DEPARTMENT OF THE ARMY
CHIEF OF ENGINEERS
2600 ARMY PENTAGON
WASHINGTON, DC 20310-2600

23 OCT 2019

CECG

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Gulf Intracoastal Waterway, Brazos River Floodgates and Colorado River Locks, Texas – Final Agency Responses to Independent External Peer Review (IEPR)

1. An IEPR was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, Engineering Circular (EC) 1165-2-217, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).

2. The IEPR was conducted by Battelle Memorial Institute (Battelle). The IEPR panel consisted of five members with technical expertise in economics, environmental resources, hydrology and hydraulics, structural and civil engineering, and port operations.

3. The enclosed document contains the approved final written responses of the U.S. Army Corps of Engineers (Corps) to the issues raised and recommendations contained in the IEPR Report. The IEPR Report and final written Corps responses will be posted on the Internet, as required by EC 1165-2-217.

4. If you have any questions on this matter, please contact me or have a member of your staff contact Eddie Douglass, Acting Deputy Chief, Southwestern Division Regional Integration Team, at (202) 761-0297.

Encl

VITAL PROJECT
PROVIDING SAFE AND
EFFICIENT NAVIGATION
ON THE NATION'S
ENERGY COAST!

TODD T. SEMONITE
Lieutenant General, USA
Commanding

Gulf Intracoastal Waterway, Brazos River Floodgates and Colorado River Locks, Texas, Feasibility Study
Integrated Feasibility Report and Environmental Impact Statement
DRAFT
U.S. Army Corps of Engineers Response to
Independent External Peer Review
18 March 2019

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act (WRDA) of 2007 (P.L. 110-114), Engineering Circular (EC) 1165-2-217, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (2004).

The goal of the U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide the most scientifically sound, sustainable water resource solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people. Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to conduct the IEPR of the Gulf Intracoastal Waterway (GIWW), Brazos River Floodgates (BRFG) and Colorado River Locks (CRL), Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS).

The IEPR panel reviewed the DIFR-EIS (inclusive of all appendices). The Final IEPR Report was issued on 8 May 2018.

Overall, seven comments were identified and documented by Battelle. Of the 7 comments, 4 were considered medium significance, 1 was medium-low significance and 2 were deemed low significance.

Based on the technical content of the GIWW BRFG-CRL review documents and the overall scope of the project, Battelle identified candidates for the panel in the field of Civil Works Planning/Economics, Biological Resources and Environmental Law Compliance, Hydrology and Hydraulic Engineering, Structural/Civil Engineering, and Port Operations were selected for the IEPR.

1. Comment – *Medium*: During review of the public comments the Panel noted that comments from several local organizations described environmental consequences and cumulative effects resulting from implementation of the TSP, including inducted flooding, increased siltation, and changes in salinity, that are not fully addressed.

This comment includes six recommendations for resolution, five were adopted, and one was not adopted.

1. Group the public comments by topic and develop a response to each issue raised.

   USACE Response: Adopted
   Action Taken: The public comments have been grouped into categories and summarized. A response for each category of comments was compiled. A matrix summarizing the public comments and responses is provided in the Public Meeting Summary Report (Appendix G), which is contained in Environmental Appendix D-11 (Public Involvement). This has been confirmed to be included in the final report environmental appendix.

2. Consider performing more detailed analyses with respect to the potential for increased siltation and induced flooding resulting from implementation of the TSP.

   USACE Response: Not Adopted
   Action Taken: Sedimentation has been analyzed for the proposed TSP and existing conditions. Cumulative sedimentation impacts were quantified and included in the economic analysis. An analysis of Water Surface Elevation (WSE) at communities along the San Bernard River was included in analysis of the TSP. The TSP showed no significant impacts to WSE at these communities. Salinity modeling was conducted for the TSP and existing conditions. An explanation of this analysis was included in the Engineering Appendix A of the IFR, Sub-Appendix 1 titled "Hydraulic Engineering Appendix – Brazos River Floodgates".

3. Describe more fully the expected effects of the TSP on plans to re-open the mouth of the San Bernard River.

   USACE Response: Adopted
   Action Taken: In order to adequately address the public comments regarding the effects of the TSP on the re-opening of the San Bernard River, additional hydraulic analysis was conducted utilizing the existing AdH models to determine the siltation that would occur in the mouth from the GIWW. Generally speaking, increased sedimentation was noted in the mouth from the GIWW as a result of the TSP. It should be noted that while the TSP causes an increase in sedimentation in the mouth from the GIWW, the majority of sedimentation in the mouth of the San Bernard is governed by littoral processes, which could not be modeled by the current analysis software. Additionally, an empirical inlet stability analysis was performed relating the tidal prism to historical littoral drift rates. This analysis indicates that for existing conditions and the TSP, the San Bernard inlet would remain an ephemeral inlet with poor stability and prone to closure, the difference in inlet stability

between existing conditions and the TSP is negligible. We previously stated that the following text would be added to Paragraph 5.16 in the main report to address the concern:

> *"In order to address the concern of silting in the river's mouth, hydraulic modeling was conducted to examine the sedimentation patterns in the GIWW if the San Bernard were opened with the TSP constructed. In general, the modeling indicated that the open San Bernard condition resulted in increased sedimentation in the mouth of the San Bernard and the GIWW between the San Bernard and Brazos rivers for existing conditions and the TSP. Wave driven sediment transport was not included in the model, and the model results only reflected sedimentation due to river deposition. Much of the morphology of the Sand Bernard River mouth is governed by the littoral processes and therefore the model runs should not be used to develop any conclusions regarding the impact of the proposed TSP on the duration that the San Bernard River mouth will remain open. The model results should only be used to assess the impacts of the open San Bernard inlet on sedimentation in the GIWW. However, to form a general understanding of the potential impact of the TSP on the stability of an open San Bernard inlet, an empirical inlet stability analysis was performed relating the tidal prism to historical littoral drift rates. For both existing conditions and for the proposed TSP, it was found that the San Bernard inlet will remain an ephemeral inlet with poor stability and prone to closure, and the difference in inlet stability between existing and TSP conditions is negligible."*

Additional details of the modeling were included in Paragraph 2 of Appendix A – Engineering Appendix and Sub-Appendix 1 titled "*Hydraulic Engineering Appendix – Brazos River Floodgates"*.

Subsequent to the incorporation of the responses to the IEPR comments, additional revisions were made to the text in the main report in response to additional DQC and ATR comments. The below revised wording is now included in Paragraph 5.15 (formerly Paragraph 5.16 referenced above) to address the IEPR comment:

"To address concerns about the proposed open channel and increased sediment in the West GIWW affecting the opening of the San Bernard River outlet, additional modeling was performed to include an open connection between the San Bernard River and the Gulf of Mexico. Qualitative comparisons were made to analyze the general impact of the Recommended Plan on sedimentation. within the GIWW and the inlet stability of the San Bernard mouth when compared to existing conditions. Detailed information on the modeling performed is available in ***Engineering Appendix A-1: Hydraulic Engineering Appendix – Brazos River Floodgates****. The results indicate when the San Bernard River outlet is open, the Recommended Plan showed an increase in sedimentation. of approximately 9,700 cy/year in the San Bernard Gulf Channel when compared to existing conditions. However, an open San Bernard mouth would cause additional sedimentation in the West GIWW: approximately 134,800 cy/year under existing conditions and 114,900 cy/year under the Recommended Plan. The inlet stability analysis indicated that the San Bernard River outlet has poor stability during both existing conditions and under the Recommended Plan, and that any changes in the inlet stability due to the Recommended Plan would be minor and would not change the stability regime of the San Bernard inlet.*

In addition, the controlling process for the morphology of the San Bernard River mouth is the net westward transport of sediments deposited by the Brazos River into the Gulf, not sediment deposition via the GIWW."

4. Develop a more detailed discussion of cumulative environmental effects on the existing environment from concurrent implementation of the TSP and the re-opening of the mouth of the San Bernard River.

   USACE Response: Adopted
   Action Taken: Additional modeling assuming an open San Bernard River mouth was completed, and additional discussion of environmental effects of the TSP with an open San Bernard mouth is provided in Section 5.15 of the IFR-EIS.

5. Amend the DFR to include information on the issues raised and results of any additional analyses performed.

   USACE Response: Adopted
   Action Taken: Additional analyses was conducted to address issues raised during public review. Discussion of additional modeling performed to address comments relating to impacts to the San Bernard River and Port Freeport is provided in Section 4.2 and 4.3 of the IFR-EIS and in Sections 1.5.1 and 1.5.2 of the Engineering Appendix.

6. Include a description of additional studies to be conducted during PED to address navigation and additional maintenance issues, including SHIPSIM and a DMMP.

   USACE Response: Adopted during the PED phase
   Action Taken: The Final Report clearly states in Section 4.15 that SHIPSIM will be conducted for the Recommended Plan during PED. Details on the DMMP for the dredging/placement increment for the construction of the Recommended Plan and its subsequent maintenance are detailed in Section 6.3 and Appendix 9 of the Engineering Appendix.

2. Comment – *Medium*: Details on the hydrologic watershed models are not provided, therefore it is unclear how the watershed runoff and tidal flows interact and how the TSP will be used to improve waterway navigation.

This comment includes three recommendations for resolution, all were adopted.

1. Describe in more detail how rainfall-runoff values were estimated using the TxRR model, to account for diversions, returns flows associated with water rights and holders of discharge permits, and impacts of evaporation and precipitation on the bay surface area.

   USACE Response: Adopted
   Action Taken: The T data from the Texas Rainfall Runoff (TxRR) Model (from Texas Water Development Board) was only used to assess the historic seasonal contribution of local hydrology to the hydraulics of the GIWW. As stated in the H&H Appendix of the draft engineering appendix, the Brazos River has a negligible contribution of local hydrology (i.e. downstream of the USGS-Rosharon gage). Furthermore, while the San

Bernard River did have a significant contribution from local hydrology, the overall flow into the system in the San Bernard watershed is an order of magnitude smaller than in the Brazos. Thus, the local hydrology of the San Bernard watershed was also excluded from the model.

Like the Brazos, the lower reaches of the Colorado River also have negligible freshwater inflow/tributaries. For the evaluation of the Colorado River, no hydrologic model was developed. The flows in the Colorado River are measured by the USGS at Bay City, TX. The measured flows were applied as a model boundary condition. Precipitation and evaporation were applied to the Colorado River model. The precipitation and evaporation datasets are descripted in the Colorado River H&H appendix. Further calibration information is provided in the Colorado River H&H appendix.

The above explanation was included in the Final Report, Section 3.8.1 with a reference to the Engineering Appendix (Section 2.1.1.2 of Appendix 1) for detailed explanation.

2. Provide details on the accuracy of the model calibration, especially in view of the special features of the Brazos runoff.

   USACE Response: Adopted
   Action Taken: Calibration and validation of the AdH models is described in detail in the H&H Appendices of the Engineering Appendix (Section 3.1.4 of Appendix 1 and Page 24 of Appendix 2). A brief explanation of model calibration is provided in Section 3.8.1 of the IFR-EIS with a reference to the Engineering Appendix for detailed explanation.

3. Provide more details on the model domain development and calibration of the ADH in the report.

   USACE Response: Adopted
   Action Taken: Calibration and validation of the AdH models is described in detail in the H&H Appendices of the Engineering Appendix (Section 3.1.4 of Appendix 1 and Page 24 of Appendix 2). A brief explanation of model calibration is provided in Section 3.8.1 of the IFR-EIS with a reference to the Engineering Appendix for detailed explanation.

3. Comment – *Medium*: Details on the modeling of Hurricane Harvey and further weather conditions are not provided in the DFR, therefore it is unclear if future predictions are fully reliable.

This comment includes three recommendations for resolution, all were adopted.

1. Provide more information on the model calibration of Hurricane Harvey, including the frequency of hurricanes and what was done once the model calibration was completed.

   USACE Response: Adopted
   Action Taken: Additional details on the modeling performed form Harvey are included in Section 3.7.3.1 of the main report. Hurricane Harvey was not modeled at the BRFG. Accurate modeling of Hurricane Harvey would require a full floodplain simulation to accurately capture the overbank flows associated with storms of this magnitude, and would

also need to be dynamically coupled with a hydrology model. Sedimentation surveys were analyzed for pre- and post-storm conditions, and sedimentation rates were quantified for the existing system. Based on information received from USACE, Galveston District Operations, during Hurricane Harvey, the east gate was left pinned open from August 24th, 2017 until September 1st, 2017. The west gate was pinned open from August 24th, 2017 until September 4th, 2017. Even with the pinning open of the west gate during a significant portion of the high flow event, the sedimentation in the GIWW west of the intersection was minimal compared to the sedimentation in the east forebay. Therefore, during large flow events such as Hurricane Harvey, the removal of the west gate under the TSP is not expected to control shutdowns due to sedimentation. It is also worth noting that no shutdowns of the GIWW due to sedimentation occurred as a result of Hurricane Harvey.

Hurricane Harvey was modeled at the CRL; the flows were similar in volume to other major historical floods. Sedimentation surveys were analyzed for pre- and post- storm conditions, and sedimentation rates were quantified for the existing system. The sedimentation rates were compared to the AdH model that was run for the Harvey event at Colorado and it was determined that the existing model was underestimating the sedimentation for the larger flood event. Sediment samples were taken and revealed a larger concentration of sand for the higher flow event than what had been assumed for Harvey. The AdH model was recalibrated by adjusting the sand concentration for the higher flow events. Additional information is provided in the Colorado River H&H appendix, Page 33.

2. Clarify whether the new predictions have any effect on prior climate change predictions.

   USACE Response: Adopted
   Action Taken: Hurricane Harvey was simulated using directly measured values from the upstream USGS gages and from the offshore tidal gage at Freeport. As such, Hurricane Harvey was simulated directly based on directly measured data, including both elevated river stage and storm surge; not simply as a proxy frequency event. Furthermore, under hurricane conditions the gates are typically pinned open to mitigate the potential impacts to river stage and to minimize damage to the gates and gate operations system. This was also the case in Hurricane Harvey, and was modeled as such. The Hurricane Harvey simulation was not critical to our confidence in the calibrated model; however, it provided the opportunity to cross-check the numerical model with reliable pre- and post-storm data. Climate change analysis was conducted based on relative sea level rise estimates. The results of the Hurricane Harvey analysis did not affect those predictions. The above explanation was provided in Section 3.7.3.1 for completeness of the discussion of the impacts of Harvey.

3. Provide information on how the new river stages results were used in the study, the range of potential future hurricane-induced higher river stages, and how they would be addressed.

   USACE Response: Adopted
   Action Taken: See response to Recommendation 2 above; Section 3.7.3.1 provides for completeness of the discussion for impacts of Harvey.

4. Comment – *Medium*: It is unclear what the actual costs are for each alternative, which may affect both the ranking of the alternatives and their feasibility.

This comment includes two recommendations for resolution, both were adopted.

1. Describe in more detail how the First Construction cost figures in DFR Table 3.11 were derived.

   USACE Response: Adopted
   Action Taken: A reference will be added to Section 3.5.3 (confirmed now as Section 3.8.3) of the final report that for a detailed breakdown of the costs presented in Table 3.11 (now Table 3.13); also refer to Appendix A, Paragraph 5.2 titled "Baseline Project Cost for Each Alternative."

2. Review the costs presented in DFR Table 3.11 to ensure they are consistent with those presented in Appendix A.

   USACE Response: Adopted
   Action Taken: Costs were updated as a result of the various reviews that have been conducted. The PDT reviewed the DFR and Appendix A in detail to ensure that the costs presented are accurate and consistent across the entire report.

   The discrepancy noted in the comment for Alternative 2b was due to the fact that at one point, the PDT was considering a rehabilitation with and without a replacement of the existing guidewalls. The option to include the guidewall was eliminated just prior to submittal of the DIFR-EIS, however, the cost estimate associated with that option of Alternative 2b was not eliminated from Appendix A. The discrepancy noted for Alternative 4a is due to the fact that Page 377 of the Draft Engineering Appendix referenced the risk analysis calculations sheet, which does not include E&D and S&A.

5. Comment – *Medium/Low*: It is unclear how the Brazos waterway system works and how the associated challenges will be addressed.

This comment includes four recommendations for resolution, two were adopted and two were not adopted.

1. Double-check the exact link of the website shown above.

   USACE Response: Not Adopted
   Action Taken: The link of the website provided by USACE was double-checked. The site works; therefore, the assumption is it may have been down when it was checked.

2. Describe how the inland navigation traffic flows from St. Mark, FL to Brownsville, TX. Provide a flow chart showing where water is coming in and out along the waterway, and how river flows, locks, and gate operations are scheduled.

   USACE Response: Not Adopted

Action Taken: Concur background is helpful and has been provided; however, not to the degree cited. The scope of this project is focused on the BRFG and CRL and alleviating accidents and improving navigation through these structures. The report already includes a section on the historic background and general navigation use section.

As documented in Appendix B – Economic Appendix, Section 1.1.5, the system evaluated for this study was defined as one comprised of the Brazos and Colorado River projects only. These projects have a significantly high level of traffic commonality, suggesting that any substantial change at one project has the potential to alter traffic patterns or operations at the other project. Both projects however have a relatively low level of commonality with other projects on the GIWW, which suggests that changes to Brazos or Colorado would have little relative impacts on the operational performance of other USACE Lock projects, and vice versa. Because of this, the PDT believes traffic on or operation of other segments of the GIWW would have little bearing on this study, and as such, efforts towards gathering and presentation data have been focused on these two projects only. The table below illustrates traffic commonality with other USACE projects:

Project	Average Tonnage	Average Through Colorado, Brazos, & Lock	Commonality
Algiers	23,029,425	1,750,659	8%
Bayou Boeuf	25,253,375	2,116,894	8%
Bayou Sorrel	18,832,450	1,852,975	10%
Calcasieu	38,127,544	4,568,180	12%
Inner Harbor	15,967,412	425,916	3%
Leland Bowman	37,984,467	4,473,239	12%
Port Allen	19,486,405	1,850,999	9%

3. Describe how the needed minimum navigation waterway depth is sustained.

USACE Response: Adopted
Action Taken: The needed minimum navigation waterway depth is sustained through recurring maintenance dredging and placement of the dredged material into coordinated upland, semi-confined, open water, and beneficial use placement areas. Some reaches require annual maintenance dredging while some reaches naturally maintain themselves at project depths. Most reaches are dredged on one to three-year cycles. The non-Federal sponsor is responsible for providing the lands, easements, and right-of-ways for placement areas associated with the Federal project. Dredged material is used beneficially whenever possible and typically consists of beach nourishment and marsh nourishment and restoration. Maintenance dredging also requires periodic chemical analysis of sediments to evaluate for a range of analytes including pesticides and metals. Routine testing allows staff to analyze and evaluate shoal material to determine whether unacceptable impacts would result from dredging operations prior to maintenance of the channel. Additionally, the District performs surveys to identify locations of natural resources such as oysters and sea grasses in order to minimize or avoid any potential impacts to these resources from maintenance dredging.

4. Describe the role(s) of the levees, pump stations, and tidal gates and whether these operations are needed during a flood.

   USACE Response: Adopted
   Action Taken: The Final Report in Section 2.2.1 mentions the levee systems adjacent to the Brazos and Colorado River Crossings are only used during a tropical surge event, not riverine flooding. The roles of the levees, pump stations, and tidal gates for this system were not evaluated as part of this study as they do not affect the behavior of the rivers and gate structures.

6. Comment –*Low*: Future use of new technology in Brazos waterway operations and navigation does not appear to have been addressed.

This comment included one recommendations for resolution that was not adopted.

1. Indicate if there are any (predictable) changes in current policies and future operating strategies of competing parties such as railroads, oil and petrochemical, and shipping companies that could affect future navigation tonnage in the GIWW and that would be worth considering.

   USACE Response: Not Adopted
   Action Taken: Modeled future traffic on the GIWW was based on forecasts developed by Martin Associates. These forecasts were based on historic traffic flows and industry production projections. In the development of these forecasts Martin Associates interviewed waterway system users, including shippers/consignees, and evaluated several sources of industry projections developed for crude petroleum, petroleum products, and chemical products, including EIA for crude and petroleum, and the American Chemistry Council for chemicals. During interviews, shippers indicated that delays under the without project case do not result in the use of surface modes, due to the fact that the waterborne movements are essentially a part of the production process of chemicals and petroleum products, and the shippers do not have the ability to use truck or rail as a substitute. The customers are notified when the barge shipment is within 4 hours of delivery, and at that time, the process of berth availability at the shipper's facility is planned. Only in very isolated instances, such as a week or more delay, would inventory stocks be jeopardized, and since system disruptions analyzed are primarily scheduled closures to effect accident repairs to the structures and average delay times are less than 6 hours, the impact on the logistics supply chain of delays is assumed to be negligible. Because of this, it was assumed that analyzed delays would not result in diversion of traffic off the waterway to competing modes, and that traffic flows on the waterway would be driven by production levels. The current modeling treats the analyzed projects and stretch of the GIWW as essentially a closed system. If future changes to study assumptions result in the need to adjust modeling to capture diversion of commodity traffic to and from the waterway in response to longer duration delays or closures, additional research into current and forecasted costs and capacities of competing modes will need to be done.

7. Comment –*Low*: Wetland sizes and locations and associated mitigation costs may be over- or under-estimated due to reliance on National Wetlands Inventory maps in lieu of a formal wetland delineation.

This comment included three recommendations for resolution, one was adopted and two were not adopted.

1. Add the NWI maps used to estimate wetlands locations and sizes to the list of references in the DFR and Appendix D.

   USACE Response: Not Adopted
   Action Taken: Subsequent wetland surveys were conducted to refine the delineation of marsh wetlands and to delineate freshwater wetlands that were identified by the natural resource agencies through aerial imagery. Wetland locations and acreages will now be based off those delineations. Wetlands in the study area were initially mapped based on field surveys and aerial photograph interpretation, with follow-up field surveys to refine mapping based on design changes and agency comments. Up-to-date wetland locations and acreages are provided in Sections 2.3 and of the IFR-EIS, as well as on Figure 2-6 and 2-7 in Section 2.2.

2. Make clear in the main body of the DFR and Appendix D that further refinement of wetlands locations, sizes, and types will be based on a formal wetlands delineation to be performed during a later phase of the study.

   USACE Response: Not Adopted
   Action Taken: Wetlands locations, sizes, and types have already been refined through field surveys. Up-to-date wetland locations and acreages are provided in Sections 2.3 and of the IFR-EIS, as well as on Figure 2-6 and 2-7 in Section 2.2.

3. Clarify once an accurate wetlands delineation has been performed, whether the habitat evaluations, mitigation plan, and associated costs will be based on these results.

   USACE Response: Not Adopted
   Action Taken: Wetland locations, sizes, and types have been already been refined through field surveys, and the habitat evaluations, mitigation plan, and associated costs are based on that information. The Mitigation Plan in Environmental Appendix D-8 provides up-to-date wetland habitat evaluations, mitigation plan, and associated mitigation costs. Habitat evaluations are also summarized in Section 2.3.1.1 of the IFR-EIS, and the mitigation plan and associated costs are summarized in Section 5.17 of the IFR-EIS.