Planning - Plan Formulation	3	5	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150, Appendix E, E-5, the status of the project authorization: Explain the need for an EDR...
Suggest pull info from Introduction and or Section 7.1 into Section 3 to meet the ER intent.

Submitted By: Lesley Prochaska ((504) 862-1454). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**

Added the following to Section 3: The need for this EDR is to document the refinements, that include inclusion of the adaptive design criteria, to the MTG Project that make up the current design (see Section 7 for more information). In addition, the EDR is needed to incorporate the increased NFSs construction cost share, as proposed by the NFSs, to limit Federal participation to initial construction, as defined in this report (see Section 10).

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 22 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021
Current Comment Status: **Comment Closed**

9479706	Planning - Plan Formulation	5	6	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150, Appendix E-7, State whether or not the reconnaissance and feasibility phases of project development were managed under
the project management policy. If not, state character and extent of previous surveys and studies made in connection with the feasibility document, cite the document number (if applicable), and treat any other pertinent prior investigations similarly. State briefly the character and extent of surveys, studies (including re-evaluation studies) and other planning completed subsequent to initiation of PED, including the results of
public meetings held.

Suggest adding statement as referenced in the above ER and moving report history from Section 2 to Section 5. Include a robust project history table, including the 2002 and 2003 Feasibility Study Reports and pertinent documents and actions that are applicable to this decision document.

Submitted By: Lesley Prochaska ((504) 862-1454). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**
Added to Section 5: 'Per ER 1110-2-1150, Appendix E-7, that directs "State whether or not the reconnaissance and feasibility phases of project development were managed under
the project management policy." The MTG Project studies listed following in chronological order, along with pertinent actions, were managed under the project management policy.' Also added the Recon and Feas. studies to Table 5-1

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 22 2021

1-1 Backcheck Recommendation **Open Comment**
I suggest not quoting the regs verbatim and instead confirm whether or not they were "managed under the project management policy"

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021

2-0 Evaluation **Concurred**
Removed first sentence of the addition so Section 5 reads: he MTG Project studies listed following in chronological order, along with pertinent actions, were managed under the project management policy.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 26 2021

2-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021
Current Comment Status: **Comment Closed**

9479715	Planning - Plan Formulation	7.2	10	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150 of : E-10. Current Engineering Studies, Investigations, and Design: ensure that the information in Section 7 presents In lieu of duplication, reference shall be freely made to the engineering appendix for items, which have not changed subsequent to its preparation.

Please review Section 7.2 and suggest changing to a new Section named: Project Changes to match guidance in ER. Suggest review of text to confirm it presents only changes and refers to appendices as needed in lieu of duplication.

Submitted By: Lesley Prochaska ((504) 862-1454). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**
Changed 7.2 to be "Current Design and Changes" Reviewed Section 7.2 per E-10. There is mention of items in the design that have not changed but are important to include to mention to explain why it didn't change or needed to characterize a system.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 22 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021
Current Comment Status: **Comment Closed**

9479716	Planning - Plan Formulation	9.3	22	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Project Risk is not typically covered in a EDR main text per ER 1110-2-1150. Please provide an introduction to why risk is being presented and differences from previous decision documents.

Submitted By: Lesley Prochaska ((504) 862-1454). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**
The goal of the EDR was to capture all of the changes in all aspects of the project since the PACR. Added the sentence ". This section discusses the changes in risk from the PACR."

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 23 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021
Current Comment Status: **Comment Closed**

9479719	Planning - Plan Formulation	11	28	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150 Appendix E Section E-14: The views and comments of other interested Federal, State and local agencies will be obtained as they relate to their specific areas of responsibilities. The document will also include the views and comments of the non-Federal sponsor.

Suggested Resolution: Add the the views of coordinating agencies and NFS on the approach USACE is taking on the Environmental Documentation being deferred.

Submitted By: Lesley Prochaska ((504) 862-1454). Submitted On: Nov 03 2021

1-0 Evaluation **Concurred**
Added/ updated the following in Section 11 "Therefore, the project team has initiated a SEIS that can progress with more available funding. Once more funding is available and the SEIS initiated, the SEIS is estimated to take 2 years to complete. Initial coordination and feedback from agencies have occurred." The NFS is providing an LOI that will support the EDR.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 23 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Lesley Prochaska ((504) 862-1454) Submitted On: Nov 26 2021
Current Comment Status: **Comment Closed**

9480600	Civil	n/a	4	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**
[**Critical/Flagged.**]

Showing epoch of 2004.65. but 209.55 is the most current epoch. NGS is working on a new epoch that would be 2017.xx. Publication date is uncertain.

Comment put in for R. Scheid

Submitted By: Brandon Davis (601-631-5961). Submitted On: Nov 04 2021

1-0 Evaluation **Concurred**
Showing the epoch that was used for the hydraulic design. A more up-to-date topo survey will be used for the designs of the individual features in the future.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 23 2021

1-1 Backcheck Recommendation **Close Comment**
This response in sufficient in the context of the EDR. However, for MTOG Project design a project datum and epoch must be established. This project datum and epoch will fix all MTOG design and modeling efforts into a current datum that integrates into the National Spaial Reference System (NSRS).

Submitted By: Ralph Scheid (504-862-2995) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

9480604 Civil n/a 4 n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

Prior to design, there will need to be a Datum Policy Memo, establishing the datum/epoch for MTOG. Does this document and policy requirements need to be addressed in this EDR?

Comments put in for R. Scheid.

Submitted By: Brandon Davis (601-631-5961). Submitted On: Nov 04 2021

1-0 Evaluation **Concurred**
No. The review of the datum for MTG will be reviewed before detailed design of the features of the project (pending funding).

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 23 2021

1-1 Backcheck Recommendation **Close Comment**
Closed without comment.

Submitted By: Ralph Scheid (504-862-2995) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

9480617 Real Estate n/a 15 n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

LERRDs needs a better definition at first use.

CFR Title 33 CFR § 203.82, defines LERRDs and could be referenced.

Comment by R. Scheid

Submitted By: Brandon Davis (601-631-5961). Submitted On: Nov 04 2021

1-0 Evaluation **Concurred**
LERRD is defined in 7.2.4 for its first use.

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 23 2021

1-1 Backcheck Recommendation **Close Comment**

Submitted By: Ralph Scheid (504-862-2995) Submitted On: Nov 23 2021
Current Comment Status: **Comment Closed**

9480625	Project Management	7.2.4.3 Future Borrow	16	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

"A temporary work area easement (for borrow) will be acquired over these areas, from an estimated 325 landowners."

Not clear this this statement "for borrow" means. Please clarify.

Comment by R. Scheid

Submitted By: Brandon Davis (601-631-5961). Submitted On: Nov 04 2021

1-0 Evaluation **Concurred**
Changed areas to "potential borrow pits".

Submitted By: Lacy Pfaff ((504) 862-1200) Submitted On: Nov 23 2021

1-1 Backcheck Recommendation **Close Comment**

Submitted By: Brandon Davis (601-631-5961) Submitted On: Nov 29 2021
Current Comment Status: **Comment Closed**

From:	Vicknair, Shawn Michael CIV USARMY CEMVN (USA)
To:	Kinsey, Mary V CIV USARMY CEMVN (USA); Burdine, Carol S CIV USARMY CEMVN (USA); Axtman, Timothy J CIV USARMY CEMVN (USA)
Cc:	Pfaff, Lacy Shaw CIV USARMY CEMVN (USA); Davis, Brandon L CIV USARMY USACE (USA)
Subject:	RE: MTG EDR, DQC, MVN OC Comments
Date:	Friday, December 3, 2021 4:18:20 PM

Mary,

Let me clarify, the comments you provided help clarify the language in the EDR. I misstated that the comments are not a concern to the DQC team. They are, in fact, a concern to the team. What I am suggesting is that the changes based on your comments do not negate or counter the DQC review or policy compliance. I am comfortable with your comments and applicable rewrites in regards to the DQC. The DQC is still valid and the rewrites do not alter policy compliance for the document. The DQC Cert is still valid.

I hope that helps.

Please let me know if we need to discuss further.

Shawn Vicknair
Deputy Chief, Regional Planning and Environment Division, South
504-862-2024 (w)
504-615-6406 (c)
Shawn.M.Vicknair@usace.army.mil

From: Kinsey, Mary V CIV USARMY CEMVN (USA) <Mary.V.Kinsey@usace.army.mil>
Sent: Friday, December 3, 2021 3:27 PM
To: Vicknair, Shawn Michael CIV USARMY CEMVN (USA) <Shawn.M.Vicknair@usace.army.mil>; Burdine, Carol S CIV USARMY CEMVN (USA) <Carol.S.Burdine@usace.army.mil>; Axtman, Timothy J CIV USARMY CEMVN (USA) <Timothy.J.Axtman@usace.army.mil>
Cc: Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <Lacy.S.Pfaff@usace.army.mil>; Davis, Brandon L CIV USARMY USACE (USA) <Brandon.L.Davis@usace.army.mil>
Subject: RE: MTG EDR, DQC, MVN OC Comments

Shawn, Thank you for your response. Counsel doesn't concur in all of your responses.

A description of cost share obligations of the NFS is required to be in any decision document. That is a requirement in all decision documents and is not merely a concern of the PPA. The PPA draws its description of the cost share obligations of the NFS from the Congressional authorization but also from the decision document. In this case one of those decision documents is this EDR. For this EDR the cost share obligations of the NFS are described in Sec 10 of EDR. In kind work and the availability of credits is also a matter of law and policy (Sec 221 of the 1970 FCA, as amended most recently by

Sec 1018 of WRRDA 2014 and by ER 1165-2-208. Those issues are addressed in the NFS obligations as well. Since the DQC is looking at the EDR for matters of compliance with regulations and policy; how is it not their concern to assure that these issues are policy compliant as laid out in the EDR?

Sill depth of the HNC Lock was addressed in the 2013 PACR and is required to be addressed in the EDR as to the appropriateness of that increased sill depth to be chargeable as a credit against the MTG project. Again, a matter of law and policy compliance that Counsel would think is subject to the DQC review.

Mary V. Kinsey
Senior Counsel, Civil Works
Office: 504-862-2828
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From: Vicknair, Shawn Michael CIV USARMY CEMVN (USA) <Shawn.M.Vicknair@usace.army.mil>
Sent: Friday, December 03, 2021 3:03 PM
To: Burdine, Carol S CIV USARMY CEMVN (USA) <Carol.S.Burdine@usace.army.mil>; Axtman, Timothy J CIV USARMY CEMVN (USA) <Timothy.J.Axtman@usace.army.mil>
Cc: Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <Lacy.S.Pfaff@usace.army.mil>; Kinsey, Mary V CIV USARMY CEMVN (USA) <Mary.V.Kinsey@usace.army.mil>; Davis, Brandon L CIV USARMY USACE (USA) <Brandon.L.Davis@usace.army.mil>
Subject: RE: MTG EDR, DQC, MVN OC Comments

Carol/Mary,

I have reviewed Mary's comments below. I do not have any concerns with Mary's comments with respect to DQC. Brandon was the DQC Lead and I am his direct supervisor. Additional, the ED Deputy Chief and I are the senior signatures on all DQC efforts led by RPEDS. All DQC comments were closed and attached to the DQC Certificate Brandon and I signed.

Comment 1 is not a concern as the EDR addresses the MTG Project. That is what we are conducting quality control review. The revision states that MTG is not responsible for depth beyond 18 feet. That is a costs share/allocation concern and should be addressed in the PPA. That clarification is no issue for DQC of the MTG EDR.

Comment 2 is not a concern for DQC because as Lacy stated, the Economic evaluation was for MTG not to include costs for the Houma Nav Sill depth beyond 18 feet. The latest changes were to update to FY22 price levels. No issue from DQC of the MTG EDR.

Comment 3 is fine. Your added language is of no concern from a DQC perspective. Brandon briefed the DQC team prior to review and all understood this was the premise of this document. No issue from DQC.

Brandon and the DQC team have reviewed the EDR from policy perspective and to ensure technical quality. Based on below concerns, I am comfortable that the DQC cert still stands as is and no further action from the team is needed.

Please let me know if there are further questions.

Shawn Vicknair
Deputy Chief, Regional Planning and Environment Division, South
504-862-2024 (w)
504-615-6406 (c)
Shawn.M.Vicknair@usace.army.mil

From: Burdine, Carol S CIV USARMY CEMVN (USA) <Carol.S.Burdine@usace.army.mil>
Sent: Friday, December 3, 2021 2:02 PM
To: Vicknair, Shawn Michael CIV USARMY CEMVN (USA) <Shawn.M.Vicknair@usace.army.mil>; Axtman, Timothy J CIV USARMY CEMVN (USA) <Timothy.J.Axtman@usace.army.mil>
Cc: Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <Lacy.S.Pfaff@usace.army.mil>
Subject: FW: MTG EDR, DQC, MVN OC Comments

Shawn and Tim, thanks for the phone call. Below are OC's recent comments on the EDR and the PM responses – please see the email chain below. Also attached are OC's comments in track changes for the EDR. We need to have the DQC review and confirm that the DQC review remains the same based on these changes and to document that in an email.
Thanks, Carol

____

Carol Burdine
Chief, Regional Projects Branch/PPMD
USACE New Orleans District
7400 Leake Ave New Orleans, LA 70118-3651
504-862-2498 - office
504-812-6004 - cell
Carol.S.Burdine@usace.army.mil

From: Kinsey, Mary V CIV USARMY CEMVN (USA) <Mary.V.Kinsey@usace.army.mil>
Sent: Friday, December 3, 2021 12:42 PM
To: Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <Lacy.S.Pfaff@usace.army.mil>; Burdine, Carol S CIV USARMY CEMVN (USA) <Carol.S.Burdine@usace.army.mil>

Cc: Roth, Stephan C CIV USARMY CEMVN (USA) <Stephan.C.Roth@usace.army.mil>
Subject: RE: MTG EDR, DQC, MVN OC Comments

Lacy and Carol,

In response to Lacy's responses regarding Counsel concerns about the DQC responses relative to the most recent iteration of the EDR following intensive engagement with HQ, I would offer the following:

I don't concur with Lacy's statement that a DQC reviewer would not know whether to question an issue or not. The question for the DQC is the quality of the report itself and its compliance with policy. If the DQC was not updated by PM with regard to the HQ guidance issued in response to the NFS deviation requests, then that lack of knowledge of the DQC members necessarily impacts the quality of the report itself and its compliance with policy. The example of the HNC Sill depth does bear on the reports quality and policy compliance and in addition it's eligibility for credit and the appropriateness of that credit allocation to Morganza is a matter of compliance with the project statutory authority as well as a matter of policy and regulation.
It doesn't matter whether a reviewer would know to question an issue or not; as Lacy, herself mentioned, the question is the quality of the report itself and compliance to policy.

There is an comment that is still marked as "open comment" in the DQC. Was it closed and if so, how was it closed?

Based on Lacy's interlineated responses to Counsel comments, I offer the following:

1. Based on the date of the DQC closeouts, was the DQC updated as project issues raised by the NFS deviation requests were discussed and responded to by HQ?
Lacy's Response: An example of compelling issue that has been added to the EDR is the HNC sill depth and it would not have had a bearing on the quality of the report. Likewise with the other changes.
Counsel reply: As I indicated above, Counsel doesn't agree that these deviation request issues are not relevant to statutory and policy compliance and the quality of the report, nor that these issues were beyond the ambit of the DQC review.

2. Was the DQC, with regard to the economic analysis, updated on the revisions that were made to the Economic Update and provided to MVD this week? I ask because the EDR Economic Analysis was substantially based on the content of the draft Economic Update that was in place at that time. It was understood, that since the Economic Update was being concurrently reviewed with preparation and review of the EDR, that the EDR might require changes in accordance with any changes to the Economic Update during its review. Likewise, discussions with HQ regarding deviation and resolution of those issues, may have impacted statements and information in the Economic Update. Did PM ensure that the Economic Update and EDR are consistent?
Lacy's Response: The changes to the Econnomic (sic) update was to mainly update to FY22 price

levels. The details that have caused changes to the EDR, such as the Houma Nav Sill would be non-consequential to the Economic Update as it was not included in those costs. Cost share is not discussed in the Economic Update.
Counsel Reply: I do not have a copy of the revised Economic Update and cannot assess if this is accurate. Please check with Economics and confirm that Lacy's response is correct.

3. With regard to your change to Section 3, regarding the purpose of the EDR, the verbiage that you inserted in the EDR and in your response to the DQC was not complete. Another primary reason for the EDR is that the revisions proposed to the 2013 PACR recommendation, per the ACAR, etc. had to be addressed in a decision document (the EDR) as the supporting decision document for the PPA (See Article I.A. of the draft PPA). I have inserted language into Section 3 to address this additional purpose for the EDR. You have already closed this comment in the DQC. I'm not sure of the DQC requirement to notify the DQC of that addition to Section 3.
Lacy's Response: The comment from the DQC reviewer was to add a reason for the EDR. The DQC reviewer was satisfied with the answer before so we are providing further clarification that would not be in the purview for a quality check.
Counsel Reply: Not sure this is accurate. The need for a supporting decision document in the PPA was a primary reason for the EDR. Policy and the model PPAs require that Article I.A. of the model PPA (the project description and scope of the PPA) must include a reference to the decision documents that serve as the basis for the provisions and obligations of the PPA. HQ in drafting the PPA made the formation of an EDR a requirement for the PPA in accordance with that policy and regulation. Please re-assess your response and confirm that your response does not need amendment.

I am going to dash out for lunch in just a few minutes. I'll let both of you know as soon as I return. I'm happy to discuss further when I return.

Mary

Mary V. Kinsey
Senior Counsel, Civil Works
Office: 504-862-2828
Cell: 504-427-6791
Email: Mary.V.Kinsey@usace.army.mil

From: Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <Lacy.S.Pfaff@usace.army.mil>
Sent: Friday, December 03, 2021 11:33 AM
To: Kinsey, Mary V CIV USARMY CEMVN (USA) <Mary.V.Kinsey@usace.army.mil>; Burdine, Carol S CIV USARMY CEMVN (USA) <Carol.S.Burdine@usace.army.mil>
Cc: Roth, Stephan C CIV USARMY CEMVN (USA) <Stephan.C.Roth@usace.army.mil>
Subject: RE: MTG EDR, DQC, MVN OC Comments

Mary,

A reminder that a District Quality Control review speaks more to the quality of the report itself and compliance to policy, not the details of the project related content which, by design, the reviewer would not know to question. Therefore, I don't think any of the points brought up below require a re-opening of the DQC. I have responses below.

Lacy Shaw Pfaff, P.E.
Project Manager
New Orleans District, USACE
Office: 504-862-1200
Cell: 904-327-3197

From: Kinsey, Mary V CIV USARMY CEMVN (USA) <Mary.V.Kinsey@usace.army.mil>
Sent: Friday, December 3, 2021 11:07 AM
To: Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <Lacy.S.Pfaff@usace.army.mil>; Burdine, Carol S CIV USARMY CEMVN (USA) <Carol.S.Burdine@usace.army.mil>
Cc: Roth, Stephan C CIV USARMY CEMVN (USA) <Stephan.C.Roth@usace.army.mil>
Subject: MTG EDR, DQC, MVN OC Comments

I note that some of your responses to the DQC are impacted by my review of the EDR, particularly where your response to the DQC included a quote of the language that you proposed to insert into the EDR in response to the DQC comments. Since the DQC comments have all been closed out, I don't know your process for advising them that I have recommended changes to the verbiage placed before them. I've tried to point those out to you in my below comment.

Otherwise, my comments are as follows:

Based on the date of the DQC closeouts, was the DQC updated as project issues raised by the NFS deviation requests were discussed and responded to by HQ?

Response: An example of compelling issue that has been added to the EDR is the HNC sill depth and it would not have had a bearing on the quality of the report. Likewise with the other changes.

Was the DQC, with regard to the economic analysis, updated on the revisions that were made to the Economic Update and provided to MVD this week? I ask because the EDR Economic Analysis was substantially based on the content of the draft Economic Update that was in place at that time. It was understood, that since the Economic Update was being concurrently reviewed with preparation and review of the EDR, that the EDR might require changes in accordance with any changes to the Economic Update during its review. Likewise, discussions with HQ regarding deviation and resolution of those issues, may have impacted statements and information in the Economic Update. Did PM ensure that the Economic Update and EDR are consistent?

Response: The changes to the Econnomic update was to mainly update to FY22 price levels. The details that have caused changes to the EDR, such as the Houma Nav Sill would be non-consequential to the Economic Update as it was not included in those costs. Cost share is not discussed in the Economic Update.

With regard to your change to Section 3, regarding the purpose of the EDR, the verbiage that you inserted in the EDR and in your response to the DQC was not complete. Another primary reason for the EDR is that the revisions proposed to the 2013 PACR recommendation, per the ACAR, etc. had to be addressed in a decision document (the EDR) as the supporting decision document for the PPA (See Article I.A. of the draft PPA). I have inserted language into Section 3 to address this additional purpose for the EDR. You have already closed this comment in the DQC. I'm not sure of the DQC requirement to notify the DQC of that addition to Section 3.

Response: The comment from the DQC reviewer was to add a reason for the EDR. The DQC reviewer was satisfied with the answer before so we are providing further clarification that would not be in the purview for a quality check.

The DQC comment requiring the inclusion in the EDR of a "robust project table" stipulated that the table needed to include reference to both the 2002 and 2003 Chief's Reports. The EDR table, in the Dec 2 EDR draft did not do that. My comments noted this and stated that both the 2002 and 2003 Chief's reports needed to be cited. I note that the DQC comment referenced Feasibility Reports. Based on the context, I think they intended reference to the Chief's Reports, which incorporate the decision document by reference and serve as the basis of the Congressional authorization of the project in 2007.

Response: Ok, can add.

With regard to the change in Section 11 regarding the SEIS, your response to the DQC that is the basis of closing the DQC comment is not quite accurate. As I pointed out in my comments on the EDR, you state that the SEiS has been funded and has been initiated, and then in a following sentence state "when the SEIS is initiated" My comment suggested that this sentence needs to be consistent with the earlier statement that the SEIS has already been initiated.

Response: Concur

Mary V. Kinsey
Senior Counsel, Civil Works
Office: 504-862-2828
Cell: 504-427-6791
Email: Mary.V.Kinsey@usace.army.mil

November 17, 2021

Mr. Mark Wingate
U.S. Army Corps of Engineers
New Orleans District
7400 Leake Avenue
New Orleans, LA 701 18

RE: Letter of Intent - Engineering and Design Report
Morganza to the Gulf Hurricane and Storm Damage
Reduction Project

Dear Mr. Wingate:

The State of Louisiana acting by and through the Coastal Protection and Restoration Authority Board of Louisiana (CPRA Board) has reviewed the draft Engineering Documentation Report (EDR) for the Morganza to the Gulf (MTG), Louisiana, Project. The EDR recommends approval of the current design based on the April 2019 Adaptive Criteria Assessment Report (ACAR), inclusive of the recommended reduction in the Federal Total Project Cost (TPC) for construction and current design standards. The CPRA Board requests that the United States Army Corps of Engineers, New Orleans District, initiate efforts to further implement the MTG Project in accordance with the EDR recommendations. Therefore, the State of Louisiana is pleased to offer its continuing support for the MTG Project.

This letter, while not legally binding on the State of Louisiana, acting by and through the CPRA Board, as an obligation of future funds, declares the State of Louisiana's full support for this effort. By this letter, CPRAB also expresses its willingness to serve as a co-non-Federal sponsor with the Terrebonne Levee and Conservation District (TLCD) for the project and to move towards execution of a Project Partnership Agreement for the Project in accord with the EDR. As understood, the EDR "documents the incorporation of the adaptive design criteria and other design refinements" into the project.

Furthermore, the CPRA Board and the TLCD are willing to accept a larger role of responsibility in delivering the project. The CPRA Board understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with non-Federal interests being responsible for the costs of performing all future work required for the project through 2085. As additional refinements are necessary to implement the project based on actual engineering and design data and on-the-ground conditions, we look forward to continue working with USACE to identity methods to reduce overall project costs and deliver an effective project that reduces hurricane and storm damage within the project area.

CPRA Board reiterates that it fully supports the MTG Project and looks forward to continuing to work with the TLCD and the USACE to provide integrated coastal protection to Louisiana's coastal communities through the implementation of this important project.

Sincerely,

Kyle R. "Chip" Kline, Jr.
Executive Assistant to the Governor for Coastal Activities
and Chairman Coastal Protection & Restoration Authority
Board of Louisiana

cc: Mark Wingate, Deputy District Engineer, USACE
Bren Haase, CPRA, Deputy Executive Director
Ignacio Harrouch, CPRA, Operations Chief
James McMenis, CPRA, Project Manager
David Peterson, CPRA, Acting General Counsel
Lacy Shaw Pfaff, USACE, Project Manager
Reggie Dupre, Executive Director, Terrebonne Levee and Conservation District
Dwayne Bourgeois, Executive Director, North Lafourche Levee District
Windell Curole, General Manager, South Lafourche Levee District

TERREBONNE LEVEE
& CONSERVATION DISTRICT

December 1, 2021

Mr. Mark Wingate
U.S. Army Corps of Engineers
New Orleans District
7400 Leake Avenue
New Orleans, LA 701 18

RE: Letter of Intent - Engineering and Documentation Report
Morganza to the Gulf Hurricane and Storm Damage Risk Reduction Project

Dear Mr. Wingate:

The Terrebonne Levee & Conservation District (TLCD) has reviewed the draft Engineering Documentation Report (EDR) for the Morganza to the Gulf (MTG), Louisiana Hurricane and Storm Damage Risk Reduction Project. The EDR recommends approval of the current design based on the April 2019 Adaptive Criteria Assessment Report (ACAR), inclusive of the recommended reduction in the Federal Total Project Cost (TPC) for construction and current design standards. The TLCD joins the State of Louisiana acting by and through the Coastal Protection & Restoration Authority Board of Louisiana (CPRAB) in requesting that the United States Army Corps of Engineers, New Orleans District, initiate efforts to further implement the MTG Project in accordance with the EDR recommendations.

This letter, while not legally binding on the TLCD, as an obligation of future funds, declares the TLCD's full support for this effort. By this letter, TLCD also expresses its willingness to serve as a co-non-Federal sponsor, along with the CPRAB, for the project and to move towards execution of a Project Partnership Agreement for the Project in accord with the EDR. As understood, the EDR "documents the incorporation of the adaptive design criteria and other design refinements" into the project.

Furthermore, TLCD and CPRAB are willing to accept a larger role of responsibility in delivering the project. The TLCD understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with non-Federal interests being responsible for the costs of performing all future work required for the project through 2085. As additional refinements are necessary to implement the project based on actual engineering and design data and on-the-ground conditions, we look forward to continue working with USACE to identity methods to reduce overall project costs and deliver an effective project that reduces hurricane and storm damage within the project area.

220-A CLENDENNING RD · HOUMA, LA 70363 · (985) 868-8523 · FAX: (985) 853-2318

The TLCD looks forward to continuing to work with the CPRAB and the USACE to provide integrated coastal protection to Louisiana's coastal communities through the implementation of this important project.

Sincerely,

TERREBONNE LEVEE & CONSERVATION DISTRICT

Anthony J. Alford
President

cc: Chip Kline, CPRAB Chairman
Bren Haase, CPRA, Deputy Executive Director
Ignacio Harrouch, CPRA, Operations Chief
James McMenis, CPRA, Project Manager
David Peterson, CPRA, Acting General Counsel
Lacy Shaw Pfaff, USACE, Project Manager
Reggie Dupre, Executive Director, Terrebonne Levee and Conservation District
Dwayne Bourgeois, Executive Director, North Lafourche Levee District
Windell Curole, General Manager, South Lafourche Levee District
Mitch Marmande, PE, MTG Program Manager

CERTIFICATE OF LEGAL SUFFICIENCY

Mississippi River and Tributaries (MR&T)
Morganza to the Gulf of Mexico, Louisiana (MTG)
Engineering Documentation Report dated December 2021

The Mississippi River and Tributaries (MR&T) Morganza to the Gulf of Mexico, Louisiana (MTG) Engineering Documentation Report (EDR) dated December 2021, including all associated documents required by the National Environmental Policy Act, has been fully reviewed by the Office of Counsel, New Orleans District, and is approved as legally sufficient.

DATE: 12/6/21

Stephan C. Roth
District Counsel
U.S. Army Engineer District
New Orleans