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October 28, 2013

# Final Independent External Peer Review Report West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement



Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Risk Management National Planning Center of Expertise
Baltimore District

Contract No. W911NF-11-D-0001
Task Order: 13-045
Delivery Order Number: 0209

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# West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection
# St. Charles, St. John the Baptist, and St. James Parishes, Louisiana,
# Integrated Draft Feasibility Report/Environmental Impact Statement

by

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Columbus, OH 43201

for

Department of the Army
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Coastal Storm Risk Management National Planning Center of Expertise
for the Baltimore District

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# St. Charles, St. John the Baptist, and St. James Parishes, Louisiana,
# Integrated Draft Feasibility Report/Environmental Impact Statement

by

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October 28, 2013

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# Final Independent External Peer Review Report for the

## West Shore-Lake Pontchartrain, Louisiana Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana Integrated Draft Feasibility Report/Environmental Impact Statement

## EXECUTIVE SUMMARY

### Project Background and Purpose

The purpose of the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/ Environmental Impact Statement (IDFR/EIS) project is to determine the Federal interest in implementing a hurricane protection levee system to provide protection to St. Charles, St. John the Baptist, and St. James parishes against hurricane-induced tidal surges originating from Lake Pontchartrain and Lake Maurepas.

The specific plan formulation rationale for the feasibility study has evolved over the course of the many prior studies regarding hurricane and storm damage risk reduction in the study area. Due to the changing natural and social dynamics in the area, all prior formulations and rationales are being revisited during this feasibility study. These include the previously developed non-structural measures (evacuation, elevation of structures, and property acquisitions), and the structural measures (levees, floodwalls, flood gates, pump stations, tidal exchange structures, and water storage areas). Since the authorization for this study provides for hurricane protection and flood control in St. Charles, St. John the Baptist, and St. James parishes, the alternatives to be evaluated are being limited to the needs in these three parishes.

### Independent External Peer Review Process

The United States Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the West Shore-Lake Pontchartrain (WSLP) IDFR/EIS (hereinafter WSLP-IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012a). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the WSLP-IEPR review documents. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The WSLP-IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012a) and OMB (2004). This final report describes the WSLP-IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the WSLP-IEPR Panel (the Panel).

Based on the technical content of the WSLP-IEPR review documents and the overall scope of the project, Battelle consulted with the Louisiana Water Resources Council (LWRC) Primary

Panel Members to assess their expertise in the following key technical areas: Civil Works planning, economics, biology/ecology, hydrology and hydraulic (H&H) engineering, civil/mechanical engineering, and geotechnical/structural engineering. Since the requirement for a geotechnical/structural engineering expert was outside the expertise of the LWRC Primary Panel, Battelle contacted experts in the LWRC Candidate Pool who met this requirement. Battelle evaluated these candidate panel members in terms of their technical expertise and potential COIs. Six panel members were selected for the WSLP-IEPR. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The Panel received an electronic version of the WSLP-IEPR IDFR/EIS and associated appendices, along with a charge that solicited comments on specific sections of the documents to be reviewed. USACE prepared and provided the charge questions to Battelle. Battelle reviewed the charge questions and, when necessary, made revisions, additions, or deletions to address any consistency, clarity, and wording issues. The final charge questions follow guidance provided in USACE (2012a) and OMB (2004), and were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the WSLP-IEPR documents individually. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. None of the charge questions generated conflicting responses from the panel members. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendations on how to resolve the comment. Overall, 19 Final Panel Comments were identified and documented. Of these, 12 were identified as having medium significance, and 7 had low significance.

## Results of the Independent External Peer Review

The panel members agreed among one another on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012a; p. D-4) in the WSLP-IEPR review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

The Panel agreed that the WSLP-IEPR review documents and appendices are well-written and concise; the Panel recognizes that the Specific Measurable Attainable Risk Informed Timely (SMART) Planning approach was applied to this study by USACE and appreciates the efficiency and clarity with which the project information was presented, in accordance with this approach. While the Panel believed that the main points were presented clearly, it identified areas where additional documentation and clarification is warranted.

**Civil Works Planning** – The Panel found that the process used to select the recommended alternative was rational and conducted in a reasonable manner; however, data sources, analytical findings, and references associated with the development and the analyses of project alternatives are not well-documented. This information is important to provide, especially for projects developed within the parameters of the SMART Planning framework. The Panel believes this issue can be addressed by adding references and summaries of the analyses underlying the IDFR/EIS to understand the development and costing of the project and the plan selection process.

The Panel noted that the IDFR/EIS does not describe the process for verifying key assumptions, nor does it explain how the plan formulation process will be iterated in response to any changes in key assumptions and how the Tentatively Selected Plan (TSP) may be affected. This concern can be addressed by reviewing the list of uncertainties for completeness, identifying which uncertainties will be addressed during further feasibility assessment, and explaining how the plan formulation process will be iterated in response to any changes in key assumptions.

**Engineering –** Although the technical analyses supporting the report are very preliminary and will require extensive refinement and additions during the development of the feasibility-level report, the studies to date adequately support the evaluation of alternatives and the selection of Alternative C as the TSP. The civil design is based upon a clear understanding of the project objectives and appropriate design criteria. The Panel noted, however, that the absence of geotechnical site data creates significant uncertainty with regard to the soil conditions to be encountered for the TSP, and that the need to acquire this missing information early in the subsequent design phase is not addressed. Without a complete assessment of high-level geotechnical engineering activities that are required during the design phase, the cost comparison across alternatives could be affected; however, the project's technical feasibility is not likely to be affected. This issue can be addressed by including a discussion in the IDFR/EIS acknowledging the need to obtain additional borings for the Alternative C alignment.

The Panel noted that a plan for the disposal of excavated fill materials from the drainage channel is not incorporated into the proposed design. The accuracy cost estimate, real estate requirements and the potential environmental impacts of the project cannot be verified or understood without including a disposal plan for excavated material in the design. This documentation issue can be addressed by refining the interior drainage analysis to verify the required size of the drainage channel, developing a plan to dispose of excavated material and including a discussion of the plan in the IDFR/EIS, conducting appropriate stability analyses to validate on-site disposal options, modifying cost estimates, and revising the assessment of environmental impacts to reflect the adopted disposal plan.

In addition, the Panel found that 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. The level of flood analysis completed to date is not sufficiently refined to determine whether induced flooding will occur inside or outside of the proposed levee. The Panel recommends using ADCIRC and STWAVE to simulate the TSP, completing detailed rainfall-runoff modeling of the TSP, and including examples of feasible on-site and off-site flood mitigation measures as part the TSP.

**Economics –** The Panel acknowledges that the stated goals of Planning Objectives 2 and 5 as identified in the IDFR/EIS are to reduce risk to residents' lives and to reduce risk of damage and loss of critical infrastructure. However, it is difficult to assess the degree to which the residual risks (e.g., from levee overtopping or levee failure) under each alternative have been reduced because the residual risk has not been quantified. This issue can be addressed by performing a quantitative analysis of the residual risk to residents' lives and to evacuation infrastructure under each alternative.

The Panel believes that the incremental economic analysis of the benefits and costs of each separable non-structural element is needed at this stage in the planning process to ensure that the comparison of alternatives identifies the TSP with the highest net benefits possible. An economic evaluation of the separable non-structural measures will improve the defensibility of the analysis and support the determination of the National Economic Development (NED) plan and TSP. This can be accomplished by performing a reach-by-reach comparison of the monetary benefits and costs of the non-structural measures and iterating on plan formulation steps as needed to verify or revise the selection of the NED plan and TSP. Furthermore, without the assurance that necessary non-structural measures will be implemented over the 50-year time period, there is no longer equivalence of risk reduction and, hence, no longer equivalence in the benefits of Alternatives A, C, and D over the 50-year time period. In this case, an economic analysis cannot rely solely on a comparison of costs across alternatives. The Panel recommends that for each alternative, the benefits and costs that are equally certain and under the control of USACE be calculated, without relying on the actions of local entities to achieve equal benefits across alternatives.

**Environmental –** The Panel believes that the results of the environmental analysis are technically sound at this point in the project, but the analysis could be strengthened by elaborating on some key issues. The Panel noted that the cumulative effects analysis does not consider other past, present, and future projects in the region and does not provide the degree of detail necessary to comply with National Environmental Policy Act (NEPA) requirements. The report would benefit from a comprehensive list and description of reasonably foreseeable future actions and activities (based on known future projects, and past/predictable development patterns) that are anticipated to occur in the project area. It would also be useful to include a discussion, in concert with SMART Planning, of the forecasted positive and negative cumulative effects that the TSP may have on those activities. The potential effects of climate change on the TSP do not appear to have been considered; this issue can be addressed by describing the potential effects of climate change and how these potential effects were considered during the plan formulation process. Additionally, a discussion of the rationale for selecting Alternative C as the TSP is also warranted to fully address the concerns expressed in the public comments.

Mitigation costs for direct and indirect habitat impacts are a large component of the relative cost difference between alternatives. Should wetlands impacts prove to be larger than estimated and mitigation costs higher than predicted, the selection of the TSP may require re-evaluation. This component of risk and uncertainty is not discussed, but this issue could be addressed by discussing the current understanding of hydrology associated with the TSP, the qualitative nature of the wetlands assessment, the margin of error assumed, and future studies that are planned to more quantitatively and thoroughly evaluate all wetlands effects resulting from the TSP.

**Table ES-1. Overview of 19 Final Panel Comments Identified by the WSLP-IEPR Panel**

| No. | Final Panel Comment |
|---|---|
| | **Significance – Medium** |
| 1 | A plan for disposal of the large volume of excavated fill materials from the drainage channel is not incorporated into the proposed design, and the many factors associated with the disposal of excavated material that could increase project costs and environmental impacts are not addressed. |
| 2 | 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. |
| 3 | The separable non-structural elements of Alternatives A and C have not been shown to be economically feasible. |
| 4 | The assumption 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. |
| 5 | The residual risk to life (e.g., from levee overtopping or levee failure) and infrastructure of the alternatives has not been quantified. |
| 6 | 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. |
| 7 | 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. |
| 8 | 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. |
| 9 | Data sources, analytical findings, and references associated with the development and the analysis of project alternatives are not well-documented. |
| 10 | 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). |
| 11 | Wetland impact assessment is preliminary; therefore, mitigation costs associated with the impacts are uncertain, which may affect the selection of the Tentatively Selected Plan (TSP). |
| 12 | Public concerns have not been adequately identified and addressed. |

**Table ES-1. Overview of 19 Final Panel Comments Identified by the WSLP-IEPR Panel (continued)**

| | Significance – Low |
|---|---|
| 13 | The basis for selecting the 100-year-flood level of protection is not provided and therefore could not be evaluated. |
| 14 | 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. |
| 15 | The use of adaptability for future levee expansion as a criterion in plan formulation and alternatives evaluation is not fully described. |
| 16 | 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. |
| 17 | Potential impacts from climate change, while referred to in the documentation, are not described or analyzed in accordance with U.S. Army Corps of Engineers (USACE) policy. |
| 18 | The intermediate relative sea level rise (RSLR) scenario is presented inconsistently throughout the project documents. |
| 19 | Project operations with the intermediate scenario of relative sea level rise (RSLR) and project adaptability to higher than the intermediate scenario of RSLR are not described. |

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## List of Tables

## LIST OF ACRONYMS

| | |
|---|---|
| **ASCE** | American Society of Civil Engineers |
| **ATR** | Agency Technical Review |
| **COI** | Conflict of Interest |
| **CFR** | Code of Federal Regulations |
| **CSU** | Colorado State University |
| **CSVR** | Content-to-Structure Value Ratio |
| **DrChecks** | Design Review and Checking System |
| **EC** | Engineer Circular |
| **EM** | Engineer Manual |
| **ER** | Engineer Regulation |
| **ERDC** | Engineer Research and Development Center |
| **EIS** | Environmental Impact Statement |
| **FERC** | Federal Energy Regulatory Commission |
| **H&H** | Hydrology and Hydraulic |
| **HEC-FDA** | Hydrologic Engineering Center-Flood Damage Reduction Analysis |
| **HEC-HMS** | Hydrologic Engineering Center-Hydrologic Modeling System |
| **HEC-RAS** | Hydrologic Engineering Center-River Analysis System |
| **HET** | Habitat Evaluation Team |
| **IDFR** | Integrated Draft Feasibility Report |
| **IEPR** | Independent External Peer Review |
| **LWRC** | Louisiana Water Resources Council |
| **NED** | National Economic Development |
| **NEPA** | National Environmental Policy Act |
| **OEO** | Outside Eligible Organization |
| **OMB** | Office of Management and Budget |
| **PDT** | Project Delivery Team |
| **PE** | Professional Engineer |
| **PFMA** | Potential Failure Mode Analysis |
| **RSLR** | Relative Sea Level Rise |
| **SAR** | Safety Assurance Review |
| **SMART** | Specific, Measurable, Attainable, Risk Informed, and Timely |

| | |
|---|---|
| **TSP** | Tentatively Selected Plan |
| **UF** | University of Florida |
| **USACE** | United States Army Corps of Engineers |
| **WES** | Waterways Experiment Station |
| **WSLP** | West Shore-Lake Pontchartrain |

# 1. INTRODUCTION

The purpose of the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/ Environmental Impact Statement (IDFR/EIS) project is to determine the Federal interest in implementing a hurricane protection levee system to provide protection to St. Charles, St. John the Baptist, and St. James parishes against hurricane-induced tidal surges originating from Lake Pontchartrain and Lake Maurepas.

The specific plan formulation rationale for the feasibility study has evolved over the course of the many prior studies regarding hurricane and storm damage risk reduction in the study area. Due to the changing natural and social dynamics in the area, all prior formulations and rationales are being revisited during this feasibility study. These include the previously developed non-structural measures (evacuation, elevation of structures, and property acquisitions), and the structural measures (levees, floodwalls, flood gates, pump stations, tidal exchange structures, and water storage areas). Since the authorization for this study provides for hurricane protection and flood control in St. Charles, St. John the Baptist, and St. James parishes, the alternatives to be evaluated are being limited to the needs in these three parishes.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the West Shore-Lake Pontchartrain (WSLP) IDFR/EIS (hereinafter WSLP-IEPR) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE) Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE, 2012a) and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the WSLP-IEPR process, describes the WSLP-IEPR panel members and their selection, and summarizes the Final Panel Comments of the Panel on the existing environmental, economic, and engineering analyses contained in the WSLP-IEPR review documents. The full text of the Final Panel Comments is presented in Appendix A.

# 2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (2012a).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the WSLP-IEPR was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC No. 1165-2-214). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

# 3. METHODS

This section describes the method followed in selecting the members for the WSLP-IEPR Panel (the Panel) and in planning and conducting the WSLP-IEPR. The WSLP-IEPR was conducted following procedures described by USACE (2012a) and in accordance with OMB (2004) guidance. Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

## 3.1 Planning and Schedule

At the beginning of the Period of Performance, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the WSLP-IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. In addition, 76 charge questions provided by USACE were reviewed by Battelle and, when necessary, were revised to address any consistency, clarity, and wording issues. Battelle included two additional charge questions that sought summary information from the panel members. The final charge questions follow guidance provided in USACE (2012a) and OMB (2004) and were included in the draft and final Work Plans. The final charge also included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Table 1 is based on receipt of pre-award funding from the USACE Contracting Officer's Representative and the Army Research Office's Contracting Officer to begin initial work on the project (i.e., pre-award funding receipt) on August 19, 2013. The review documents were provided by USACE on September 9, 2013. Note that the work items listed in Task 6 occur after the submission of this report. Battelle will enter the 19 Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the WSLP-IEPR results.

**Table 1. WSLP-IEPR Schedule**

| Task | Action | Due Date |
|---|---|---|
| 1 | Pre-Award Funding | 8/19/2013 |
| | Notice to Proceed | 8/28/2013 |
| | Review documents available | 9/9/2013 |
| | Battelle submits draft Work Plan[a] | 9/3/2013 |
| | USACE provides comments on draft Work Plan | 9/6/2013 |
| | Battelle submits final Work Plan[a] | 9/9/2013 |
| 2 | Battelle requests input from USACE on the COI questionnaire | 8/22/2013 |
| | USACE provides comments on COI questionnaire | 8/26/2013 |
| | Battelle submits list of selected panel members[a] | 8/30/2013 |
| | USACE confirms the panel members have no COI | 9/4/2013 |
| | Battelle completes subcontracts for panel members | 9/11/2013 |
| 3 | Battelle convenes kick-off meeting with USACE | 8/27/2013 |
| | Battelle sends review documents to panel members | 9/11/2013 |
| | Battelle convenes kick-off meeting with panel members | 9/12/2013 |
| | Battelle convenes kick-off meeting with USACE and panel members | 9/12/2013 |
| | Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE | 9/25/2013 |
| 4 | Panel members complete their individual reviews | 9/26/2013 |
| | Battelle provides panel members with talking points for Panel Review Teleconference | 9/30/2013 |
| | Battelle convenes Panel Review Teleconference | 10/1/2013 |
| | Battelle provides Final Panel Comment templates and instructions to panel members | 10/2/2013 |
| | Panel members provide draft Final Panel Comments to Battelle | 10/9/2013 |
| | Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments | 10/10-10/20/2013 |
| | Battelle finalizes Final Panel Comments | 10/21/2013 |
| | Battelle provides Final IEPR Report to panel members for review | 10/23/2013 |
| | Panel members provide comments on Final IEPR Report | 10/24/2013 |

**Table 2. WSLP-IEPR Schedule (continued)**

| Task | Action | Due Date |
|---|---|---|
| **5** | **Battelle submits Final IEPR Report to USACE[a]** | **10/28/2013** |
| **6[b]** | Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE | 10/29/2013 |
| | Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process | 10/29/2013 |
| | Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process | 10/29/2013 |
| | USACE provides draft Project Delivery Team (PDT) Evaluator Responses to Battelle | 11/4/2013 |
| | Battelle provides the panel members the draft PDT Evaluator Responses | 11/4/2013 |
| | Panel members provide Battelle with draft BackCheck Responses | 11/6/2013 |
| | Battelle convenes teleconference with panel members to discuss draft BackCheck Responses | 11/7/2013 |
| | Battelle convenes Comment-Response Teleconference with panel members and USACE | 11/8/2013 |
| | USACE inputs final PDT Evaluator Responses to DrChecks | 11/18/2013 |
| | Battelle provides final PDT Evaluator Responses to panel members | 11/18/2013 |
| | Panel members provide Battelle with final BackCheck Responses | 11/20/2013 |
| | Agency Decision Milestone Briefing[c] | 11/21/2013 |
| | Battelle inputs the panel members' final BackCheck Responses to DrChecks | 11/22/2013 |
| | Battelle submits pdf printout of DrChecks project file[a] | 11/25/2013 |
| | Civil Works Review Board[c] | 4/17/2014 |
| | Contract End/Delivery Date | 8/14/2014 |

*a Deliverable.*

*b Task 6 occurs after the submission of this report.*

*c The Agency Decision Milestone Briefing and Civil Works Review Board were listed in the SOW under Task 3, but relocated in this schedule to reflect the chronological order of activities.*

## 3.2 Identification and Selection of IEPR Panel Members

Based on the technical content of the WSLP-IEPR review documents and the overall scope of the project, Battelle consulted with the Louisiana Water Resources Council (LWRC) Primary Panel Members to assess their expertise in the following key technical areas: Civil Works planning, economics, biology/ecology, hydrology and hydraulic (H&H) engineering, civil/mechanical engineering, and geotechnical/structural engineering. Since the requirement for a geotechnical/structural engineering expert was outside the expertise of the LWRC Primary Panel, Battelle contacted experts in the LWRC Candidate Pool who met this requirement. Battelle evaluated these candidate panel members in terms of their technical expertise and potential COIs. Six panel members were selected for the WSLP-IEPR. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The candidates were screened for the following potential exclusion criteria or COIs.[1] These COI questions were intended to serve as a means of disclosure and to better characterize a candidate's employment history and background. Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

- Previous and/or current involvement by you or your firm[2] in the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement.
- Previous and/or current involvement by you or your firm2 in coastal storm damage reduction, flood control, or ecosystem restoration projects in St. Charles, St. Johns the Baptist, Ascension or St. James parishes Louisiana.
- Previous and/or current involvement by you or your firm[2] in the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement and related projects.
- Previous and/or current involvement by you or your firm[2] in the conceptual or actual design, construction, or operation and maintenance of any projects in the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement and related projects.
- Current employment by USACE.
- Previous and/or current involvement with paid or unpaid expert testimony related to the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement.
- Previous and/or current employment or affiliation with members of the cooperating agencies or local sponsors: Louisiana Department of Transportation and Development; Louisiana Department of Natural Resources; Louisiana Coastal Protection and Restoration Authority (for pay or *pro bono*).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse,

[1] Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "….when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

[2] Includes any joint ventures in which panel member's firm is involved and if the firm serves as a prime or as a subcontractor to a prime.

or children related to St. Charles, St. John the Baptist, Ascension or St. James parishes, Louisiana.

- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the New Orleans District.
- Previous or current involvement with the development or testing of models that will be used for or in support of the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement.
- Current firm[2] involvement with other USACE projects, *specifically* those projects/contracts that are with the New Orleans District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the New Orleans District.
- *Any* previous employment by the USACE as a direct employee, *notably* if employment was with the New Orleans District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- *Any* previous employment by the USACE as a contractor (either as an individual or through your firm[2]) within the last 10 years, *notably* if those projects/contracts are with the New Orleans District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning coastal storm damage reduction, flood control, or ecosystem restoration, and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement and project-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years came from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from contracts with the non-Federal sponsor (Louisiana Department of Transportation and Development; Louisiana Department of Natural Resources; Louisiana Coastal Protection and Restoration Authority).
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement.
- Participation in relevant prior and/or current Federal studies relevant to this project and/or the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles,

St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement.

- Previous and/or current participation in prior non-Federal studies relevant to this project and/or the West Shore-Lake Pontchartrain, Louisiana, Hurricane Protection project, St. Charles, St. John the Baptist, Ascension and St. James Parishes, Louisiana, Integrated Draft Feasibility Report/Environmental Impact Statement.
- Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project?

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. The six final reviewers either were affiliated with consulting companies or academic institutions or were independent consultants. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel. Section 4 of this report provides names and biographical information on the panel members.

## 3.3 Conduct of the IEPR

Prior to beginning their review and within 1 day of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the WSLP-IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the Panel received an electronic version of the final charge as well as the WSLP-IEPR review documents and reference materials listed below.

This project was developed under the Specific, Measurable Attainable, Risk Informed, and Timely (SMART) Planning process. As such, the review documents were designated as "primary" and "supporting." The primary review documents, shown in bold font, were reviewed in their entirety by the panel members. The supplemental review documents were labeled as such because they were reviewed as needed by the individual panel members to locate back-up information, supporting statements, and conclusions.

- **WSLP IDFR/EIS (100 pages)**
- **Engineering Appendix (70 pages)**
- **Economics (40 pages)**
- **Real Estate (100 pages)**
- **Summary of Public Comments (7 pages)**
- Risk Register (3 pages)
- H&H Analysis (212 pages)
- Civil Design (130 pages)
- Geotechnical and Structural Engineering (580 pages)

- Cost Engineering (15 pages)
- USACE guidance Civil Works Review (EC 1165-2-214), dated 15 December 2012
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

In addition, throughout the review period, USACE provided the following documents at the request of panel members. These documents were provided to Battelle and then disseminated to the Panel as additional information only and were not part of the official review.

- Relative Sea Level Rise IAW EC-1165-2-212, for the Lake Pontchartrain at West End (85625)
- 2013-07-01 Final Array Alignment with Labels 34 by 44

About half-way through the review of the WSLP-IEPR review documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 15 panel member questions to USACE. USACE was able to provide responses to most of the questions during the teleconference; the remaining panel member questions required additional coordination within USACE and were addressed by September 25, 2013.

## 3.4 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response table provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. As a result of the review, Battelle summarized the individual comments into a preliminary list of 25 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

## 3.5 IEPR Panel Teleconference

Battelle facilitated a 4-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

At the end of these discussions, the Panel identified 20 comments and discussion points that should be brought forward as Final Panel Comments.

## 3.6 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the WSLP-IEPR:

- Lead Responsibility: For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel member as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium, low; see description below)
  4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
  1. High: Describes a fundamental problem with the project that could affect the recommendation, success, or justification of the project. Comments rated as high indicate that the Panel analyzed or assessed the methods, models, and/or analyses and determined that there is a "showstopper" issue.
  2. Medium: Affects the completeness of the report in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium indicate that the Panel does not have sufficient information to analyze or assess the methods, models, or analyses.
  3. Low: Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate that the Panel identified information (tables, figures, equations, discussions) that was mislabeled or incorrect or data or report sections that were not clearly described or presented.
  - Guidance for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is

needed).

During the Final Panel Comment development process, the Panel determined that one of the Final Panel Comments could be merged with another Final Panel Comments; therefore, the total Final Panel Comment count was reduced to 19. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 19 Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

## 4. PANEL DESCRIPTION

Candidates for the Panel were identified from the LWRC Primary Panel, LWRC Candidate Pool, and Battelle's Peer Reviewer Database. An overview of the credentials of the six panel members and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his or her area of technical expertise is presented in the text that follows the table.

**Table 2. WSLP-IEPR Panel: Technical Criteria and Areas of Expertise**

| Technical Criterion | Casavant | Loomis | Crouch | Orr | Ellis | Spaulding |
|---|---|---|---|---|---|---|
| **Civil Works Planning** | | | | | | |
| Minimum 10 years of experience in public works planning | X | | | | | |
| Direct experience working for or with USACE | X | | | | | |
| Familiar with USACE plan formulation process, procedures, and standards | X | | | | | |
| Familiar with USACE hurricane and coastal storm damage risk reduction projects | X | | | | | |
| Minimum 5 years of experience directly dealing with the USACE six-step planning process governed by Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook (USACE, 2000a) | X | | | | | |
| Experience identifying and evaluating impacts to environmental resources from structural flood risk management | X | | | | | |
| Experience identifying and evaluating impacts related to hurricane and coastal storm damage risk reduction projects | X | | | | | |
| **Economics** | | | | | | |
| Minimum 10 years of experience directly related to water resource economic evaluation or review | | X | | | | |

**Table 2. West Shore IEPR Panel: Technical Criteria and Areas of Expertise (continued)**

| Technical Criterion | Casavant | Loomis | Crouch | Orr | Ellis | Spaulding |
|---|---|---|---|---|---|---|
| Direct experience working for or with USACE | | X | | | | |
| Familiar with the USACE planning process, guidance, and economic evaluation techniques | | X | | | | |
| Familiar with the USACE hurricane and coastal storm damage risk reduction analysis and economic benefit calculations | | X | | | | |
| Familiar with the standard USACE computer programs, including Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) | | X | | | | |
| Experience with the National Economic Development (NED) analysis procedures, particularly as they relate to hurricane and coastal storm damage risk reduction | | X | | | | |
| Active participation in related profession societies | | X | | | | |
| Minimum M.S. degree or higher in economics | | X | | | | |
| **Biology/Ecology** | | | | | | |
| Minimum 10 years of demonstrated experience evaluating and conducting National Environmental Policy Act (NEPA) impact assessments, including cumulative effects analyses, for complex multi-objective public works projects with competing trade-offs | | | X | | | |
| Extensive background experience with and working knowledge of the implementation of the NEPA compliance process | | | X | | | |
| Experience working with NEPA impact assessment in marsh and urban areas and related ecosystem species and habitats | | | X | | | |
| Familiar with USACE calculation of evaluation of environmental benefits | | | X | | | |
| Knowledge of Endangered Species Act with regional knowledge of south Louisiana-specific regulatory requirements | | | X | | | |
| Minimum M.S. degree or higher in an appropriate field of study. | | | X | | | |

**Table 2. West Shore IEPR Panel: Technical Criteria and Areas of Expertise (continued)**

| Technical Criterion | Casavant | Loomis | Crouch | Orr | Ellis | Spaulding |
|---|---|---|---|---|---|---|
| **Hydrology & Hydraulic (H&H) Engineering** | | | | | | |
| Registered professional engineer with a minimum 10 years of experience in hydraulic engineering with an emphasis on large public works projects | | | | X | | |
| Familiar with USACE application of risk and uncertainty analyses in hurricane storm damage risk reduction studies | | | | X | | |
| 5 to 10 years of experience working with numerical modeling applications for storm surge and wave analysis modeling and interior hydraulic modeling | | | | X | | |
| Familiar with standard USACE H&H computer models | | | | X | | |
| Active participation in related professional societies | | | | X | | |
| Minimum M.S. degree or higher in engineering | | | | X | | |
| **Civil/Mechanical Engineering** | | | | | | |
| Registered professional engineer from academia, a public agency whose mission includes flood damage prevention, or an Architect-Engineer or consulting firm, having a minimum 15 years of experience in civil or mechanical engineering assessing hurricane storm damage risk reduction system projects | | | | | X | |
| Direct civil or mechanical engineering with regard to: | | | | | | |
| a. levees | | | | | X | |
| b. floodwalls | | | | | X | |
| c. retaining wall | | | | | X | |
| d. pump stations | | | | | X | |
| e. gatewell structures | | | | | X | |
| f. utility penetrations | | | | | X | |
| g. stoplog and sandbag gaps and other closure structures | | | | | X | |
| h. interior drainage | | | | | X | |

**Table 2. West Shore IEPR Panel: Technical Criteria and Areas of Expertise (continued)**

| Technical Criterion | Casavant | Loomis | Crouch | Orr | Ellis | Spaulding |
|---|---|---|---|---|---|---|
| i. drainage structures | | | | | X | |
| j. utility relocations | | | | | X | |
| k. non-structural measures | | | | | X | |
| Capable of addressing USACE Safety Assurance Review (SAR) aspects of all projects | | | | | X | |
| Active participation in related professional engineering and scientific societies | | | | | X | |
| Minimum BS degree in engineering | | | | | X | |
| **Geotechnical/Structural Engineering** | | | | | | |
| Registered professional engineer from academia, a public agency whose mission includes flood damage reduction, or an Architect-Engineer or consulting firm, having a minimum 15 years of experience in soils engineering or related field | | | | | | X |
| Familiar with geotechnical practices, as either a designer or construction project engineer, associated with hurricane and coastal storm damage risk reduction projects in southeastern Louisiana, including: | | | | | | X |
| a. levees | | | | | | X |
| b. floodwalls | | | | | | X |
| c. retaining wall | | | | | | X |
| d. pump stations | | | | | | X |
| e. gatewell structures | | | | | | X |
| f. utility penetrations | | | | | | X |
| g. stoplog and sandbag gaps and other closure structures | | | | | | X |
| h. interior drainage structures | | | | | | X |
| Skillful with the USACE risk-informed approach to hurricane storm damage risk reduction system projects | | | | | | X |

**Table 2. West Shore IEPR Panel: Technical Criteria and Areas of Expertise (continued)**

| Technical Criterion | Casavant | Loomis | Crouch | Orr | Ellis | Spaulding |
|---|---|---|---|---|---|---|
| Capable of addressing USACE SAR aspects of all projects | | | | | | X |
| Active participation in related professional societies | | | | | | X |
| Minimum BS degree in engineering | | | | | | X |

## *Ken Casavant, Ph.D.*

**Role:** Civil Works Planning
**Affiliation:** Independent Consultant

Dr. Casavant is a professor and agricultural economist at the School of Economic Sciences at Washington State University, Director of the Freight Policy Transportation Institute, and has served as an adjunct professor at North Dakota State's Upper Great Plains Transportation Institute since 2002. He earned his Ph.D. in economics from Washington State University in 1971 and has 45 years of experience as an economist, with expertise in transportation economics and planning. He has served as an economic consultant detailing the tradeoffs necessary on several public works projects, most recently on studies of the deep-draft national and international maritime industry.

Dr. Casavant also has over 10 years of experience in plan formulation and evaluation and comparison of alternative plans for numerous ecosystem restoration projects, navigation studies, and feasibility studies, including his technical reviews of the Lower Columbia River Channel Deepening Project, the Upper Mississippi and Illinois Navigation Study, the Barataria Basin Barrier Shoreline Restoration Study, and the Mississippi River Gulf Outlet Ecosystem Restoration Plan. Many of these studies included the assessment and sensitivity analyses of hurricane and coastal storm risk reduction projects, including the Donaldsonville to the Gulf project.

Over the last 7 years, Dr. Casavant has worked on more than 13 USACE projects affording him knowledge of a detailed and complete inventory of the USACE standards and procedures, including the IWR-Planning Suite methodologies, with a focus on ecological output per dollar of relevant expenditure for alternative project formulations. His experience with the USACE six-step planning process (governed by Engineer Regulation [ER] 1105-2-100, Planning Guidance Notebook [USACE, 2000a]) has been established from his work as a technical reviewer and peer reviewer on more than 20 projects. These include the Port of Iberia Channel Deepening Project in 2006 for USACE; the External Independent Economic Opinion on Identifying and Measuring NED Benefits: Navigation Shipping USACE, in 2007; and the Morganza to the Gulf IEPR study, a hurricane protection and storm damage risk project.

Dr. Casavant has experience identifying and evaluating impacts to environmental resources from

structural flood risk and impacts related to hurricane and coastal storm damage risk reduction projects. The six most recent projects he has contributed to had critical components concerning the impacts of environmental resources from flood risk and coastal storm damage. He has also been a plan formulator expert on five separate IEPRs; several of the projects had a specific objective to evaluate the damage reduction and the risk associated with achieving benefits of the flood risk management, and one project focused specifically on the impact to shorelines.

Dr. Casavant has published more than 70 journal articles and has contributed to hundreds of written documents including chapters in books; books; abstracts; proceedings; professional materials; conference papers; and research bulletins, circulars, and reports. He is a member of numerous professional associations, including the Transportation Research Board - National Research Council, the International Agricultural Economics Association, and the Logistics and Physical Distribution Association.

### *John Loomis, Ph.D.*

**Role:** Economics
**Affiliation:** University of Colorado

Dr. Loomis is a professor of economics in the Department of Agricultural and Resource Economics at Colorado State University (CSU). He earned his Ph.D. in economics from CSU in 1983; has taught courses in economics at the University of California-Davis and CSU for more than 20 years; and has conducted economic water resources evaluations for over 30 years. His experience in public works planning includes teaching graduate-level courses in water resource economics; authoring a book on environmental policy analysis for decision-making; and serving for 3 years as an economic reviewer for the USACE Upper Yuba River studies on reservoir management in California. In addition, he served as an economics reviewer for the Lower Colorado River Authority San Antonio Water System, Texas, transbasin water public project to move water from the Lower Colorado River to the city of San Antonio. He also served as a consultant for the State of Utah economic benefits of public works projects to improve water quality in rivers and lakes. He has direct experience working for USACE and is familiar with USACE planning process, guidance, and economic evaluation techniques. Dr. Loomis was an economic instructor for USACE Waterways Experiment Station (WES) training courses for USACE employees. In addition, he was an USACE contractor on the Lower Snake River dam removal feasibility study and EIS and has served as an economist on four Battelle-led USACE IEPRs: two flood control projects (Donaldsonville to the Gulf and Morganza to the Gulf); one coastal storm damage reduction project (Surf City and North Topsail Beach, North Carolina); and one water management and reallocation project (Chatfield Storage Reallocation Study, Colorado).

Dr. Loomis's experience with USACE related to hurricane and coastal storm damage reduction projects includes the two New Orleans District flood control IEPR projects (Donaldsonville and Morganza) and his significant experience with USACE procedures for calculating flood damages. In addition, he has experience with hurricane and flood risk management analysis and benefit calculations on damage avoided and property values, and he is familiar with USACE computer programs such as the Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) model, the content-to-structure value ratios (CSVRs) method, and

spreadsheet analysis. This experience, in part, related to working on Donaldsonville to the Gulf, Morganza to the Gulf, and Surf City IEPRs. Dr. Loomis has demonstrated experience in National Economic Development (NED) analysis procedures related to flood risk management, coastal storm damage reduction, and economic benefit calculations. His economic courses for USACE-WES related directly to the NED procedures presented in US Water Resources Council Economic and Environmental Principles and Guidelines. He also included NED benefit calculations (benefit-cost ratios, net present value, discounting) in his CSU Water Resource Economics course. Dr. Loomis is an active member of relevant professional societies.

Dr. Loomis served as Associate Editor for the Water Resources Research journal. He is currently associate editor for the American Journal of Agricultural Economics and co-editor of the Association of Environmental and Resource Economists Newsletter. He also served as an elected officer for the Association of Environmental and Resource Economists.

### *Kay Crouch*

**Role:** Biology/Ecology
**Affiliation:** Crouch Environmental Services, Inc.

Ms. Crouch is president of Crouch Environmental Services, Inc., a company specializing in National Environmental Policy Act (NEPA) analysis, environmental site assessment, permitting, and mitigation for projects with high public and interagency interests. She earned her M.S. in biology/ecology in 1978 from Steven F. Austin State University and has received additional academic training in the NEPA process from the Duke University Nicholas School of Environmental and Earth Sciences (2004-2005). Ms. Crouch has 35 years of nationwide experience in conducting environmental site assessments and NEPA impact assessments for complex multi-objective public works projects with competing trade-offs. She has performed numerous environmental evaluations throughout the coastal ecosystems of Louisiana and Texas in support of Federal Energy Regulatory Commission (FERC) filings and NEPA documentation. For the first 10 years of her consulting career, Ms. Crouch worked predominantly in Louisiana performing NEPA analyses for oil and gas pipelines crossing the Louisiana Coastal Zone and has prepared over 100 NEPA documents since 1978.

Ms. Crouch has experience working with NEPA impact assessment in marsh and urban areas and related ecosystem species and habitats. She has worked extensively in the coastal marsh habitats that span the Gulf Coast. She has experience in high and low tidal marsh restoration and evaluation, as well as inland wetlands. She has also worked on projects in Louisiana involving evaluation of chenieres and inland swamps. In the mid-1990s, Crouch Environmental Services Inc. designed and constructed the Baytown Nature Center, Texas, a large coastal marsh creation project for which the company received the 1998 Award of Excellence from the National Association of Landscape Architects.

Ms. Crouch is familiar with USACE calculations of environmental benefits and routinely performs cumulative effects analyses on high-visibility public works projects as part of her extensive NEPA practice. This type of modeling has been required on every flood damage reduction and ecosystem restoration project she has worked on relating to USACE, including Clear Creek, Addicks and Barker Dams and Reservoirs. Additionally, she has experience serving

as an environmental expert in previous IEPRs of USACE projects. She has knowledge of the Endangered Species Act – specifically, with the listed species found in Southern Louisiana, including state-listed species through her work in the Louisiana coastal zone and previous IEPR review. Ms. Crouch is a member of the Society of Wetland Scientists.

### *Michelle Orr, P.E.*

**Role:** H&H Engineering
**Affiliation:** Environmental Science Associates

Ms. Orr is Director of the Wetlands & Estuaries Group at Environmental Science Associates. She earned her M.S. in water resources engineering from the University of California, Berkeley in 1995 and is a licensed professional civil engineer in California. She has a background in coastal and riverine hydraulics and 20 years of experience in completing flood studies and integrating flood management with habitat restoration. She has worked in California, Oregon, Washington, Louisiana, and Florida, with particular experience in the San Francisco Estuary. She recently led the environmental and engineering services for the South Bay Salt Pond Restoration Project, which will restore over 15,000 acres of wetlands and provide flood protection for 15 miles of shoreline in South San Francisco Bay. This project is the largest wetland restoration on the West Coast. Ms. Orr is a LWRC Primary Panel Member.

Ms. Orr is familiar with USACE application of risk and uncertainty analysis in flood risk management through her review of the South San Francisco Bay Shoreline Study uncertainty analysis and IEPR review for the Donaldsonville to the Gulf Flood Control Project Feasibility Scoping Report and Supporting Documentation. She has conducted studies that utilize components of the risk and uncertainty approach, such as identifying probability distributions for forcing events, identifying joint probabilities, and conducting multiple simulations for sensitivity assessment. She has education and experience in coastal storm damage risk reduction.

Ms. Orr regularly works with numerical modeling applications for storm surge and wave analysis modeling and interior hydraulic modeling. She has been responsible for numerous projects that use one-dimensional and two-dimensional hydrodynamic models (e.g., MIKE-11, MIKE-21, MIKE Flood, Delft3D, unTRIM) linked to wave modules to address circulation driven by tides, wind, and waves in coastal waters; model tidal and wave-driven sediment transport; and forecast coastal storm surge and flooding. She has also conducted numerous drainage analyses of flood-prone, low-lying areas behind flood protection levees, including numerical modeling of runoff, ponding/detention, and drainage by pumping and gravity flow through culverts. Through her education and project work, Michelle has worked extensively with H&H models approved for use by USACE, including HEC-River Analysis System (HEC-RAS), HEC-Hydrologic Modeling System (HEC-HMS), HEC-6, the MIKE suite of models, Delft3D, and ADCIRC. Ms. Orr has also served as the H&H expert on previous IEPRs.

Ms. Orr is actively engaged in the scientific and restoration communities through conference presentations and peer-reviewed publications.

## *Ralph Ellis, P.E., Ph.D.*

**Role:** Civil/Mechanical Engineering
**Affiliation:** University of Florida

Dr. Ellis is an Associate Professor in the Department of Civil Engineering at the University of Florida (UF) specializing in civil engineering and construction engineering. He earned his Ph.D. in civil engineering from UF in 1989 and is a registered professional engineer (PE) in Florida. Dr. Ellis has over 35 years of combined experience in industry and academia. He has worked on large-scale civil engineering projects both regionally and internationally. His experience in industry (1973-1989) has included the design and construction of levees, pumping stations, piping, and other structures related to water control; construction of temporary and permanent sheet pile walls; and dewatering operations. Many of the projects involved floodwalls, retaining walls, gatewell structures, interior drainage systems and structures, and the application of stoplog, sandbag, and other closure techniques. Before joining UF, Dr. Ellis was president of the Hammer Corporation construction firm and Director of Projects for the FMI - Hammer Joint Venture. From 1975 to 1985, he directed Joint Venture operations in south Florida and Central America for U.S. government agencies, USACE, the U.S. Navy, and the Panama Canal Company. Many of these projects involved significant earthwork structures (including flood control structures) and marine construction activities. He also has been responsible for many projects involving utility relocations and penetrations and has conducted national research on utility relocations.

At UF, Dr. Ellis currently teaches senior design classes on the design of pumping stations and related control structures. He has also taught courses on pumping stations and has developed and taught earthwork levee construction methods (including related design concepts) and environmental protection planning. As a civil engineering professor, Dr. Ellis has maintained an up-to-date knowledge of (1) USACE risk and uncertainty analyses as they apply to hurricane storm damage and risk reduction studies; (2) hurricane and storm damage risk reduction design criteria requirements and storm drainage system and design; (3) the full range of non-structural measures available for flood risk reduction; and (4) Safety Assurance Review (SAR) aspects of USACE projects. As a result, he was selected to participate in several Louisiana coastal storm damage reduction and ecosystem restoration project IEPRs for USACE, assessing analyses associated with cost engineering and construction management. He also has participated in an IEPR for a SAR of an impoundment project in Palm Beach County, Florida.

Dr. Ellis is an active member of the American Society of Civil Engineers (ASCE). He was a member of the ASCE Committee on Critical Infrastructure, providing input on national infrastructure renewal issues (2009-2012), and was a director of the ASCE Education and Research Directorate (2003-2007).

## *Doug Spaulding, P.E.*

**Role:** Geotechnical/Structural Engineering
**Affiliation:** Spaulding Consultants, Inc.

Mr. Spaulding is a Principal and geotechnical engineer with Spaulding Consultants, LLC, responsible for dam, levee, and floodwall design and inspection. He earned his M.S. in geotechnical engineering from Purdue University, and is a licensed PE in Wisconsin, Minnesota, Michigan, North Dakota, and Arkansas. He has over 45 years of experience in the design, evaluation, and inspection of water-retaining structures. During that time, he has provided geotechnical design services for flood control levees and embankments in a 10-state area, including Louisiana. His experience includes 10 years with USACE, where he served as Chief of the Levee and Channel Design Section for the St. Paul District. In that capacity, he managed the development of the Pembina levee project in North Dakota and provided geotechnical design services for over $200 million worth of local flood protection projects in Minnesota and North Dakota. The Pembina project and the Mankato and Winona flood control projects in Minnesota all included extensive sections of floodwall (both I-wall and T-wall configurations). In addition, for the Winona project, Mr. Spaulding supervised the evaluation of underseepage.

Mr. Spaulding's background includes evaluating the stability of levee sections founded on soft clay foundations. His experience also includes geotechnical design of cellular sheet pile structures, sheet pile tieback walls, conventional gravity walls, and pump stations founded on sand and soft clay deposits. He has provided design services for embankments using preload fills to strengthen underlying foundation deposits. He recently served as a consultant to evaluate the instability caused by a sanitary landfill founded on over 100 feet of soft lacustrine clay. All of the local flood control projects for which Mr. Spaulding has provided design services have involved at least several gatewells to accommodate gravity drainage.

Mr. Spaulding's experience also includes flood barrier penetrations related to pressurized water supply lines, communication cables, and other utility systems, including penetrations through impervious and pervious levee sections and true concrete flood barrier structures. He has designed ramp sections, aluminum stoplog closures, sandbag freeboard closures, and, in one case, a temporary earth levee section. He also has experience in geotechnical design considerations for ditches, interceptor drainage pipe systems, and ponding areas. For the Mankato project, one ponding area required construction of an embankment designed to allow overtopping under an extreme flood event without failure of the embankment.

Over the last 10 years, Mr. Spaulding has participated in over 75 Potential Failure Mode Analysis (PFMA) evaluations of USACE flood control dams and hydroelectric projects. As a FERC authorized facilitator of PFMA evaluations, Mr. Spaulding has directed over 50 evaluations for embankment dams, concrete gravity structures, and arch dam structures.

Mr. Spaulding has recently provided peer review services on two reaches of hurricane protection projects in the New Orleans area. In 2008, he peer-reviewed the geotechnical design of the New Orleans Group 1 to Group 3 pump stations. In 2010, Mr. Spaulding served on the IEPR team reviewing an upgrade of the seepage control system for the East St. Louis flood control project. This $190 million project included upgrades to seepage berms, relief well systems, and slurry

cutoff trenches. He also recently served on the IEPR evaluation team for the Pine Creek dam remediation in Oklahoma, assessing proposed methods to control internal embankment seepage around an existing conduit that had created large internal voids in the 50-year-old dam. Overall, in the last 4 years, Mr. Spaulding has served on five IEPR review panels dealing with local flood protection projects, dam remediation, dam replacement, and seepage control system upgrades. This experience has provided extensive background in USACE's SAR requirements. In addition, Mr. Spaulding has participated in extensive Section 408 review for the installation of a large hydroelectric project at a USACE flood control dam.

Mr. Spaulding is a lifetime member of the ASCE. He also is a member of the Minnesota Geotechnical Society, the National Hydropower Association, and the Construction Panel for the Minneapolis section of the American Arbitration Association.

## 5. SUMMARY OF FINAL PANEL COMMENTS

The panel members agreed among one another on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012a; p. D-4) in the WSLP-IEPR review documents. Table 3 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

The Panel agreed that the WSLP-IEPR review documents and appendices are well-written and concise; the Panel recognizes that the Specific Measurable Attainable Risk Informed Timely (SMART) Planning approach was applied to this study by USACE and appreciates the efficiency and clarity with which the project information was presented, in accordance with this approach. While the Panel believed that the main points were presented clearly, it identified areas where additional documentation and clarification is warranted.

**Civil Works Planning** – The Panel found that the process used to select the recommended alternative was rational and conducted in a reasonable manner; however, data sources, analytical findings, and references associated with the development and the analyses of project alternatives are not well-documented. This information is important to provide, especially for projects developed within the parameters of the SMART Planning framework. The Panel believes this issue can be addressed by adding references and summaries of the analyses underlying the IDFR/EIS to understand the development and costing of the project and the plan selection process.

The Panel noted that the IDFR/EIS does not describe the process for verifying key assumptions, nor does it explain how the plan formulation process will be iterated in response to any changes in key assumptions and how the Tentatively Selected Plan (TSP) may be affected. This concern can be addressed by reviewing the list of uncertainties for completeness, identifying which uncertainties will be addressed during further feasibility assessment, and explaining how the plan formulation process will be iterated in response to any changes in key assumptions.

**Engineering –** Although the technical analyses supporting the report are very preliminary and will require extensive refinement and additions during the development of the feasibility-level report, the studies to date adequately support the evaluation of alternatives and the selection of

Alternative C as the TSP. The civil design is based upon a clear understanding of the project objectives and appropriate design criteria. The Panel noted, however, that the absence of geotechnical site data creates significant uncertainty with regard to the soil conditions to be encountered for the TSP, and that the need to acquire this missing information early in the subsequent design phase is not addressed. Without a complete assessment of high-level geotechnical engineering activities that are required during the design phase, the cost comparison across alternatives could be affected; however, the project's technical feasibility is not likely to be affected. This issue can be addressed by including a discussion in the IDFR/EIS acknowledging the need to obtain additional borings for the Alternative C alignment.

The Panel noted that a plan for the disposal of excavated fill materials from the drainage channel is not incorporated into the proposed design. The accuracy cost estimate, real estate requirements and the potential environmental impacts of the project cannot be verified or understood without including a disposal plan for excavated material in the design. This documentation issue can be addressed by refining the interior drainage analysis to verify the required size of the drainage channel, developing a plan to dispose of excavated material and including a discussion of the plan in the IDFR/EIS, conducting appropriate stability analyses to validate on-site disposal options, modifying cost estimates, and revising the assessment of environmental impacts to reflect the adopted disposal plan.

In addition, the Panel found that 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. The level of flood analysis completed to date is not sufficiently refined to determine whether induced flooding will occur inside or outside of the proposed levee. The Panel recommends using ADCIRC and STWAVE to simulate the TSP, completing detailed rainfall-runoff modeling of the TSP, and including examples of feasible on-site and off-site flood mitigation measures as part the TSP.

**Economics –** The Panel acknowledges that the stated goals of Planning Objectives 2 and 5 as identified in the IDFR/EIS are to reduce risk to residents' lives and to reduce risk of damage and loss of critical infrastructure. However, it is difficult to assess the degree to which the residual risks (e.g., from levee overtopping or levee failure) under each alternative have been reduced because the residual risk has not been quantified. This issue can be addressed by performing a quantitative analysis of the residual risk to residents' lives and to evacuation infrastructure under each alternative.

The Panel believes that the incremental economic analysis of the benefits and costs of each separable non-structural element is needed at this stage in the planning process to ensure that the comparison of alternatives identifies the TSP with the highest net benefits possible. An economic evaluation of the separable non-structural measures will improve the defensibility of the analysis and support the determination of the National Economic Development (NED) plan and TSP. This can be accomplished by performing a reach-by-reach comparison of the monetary benefits and costs of the non-structural measures and iterating on plan formulation steps as needed to verify or revise the selection of the NED plan and TSP. Furthermore, without the assurance that necessary non-structural measures will be implemented over the 50-year time period, there is no longer equivalence of risk reduction and, hence, no longer equivalence in the benefits of Alternatives A, C, and D over the 50-year time period. In this case, an economic analysis cannot

rely solely on a comparison of costs across alternatives. The Panel recommends that for each alternative, the benefits and costs that are equally certain and under the control of USACE be calculated, without relying on the actions of local entities to achieve equal benefits across alternatives.

**Environmental –** The Panel believes that the results of the environmental analysis are technically sound at this point in the project, but the analysis could be strengthened by elaborating on some key issues. The Panel noted that the cumulative effects analysis does not consider other past, present, and future projects in the region and does not provide the degree of detail necessary to comply with National Environmental Policy Act (NEPA) requirements. The report would benefit from a comprehensive list and description of reasonably foreseeable future actions and activities (based on known future projects, and past/predictable development patterns) that are anticipated to occur in the project area. It would also be useful to include a discussion, in concert with SMART Planning, of the forecasted positive and negative cumulative effects that the TSP may have on those activities. The potential effects of climate change on the TSP do not appear to have been considered; this issue can be addressed by describing the potential effects of climate change and how these potential effects were considered during the plan formulation process. Additionally, a discussion of the rationale for selecting Alternative C as the TSP is also warranted to fully address the concerns expressed in the public comments.

Mitigation costs for direct and indirect habitat impacts are a large component of the relative cost difference between alternatives. Should wetlands impacts prove to be larger than estimated and mitigation costs higher than predicted, the selection of the TSP may require re-evaluation. This component of risk and uncertainty is not discussed, but this issue could be addressed by discussing the current understanding of hydrology associated with the TSP, the qualitative nature of the wetlands assessment, the margin of error assumed, and future studies that are planned to more quantitatively and thoroughly evaluate all wetlands effects resulting from the TSP.

**Table 3. Overview of 19 Final Panel Comments Identified by the WSLP-IEPR Panel**

| No. | Final Panel Comment |
|---|---|
| | **Significance – Medium** |
| 1 | A plan for disposal of the large volume of excavated fill materials from the drainage channel is not incorporated into the proposed design, and the many factors associated with the disposal of excavated material that could increase project costs and environmental impacts are not addressed. |
| 2 | 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. |
| 3 | The separable non-structural elements of Alternatives A and C have not been shown to be economically feasible. |
| 4 | The assumption 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. |
| 5 | The residual risk to life (e.g., from levee overtopping or levee failure) and infrastructure of the alternatives has not been quantified. |
| 6 | 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. |
| 7 | 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. |
| 8 | 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. |
| 9 | Data sources, analytical findings, and references associated with the development and the analysis of project alternatives are not well-documented. |
| 10 | 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). |
| 11 | Wetland impact assessment is preliminary; therefore, mitigation costs associated with the impacts are uncertain, which may affect the selection of the Tentatively Selected Plan (TSP). |
| 12 | Public concerns have not been adequately identified and addressed. |

**Table 3. Overview of 19 Final Panel Comments Identified by the WSLP-IEPR Panel (continued)**

| | Significance – Low |
|---|---|
| 13 | The basis for selecting the 100-year-flood level of protection is not provided and therefore could not be evaluated. |
| 14 | 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. |
| 15 | The use of adaptability for future levee expansion as a criterion in plan formulation and alternatives evaluation is not fully described. |
| 16 | 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. |
| 17 | Potential impacts from climate change, while referred to in the documentation, are not described or analyzed in accordance with U.S. Army Corps of Engineers (USACE) policy. |
| 18 | The intermediate relative sea level rise (RSLR) scenario is presented inconsistently throughout the project documents. |
| 19 | Project operations with the intermediate scenario of relative sea level rise (RSLR) and project adaptability to higher than the intermediate scenario of RSLR are not described. |

# 6. REFERENCES

40 CFR 1508.7. Code of Federal Regulations, Title 40: Protection of Environment. Chapter V: Council on Environmental Quality, Part 1508.7, Cumulative Impact.

Brekke, L.D., Kiang, J.E., Olsen, J.R., Pulwarty, R.S., Raff, D.A., Turnipseed, D.P., Webb, R.S., and White, K.D. (2009). Climate change and water resources management—A federal perspective: U.S. Geological Survey Circular 1331, 65 p. Available online at http://pubs.usgs.gov/circ/1331/.)

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

USACE (2013). Responses to Climate Change. U.S. Army Corps of Engineers website dated January 14, 2013. Available at www.corpsclimate.us/. Accessed September 13, 2013.

USACE (2012a). Water Resources Policies and Authorities: Civil Works Review. Department of the Army, US Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-214. December.

USACE (2012b). Climate Change Adaptation Plan and Report. U.S. Army Corps of Engineers. June.

USACE (2011a). Fargo Moorhead Metropolitan Area Flood Risk Management Feasibility Report and Environmental Impact Statement. U.S. Army Corps of Engineers, St. Paul District. April.

USACE (2011b). Sea-Level Change Considerations for Civil Works Programs. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-212. October.

USACE (2007). External Independent Economic Opinion on Identifying and Measuring NED Benefits: Navigation Shipping.

USACE (2000a). Planning Guidance Notebook. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) No. 1105–2–100. April.

USACE(2000b). Design and Construction of Levees. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Manual (EM) No. 1110–2–1913. April.

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# APPENDIX A

## Final Panel Comments

## on the

## WSLP-IEPR

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## Final Panel Comment 1

**A plan for disposal of the large volume of excavated fill materials from the drainage channel is not incorporated into the proposed design, and the many factors associated with the disposal of excavated material that could increase project costs and environmental impacts are not addressed.**

### Basis for Comment

The alignment and cross-sections shown for each alternative, including the Tentatively Selected Plan (TSP), show a drainage canal section located on the landward side of the flood barrier. As described in Section 5.1 of the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS), this canal will have an invert of -10 NAVD88 and would be located a minimum of 50 feet landward from the levee section (Eustis Geotechnical Report). The quantity and cost spreadsheet for the TSP indicates a volume of 2.8 million cubic yards of dredging attributable to excavation of the drainage canal. The means of disposal of this large volume of excavated material are not described in the IDFR/EIS or the proposed design. The following potential disposal options increase both estimated projects costs and impacts:

1. **Haul Off-Site** – If the excavated material is hauled off-site, a disposal area of at least several hundred acres will be required. The cost of hauling the material off-site would also significantly increase the excavation cost, which is currently estimated to be $6 per cubic yard.
2. **Place Adjacent to the Canal** – If the excavated material is placed in piles adjacent to the canal section, additional land that is not identified in the proposed design will be required. The disposal piles will also create additional environmental impacts and significant stability issues for both the levee and the canal slopes. Based on the weak foundation deposits that are likely present in the project area, the stability issues for the excavated channel slope and adjacent spoil piles could be more critical than for the levee section.
3. **Use for Levee Fill** – The use of excavated material for levee fill may not be feasible or economical due to the characteristics and wetness of the excavated material.

Options 1 and 2 would require additional project lands, which in turn would create additional costs and environmental impacts associated with the use of either wetland or upland areas for disposal of excavated material. The disposal of excavated material for the U.S. Army Corps of Engineers (USACE) Fargo-Moorhead Diversion project in Minnesota and North Dakota (USACE, 2011a) is a major factor driving both project costs and environmental impacts. The disposal of excavated material raises similar concerns for the West Shore-Lake Pontchartrain project.

### Significance – Medium

The accuracy cost estimate, real estate requirements and the potential environmental impacts of the project cannot be verified or understood without including a disposal plan for excavated material in the design.

## Recommendations for Resolution

1. Refine the interior drainage analysis to verify the required size of the drainage channel.
2. Develop a plan to dispose of excavated material and add a discussion of the plan to the IDFR/EIS.
3. Conduct appropriate stability analyses to validate on-site disposal options.
4. Modify cost estimates and revise the assessment of environmental impacts to reflect the adopted disposal plan.

**Literature Cited:**

USACE (2011a). Fargo Moorhead Metropolitan Area Flood Risk Management Feasibility Report and Environmental Impact Statement. U.S. Army Corps of Engineers, St. Paul District. April.

## Final Panel Comment 2

**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.**

### Basis for Comment

The Specific, Measurable Attainable, Risk Informed, and Timely (SMART) Planning process makes decisions informed by managing risk and acknowledging uncertainty. Data collection, analysis, and reporting are focused on providing only the information needed to make feasibility-level decisions. Consistent with the SMART Planning process, uncertainties are identified in Chapter 5, Section 5.1.5, of the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS), and it is noted that risk and uncertainty will be further considered during subsequent feasibility-level analysis.

The following uncertainties are described:

- Environmental factors: relative sea level rise and size and frequency of storm events
- Engineering factors: levee/structure failure and induced flooding
- Economic factors
- Implementation factors related to the non-structural components

Elsewhere in the document, impacts to wetlands and associated mitigation costs are identified as highly uncertain at this stage in the study. These are not included in the list of uncertainties summarized in Chapter 5 of the IDFR/EIS.

The document does not describe the process for verifying key assumptions during further feasibility analysis, how the plan formulation process will be iterated in response to any changes in key assumptions, and how the TSP may be affected. The document does mention very briefly (IDFR/EIS, p. 5-5) that further evaluation of the non-structural components may reduce the number of structures that would be included in the TSP.

The document does not mention other possible changes to the TSP that may be required. For example, changes may be needed to mitigate off-site flood impacts or to reduce wetland impacts. Regarding potential off-site flood impacts, no specific mitigation measures are mentioned or shown to be feasible. Further wetland impact analysis may reveal greater-than-assumed impacts and associated mitigation costs, which could change the relative cost effectiveness of the alternatives and favor selection of an alternative with fewer wetland impacts. The range of potential changes to the TSP is not clear.

### Significance – Medium

Potential changes to the TSP as a result of further feasibility analysis are not explained and therefore not understood.

### Recommendations for Resolution

1. Review the list of uncertainties summarized in Chapter 5 of the IDFR/EIS for completeness, add to the list as needed, and identify which uncertainties will be addressed during further feasibility assessment.
2. Describe the process for verifying key assumptions once the feasibility analysis is complete and explain how the plan formulation process will be iterated in response to any changes in key assumptions.
3. Describe or elaborate on how the TSP may be affected by the results of further feasibility analysis.
4. Use the information from Recommendations 1-3 in subsequent communication of risk to the U.S. Army Corps of Engineers, stakeholders, and the public.

## Final Panel Comment 3

**The separable non-structural elements of Alternatives A and C have not been shown to be economically feasible.**

### Basis for Comment

The benefits and costs of a stand-alone non-structural plan are evaluated in the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS); however, the evaluation apparently did not include reach-level detail. The costs of the stand-alone non-structural plan in its entirety were found to far exceed the benefits (IDFR/EIS, p. 3-4); therefore, the stand-alone non-structural plan was dropped from further consideration.

However, it is stated (IDFR/EIS, p. 3-4) that non-structural elements were added to Alternative A and to the Tentatively Selected Plan (TSP) (Alternative C) to provide the same level of storm-surge risk reduction as Alternative D (which requires no non-structural measures). This plan formulation facilitates the comparison of alternatives, but it appears to leave a step of the plan formulation process incomplete at this stage of the feasibility study.

In order to maximize net benefits when conducting a benefit-cost analysis, the separable features of a project are to be evaluated to ensure that the benefits of the separable features exceed their costs. The separable non-structural elements were included in Alternative A and Alternative C (the TSP), though the economic feasibility of these separable elements had not yet been established.

The IDFR/EIS (p 3-5) states that the economic feasibility of non-structural elements will be determined by reach during the subsequent feasibility-level design study. The reason for deferring this part of the economic analysis is not provided. The costs of the non-structural measures were included in the costs of Alternatives A and C (IDFR/EIS, p. 3-10, Table 3-3; Economic Appendix D, p. 26). However, the incremental benefits of these non-structural measures are not reported, so the Panel could not assess whether their benefits exceed their costs. The Panel understands that the Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) model should be able to calculate the damages avoided (i.e., the primary benefits) from the non-structural measures. The Panel believes that the incremental economic analysis of the benefits and costs of each separable non-structural element is needed at this stage in the planning process to ensure that the comparison of alternatives identifies the TSP with the highest net benefits possible.

### Significance – Medium

An economic evaluation of the separable non-structural measures contained in Alternatives A and C will improve the defensibility of the analysis and support the determination of the National Economic Development (NED) plan and TSP.

### Recommendations for Resolution

1. 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.

## Final Panel Comment 4

**The assumption 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.**

### Basis for Comment

The Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS) states (pp. 3-6 and 3-11) that Alternatives A, C, and D are assumed to provide equal levels of risk reduction. This assumption is the basis for assuming equal benefits across the alternatives in Table 3-5 (p. 3-12). However, with respect to Alternative C, the IDFR/EIS states (p. 4-6): "It is anticipated that local parish building codes would place restrictions on the elevation of future construction in the area where non-structural acquisition or raising in place is necessary."

This assumption appears to be made to justify equal risk reduction, and hence equal benefits, of Alternatives C and D. However, differences in risk reduction could arise because the implementation of non-structural measures is uncertain.

The Economics Appendix D (pp. 25- 26) states that for "… Alternatives A and C to provide the same benefits, structure raisings or acquisitions will be offered in the area not receiving risk reduction by structural measures".

The costs of the non-structural measures associated with each alternative were included. However, households may not take the offer for acquisition, or they may not participate in structural raisings, since homeowners would have to bear some portion of the cost to raise their structure.*****

Without assurances that the necessary non-structural measures will be implemented over the 50-year time period, there is no longer 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.

### Significance – Medium

The economic justification for selecting Alternative C as the Tentatively Selected Plan hinges on the assumption of equal benefits across alternatives, which may be invalid.

### Recommendations for Resolution

1. For each alternative, calculate the benefits and costs that are equally certain and under the control of the U.S. Army Corps of Engineers (USACE), without relying on the actions of other local entities to achieve equal benefits across alternatives.

***** *The Panel was informed of this requirement during a September 12, 2013, teleconference with USACE and Battelle.*

## Final Panel Comment 5

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

### Basis for Comment

Planning Objectives 2 and 5 identified in the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS) (p. 1-6) are to reduce risk to residents' lives and to reduce risk of damage and loss of critical infrastructure (especially the I-10/I-55 hurricane evacuation route). However, it is difficult to assess the degree to which the residual risks under each alternative have been reduced because the residual risk has not been quantified. In particular, the following statements indicate that there is still significant residual risk to life and infrastructure under Alternatives A and C:

- The IDFR/EIS (p. 3-7) indicates that Alternative A has the greatest residual risk of levee overtopping that would immediately inundate populated areas.
- The IDFR/EIS (p. 3-8) indicates that Alternative C has less residual risk than Alternative A because levee overtopping would not immediately inundate populated areas. However, Alternative C does not reduce risk to infrastructure in St. James Parish.

Further, there is little documentation in the IDFR/EIS of how these residual risks to life and infrastructure were measured. The residual risks to life (probabilities of loss of life, number of people at risk) are not quantified across alternatives; therefore, the magnitude of differences in residual risk across alternatives cannot be identified, and any reduction in risks compared to the existing situation cannot be confirmed.
This quantitative residual risk information is important to the selection of the Tentatively Selected Plan (TSP) since reducing risks is the stated goal of Planning Objectives 2 and 5.

### Significance – Medium

A quantitative analysis of residual risk is needed to assess how well the TSP meets the two risk-related planning objectives.

### Recommendations for Resolution

1. Perform a quantitative analysis of the residual risk to residents' lives and to evacuation infrastructure under each alternative.

## Final Panel Comment 6

**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.**

### Basis for Comment

The potential flood impacts of the alternatives are assessed in Section 4.1 of the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS). However, as noted in Section 5.1 (p. 5-4), the level of flood analysis completed to date is not sufficiently refined to determine whether induced flooding will occur inside or outside of the proposed levee. For example:

- While Alternatives A, B, and D have been modeled using ADCIRC and STWAVE to assess potential storm surge elevations outside the levee (Appendix B: Engineering), the Tentatively Selected Plan (TSP) (Alternative C) has not been modeled. Additionally, where modeling results are available (for Alternatives A and D), these results are not described in the text. Storm surge modeling of Alternative D for the 100-year event indicates potential off-site water level increases of up to 0.8 foot outside the levee, west of Lake Maurepas (Figure 127 of the Storm Surge Frequencies memorandum). These values are not provided in the Environmental Consequences discussion (IDFR/EIS, Section 4.1.1).
- The potential for induced flooding inside the proposed levee has received only a rough-order-of-magnitude assessment (Appendix B: Engineering, .p. 8). No detailed rainfall-runoff analysis has been completed to date.

The project commits to “incorporate features to mitigate for any potential induced flooding” (IDFR/EIS, p. 5-4). However, no examples of feasible mitigation measures are presented.

### Significance – Medium

The preliminary nature of the flood assessment affects the completeness of the IDFR/EIS, and the flood mitigation measures that may need to be implemented have not been demonstrated to be feasible.

### Recommendations for Resolution

1. Use the models (ADCIRC and STWAVE) to simulate the TSP (Alternative C) and document the results.
2. Complete detailed rainfall-runoff modeling of the TSP and document the results.
3. Present examples of feasible on-site and off-site flood mitigation measures unless or until it has been shown that such mitigation measures are not needed.
4. Include any required flood mitigation measures in the description of the TSP.

## Final Panel Comment 7

**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.**

### Basis for Comment

The Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) model was used to quantify the damages to the top 10 damage reaches (Appendix D: Economics, p. 26). On the same page, it is stated that the 46% damage reduction for these reaches was extrapolated to the remaining 71 reaches.

Further, the 46% damage reduction calculated for the year 2020 was applied to all the reaches in the year 2070 with intermediate relative sea level rise.

Generalizing damage reduction from a sample of reaches to all the reaches requires that the sampled reaches be representative of the overall reaches.

Applying the percent damage reduction from the top 10 reaches in terms of percent damage reduction to the other 71 reaches may overstate the percent damage reductions realized in the other 71 reaches, but the degree of this overstatement is not known.

### Significance – Medium

The economic feasibility of the alternatives and the selection of the Tentatively Selected Plan depend on an accurate measure of benefits.

### Recommendations for Resolution

1. Apply the HEC-FDA model to calculate the damage reduction to each of the reaches in the years 2020 and in 2070.
2. Apply the HEC-FDA model to a random sample of the reaches, and extrapolate the resulting percentage damage reduction to all the remaining reaches, if it is not possible to calculate damage reduction to all reaches.

## Final Panel Comment 8

**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.**

### Basis for Comment

The absence of geotechnical site data for Alternative C (the Tentatively Selected Plan [TSP]) is acknowledged in the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS), but the need to acquire this missing information early in the subsequent design phase is not addressed. The geotechnical site data for approximately one-half of the levee alignment for the TSP were extrapolated from soil boring reports taken in the general study area, but not within the proposed alignment. The absence of geotechnical data creates significant uncertainty with regard to the soil conditions to be encountered in this portion of the TSP. This is relevant because this risk occurs only in the TSP and not in the other alternatives. The actual conditions could be significantly different than those assumed, which could require design adjustment for the levee and possibly other structures in this area. If required, design modification could increase the cost of the levee construction in this section of Alternative C and influence the cost comparison of alternatives.

### Significance – Medium

Without a complete assessment of high-level geotechnical engineering activities that are required during the next project phase, the cost comparison across alternatives could be affected, but a design modification is not likely to affect the project's technical feasibility.

### Recommendations for Resolution

1. Include a discussion in the report acknowledging the need to obtain additional borings for the Alternative C alignment.

## Final Panel Comment 9

**Data sources, analytical findings, and references associated with the development and the analysis of project alternatives are not well-documented.**

### Basis for Comment

Significant analyses have been done in developing and evaluating the West Shore-Lake Pontchartrain (WSLP) project alternatives. However, it is important to provide information such as data sources, analytical findings, and references, especially for projects developed within the parameters of the Specific, Measurable Attainable, Risk Informed, and Timely (SMART) Planning framework, so that panel members and other reviewers can understand how the project was developed. In many cases, it appears that the information underlying the analyses is readily available. Selected examples of incomplete documentation include the following:

1) The rationale for the assumptions of models and alternative selection/evaluation is generally given, but data and sources are not provided in many instances. As a result, the assumptions appear unjustified.
2) The assertions and rationale regarding measures that were considered and eliminated are incompletely discussed, even under this risk-informed decision model.
3) The details of the scoring of alternatives (Integrated Draft Feasibility Report/Environmental Impact Statement [IDFR/EIS], pp. 3-4) are not explained, and it could not be determined how the total score was computed, other than that the alternatives were scored on how well they met the objectives and avoided constraints. The IDFR/EIS also does not identify the party responsible for scoring the alternative plans or explain how the objectives and constraints factored into the scoring process. Such information and documentation is needed to understand the reasonableness of this process.
4) Four Federal accounts were used to facilitate comparison of the alternatives; however, the source of these accounts is not provided. It appears the accounts may have come from the U. S. Water Resources Council Principles and Guidelines.
5) There is an unstated assumption that the 30 residential structures and the 80 commercial structures used to estimate content-to-structure value ratios are geographically representative of the study area. However, no information is provided on how the sample was selected or which Parishes in the study area were represented.
6) The indirect impact costs are substantial and, while the development of high and low costs is a reasonable approach, no references for the documents used to develop the costs are provided. Therefore, it is not possible to understand, for example, why Alternative D, which encloses the greatest area of existing wetlands, has a range of habitat mitigation costs that extends below the ranges provided for the other alternatives (IDFR/EIS, p. 3-10).
7) The habitat reduction value impacts are based on available information that is not cited (IDFR/EIS, p. 3-10).

8) The reasonableness of the costs provided on p. 25 of the IDFR/EIS could not be determined because the referenced cost spreadsheet is not provided.

9) The basis for the real estate costs regarding the structural features and the non-structural buyouts is not provided. It appears that these costs may be based on the median value of owner-occupied housing units given in Section 2.3.6 (p. 2-14 of the IDFR/EIS), but no reference is provided.

10) Tables 17-19 and 21-23 in Appendix D, Economics, are presented with almost no explanation of the costs. For example, Tables 17 and 18 do not explain whether the $6 million in recurring costs are non-structural costs. These costs do not appear be associated with operations, maintenance, repair, rehabilitation, and replacement costs because they are absent from Table 19 (Alternative D).

11) The costs for the various alternatives (Table 3-3 of the IDFR/EIS) include allocations for indirect impact costs as described in the paragraph preceding the table (p. 3-9), but the overall reasonableness of the alternatives could not be determined because the cost data are not provided.

## Significance – Medium

Supporting information and documentation of the analyses underlying the IDFR/EIS is required to understand the development and costing of the project and plan selection process.

## Recommendations for Resolution

1. Provide 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.

## Final Panel Comment 10

**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).**

### Basis for Comment

Cumulative effects are defined by 40 CFR 1508.7 as: "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions." Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

The primary purpose of the cumulative effects analysis in the NEPA process is to ensure that Federal decisions consider the full range of consequences. The range of actions that must be considered includes not only the project proposal but all connected and similar actions, public or private, that could contribute to cumulative effects. The following specific comments relate to the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS) cumulative effects analysis:

1. Additional population and economic growth are possible consequences of implementation of the Tentatively Selected Plan (TSP). Potential positive and negative impacts associated with population and economic sector growth within the levee protection zone are not fully discussed. Additional economic activity, pressure on highway systems and on sewer and water capacity, and potentially greater flood damage losses and greater human health risks as a result of expected growth are examples of cumulative socioeconomic effects that have not been raised.
2. The description and analysis of cumulative effects do not adequately address the effects of other large projects planned in the region when combined with the potential effects of the TSP. Other large projects may compete for borrow materials and wetland mitigation sites, and may affect assumptions used in selecting the TSP. Other large projects may have synergistic beneficial effects when combined with the TSP or may have negative effects on the TSP. In particular, the cumulative effects of proposed diversion projects in the region have not been discussed in relation to the TSP. The project may affect the area of influence of the proposed Maurepas Swamp Diversions. The interaction of the proposed Hope Canal diversion with the proposed project levee is not described.
3. Cumulative effects of unrelated private actions, including actions that may adversely affect the TSP, are not described. These may include, but are not limited to, private development (residential, commercial, and industrial) and oil and gas and other energy activities. For example, activities requiring the creation of new canals within surrounding wetlands (including the planned mitigation sites) may have adverse effects on the federal investment.
4. Cumulative effects for wetlands losses and fish and aquatic resources are only minimally described. A brief but more thorough discussion of cumulative effects for these resources, considering all reasonable unrelated foreseeable future

scenarios, including climate change, is a requirement of NEPA.

**Significance – Medium**

The discussion of cumulative effects in the IDFR/EIS does not provide the degree of detail necessary to comply with NEPA requirements.

**Recommendations for Resolution**

1. Include a comprehensive list of reasonably foreseeable future actions (based on known future projects and past/predictable development patterns) that may be undertaken in the project area in the IDFR/EIS.
2. In concert with Specific, Measurable Attainable, Risk Informed, and Timely (SMART) Planning framework, in tabular form, briefly describe foreseeable activities that are anticipated to occur in the project area (e.g. other Federal projects, development infrastructure expansion, oil and gas exploration and production, diversion canal creation or expansion, pipeline system expansion and maintenance, and other similar activities common to the project area) and forecast cumulative effects, both positive and negative, that the TSP may have on those activities.
    a. Include the potential effects that those activities may have on the Federal investment in the TSP (both levee construction and mitigation). In particular, give greater attention to both positive and negative socioeconomic and ecological effects, including potential effects of climate change.
3. Briefly describe related flood damage reduction and restoration/mitigation projects anticipated to be performed under other authorities. Summarize their adverse and positive effects in combination with those anticipated for the TSP.
4. Briefly describe any measures anticipated to be implemented to mitigate adverse cumulative effects, including those that may be adverse to the Federal project.

**Literature Cited:**

40 CFR 1508.7. Code of Federal Regulations, Title 40: Protection of Environment. Chapter V: Council on Environmental Quality, Part 1508.7, Cumulative Impact.

## Final Panel Comment 11

**Wetland impact assessment is preliminary; therefore, mitigation costs associated with the impacts are uncertain, which may affect the selection of the Tentatively Selected Plan (TSP).**

### Basis for Comment

The assessment of wetland impacts at this stage of the study is preliminary and is based on data that are not field verified. Potential wetlands effects for areas interior to the proposed levee are unknown. Changes in hydrology and resulting effects on wetlands are estimated and uncertain. Habitat connectivity, fragmented by the proposed levee, is not described. This includes connectivity of wetlands, channels, and the overmarsh water column. The potential effects of introducing a corridor of higher ground into the wetlands are not discussed. The preliminary nature of the wetlands impact assessment is acknowledged in the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS).

Operational elements of the TSP with respect to potential wetlands effects are not described. In particular, operation of sluice gates and their potential to reduce sediment delivery to wetlands (from the proposed Maurepas Swamp diversions, for example) is not evaluated.

Mitigation costs for direct and indirect habitat impacts are a large component of the relative cost difference between alternatives (IDFR/EIS Table 3-3, p. 3-10). Should wetlands impacts prove to be larger than estimated and mitigation costs higher than predicted, the selection of the TSP may require re-evaluation. This component of risk and uncertainty is not discussed.

It is noted that coordination with the Habitat Evaluation Team (HET) is ongoing.

### Significance – Medium

The preliminary nature of the assessment of wetlands affects the completeness of the documentation and identification of risk and uncertainty.

### Recommendations for Resolution

1. Describe in more detail the qualitative nature of the wetlands assessment, the margin of error assumed, and future studies that are planned to more quantitatively and thoroughly evaluate all wetlands effects resulting from the TSP.
2. Discuss in more detail the current understanding of hydrology associated with the TSP and what effects this could have on wetlands within the project area.
3. Expand the discussion of mitigation measures to compensate for more extensive wetlands effects, if any.
4. Describe ongoing coordination with the HET with respect to wetlands mitigation and compensation for habitat loss and fragmentation.
5. Discuss the operational elements of the TSP and potential effects on sediment

fate and transport with respect to wetlands in the project area.

6. Provide a more detailed discussion of wetlands mitigation costs, including the assumptions and uncertainties, and how uncertainties in the cost estimate may affect the evaluation of alternatives and the TSP.

## Final Panel Comment 12

**Public concerns have not been adequately identified and addressed.**

### Basis for Comment

Public comments were collected by the U.S. Army Corps of Engineers (USACE) at previous scoping and other public meetings. Additionally, the public comment period was extended past the time period the Panel was allotted to complete its review of the West Shore-Lake Pontchartrain project. While the Panel did not have access to all public comments received by USACE, a summary of the public comments was provided for review prior to the completion of the Final Independent External Peer Review Report.

The Panel noted a strong community preference for Alternative D stated in the public comments. Considering the arguments put forward by stakeholders for the selection of Alternative D over C, it appears that the decision to adopt Alternative C as the Tentatively Selected Plan (TSP) was not fully explained and may be perceived as unjustified by the community.

### Significance – Medium

Additional discussion of the rationale for selecting Alternative C as the TSP is warranted to fully address the concerns expressed in the public comments.

### Recommendations for Resolution

1. Describe more fully, perhaps in tabular or spreadsheet form, the public comments received during scoping, interim public meetings, and the recent comment period.
2. Provide additional discussion and explanation for the selection of Alternative C as the TSP in light of the public's preference for Alternative D.
3. Provide responses to the public's arguments put forward during the comment period for the selection of Alternative D.

## Final Panel Comment 13

**The basis for selecting the 100-year-flood level of protection is not provided and therefore could not be evaluated.**

### Basis for Comment

The Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS) and related evaluations focused almost entirely on a 100-year level of protection. There was no discussion related to greater degrees of protection requiring higher and longer flood barriers. It is likely that the construction of the proposed flood protection structures will increase the public's sense of security, which in turn will likely spur more development within the protected area. On previous U.S. Army Corps of Engineers urban flood protection projects, such as the Pembina local flood protection project in North Dakota, this type of increased hazard potential required upgrading the level of protection after the urban protection projects had been in place for almost 40 years. The Panel's experience with other urban flood protection projects throughout the United States indicates that a 100-year level of protection has been generally the lowest employed for local flood protection projects.

### Significance – Low

Although the 100-year level of protection is a standard that has been adopted for other projects in the general area, a discussion of the rationale for selecting the 100-year level of protection would strengthen the report and increase the credibility of the evaluation of alternatives.

### Recommendations for Resolution

1. Modify the IDFR/EIS to include a discussion of the rationale for using the 100-year level of protection for all alternatives.

## Final Panel Comment 14

**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.**

### Basis for Comment

Section 8.1 of the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS) states that environmental control structures (culverts with flap gates) would be used for environmental control during flood events. The use of flap gates is also described in Section 3 related to Alternative A. The type of flap gates that would be employed for the Tentatively Selected Plan (Alternative C) was not specified. The use of non-automated flap gates is generally limited to agricultural levees rather than urban flood barriers. U.S. Army Corps of Engineers (USACE) guidance provided in Engineer Manual (EM) 1110 – 2 – 1913 (USACE, 2000b) indicates that gravity lines penetrating the levee should be controlled by slide gates where the rate of rise of water during major flood events is slow or predictable or by automated flap gates. The advantages of the slide gates are that they are more reliable than flap gates, even if the flap gates are automated. The USACE guidance also indicates that consideration should be given to supplemental means (secondary gate systems) to close gravity drainage lines that penetrate the levee.

### Significance – Low

The use of flap gate closures may be inappropriate for the West Shore-Lake Pontchartrain project, and the added cost of utilizing automated slide gate closures instead would be very small.

### Recommendations for Resolution

1. Evaluate the relative reliability of automated flap gate closure systems and slide gate closure systems in future design stages.

**Literature Cited:**

USACE(2000b). Design and Construction of Levees. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Manual (EM) No. 1110–2–1913. April 30.

## Final Panel Comment 15

**The use of adaptability for future levee expansion as a criterion in plan formulation and alternatives evaluation is not fully described.**

### Basis for Comment

Levees that can be readily widened, if needed, are more adaptable than those that can be widened only with the purchase and/or relocation of existing structures. Adaptability is used as an evaluation criterion, with Alternative A identified as the least adaptable as compared to Alternatives C and D (Integrated Draft Feasibility Report/Environmental Impact Statement [IDFR/EIR], p. 3-7).

A slightly modified version of Alternative A with a small offset from the developed edge would allow for adaptability while increasing wetland impacts by only the slightest amount. Such a modified version may perform better than Alternative A, but it does not appear to have been considered.

Alternatives A, C, and D each include a large canal on the inboard side that would appear to limit future expansion, and all appear equally expandable on the outboard side of the levee. Considering these similarities among the alternatives, and because the process used to evaluate the differences in adaptability between alternatives was not explained in the IDFR/EIS, it is not understood how the alternatives differ in adaptability.

### Significance – Low

The limited nature of the discussion of adaptability affects the completeness of the IDFR/EIS.

### Recommendations for Resolution

1. Clarify the importance of adaptability as an evaluation criterion.
2. Consider a modified version of Alternative A that provides for adaptability, or explain why such a modified version is not considered, if adaptability is an important criterion.
3. Provide a brief explanation of how differences in adaptability were evaluated between alternatives.

## Final Panel Comment 16

**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.**

### Basis for Comment

Technical feasibility and estimated costs are directly influenced by the planned construction process. The Tentatively Selected Plan (Alternative C) involves constructing approximately 18 miles of earthen levee and drainage canal, with much of the alignment located in areas with soft foundation soil conditions. It is difficult to properly assess project feasibility without a discussion of the planned construction process and sequence that accounts for known obstacles that could impede the project schedule.

### Significance – Low

A discussion of the planned construction process and sequence will improve the quality and clarity of the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS).

### Recommendations for Resolution

1. Add a discussion of the planned construction process and sequence to the IDFR/EIS.

## Final Panel Comment 17

**Potential impacts from climate change, while referred to in the documentation, are not described or analyzed in accordance with U.S. Army Corps of Engineers (USACE) policy.**

### Basis for Comment

(Note: The consideration of the relative sea level rise aspect of climate change on the West Shore-Lake Pontchartrain (WSLP) planning process is addressed in a separate Panel comment.)

While the potential effects of climate change on the Tentatively Selected Plan (TSP) are mentioned, climate change is not discussed as a discrete topic in the Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS), and the process for incorporating the general effects of climate change into the planning process is not described in the WSLP project documentation. Recent guidance issued by USACE states the agency's intention to consider climate change as part of the planning process, as shown in the following excerpts: "Climate change impacts affect water availability, water demand, water quality, stormwater and wastewater infrastructure, flood and coastal storm infrastructure, wildland fires, ecosystem functioning, coastal zone functioning, navigation, and energy production and demand. All of these factors affect the water resources projects operated by the Corps and its non-Federal sponsors. Many of these were designed and constructed before climate change was recognized as a potential influence. "The entire portfolio of USACE Civil Works water resources infrastructure and programs, existing and proposed, could be affected by climate change and adaptation to climate change. This affects design and operational assumptions about resource supplies, system demands or performance requirements, and operational constraints. Both droughts and floods can affect the operations of these projects. Numerous regulatory decisions made by USACE will need to be informed by climate change impacts and adaptation considerations throughout the U.S., especially in western states." (USACE, 2013) "In response to a growing body of evidence about climate impacts to our missions and operations, we published a foundational report with other water resources agencies: *Climate Change and Water Resources Management: A Federal Perspective*. [2] Since that time, we have developed a governance structure to support mainstreaming adaptation by establishing an overarching USACE *Climate Change Adaptation Policy Statement and a Climate Change Adaptation Steering Council*. This policy requires USACE to mainstream climate change adaptation in all activities to help enhance the resilience of our built and natural water-resource infrastructure and reduce its potential vulnerabilities to the effects of climate change and variability." (USACE, 2012b)

### Significance – Low

The IDFR/EIS may not comply with the USACE climate change adaptation policy because the potential effects of climate change are not discussed as a discreet topic.

[2] Brekke et al. (2009).

## Recommendations for Resolution

1. Describe, briefly, the potential effects of climate change on the TSP as a discrete topic.
2. Discuss how the potential effects of climate change were considered during plan formulation and development.
3. Revise the EIS and the environmental summary in the IDFR/EIS to include this information.

**Literature Cited:**

Brekke, L.D., Kiang, J.E., Olsen, J.R., Pulwarty, R.S., Raff, D.A., Turnipseed, D.P., Webb, R.S., and White, K.D. (2009). Climate change and water resources management—A federal perspective: U.S. Geological Survey Circular 1331, 65 p. Available online at http://pubs.usgs.gov/circ/1331/.)

USACE (2013). Responses to Climate Change. U.S. Army Corps of Engineers website dated January 14, 2013. Available at www.corpsclimate.us/. Accessed September 13, 2013.

USACE (2012b). Climate Change Adaptation Plan and Report. U.S. Army Corps of Engineers. June 2012.

## Final Panel Comment 18

**The intermediate relative sea level rise (RSLR) scenario is presented inconsistently throughout the project documents.**

### Basis for Comment

The term “intermediate” RSLR is used to refer to two different scenarios. In Table 2-2 (Integrated Draft Feasibility Report/Environmental Impact Statement [IDFR/EIS], p 2-3), the term refers to the National Research Council (NRC) Curve I, in accordance with U.S. Army Corps of Engineers (USACE) Engineer Circular (EC) 1165-2-212 (2011b). On the same page, in Figure 2-2, the term refers to NRC Curve II (intermediate of the three NRC curves). The values differ by approximately 0.8 foot in the year 2070. It appears that the intermediate RSLR scenario used in the analysis corresponds with NRC Curve I.

### Significance – Low

The inconsistent descriptions of “intermediate” RSLR affect document readability.

### Recommendations for Resolution

1. Revise the document, including text, tables, and figures, for consistent presentation of the “intermediate” RSLR scenario.

**Literature Cited:**

USACE (2011b). Sea-Level Change Considerations for Civil Works Programs. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-212. October.

## Final Panel Comment 19

**Project operations with the intermediate scenario of relative sea level rise (RSLR) and project adaptability to higher than the intermediate scenario of RSLR are not described.**

### Basis for Comment

The U.S. Army Corps of Engineers (USACE) provides guidance for incorporating the effects of projected future sea-level change in project implementation (USACE, 2011b). The guidance states: "Planning, engineering, designing, operating, and maintaining for sea level change must consider how sensitive and adaptable 1) natural and managed ecosystems and 2) human and engineered systems are to climate change and other related global changes."

The West Shore-Lake Pontchartrain (WSLP) planning process identifies low, intermediate, and high rates of RSLR (Integrated Draft Feasibility Report/Environmental Impact Statement [IDFR/EIS], p. 2-3; Appendix B: Engineering) and models coastal storm surge for these three scenarios. The intermediate RSLR scenario was applied for the WSLP feasibility study (IDFR/EIS, p. 5-3).

The intermediate RSLR scenario is used to develop the design flood elevation. It is not clear whether the intermediate RSLR scenario is used in the operations plan, specifically regarding the closure frequency of the water control structures. The operations plan is based on an estimated closure frequency of 8.5 days per year, and there is no discussion of how this frequency may or may not increase under the assumed RSLR scenario. It is stated (IDFR/EIS, p. 4-18) that any impacts associated with more frequent closure due to RSLR would be analyzed and documented in a future supplemental National Environmental Policy Act document, implying that project operations have not considered RSLR.

Per USACE guidance, a description of how project benefits change under the low and high RSLR scenarios is provided (IDFR/EIS, p. 5-3). However, adaptability of the project to the high RSLR scenario is not discussed. Adaptation approaches could include, for example, raising levees and increasing pump capacities.

Adaptation requires monitoring or tracking the actual rate of RSLR during the design life of the project. A discussion of how the actual rate of RSLR will be monitored or tracked, or which agency will be responsible for monitoring or tracking, is not provided. It is also unclear how a higher RSLR scenario would be used by USACE or the local sponsor in adaptive management to consider future implementation of adaptation measures.

### Significance – Low

The discussion of RSLR in the IDFR/EIS is incomplete and does not fully comply with USACE guidance.

## Recommendations for Resolution

1. Evaluate average annual closure frequency with RSLR, summarize the results of this evaluation in the text, and revise the estimate of closure frequency in the text as needed.
2. Add text to discuss adaptability of the project to a higher RSLR than has been assumed for design.
3. Describe how and by whom the actual rate of RSLR will be monitored or tracked during the operational phase of the project, and how a higher RSLR would be used in adaptive management to consider future implementation of adaptation measures.

**Literature Cited:**

USACE (2011b). Sea-Level Change Considerations for Civil Works Programs. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-212. October.

# APPENDIX B

## Final Charge to the Independent External Peer Review Panel as Submitted to USACE on September 9, 2013

## on the

## WSLP-IEPR

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# Charge Questions and Guidance to the Panel Members for the Independent External Peer Review of the WSLP-IEPR

## BACKGROUND

The purpose of the feasibility study is to determine the Federal interest in implementing a hurricane protection levee system to provide protection to St. Charles, St. John the Baptist, and St. James parishes against hurricane-induced tidal surges originating from Lake Pontchartrain and Lake Maurepas.

The specific plan formulation rationale for the feasibility study has evolved over the course of the many prior studies regarding hurricane and storm damage risk reduction in the study area. Due to the changing natural and social dynamics in the area, all prior formulations and rationales are being revisited during this feasibility study. These include the previously developed non-structural measures: evacuation, elevation of structures, and property acquisitions, and the structural measures: levees, floodwalls, flood gates, pump stations, tidal exchange structures and water storage areas. Since the authorization for this study provides for hurricane protection and flood control in St. Charles, St. John the Baptist, and St. James parishes, the alternatives to be evaluated are being limited to the needs in these three parishes. The rough order magnitude estimate of total project cost for the levees being investigated in the feasibility study range from $275 million to $450 million.

## OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the West Shore-Lake Pontchartrain, Louisiana Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana Integrated Feasibility Report/Environmental Impact Statement (EIS) (hereinafter: WSLP - IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review* (EC 1165-2-214, dated December 15, 2012), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the WSLP – IEPR documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in Civil Works planning, economics, biology/ecology, hydrologic and hydraulic engineering, civil/mechanical engineering, and geotechnical

engineering issues relevant to the project. They will also have experience applying their subject matter expertise to coastal storm damage reduction issues.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-214, Appendix D, review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

## DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review.

**Documents for Review**
The following documents are to be reviewed by designated discipline:

| Primary Documents<br>Title | Approx. No. of Pages | Required Disciplines |
|---|---|---|
| **WSLP Draft Integrated Feasibility Report/EIS** | 100 | All Disciplines |
| Engineering Appendix | 70 | All Engineering Disciplines |
| Economics | 40 | Economics, Plan Formulation |
| Real Estate | 100 | Economics, Plan Formulation |
| Public Comments | 50 | All Disciplines |
| **Primary Documents Page Count** | **360** | |

## Documents for Review, continued

| Supporting Documents<br>Title | Approx. No. of Pages | Required Disciplines |
|---|---|---|
| Risk Register | 3 | All Disciplines |
| Hydrologic and Hydraulic Analysis | 212 | Hydrologic and Hydraulic Engineering |
| Civil Design | 130 | Civil/Mechanical; Geotechnical/Structural Engineering |
| Geotechnical and Structural Engineering | 580 | Geotechnical/Structural Engineering |
| Cost Engineering | 15 | Civil Work Planning ; Economics,; All Engineering Disciplines |
| Supporting Documents Page Count | 940 | |
| Total Page Count | 1300 | |

## Documents for Reference

- USACE guidance Civil Works Review, (EC 1165-2-214) dated 15 December 2012
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review released December 16, 2004.

## SCHEDULE

This final schedule is based on the September 9, 2013 receipt of the final review documents. The schedule will be revised upon receipt of final review documents.

| Task | Action | Due Date |
|---|---|---|
| **Conduct Peer Review** | Battelle sends review documents to panel members | 9/11/2013 |
| | Battelle convenes kick-off meeting with panel members | 9/12/2013 |
| | Battelle convenes kick-off meeting with USACE and panel members | 9/12/2013 |
| | Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE | 9/23/2013 |
| | Panel members complete their individual reviews | 9/26/2013 |
| **Prepare Final Panel Comments and Final IEPR Report** | Battelle provides panel members with talking points for Panel Review Teleconference | 9/30/2013 |
| | Battelle convenes Panel Review Teleconference | 10/1/2013 |
| | Battelle provides Final Panel Comment templates and instructions to panel members | 10/2/2013 |
| | Panel members provide draft Final Panel Comments to Battelle | 10/9/2013 |
| | Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments | 10/10-10/20/2013 |
| | Battelle finalizes Final Panel Comments | 10/21/2013 |
| | Battelle provides Final IEPR Report to panel members for review | 10/23/2013 |
| | Panel members provide comments on Final IEPR Report | 10/24/2013 |
| | *Battelle submits Final IEPR Report to USACE | 10/28/2013 |
| **Comment/ Response Process** | Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE | 10/29/2013 |
| | Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process | 10/29/2013 |
| | USACE provides draft PDT Evaluator Responses to Battelle | 11/4/2013 |
| | Battelle provides the panel members the draft PDT Evaluator Responses | 11/4/2013 |
| | Panel members provide Battelle with draft BackCheck Responses | 11/6/2013 |
| | Battelle convenes teleconference with panel members to discuss draft BackCheck Responses | 11/7/2013 |
| | Battelle convenes Comment-Response Teleconference with panel members and USACE | 11/8/2013 |
| | USACE inputs final PDT Evaluator Responses to DrChecks | 11/18/2013 |
| | Battelle provides final PDT Evaluator Responses to panel members | 11/18/2013 |
| | Panel members provide Battelle with final BackCheck Responses | 11/20/2013 |

| Task | Action | Due Date |
|---|---|---|
| **Comment/ Response Process** | Battelle inputs the panel members' final BackCheck Responses to DrChecks | 11/22/2013 |
| | *Battelle submits pdf printout of DrChecks project file | 11/25/2013 |
| **ADMB** | Agency Decision Milestone Briefing | 11/21/2013 |
| **CWRB** | Civil Works Review Board | 4/17/2013 |

## CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the WSLP - IEPR documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or Appendix) are included in the general charge guidance, which is provided below.

### General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the WSLP - IEPR documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-214; Appendix D).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.

4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager (Julian DiGialleonardo, digialleonardoj@battelle.org), Program Manager (Karen Johnson-Young (johnson-youngk@battelle.org) or Deputy Program Manager (Rachel Sell (sellr@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnson-youngk@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

**Please submit your comments in electronic form to Julian DiGialleonardo, digialleonardoj@battelle.org, no later than September 26, 2013, 10 pm ET.**

# Independent External Peer Review of the

## West Shore-Lake Pontchartrain, Louisiana Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana Integrated Feasibility Report/Environmental Impact Statement

## Charge Questions and Relevant Sections as Supplied by USACE

### General Questions

1. Within the context of risk-informed decision-making, to what extent has it been shown that the project is technically sound?

2. Are the assumptions that underlie the engineering, and environmental analyses sound?

3. Within the context of risk-informed decision-making, are the engineering, and environmental methods, models and analyses used adequate and acceptable?

4. Were all models used in the analyses used in an appropriate manner with assumptions appropriately documented and explained?

5. Were risk and uncertainty sufficiently considered?

6. Was the process used to select the recommended alternative rational and was the process implemented in a reasonable manner given the project constraints?

7. Does the environmental impact statement satisfy the requirements of National Environmental Policy Act (NEPA)? Were adequate considerations given to significant resources by the project?

8. Assess the recommended alternatives from the perspective of systems. It should also include systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

### Safety Assurance Review Questions

9. Within the context of risk-informed decision-making, were the methods used to evaluate the condition of the structural features adequate and appropriate given the circumstances?

10. Have the appropriate alternatives been considered and adequately described for this project and do they appear reasonable?

11. Within the context of risk-informed decision-making, do the project features adequately address redundancy, resiliency, or robustness with an emphasis on interfaces between structures, materials, members, and project phases?

12. For the current design developed using limited detailed information, are the quality and quantity of the surveys, investigations, and engineering sufficient to assess expected risk reduction?

13. Have the hazards that affect the structures been adequately documented and described? If not, is the risk register documented accordingly?

14. Are the models used to assess hazards appropriate?

15. Are the assumptions made for the impacts appropriately documented and explained in the report documentation and/or risk register?

16. Is there sufficient information presented to identify, explain, and comment on the assumptions that underlie the engineering analyses? Has the risk register adequately documented assumptions and corresponding risks associated with limited detailed information associated with the various engineering analyses?

17. Are there any additional analyses or information available or readily obtainable that would affect decisions regarding the structures?

18. Does the physical data and observed data provide adequate information to characterize the structures and their performance?

19. Have all characteristics, conditions, and scenarios leading to potential failure, along with the potential impacts and consequences, been clearly identified and described? Have all pertinent factors, including but not necessarily limited to population-at-risk been considered?

20. Does the analysis adequately address the uncertainty given the consequences associated with the potential loss of life for this type of project?

21. From a public safety perspective, is the proposed alternative reasonably appropriate or are there other alternatives that should be considered?

22. Has anything significant been overlooked in the development of the assessment of the project or the alternatives?

23. Do the alternatives and their associated costs appear reasonable? Do the benefits and consequences appear reasonable?

**Specific Charge Questions for the West Shore-Lake Pontchartrain, Louisiana Hurricane Protection St. Charles, St. John the Baptist, and St. James Parishes, Louisiana Integrated Feasibility Report/Environmental Impact Statement**

## Objectives

24. Is the purpose of the project adequately defined? If not, why?

25. Has the project need been clearly described?

26. Have the public concerns been identified and adequately described?

27. Are the specific objectives adequately described?

28. In your opinion, are there any other issues, resources, or concerns that have not been identified and/or addressed?

## Alternatives

29. Has the criteria to eliminate plans from further study been clearly described?

30. Is each of the different alternative plans clearly described?

31. Within the context of risk-informed decision-making, were the assumptions made for use in developing the future with-project conditions for each alternative reasonable? Were adequate scenarios considered? Were the assumptions reasonably consistent across the range of alternatives and/or adequately justified where different?

32. Are the changes between the without- and with-project conditions adequately described for each alternative?

33. Have comparative impacts been clearly and adequately described?

34. Comment on the optimization and incremental analysis process for the final array of alternatives.

35. Are the criteria used to evaluate the multi-criteria decision analysis adequate and appropriate? If not, why?

36. Are there any unmitigated environmental impacts not identified and if so could they impact project designs?

37. Please comment on the likelihood of the recommended alternative will achieve the expected outputs.

38. Are residual risks adequately described and is there a sufficient plan for communicating the residual risk to affected populations?

39. Are future Operation, Maintenance, Repair, Replacement, and Rehabilitation efforts adequately described and are the estimated cost of those efforts reasonable for each alternative?

40. Within the context of risk-informed decision-making, have the impacts to the existing infrastructure, utilities, and transportation infrastructure been adequately addressed?

## Affected Environment

41. Is the description of the climate in the study area sufficiently detailed and accurate?

42. Is the description of wetland resources in the project area complete and accurate?

43. Is the description of aquatic resources in the project area complete and accurate?

44. Is the description of threatened and endangered species resources in the study area complete and accurate?

45. Is the description of the historical and existing recreational resources in the study area complete and accurate?

46. Is the description of the cultural resources in the study area complete and accurate?

47. Is the description of the historical and existing socioeconomic resources in the study area complete and accurate? Were specific socioeconomic issues not addressed?

## Environmental Consequences

48. Have impacts to significant resources been adequately and clearly described?

49. To what extent have the potential impacts of the alternatives on significant resources been addressed and supported?

50. Are the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and supported?

51. Have impacts from borrow areas been adequately and clearly described?

## Cumulative Impacts

52. Are cumulative impacts adequately described and discussed? If not, please explain.

## Mitigation

53. Are mitigation measures adequately described and discussed? If not, please explain.

## Economics Appendix

54. Were the benefit categories used in the economic analysis adequate to calculate a benefit-to-cost ratio for each of the project alternatives?

55. To what extent are the input parameters, methods, models and analyses used in the study methodology as documented in the Economics Appendix appropriate and consistent with current best management practices?

56. Were the methods to calculate structure and content values appropriate and adequately described?

57. Was the methodology to assess storm damages, and storm damage reduction appropriate and adequately described?

58. Were the methods used to develop the content-to-structure value ratios (CSVRs) appropriate and were the generated results applicable to the study area?

59. Has the report adequately addressed the issue of repetitive flood damages and the subsequent extent of rebuild/repair by property owners as relates to annual damage estimation and have scenarios identified in the report adequately addressed the range of impact to project justification?

60. Were risk and uncertainty sufficiently considered in relation to the future development process?

### Hydrology and Hydraulics Appendix

61. Was the hydrology discussion sufficient to feasibility scope to characterize current baseline conditions and to allow for evaluation of how forecasted conditions (with- and without-proposed actions) are likely to affect hydrologic conditions?

### Geotechnical Engineering

62. Is the description of the geomorphic and physiographic setting of the proposed project area accurate and comprehensive?

63. Were the geotechnical analyses adequate and appropriate for the current level of design as presented in the report documentation?

### Civil Design

64. Have the design and engineering considerations presented been clearly outlined and will they achieve the project objectives?

65. Are any additional design assumptions necessary to validate the preliminary design of the primary project components?

66. Are the assumptions used to determine the cost of operations and maintenance for the proposed project adequately documented and explained?

### Cost

67. To what extent have significant project construction costs been adequately identified and described?

68. Are the costs adequately justified?

## Real Estate Plan

69. Comment on the extent to which assumptions and data sources used in the economics analyses are clearly identified and the assumptions are justified and reasonable.

70. Does the Real Estate Plan adequately address all real estate interests (public and private)?

71. Have potential relocations as a result of the project been adequately addressed?

72. Hazardous, Toxic, and Radioactive Waste

73. Within the context of risk-informed decision-making, comment on the extent to which impacts of the alternatives may have on hazardous, toxic, and radioactive waste issues?

## Public Involvement and Correspondence

74. Based on your experience with similar projects, has adequate public, stakeholder, and agency involvement occurred to determine all issues of interest and to ensure that the issues have been adequately addressed to the satisfaction of those interested parties? Should additional public outreach and coordination activities be conducted?

## Summary Questions

75. Please identify the most critical concerns (up to 5) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

76. Please provide positive feedback on the project and/or review documents.