



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
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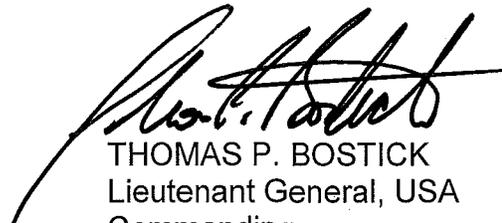
CECW-MVD

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: West Shore Lake Pontchartrain, Louisiana, Hurricane and Storm Damage Risk Reduction - Final Agency Response to Independent External Peer Review

1. An Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, Engineering Circular (EC) 1165-2-214, 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. The IEPR panel consisted of six panel members with technical expertise in civil works planning, economics, biology/ecology, hydrology/hydraulic engineering, civil/mechanical engineering, and geotechnical/structural engineering.
3. The enclosed document contains the approved final written responses of the U.S. Army Corps of Engineers (USACE) to the issues raised and recommendations contained in the IEPR Report. The IEPR Report and final written USACE responses will be posted on the Internet, as required by EC 1165-2-214.
4. If you have any questions on this matter, please contact me or have a member of your staff contact Joe Redican, Deputy Chief, Mississippi Valley Division Regional Integration Team, at (202) 761-4523.

Encl



THOMAS P. BOSTICK
Lieutenant General, USA
Commanding

**West Shore Lake Pontchartrain, Louisiana, Hurricane and Storm Damage Risk Reduction Study
Integrated Draft Feasibility Report/Environmental Impact Statement
U.S. Army Corps of Engineers Response to Independent External Peer Review
November 2014**

Independent External Peer Review (IEPR) was conducted for the subject study in accordance with Section 2034 of the Water Resources Development Act of 2007, Engineering Circular 1165-2-214, 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 scientifically sound, sustainable water resources 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 the USACE was engaged to conduct the IEPR of the West Shore Lake Pontchartrain, Louisiana, Hurricane and Storm Damage Risk Reduction Study, Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS).

The Battelle appointed an IEPR panel to review the draft report and supporting documents that was issued on September 9, 2013. The Final IEPR Report was issued in October 2013. Nineteen comments were documented with no comments identified of high significance. Twelve comments were identified as having medium significance, and seven comments were low significance. The following discussions present the final responses to the nineteen comments.

The West Shore Lake Pontchartrain, Louisiana, Hurricane and Storm Damage Risk Reduction study is a Coastal Storm Damage Reduction (CSDR) study that evaluates opportunities to implement a risk reduction system in St. Charles, St. John the Baptist, and St. James parishes against hurricane-induced tidal surges originating from Lake Pontchartrain and Lake Maurepas. These opportunities include features such as levees, floodwalls, pump stations and nonstructural measures.

- 1. Comment – *Medium Significance*: A plan for disposal of the large volume of excavated fill materials from the drainage channel is not incorporated into the proposed design, which could increase project costs and environmental impacts.**

This comment includes four recommendations for resolution; three were adopted and one was not adopted as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended that the report (1) refine the interior drainage analysis to verify the required size of the drainage channel and conduct appropriate stability analyses to validate on-site disposal options. This in turn could (2) modify cost estimates and revise the assessment of environmental impacts. The panel also recommended that the study (3) develop a plan to dispose of excavated material and the plan be added to the IDFR/EIS. One comment recommended (4) conducting appropriate stability analyses to validate on-site disposal options.

The Engineering Appendix (B), hydraulics section was revised to include the results from an interior model to ensure that the interior drainage channel size is large enough to pass drainage flows. This model verified the required size of the drainage channel and quantities of the excavated material.

USACE Response: Not Adopted

Since on-site disposal was not part of the final recommended solution, the USACE did not conduct appropriate stability analyses to validate on-site disposal options. Any suitable material for an on-site disposal option could be used in the construction of the levee but the report assumed a 100% imported levee fill assumption for final cost estimating purposes. The the total project cost summary, in the Engineering Appendix (B), Annex 1, assumed all material from drainage channel excavation the will be used as beneficial reuse of dredged material for land reclamation of open water bottom for wetland creation as part of the required mitigation plan. The cost for mitigation reflects a cost savings due to the utilization of material from the drainage channel excavation.

2. Comment – *Medium Significance*: The process for verifying key assumptions and the potential effects of this process on the future development of the Tentatively Selected Plan (TSP) are not explained.

This comment includes four recommendations for resolution; all were adopted as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) review the list of uncertainties summarized in Chapter 5 for completeness, add to the list as needed, and identify which uncertainties were addressed during further feasibility assessment, and (2) describe the process used to verify key assumptions once the feasibility analysis was complete. The panel also recommended that (3) the final report describe how the TSP was affected by the results of the feasibility analysis. The final report should (4) communicate the risk of uncertainties to the USACE, stakeholders and the public.

The report was revised to update the uncertainties summarized in Chapter 5. Some uncertainties were removed based on the additional data collected under the feasibility-level of design analysis. In Chapter 3, Section 3.9 “Additional Plan Formulation” the report, in order to ensure that there were no significant changes to the TSP between the draft and final report, the study compared the data collected under the feasibility analysis to the data used to screen plans (e.g., a comparative analysis between the TSP and Alternatives A and D was conducted). The study determined that new information collected to resolve uncertainties would not have changed the TSP decision. Minor changes to the TSP, such as cost increases or decreases, were documented in Section 3.9 of the final report.

3. Comment – *Medium Significance*: The separable non-structural elements of Alternatives A and C have not been shown to be economically feasible.

This comment includes one recommendation for resolution; it was not adopted as discussed below.

USACE Response: Not Adopted

The IEPR panel recommended that the study perform a reach-by-reach comparison of the monetary benefits and costs of the non-structural measures and iterate on plan formulation steps as needed to verify or revise the selection of the NED plan and TSP.

Although the study did not perform a reach-by-reach comparison to remove noneconomic feasible reaches, the study did revise the overall separable elements of Alternatives A and C. As discussed in Section 3.9, the study did iterate on plan formulation steps for the St. James Parish area and developed more cost effective and acceptable measures to be included with the final recommendation. In St. James Parish, the recommended plan includes berms around the communities of Gramercy, Lutchter and Grand Point. Each of the three berms was incrementally justified. As described in Section 5.1, the plan also includes the elevation of an estimated 14 residential structures, flood proofing of an estimated 4 non-residential structures, and the flood proofing of an estimated 5 light industry/warehouse structures.

4. Comment – *Medium Significance*: Assuming that the benefits are equivalent for Alternatives A, C, and D is not supported due to the potential differences in risk reduction across alternatives arising from the uncertainty of the implementation of non-structural measures.

This comment includes one recommendation for resolution; it was not adopted as discussed below.

USACE Response: Not Adopted

The IEPR panel recommended that the study, for each alternative, calculate the benefits and costs that are equally certain and under the control of the USACE, without relying on the actions of other local entities to achieve equal benefits across alternatives. The basis for its comment was that without assurances that the necessary non-structural measures will be implemented over the 50-year time period, there is no longer an equivalence of risk reduction and, hence, no longer equivalence in benefits of Alternatives A, C, and D over the 50-year time period. Therefore, the economic analysis cannot rely solely on a comparison of costs across alternatives.

The study did not adopt the recommendation since it was necessary to utilize, to the maximum extent possible, existing information to facilitate the screening of alternatives in the IDFR/EIS. The absence of with-project stage-probability relationships for the alternatives prevented a direct comparison of the economic performance of the structural alternatives, leaving a comparison of project alternatives on the basis of costs alone, as the next best method. The analysis utilized an assumption of 100 percent participation by residents in the implementation of the nonstructural component in the IDFR/EIS as a simplifying assumption to facilitate the screening analysis. The justification for using this assumption was not to ensure accuracy of the level of risk reduction provided to residents in the 100-year flood plain, but only to ensure that the level of risk reduction for Alternatives A and C were equivalent to Alternative D.

5. Comment – *Medium Significance*: The residual risk to life (e.g., from levee overtopping or levee failure) and infrastructure under the alternatives has not been quantified.

This comment includes one recommendation for resolution; it was not adopted as discussed below.

USACE Response: Not Adopted

The IEPR panel recommended that the study perform a quantitative analysis of the residual risk to resident's lives and to evacuation infrastructure under each alternative.

The study did not perform a quantitative analysis of the residual risk to resident's lives and to evacuation infrastructure since the final screening of alternatives to determine a recommended plan was based solely upon NED criteria. The report documents that life safety is addressed by existing local procedures for evacuating completely well before expected hurricane landfall, thereby removing the residents from harm's way.

6. Comment – *Medium Significance*: The preliminary assessment of flood impacts does not allow for a full evaluation of potentially induced flooding, and flood mitigation measures that may need to be implemented are not identified.

This comment includes four resolution recommendations that were adopted as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended that (1) the study use the detailed rainfall-runoff and surge models to simulate the TSP (Alternative C) and (2) develop feasible on-site and off-site flood mitigation measures if needed. These (3) mitigation measures should be documented in the final report.

The study performed detailed rainfall-runoff and surge models to simulate impacts with the final recommendation, and determined that the potential impacts to communities outside of the proposed levee alignment would be similar with and without the recommended levee alignment. Inside of the levee alignment, modifications to the interior drainage system have been included to mitigate for project-induced damage from rainfall associated with storm events. Using modeling data, the six proposed gated water control structures were appropriately sized and strategically placed along the alignment in areas where gravity drainage through canals exists. The results from the model were used to size the pump stations and gated structures to eliminate potential interior rainfall flooding impacts during the closing of the gates for storm events. Hydrologic connectivity/tidal interchange would be maintained between the wetlands and developed areas within the 47 square mile levee-enclosed area and the surrounding swamps and Lakes Maurepas and Pontchartrain at all times except during the closing of the gates for storm events. The evaluation results are documented in the final report in section 3.9.4, section 4.3.2.1, and section 5.1 and also documented in the engineering appendix (B), hydraulics section.

7. Comment – *Medium Significance:* The economic analysis, which uses the percent reduction in damages for the top 10 damage reaches to extrapolate to the remaining reaches and to the year 2070, is not consistent with statistical principles.

This comment includes two recommendations for resolution; one adopted, as discussed below. The second recommendation was not needed since the first one was already adopted.

USACE Response: Adopted

Action Taken: The panel recommended (1) applying the Flood Damage Reduction Analysis (HEC-FDA) model to calculate the damage reduction to each of the reaches in the years 2020 and 2070. If it is not possible to calculate damage reduction to all reaches, the panel recommended (2) applying a random sample of the reaches and extrapolating the resulting percent damage reduction to the remaining reaches.

USACE concurred that the selection of the 10 damage reaches for further benefit assessment under the IDFR/EIS did not represent a random sample of all study area reaches. However, the 10 reaches did account for 90-95 percent of total expected annual without-project damages for the entire study area comprising the 81 reaches. This approach was adopted for expediency and streamlined the activities necessary to calculate damages using HEC-FDA.

A random sample was not used for the final evaluation, so this recommendation was not adopted. As described in “Part 2: Economic and engineering inputs to the HECFDA Model” of the Economic Appendix (D), the final recommendation applied the full HEC-FDA model to calculate the damage reduction to each of the reaches in the years 2020 and in 2070. The results of the final evaluation have been included in the final report, in section 5.7 “Benefit Analysis associated with the Recommended Plan.”

8. Comment – *Medium Significance:* The need to acquire additional borings for Alternative C during the feasibility-level design phase of the study, which could reveal different soil conditions from those assumed, is not acknowledged.

This comment includes one recommendation for resolution; it was adopted, as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended including a discussion in the report acknowledging the need to obtain additional borings for the Alternative C alignment.

The study acquired more borings for the final evaluation under feasibility design to further reduce soil condition uncertainties. The project team used existing boring data (in excess of 150 borings) to develop cost estimates; where there were no borings, the team used the most conservative boring data to develop settlement and compaction rates. A discussion on risk is included in the final report in section 5.8 “Risk & Uncertainty Analysis associated with the Recommended Plan” and risk associated with different soil conditions has been accounted for in the final certified cost estimate, in the Engineering Appendix (B), Annex 1. Additional detailed boring investigations during the Preconstruction Engineering and Design (PED) Phase is planned once the project is authorized. This process is consistent with USACE planning guidance of acknowledged uncertainties and reducing risk through mitigation measures.

9. Comment – *Medium Significance*: Data sources, analytical findings, and references for the development and the analysis of project alternatives are not well-documented.

This comment includes a recommendation for resolution; it was adopted, as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended providing references and summaries of data that support assumptions made, and provide documentation of the data collection efforts and analyses that have been undertaken, including the indirect and direct costs.

The report was revised to include additional summary data and appendices were expanded to include additional technical data. A detailed Environmental (A), Engineering (B), Real Estate (C), Economics (D), and Plan Formulation (E) Appendix has been added to the final report to document the data collection efforts and analyses that have been undertaken.

10. Comment – *Medium Significance*: The cumulative effects analysis does not consider other past, present, and future projects in the region, as required by the National Environmental Policy Act (NEPA).

This comment includes four recommendations for resolution; all were adopted, as discussed below.

USACE Response: Adopted

Action Taken: The panel recommended (1) providing a comprehensive list, in tabular form, of reasonably foreseeable future actions that may be undertaken in the project area. The list should include (2) the potential effects, positive and negative, that those activities may have on the Federal investment. The report should (3) briefly describe related flood damage reduction and restoration/mitigation projects anticipated to be performed under other authorities and (4) briefly describe any measures anticipated to be implemented to mitigate adverse cumulative effects, including those that may be adverse to the Federal project.

Section 4.4 “Cumulative Effects” of the report was added to include additional details on cumulative effects. These revisions are in tabular form, and provide a description of past, present, and reasonably foreseeable future projects in the study area. The cumulative effects discussion on each of the resources considered for each alternative has been included in the final report in tabular form and complies with NEPA requirements. Section 2.4 “Natural Environment” of the final report describes related flood damage reduction and restoration/mitigation projects anticipated to be performed under other authorities. Section 4.5 “Mitigation Requirements Associated with the Recommended Plan” of the final report describes the measures that will be implemented to mitigate adverse effects associated with the Federal project.

11. Comment – *Medium Significance*: Wetland impact assessment is preliminary; therefore, mitigation costs for the impacts are uncertain, which may affect the selection of the TSP.

This comment includes six recommendations for resolution; all were adopted, as discussed below.

USACE Response: Adopted

Action Taken: The panel recommended (1) describing in more detail the qualitative nature of the wetlands assessment taken under the IDFR/EIS. The final report should (2) include a more detailed discussion of the current understanding of hydrology associated with the TSP and a discussion of mitigation measures to compensate for TSP impacts. The final report should (3) include discussions on the coordination with resource agencies with respect to wetlands mitigation (4) compensation for habitat loss and fragmentation, and (5) operational elements of the TSP to reduce effects in the wetlands. The final report should also (6) include more detailed discussion of wetlands mitigation costs, including the assumptions and uncertainties, and how uncertainties in the cost estimate may have affect the evaluation of alternatives and the TSP.

After identifying the TSP, the team conducted a quantitative wetlands assessment using a Wetlands Value Assessment (WVA) methodology to describe with and without project conditions in Average Annual Habitat Units (AAHU). Information on the results can be found in Annex R of the Environmental Appendix (A). Additional hydrological modeling of both interior and exterior areas characterized the project-induced direct and indirect impacts with the final recommendation. As found in Annex S of the Environmental Appendix (A), mitigation measures to compensate for project-induced wetlands effects were developed and added to the overall project cost estimate. A comparison of the results in section 3.9.5 in the final report showed that differences in AAHU are not considered significant enough to drive selection of a different plan, primarily due to the fact that the projected difference in mitigation costs between Alternative C and Alternative A does not cause Alternative C to cease being the NED plan. Section 4.5 “Mitigation Requirements Associated with the Recommended Plan” of the final report provides a detailed discussion of wetlands mitigation, including the assumptions and uncertainties. Section 3.9.4, Section 4.3.2.1, Section 5.1 and also the engineering appendix (B), hydraulics section and Annex S of the Environmental Appendix (A) provides the result of the hydrologic modeling of the recommended plan and its potential effects on wetlands.

12. Comment – *Medium Significance*: Public concerns not adequately identified and addressed.

This comment includes three recommendations for resolution; all were adopted, as discussed below.

USACE Response: Adopted

Action Taken: The panel recommended (1) describing more fully, perhaps in tabular or spreadsheet form, the public comments received during scoping, interim public meetings, and the 45 day public comment period of the draft report. The panel also recommended (2) providing additional discussion and explanation for the selection of Alternative C as the TSP in light of the public’s arguments for Alternative D. In addition the panel recommended (3) providing responses to the public’s arguments put forward during the comment period for the selection of Alternative D.

The final report in Annex P of the Environmental Appendix (A) now includes an appendix with all public comments on the IDFR/EIS and an analysis has been conducted to address all public comments. In order to address public comments related to concerns between Alternative C and Alternative D, additional details on the Total NED Project Costs (Gross Investment) and annual cost between each alternative have been included in Section 3.7 “Summary of Accounts and Comparison of Alternatives” of the final report to show the full investment cost between Alternatives C and D.

13. Comment – *Low Significance*: The basis for selecting the 100-year-flood level of protection is not provided and therefore could not be evaluated.

This comment includes one recommendation for resolution; it was adopted, as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended modifying the IDFR/EIS to include a discussion of the rationale for using the 100-year level of protection for all alternatives.

Based on the results of feasibility level design of the TSP, varying levels of rough order of magnitude (ROM) cost for different levels of risk reduction (50 yr and 200 yr) and different sea level scenarios were used to capture and quantify the extent of the risk and uncertainty with the investment decision. The final report, in the Economics Appendix (D) under “Optimization Of Level Of Risk Reduction” now includes the rationale for selecting the 100-year level of protection based on a NED analysis.

14. Comment – *Low Significance*: The proposed use of flap gates to provide closure under high water conditions may not be compatible with the safety or reliability requirements associated with an urban flood barrier.

This comment includes a recommendation for resolution; it was adopted, as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended evaluating the relative reliability of automated flap gate closure systems and slide gate closure systems in future design stages.

The study evaluated the uses of automated flap gate closure systems and slide gate closure systems during feasibility design. The study determined flap gate closures would be appropriate at all locations. All locations are along an existing highway allowing for an easy access route to each location. The location of these structures are discussed in Section 5.1 of the main report and shown in the Map Annex, under Figure 5-2.

15. Comment – *Low Significance*: The use of adaptability for future levee expansion as a criterion in plan formulation and alternatives evaluation is not fully described.

This comment includes three recommendations; all were adopted as discussed below..

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) clarifying the importance of adaptability as an evaluation criterion and (2) to explain why modified versions of alternatives were not considered. The report should briefly explain of how differences in adaptability were evaluated between alternatives.

Section 3.7 “Summary of Accounts and Comparison of Alternatives” of the final report discusses why adaptability is important to the recommended plan due to the uncertainties of potential sea level rise impacts to the communities. Additional modifications to Alternative A would not have changed plan selection. The main reason for including Alternative A was to have an alternative with minimum impacts to forested wetlands. Section 3.9.5 “Comparison of Final Feasibility Designed TSP to Estimated Final Feasibility Design for Alternatives A and D” includes a discussion on the tradeoffs with each alternative related to adaptability.

16. Comment – *Low Significance*: A well-defined description of the planned construction procedures is not provided; therefore, the reasonableness of the cost estimate and the technical feasibility of the design cannot be determined.

This comment includes a resolution recommendation that was adopted as discussed below.

USACE Response: Adopted

Action Taken: The final Engineering Appendix (B) includes a more detailed construction schedule for the recommended plan. Chapter 5 of the final report discusses the construction sequences, including the planned lifts during the 50-year project life to maintain the 100 year level of risk reduction of the structural system.

17. Comment – *Low Significance*: Potential impacts from climate change, while referred to in the documentation, are not described or analyzed in accordance with USACE policy.

This comment includes three recommendations for resolution; all were adopted, as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) describing, briefly, the potential effects of climate change on the TSP as a discrete topic. The panel also recommended (2) describing how potential effects were considered during plan formulation and recommended (3) revising the EIS and the environmental summary in the IDFR/EIS to include this information.

Chapter 3 of the final report includes additional information on impacts and how potential climate change effects were considered in formulating plans for the future without project and future with project conditions. Section 5.8 “Risk & Uncertainty Analysis associated with the Recommended Plan” and the Economic Appendix (D) under “Sea Level Rise Scenarios” provides information on how changes in RSLR conditions can impact the benefit analysis associated with the recommended plan

18. Comment – *Low Significance*: The intermediate relative sea level rise (RSLR) scenario is presented inconsistently throughout the project documents.

This comment includes one recommendation for resolution; it was adopted, as discussed below.

USACE Response: Adopted

Action Taken: The IEPR panel recommended revising the document, including text, tables, and figures, for consistent presentation of the “intermediate” RSLR scenario.

A global change was made to the final report to increase its readability and a detailed presentation of the value used to determine the “intermediate” RSLR scenario was included main report.

19. Comment – *Low Significance*: Project operations with the intermediate relative sea level rise (RSLR) scenario and project adaptability to higher RSLR scenarios are not described.

This comment includes three recommendations; all were adopted, as discussed below.

USACE Response: Adopted

Action Taken: The panel recommended (1) evaluating the average annual closure frequency with RSLR and (2) discussing the adaptability of the project to a higher RSLR than has been assumed for design. The panel

also recommended (3) describing how and by whom the actual rate of RSLR will be monitored or tracked during the operational phase of the project.

Section 5.1 of the final report includes an evaluation of the average annual closure frequency with RSLR. The final report discusses the ability to adapt the recommended design. The final recommendation expects the rate of closure would be the same regardless of the actual rate of RSLR as closure of the system is tied to tropical storm events and the elevation trigger would be adjusted as sea level rises. The risk reduction system is only authorized to address storm surge caused by hurricanes and tropical storms. The recommendation is not authorized to mitigate for or reduce impacts caused by higher day-to-day water levels brought due to sea level rise. Rainfall and high tides could still cause significant flooding of the swamps within the levee-enclosed area. Details of monitoring and operation plans will be developed in the PED phase and documented in the O&M manual.