

Final Independent External Peer Review Report West Bank and Vicinity, Louisiana Coastal Storm Risk Management Project Draft General Reevaluation Report

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Risk Management Center
Huntington District

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Executive Summary

Project Background and Purpose

The West Bank and Vicinity (WBV) project is part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). The WBV project currently spans four sub-basins (i.e., geographic areas that are protected by a specific component of the HSDRRS and are independent hydrologic units) and includes 61 miles of perimeter levees, floodwalls, and other appurtenant facilities roughly bordering Lake Cataouatche on the south, and wrapping around to the Mississippi River and Tributaries (MR&T) levee on the east. On the east and north, as an ancillary benefit, the MR&T project levee provides perimeter hurricane and storm damage risk reduction. The project area is highly urbanized.

The WBV project is authorized to provide risk reduction from a storm surge that has 1% annual probability of exceedance under the authority provided by the 4th and 6th supplemental appropriations (Public Law [P.L.] 109-234 and P.L. 110-252) in order to provide the level of risk reduction required for participation in the National Flood Insurance Program. While the project currently provides this 1% level of risk reduction, if future measures to address the combined effects of settlement and subsidence, caused by consolidation, and sea level rise (SLR) are not carried out to maintain the project, it can be concluded that, in the future, the system may not provide a 1% level of risk reduction.

Current project authorities do not include future efforts to address the aforementioned combined effects on the WBV system. However, Section 3017 of P.L. 113-121 does provide this authorization, until it terminates on January 10, 2024. The purpose of the study is to identify whether a National Economic Development (NED) plan exists to reduce life safety risk, economic damages, and risk to the environment and human health due to the combined effects of subsidence, consolidation, and SLR on the WBV levee system.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the WBV, Louisiana, Coastal Storm Risk Management Project, Draft General Reevaluation Report (hereinafter: WBV Draft GRR 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 (2018). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. The IEPR was external to the agency and conducted following USACE

and Office of Management and Budget (OMB) guidance described in USACE (2018) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: economics, environmental resources, hydrology and hydraulic (H&H) engineering, geotechnical engineering, and civil/structural engineering. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the five-person Panel from this list.

The Panel received electronic versions of the decision documents (912 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2018) and OMB (2004), USACE prepared the charge questions, which 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 at 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.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. 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. 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/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, nine Final Panel Comments were identified and documented. Of these, two were identified as having medium/high significance, four have medium significance, and three have medium/low significance.

Results of the Independent External Peer Review

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2018) in the WBV Draft GRR. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the WBV Draft GRR's main report is well-organized, is concise, and provides supporting documentation on engineering, environmental, economic, and plan formulation issues. The report provided a balanced assessment of the economic, engineering, and environmental issues of the overall project; however, the Panel identified several elements of the project where additional analysis is warranted and places where project findings and objectives need to be documented or clarified.

Engineering: The Panel recognized that USACE has conducted many engineering analyses to address foreseeable factors that could influence the Tentatively Selected Plan (TSP); however, the Panel believes that some items that were not analyzed could impact the effectiveness of the TSP if not taken into consideration. The Panel is concerned that risk and uncertainty remain due to the fact that the Hydrologic Engineering Center-River Analysis System (HEC-RAS) simulations were not validated using Hurricane Katrina and did not take rainfall and increased storm frequency into account. Validating the model with Hurricane Katrina would verify that the assumptions used are reasonable. If the model were further updated to consider increases in rainfall and storm frequency, information on interior areas of inundation and damage would be provided, along with the frequency with which those damages may occur. This additional analysis would reduce risk and uncertainty and more fully reflect the potential impacts in the area under the TSP.

The Panel noted that incorrect assumptions regarding the Mississippi River discharge during hurricane season could impact design water levels, resulting in increased costs due to the possible need to replace floodwalls and construct additional levee lifts. When the potential for increased flood levels is considered with likely settlement under “I” walls and at least some of the “T” walls, future adjustments would be necessary, which would result in additional increases in project costs.

The Panel also believes that the WBV Draft GRR should provide additional information on the steps USACE will take to locate and assess the quality and quantity of borrow materials that will be used for the project. The soils to be used for construction of levee lifts are supposed to have a plasticity index (PI) values > 10. This may lead to swelling clays being accepted as borrow material. The use of swelling clays may result in volume changes and development of shrinkage cracks in the levee lifts. For this reason, the use of swelling clays (those that plot just below the U-line on the Casagrande plasticity chart because of their high PI values) should be avoided.

Economics: For the economics evaluation, the Panel noted that the documents acknowledged and explained the assumptions used and provided good supporting data. However, based on USACE’s preliminary findings reported in the WBV Draft GRR, there does not appear to be a clear difference between Alternatives 2 and 3 given their similar estimated project costs, project benefits, and safety aspects. The Panel is concerned that the WBV Draft GRR does not provide information on the level of sensitivity to variations of the Expected Annual Damages (EAD) and project costs under Alternatives 2 and 3. If standard deviations and probability distributions related to estimates of both the annual benefits and the annual costs were included, the WBV Draft GRR would provide the information necessary to calculate the standard deviations and probability distributions associated with the net benefits and the benefit-cost ratio (BCR) for each alternative considered. The Panel also is concerned about the assumption that current data for structure inventory, structure values, vehicle inventory, and population, as applied to the HEC Flood Damage Reduction Analysis (HEC-FDA) model for estimating EAD and to the HEC Life Loss/Direct Damage (LifeSim) simulation model for evaluating life safety risks, adequately represent future conditions. This assumption is not supported in the WBV Draft GRR.

Environmental: The Panel recognizes that the WBV Draft GRR has been prepared in compliance with and meets USACE SMART Planning requirements. However, some analyses in the WBV Draft GRR could be clarified or expanded upon to make it more comprehensive. The WBV Draft GRR should provide information on potential impacts to the function of other Federal projects within the study area to clearly document all potential impacts due to implementation of the TSP. The Panel is also concerned about data gaps and outdated information that could affect environmental evaluations, possibly underestimating potential impacts or understating the potential for determining these impacts. Finally, the WBV Draft GRR

should document USACE’s compliance with Executive Order (EO) 13166, which addresses access to services for persons whose proficiency in English is limited.

Table ES-1. Overview of Nine Final Panel Comments Identified by the WBV Draft GRR IEPR Panel

No.	Final Panel Comment
Significance – Medium/High	
1	The HEC-RAS simulations did not include data from several important variables, resulting in increased uncertainty and residual risks.
2	The WBV Draft GRR does not provide information on the level of sensitivity to variations in EAD, project costs, net benefits, or life safety risks under Alternatives 2 and 3 at a level that allows for a clear identification of the NED Plan.
Significance – Medium	
3	The assumption that current data for structure inventory, structure values, vehicle inventory, and population adequately represent future conditions is not supported in the WBV Draft GRR.
4	The WBV Draft GRR lacks information on potential impacts to other Federal projects within the study area.
5	Incorrect assumptions regarding the Mississippi River discharge during hurricane season could impact design water levels, resulting in increased costs due to the possible need to replace floodwalls and construct additional levee lifts.
6	The “I” walls and at least some of the “T” walls would likely experience settlement, which would require future adjustments and increase project costs.
Significance – Medium/Low	
7	The WBV Draft GRR does not document the steps USACE will take to locate and assess the quality and quantity of borrow materials that will be used for the project.
8	Data gaps and outdated information identified in the WBV Draft GRR could affect environmental evaluations, potentially underestimating potential impacts or understating the potential for determining these impacts.
9	The WBV Draft GRR does not document compliance with EO 13166, which addresses access to services for persons whose proficiency in English is limited.

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LIST OF ACRONYMS

2D	Two-Dimensional
3D	Three-Dimensional
AACE	Association for the Advancement of Cost Estimation
ACS	American Community Survey
ADM	Agency Decision Milestone
AEP	Annual Exceedance Probability
BCR	Benefit-Cost Ratio
COI	Conflict of Interest
CW	Civil Works
DrChecks	Design Review and Checking System
EA	Environmental Assessment
EAD	Expected Annual Damages
EC	Engineer Circular
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FS	Feasibility Study
GIS	Geographic Information System
GRR	General Reevaluation Report
H&H	Hydrology and Hydraulic
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEC-LifeSim	Hydrologic Engineering Center-Life Loss/Direct Damage Simulation
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HEP	Habitat Evaluation Procedure
HSDRRS	Hurricane and Storm Damage Risk Reduction System
HTRW	Hazardous, Toxic, and Radioactive Waste

IEPR	Independent External Peer Review
IWR	Institute for Water Resources
L&D	Locks and Dams
LEP	Limited English Proficiency
MR&T	Mississippi River and Tributaries
NED	National Economic Development
NEPA	National Environmental Policy Act
O&M	Operation and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OPSEC	Operations Security
P.E.	Professional Engineer
P.G.	Professional Geologist
P.L.	Public Law
PAR	Population at Risk
PDT	Project Delivery Team
PED	Preconstruction Engineering and Design
PI	Plasticity Index
QA	Quality Assurance
REC	Recognized Environmental Condition
RMC	Risk Management Center
RSLR	Relative Sea Level Rise
SAR	Safety Assurance Review
SLR	Sea Level Rise
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WBV	West Bank and Vicinity
WVA	Wetland Value Assessment

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1. INTRODUCTION

The West Bank and Vicinity (WBV) project is part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). The WBV project currently spans four sub-basins (i.e., geographic areas that are protected by a specific component of the HSDRRS and are independent hydrologic units) and includes 61 miles of perimeter levees, floodwalls, and other appurtenant facilities roughly bordering Lake Cataouatche on the south, and wrapping around to the Mississippi River and Tributaries (MR&T) levee on the east. On the east and north, as an ancillary benefit, the MR&T project levee provides perimeter hurricane and storm damage risk reduction. The project area is highly urbanized.

The WBV project is authorized to provide risk reduction from a storm surge that has 1% annual probability of exceedance under the authority provided by the 4th and 6th supplemental appropriations (Public Law [P.L.] 109-234 and P.L. 110-252) in order to provide the level of risk reduction required for participation in the National Flood Insurance Program. While the project currently provides this 1% level of risk reduction, if future measures to address the combined effects of settlement and subsidence, caused by consolidation, and sea level rise (SLR) are not carried out to maintain the project, it can be concluded that, in the future, the system may not provide a 1% level of risk reduction.

Current project authorities do not include future efforts to address the aforementioned combined effects on the WBV system. However, Section 3017 of P.L. 113-121 does provide this authorization, until it terminates on January 10, 2024. The purpose of the study is to identify whether a National Economic Development (NED) plan exists to reduce life safety risk, economic damages, and risk to the environment and human health due to the combined effects of subsidence, consolidation, and SLR on the WBV levee system.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the WBV, Louisiana Coastal Storm Risk Management Project, Draft General Reevaluation Report (hereinafter: WBV Draft GRR IEPR) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE), Engineer Circular (EC) *Review Policy for Civil Works* (EC 1165-2-217) (USACE, 2018) and the Office of Management and Budget (OMB), *Final Information Quality Bulletin for Peer Review* (OMB, 2004). 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).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, and environmental analyses contained in the WBV Draft GRR IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the WBV Draft GRR IEPR.

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, as described in USACE (2018).

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 engineering, economic, and environmental analyses 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 IEPR of the WBV Draft GRR was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-217). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: economics, environmental resources, hydrology and hydraulic (H&H) engineering, geotechnical engineering, and civil/structural engineering. The Panel reviewed the WBV Draft GRR documents and produced nine Final Panel Comments in response to 34 charge questions provided by USACE for the review. This charge also included two overview questions added by Battelle, for a total of 36 questions. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-217), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2018) in the WBV Draft GRR. The following summarizes the Panel's findings.

Based on the Panel's review, the WBV Draft GRR's main report is well-organized, is concise, and provides supporting documentation on engineering, environmental, economic, and plan formulation issues. The report provided a balanced assessment of the economic, engineering, and environmental issues of the overall project; however, the Panel identified several elements of the project where additional analysis is warranted and places where project findings and objectives need to be documented or clarified.

Engineering: The Panel recognized that USACE has conducted many engineering analyses to address foreseeable factors that could influence the Tentatively Selected Plan (TSP); however, the Panel believes that some items that were not analyzed could impact the effectiveness of the TSP if not taken into consideration. The Panel is concerned that risk and uncertainty remain due to the fact that the Hydrologic Engineering Center-River Analysis System (HEC-RAS) simulations were not validated using Hurricane Katrina and did not take rainfall and increased storm frequency into account. Validating the model with Hurricane Katrina would verify that the assumptions used are reasonable. If the model were further updated to consider increases in rainfall and storm frequency, information on interior areas of inundation and damage would be provided, along with the frequency with which those damages may occur. This additional analysis would reduce risk and uncertainty and more fully reflect the potential impacts in the area under the TSP.

The Panel noted that incorrect assumptions regarding the Mississippi River discharge during hurricane season could impact design water levels, resulting in increased costs due to the possible need to replace floodwalls and construct additional levee lifts. When the potential for increased flood levels is considered with likely settlement under "I" walls and at least some of the "T" walls, future adjustments would be necessary, which would result in additional increases in project costs.

The Panel also believes that the WBV Draft GRR should provide additional information on the steps USACE will take to locate and assess the quality and quantity of borrow materials that will be used for the project. The soils to be used for construction of levee lifts are supposed to have a plasticity index (PI) values > 10 . This may lead to swelling clays being accepted as borrow material. The use of swelling clays may result in volume changes and development of shrinkage cracks in the levee lifts. For this reason, the use of swelling clays (those that plot just below the U-line on the Casagrande plasticity chart because of their high PI values) should be avoided.

Economics: For the economics evaluation, the Panel noted that the documents acknowledged and explained the assumptions used and provided good supporting data. However, based on USACE's preliminary findings reported in the WBV Draft GRR, there does not appear to be a clear difference between Alternatives 2 and 3 given their similar estimated project costs, project benefits, and safety aspects. The Panel is concerned that the WBV Draft GRR does not provide information on the level of

sensitivity to variations of the Expected Annual Damages (EAD) and project costs under Alternatives 2 and 3. If standard deviations and probability distributions related to estimates of both the annual benefits and the annual costs were included, the WBV Draft GRR would provide the information necessary to calculate the standard deviations and probability distributions associated with the net benefits and the benefit-cost ratio (BCR) for each alternative considered. The Panel also is concerned about the assumption that current data for structure inventory, structure values, vehicle inventory, and population, as applied to the HEC Flood Damage Reduction Analysis (HEC-FDA) model for estimating EAD and to the HEC Life Loss/Direct Damage (LifeSim) simulation model for evaluating life safety risks, adequately represent future conditions. This assumption is not supported in the WBV Draft GRR.

Environmental: The Panel recognizes that the WBV Draft GRR has been prepared in compliance with and meets USACE SMART Planning requirements. However, some analyses in the WBV Draft GRR could be clarified or expanded upon to make it more comprehensive. The WBV Draft GRR should provide information on potential impacts to the function of other Federal projects within the study area to clearly document all potential impacts due to implementation of the TSP. The Panel is also concerned about data gaps and outdated information that could affect environmental evaluations, possibly underestimating potential impacts or understating the potential for determining these impacts. Finally, the WBV Draft GRR should document USACE's compliance with Executive Order (EO) 13166, which addresses access to services for persons whose proficiency in English is limited.

4.2 Final Panel Comments

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

The HEC-RAS simulations did not include data from several important variables, resulting in increased uncertainty and residual risks.

Basis for Comment

The hydraulic analysis does not consider the effects of several variables that, if evaluated, would strengthen the analysis results and reduce uncertainty and residual risk. First, the HEC-RAS model used in this analysis was not validated with Hurricane Katrina, which, as stated in Appendix C, p. 39, of the WBV Draft GRR, would be the only storm available for validation of the model. Validating the HEC-RAS model with Hurricane Katrina data would verify that the assumptions used in this analysis are reasonable and the results are realistic.

Rainfall was also not included in the HEC-RAS simulations (WBV Draft GRR, Appendix C, p. 39). Interior areas of inundation could be larger and flood damages higher if rainfall were included.

The HEC-RAS model also did not take into account the effect of increasing storm frequency since 2005. The WBV Draft GRR (Section 5.2.2, p. 87) states that “These added storms may change some of the assumptions about hurricane frequency and ultimately impact the stage-frequency calculations in the river.”

Significance – Medium/High

The HEC-RAS simulations have a strong probability of influencing the project damages and costs. This may affect the choice of Alternative 2 versus Alternative 3.

Recommendations for Resolution

1. Validate the HEC-RAS model using Hurricane Katrina information.
2. Include both rainfall and increasing storm frequency in the HEC-RAS analysis.
3. Update inland hydrology with the latest data.
4. Update HEC-RAS models with the new information.
5. Update the benefit-cost analysis.

Final Panel Comment 2

The WBV Draft GRR does not provide information on the level of sensitivity to variations in EAD, project costs, net benefits, or life safety risks under Alternatives 2 and 3 at a level that allows for a clear identification of the NED Plan.

Basis for Comment

As presented in Chapter 8 and in Appendix J (Economics), the net benefits of Alternative 2 and Alternative 3 differ by a small amount (less than 2%), and the resulting BCRs are also close in value. That suggests that the identification of the NED Plan and the TSP may be sensitive to variations in EAD and project costs under each alternative considered.

Appendix J provides information about the expected annual benefits at the 75, 50, and 25 percentiles, but only provides point estimates of average annual costs. No information is provided about the standard deviation surrounding the estimates of average costs or about the probability distribution of average annual costs at the 75, 50, and 25 percentiles. The application of contingency is a common practice in cost estimation; however, the expected accuracy range for a Class 4 cost estimate, given an 80% confidence interval and after contingency, can range from more than -10% to more than +30% (AACE, 2019).

Inclusion of standard deviations and probability distributions surrounding estimates of both the annual benefits and the annual costs would provide information necessary to calculate the standard deviations and probability distributions surrounding the net benefits and the BCR for each alternative considered. A rigorous evaluation of the potential range of benefits and costs would provide more information about risks and uncertainties and about the differences between alternatives with regard to the economic analysis.

ER 1105-2-101, Risk Assessment for Flood Risk Management Studies (USACE, 2017), provides examples of detailed tables and charts appropriate for relaying probabilistic information about benefits and costs for purposes of comparing alternatives.

Additionally, the 0.5% annual exceedance probability (AEP) design would be more effective and reliable for all storm events when compared to the 1% AEP design, especially given that the analyses in the WBV Draft GRR assume that the levees do not fail prior to overtopping. The potential for levee failure prior to overtopping is difficult to quantify, but it would likely be higher under the 1% AEP design compared to the 0.5% AEP design. If levee failure were to occur, the estimates of residual damages would be higher (and estimates of benefits would be lower) under each of the alternatives considered, as compared to the current estimates in the WBV Draft GRR. If the potential for levee failure is higher under the 1% AEP design, then the associated reduction of the estimated benefits under Alternative 2 could have a greater effect on the calculation of net benefits and the BCR for that alternative, as compared to Alternative 3. The WBV Draft GRR states that fragility curves are not included in the economic modeling for the WBV project, but it does not discuss the specific economic implications of that decision for each of the alternatives considered or for the outcome of the NED Plan.

The WBV Draft GRR evaluated life safety risks for a 1% AEP with intermediate relative sea level rise (RLSR) and a 1% AEP with high RSLR. No life safety risk analysis was conducted for the 0.5% AEP design. The analysis assumes that because the 1% AEP designs with intermediate or high RSLR

Final Panel Comment 2

would result in tolerable life safety risks (average annual life loss of 1 in 10,000), the 0.5% AEP design would also result in tolerable life safety risk. It is likely that a more robust system under the 0.5% AEP design would result in a lower level of life loss as compared with the 1% AEP design. Analysis of life safety risks for the 0.5% AEP design would also provide additional information for comparing benefits between alternatives.

Significance – Medium/High

Incorporating information about the probability distributions surrounding alternative costs in the economic analysis could affect the calculation of net benefits and the BCRs under Alternatives 2 and 3. Information about the potential for levee failure and the economic implications of levee failure could also affect calculations of net benefits and the BCRs. Changes in the outcome of the economic analysis could affect the choice of the NED Plan and the TSP. Consideration of the differences in life safety risks for the 0.5% AEP design versus the 1% AEP design could also influence the choice of the TSP.

Recommendations for Resolution

1. Report the standard deviations and probability distributions related to the costs of each alternative considered.
2. Report the standard deviations and probability distributions related to the net benefits of each alternative considered.
3. Report the standard deviations and probability distributions related to the BCR of each alternative considered.
4. Perform an analysis of life safety risks and average annual life loss for the 0.5% AEP design.
5. Develop fragility curves for the existing levees, the 1% AEP design levees, and the 0.5% AEP design levees to better inform the analysis of these alternatives. Alternatively, if fragility curves cannot be developed, explicitly describe the implications for levee failure on estimated EAD for all alternatives and on the identification of the NED Plan and the TSP.
6. Given the information above, re-evaluate the choice of the NED Plan and the TSP.

AACE (2019). Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Building and General Construction Industries. Association for the Advancement of Cost Estimation. AACE International Recommended Practice No. 56R-08. Revised March 6, 2019.

USACE (2017). Risk Assessment for Flood Risk Management Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) 1105-2-101. July 17.

Final Panel Comment 3

The assumption that current data for structure inventory, structure values, vehicle inventory, and population adequately represent future conditions is not supported in the WBV Draft GRR.

Basis for Comment

The HEC-FDA model provides estimates of EAD and damages reduced based on a number of inputs, including structure inventory, content-to-structure value ratios, and vehicle inventory (based on an assumption of vehicles per household). Estimates of EAD and damages reduced for the WBV alternatives are based on current structure inventory, current content-to-structure value ratios, and current vehicle inventory, not on projections of those inputs for 2073. The actual number of structures, type of structures, value of structures and content, and number of vehicles present in the area in 2073 would likely be different from what is reflected by the current data. According to Table 4-20 in the WBV Draft GRR, the four parishes included in the WBV project are projected to grow by about 7.1 percent between 2020 and 2040, with a 15.8% increase in the number of households during that same time period. These data suggest that the number of structures and number of vehicles in the area would also increase over time. In addition, the value of structures is likely to increase over time, as most real estate and buildings do. Finally, the value of content is also likely to increase over time, since that is estimated using content-to-structure value ratios. There is no discussion or analysis in the WBV Draft GRR indicating that the current data would be reflective of future conditions. Use of current data inputs, as opposed to projected values, likely underestimates the calculations of EAD under all alternatives.

As described in Appendix D, Sections 3.6 through 3.8, the Population at Risk (PAR) is a foundational input to the HEC-LifeSim model, which estimates life loss under different scenarios. The LifeSim model uses 2017 Census population data to estimate the PAR at different geographic locations, instead of incorporating projections of future population levels. That is true for all model scenarios, including those that estimate life loss in 2073. Section 3.8 of Appendix D describes the rationale for not adjusting the population data in the LifeSim model to reflect future population projections as "...the Census reported population estimates for the New Orleans area have leveled off since 2016 and show a slight decline in population" (p. 3-13). Evaluation of population changes over a relatively short period of time (3 years) does not support the assumption of a stable population over a 50-year period (2023–2073). According to Table 4-20 in the WBV Draft GRR, the four parishes included in the WBV project are projected to grow by about 7.1 percent between 2020 and 2040, with no indication that growth would stop at that point. Use of higher population levels in the LifeSim model would result in different estimates of average annual life loss, not only because of the additional people in the area, but also perhaps because of the effects of greater population density within the defined area and the ability of those people to evacuate in a timely manner.

Significance – Medium

Use of current structure inventory, structure values, and vehicle inventory, as opposed to projections of future conditions for those inputs, likely underestimates the calculation of EAD under all alternatives considered. The impact of that underestimation on the NED Plan and the identification of the TSP is unknown.

Final Panel Comment 3

Use of 2017 population data in the LifeSim model could result in an underestimate of average annual life loss in 2073, if the 2073 population is actually greater than current levels. The effect of this assumption on the alternatives considered, including the relative effect between Alternatives 2 and 3, is unknown.

Recommendations for Resolution

1. Support the assumption that current data on structures inventory, content-to-structure value ratios, and vehicle inventory would also reflect 2073 conditions or, alternatively, revise the estimates of EAD for all alternatives using HEC-FDA modeling runs that include future projections of structures inventory, content-to-structure value ratios, and vehicle inventory.
2. Discuss the implications for EAD if 2073 conditions (structures, values, vehicles) are different than current conditions.
3. Support the use of 2017 population data in the LifeSim model or, alternatively, update model inputs to reflect projections of future population.
4. Discuss the implications for life loss estimates if the year 2073 population is greater than the 2017 population data.

Final Panel Comment 4

The WBV Draft GRR lacks information on potential impacts to other Federal projects within the study area.

Basis for Comment

In Section 2.6 of the WBV Draft GRR, Constraints, the following study-specific constraint is listed: “Avoid impacts to the functions of other Federal projects in the vicinity. These projects include but are not limited to the GIWW, MR&T, INHC, SELA, etc.” (p. 18). Under Additional Study Considerations (p. 18), the following text is included under Transfer of Risk: “The study must identify and address any potential transfer of risk to other entities. Increases to economic, life safety, or environmental risk should be avoided and/or minimized.”

The WBV Draft GRR does not include any information or data about potential impacts to the functions of other Federal projects or about potential transfer of risk to other entities. If any significant impacts to the functions of other Federal projects were to be identified, or if the WBV project were found to have the potential to transfer risk to other entities, the Panel assumes that the WBV project would be modified to avoid or minimize those effects. Modifications could result in changes to project costs, EAD or damages reduced, estimated average annual life loss, environmental effects, and the conceptual mitigation plan.

Significance – Medium

Changes to project costs or benefits would result in changes to the calculation of net benefits and the BCRs of the alternatives considered, which could affect the identification of the NED Plan and the TSP. Changes in project design could affect the analyses of environmental impacts, which could also influence the choice of the TSP. Consideration of impacts to other Federal projects could also affect the measures included in the conceptual mitigation plan.

Recommendations for Resolution

1. Analyze potential impacts to other Federal projects in the vicinity for each alternative considered in the WBV Draft GRR.
2. Evaluate the potential for transfer of economic, life safety, or environmental risk to other entities.
3. Describe any necessary changes or modifications that would be made to each alternative as a result of those analyses.
4. Quantify changes to project costs and/or economic benefits under each alternative as a result of modifications to current project designs.
5. Re-evaluate the comparison of alternatives given any revised economic information.
6. Re-evaluate the conceptual mitigation plan given any revisions to project design.
7. Complete a Regional Economic Development analysis to provide additional information about WBV's economic effects within the study area.

Final Panel Comment 5

Incorrect assumptions regarding the Mississippi River discharge during hurricane season could impact design water levels, resulting in increased costs due to the possible need to replace floodwalls and construct additional levee lifts.

Basis for Comment

Small increases in the design water surface elevation will result in larger project costs, particularly for the floodwalls in the project area. For the floodwalls, the assumption is that the walls can be modified if the required increase in wall height is 2 feet or less and that the walls would be replaced if the required increase is greater than 2 feet.

Section 5.2.2, Inland Hydrology, of the WBV Draft GRR indicates that the inclusion of data since 2002 could result in an increase in the mean discharge of the Mississippi River. This increase in discharge is estimated in the report to cause an increase of 0.5 to 1.0 foot in the design water surface elevation. While this is a small increase in the design water surface elevation, it could result in many floodwalls or sections of floodwall having to be replaced instead of being modified. The cost of replacement would be much greater than the cost of modification. This change in design water surface elevation could also increase the number of levee lifts required in some reaches, which would increase the total project cost.

Section 5.2.2 of the WBV Draft GRR also indicates that inclusion of more recent data could change the hurricane frequency by month. This could also result in a change to the mean discharge, resulting in a change to the design water surface elevation. Changes in the mean discharge could result in additional modification and replacement of floodwalls and additional levee lifts.

Significance – Medium

Any increase in the design water surface elevation would increase the total project costs and may affect the choice of Alternative 2 versus Alternative 3.

Recommendations for Resolution

1. Review the current cost estimates for both Alternative 2 and Alternative 3 to determine the cost increase if the design water surface elevation is increased by 1 foot.
2. Discuss the risk associated with this potential increase in project cost in the WBV Draft GRR.
3. Update the hydraulic models during preconstruction engineering and design (PED) to include the most recent available data.
4. Update the design water surface elevation during PED for both Alternative 2 and Alternative 3.
5. Update the benefit-cost analysis during PED to confirm the selected alternative.

Final Panel Comment 6

The “I” walls and at least some of the “T” walls would likely experience settlement, which would require future adjustments and increase project costs.

Basis for Comment

Section 5.1.1, Settlement, of the WBV Draft GRR states that no settlement was assumed for floodwalls. This is an unconservative assumption.

The “I” walls in the project area would settle as the adjacent levee embankment settles, since the walls are not supported on deep piles. As the adjacent levee embankment settles, the “I” wall would move downward along with its supporting soil.

The “T” walls may or may not settle, depending on the specifics of their foundation design. The Panel believes that some percentage of the “T” walls are likely to experience settlement as a result of the planned levee lifts. In some cases, the levee lifts would cause consolidation of the soil surrounding the piles supporting the “T” walls. This consolidation would cause settlement, which would result in negative skin friction on the piles, particularly where the “T” wall ties into the levee embankment.

The Panel found the presentation of data in Appendices A, B, and E to be confusing and difficult to follow. Appendix B includes the settlement calculations for specific levee reaches; however, the Panel was not able to relate those reaches to the information presented in Appendices A and E because the reach names and numbers are inconsistent. Additionally, the Panel had to make several assumptions to follow the method used in Appendix B for calculating the settlement for each reach. As a result, the Panel was not able to estimate the overall impact of these assumptions on the project or on the comparison of alternatives.

Significance – Medium

Settlement of the floodwalls would increase project costs because no settlement was assumed for any of the floodwalls.

Recommendations for Resolution

1. Determine the amount of “I” wall that would need to be modified or replaced due to settlement, and revise the project costs as needed.
2. Estimate the amount of “T” wall that could be affected by settlement. If the data to make this estimate are not readily available, include a contingency to account for needed modifications to or replacement of “T” walls.
3. Revise Appendices A, B, and E to use consistent reach names and numbers.
4. Include the following information for each reach in the appendices: current levee elevation and the required 2057 and 2073 levee elevations for both the 1% and 0.5% events. Additional useful information would be the expected settlement of the existing levee under the without-project condition and the total expected settlement of the with-project levee at both 2057 and 2073.

Final Panel Comment 6

5. Revise Appendix B to better explain how settlements were calculated for each reach.
6. Revise the appendices to include a concise statement or table showing the length of levee embankment, “T” wall, “I” wall, closure structure, and related structural design elements, in each reach.

Final Panel Comment 7

The WBV Draft GRR does not document the steps USACE will take to locate and assess the quality and quantity of borrow materials that will be used for the project.

Basis for Comment

Table 7-3 in the WBV Draft GRR (p. 117) indicates that Alternative 2 and Alternative 3 would require 4.125 million cubic yards and 5.086 million cubic yards of fill, respectively, for the construction of levee lifts. The potential borrow areas would consist of 20-foot-deep parcels of prime farmland, totaling 160 acres for Alternative 2 and 197 acres for Alternative 3 (WBV Draft GRR, Table 7-4, p. 127).

The WBV Draft GRR does not document the steps USACE will follow to locate and assess the quality and quantity of borrow materials. The Panel believes it is unlikely that all initially selected borrow areas would contain clay soil meeting the required specifications for the entire 20-foot depth. The Panel is uncertain if the analysis parameters (above-stated acreage of farmland, and the associated cost estimates) assume that the borrow areas would contain the required quality clay soil for the entire 20-foot depth.

The borrow material specifications stated in Table 7-4 of the WBV Draft GRR requires that the soils to be used for construction of levee lifts have plasticity index (PI) values > 10 . This may lead to swelling clays being acceptable as borrow material. The use of swelling clays may result in volume changes and development of shrinkage cracks in the levee lifts. For this reason, the use of swelling clays (those that plot just below the U-line on the Casagrande plasticity chart because of their high PI values) should be avoided. Therefore, the Panel believes that it is important to outline the steps that would be taken to locate and assess the desired quality and quantity of borrow materials.

Significance – Medium/Low

The required quality and quantity of borrow materials are essential for successful implementation of the project.

Recommendations for Resolution

1. Describe the steps USACE would take to locate and assess the quality and quantity of borrow materials in the WBV Draft GRR.
2. Include in the steps a specific requirement to avoid the use of swelling clays so that shrinkage cracks do not develop in the levee lifts.

Final Panel Comment 8

Data gaps and outdated information identified in the WBV Draft GRR could affect environmental evaluations, potentially underestimating potential impacts or understating the potential for determining these impacts.

Basis for Comment

The Panel identified several areas in the WBV Draft GRR where data gaps could affect the impact analyses:

Section 4.19 provides community, socioeconomic, and environmental justice (EJ) data within the project study area. The data presented were only projected to 2040; however, the level of analysis for the alternatives carried forward is through 2073. These forecasts are presented in Tables 4-20, 4-21, 4-22, and 4-23. Without forecast data through 2073, an analysis is incomplete for these environmental constraints, and potential impacts outlined in Section 7.17.2 may be understated/underestimated.

Section 4.19.1.7 and Table 4-24 provide information regarding race and ethnicity of populations within the project study area. The data presented are from the 2017 American Community Survey (ACS) through the U.S. Census Bureau. Updated information from 2018 is currently available through American Fact Finder (though only for a temporary period of time while the Census Bureau is updating its data retrieval methods/webpage) for the census designated places listed in Table 4-24. It is possible that demographic data have changed for these areas and that the analysis performed is outdated. Section 7.17.2 indicates that impacts to socioeconomics and EJ would be determined on a case-by-case basis once the borrow sites are selected and that potential impacts cannot be estimated. Section 7.1.4 states that borrow sites could be within multiple parishes, and Figure 7-2 provides a graphic illustrating potential borrow sites within the project study area. It is unclear how impacts for EJ communities cannot be calculated for borrow sites when a graphic of potential borrow area locations was provided in Figure 7-2. This is a geographic information system (GIS) analysis based on current and forecasted demographic data. Therefore, the Panel believes that by stating that these impacts cannot be estimated, the potential for impacts at these locations to be determined may, in effect, be understated.

Section 7.18.2 indicates that no direct or indirect impacts would be expected from hazardous, toxic, and radioactive wastes (HTRW) at the borrow areas; however, because the locations of the borrow sites are identified in Figure 7-2 (see above), GIS analysis could be performed in those areas for multiple types of recognized environmental conditions (RECs) as part of a screening assessment. This assessment could evaluate potential impacts from oil and gas wells, pipelines, current regulatory database records through the U.S. Environmental Protection Agency and/or Louisiana Department of Environmental Quality, Superfund sites, etc. Because existing information is available for the borrow sites, the estimated impacts identified in the WBV Draft GRR may be understated.

Significance – Medium/Low

Without current information about forecast data for socioeconomic and EJ communities through 2073 for the project area and borrow sites and for HTRW impacts at potential borrow sites, the justification for implementing the TSP could be affected.

Final Panel Comment 8

Recommendations for Resolution

1. Provide data, analyses, and/or models forecasting socioeconomic and EJ community data through the 2073 analysis year to support alternative selection and impact analyses.
2. Conduct a GIS analysis for potential borrow sites in comparison to existing regulatory databases for potential RECs in these areas and in socioeconomic/EJ communities. Revise the WBV Draft GRR to account for any changes in the analyses based on these data.
3. Revise the community impacts analysis to include current Census Bureau and/or ACS data from 2018, at a minimum.

Final Panel Comment 9

The WBV Draft GRR does not document compliance with EO 13166, which addresses access to services for persons whose proficiency in English is limited.

Basis for Comment

EO 13166, “Improving Access to Services with Persons with Limited English Proficiency,” requires that Federal agencies ensure that their programs and activities are meaningfully accessible to those defined as Limited English Proficiency (LEP) individuals. EO 13166 is also tied into aspects of Title VI of the Civil Rights Act of 1964 and Title VI regulations, which prohibit discrimination based on national origin (LEP, 2020). The Department of Defense has implemented guidance for Federal financial assistance recipients, as an example, providing a uniform framework to make responsible efforts to ensure meaningful access by LEP persons (78 Fed. Reg. 251, December 31, 2013). ER 1105-2-100 (Section 2-7, Environmental Compliance, and Appendix C, Environmental Evaluation and Compliance) states that projects and studies should be in compliance with all applicable Federal environmental statutes and regulations (USACE, 2000).

The census data in Sections 4.19.1.7 and 7.17 of the WBV Draft GRR provide demographic information regarding ethnicity and race and proposed impacts to EJ communities. These sections do not provide information regarding individuals that speak English “less than very well” (LEP persons), regardless of ethnicity and race.

Sections 2.1, 2.5, and 4 of the WBV Draft GRR indicate that documentation of compliance with “applicable Executive Orders” would be performed; however, documentation of compliance with EO 13166 is not provided. Given that EO 13166 is related to community/socioeconomic and EJ considerations and Federal statutes, and EJ communities were documented to be present within the study area, compliance with EO 13166 is applicable.

Significance – Medium/Low

The evaluation for compliance with EO 13166 and LEP guidelines would provide additional support for the selection of alternatives to be considered for analysis, including the TSP.

Recommendations for Resolution

1. Revise Sections 4.19.1.7 and 7.17 of the WBV Draft GRR to include an analysis of LEP communities.
2. Provide an environmental commitment in Section 7.17.4 of the WBV Draft GRR that LEP communities, if present, would be provided meaningful access to project information, notifications, and other aspects of the proposed project now and in the future.
3. Provide information about compliance with LEP guidelines and EO 13166 in Section 10.7 of the WBV Draft GRR that discusses sponsor commitments (as a contributor to financial assistance toward the implementation of the project).

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APPENDIX A

IEPR Process for the WBV Draft GRR Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the major milestones and deliverables of the WBV Draft GRR IEPR. Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by U.S. Army Corps of Engineers (USACE) on December 9, 2019. Note that the actions listed under Task 6, as well as the public comment activities, occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on April 15, 2020. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the WBV Draft GRR IEPR

Task	Action	Due Date
1	Award/Effective Date	10/24/2019
	Review documents available	12/9/2019
	Public comments available ^b	2/11/2020
	Battelle submits draft Work Plan ^a	11/4/2019
	USACE provides comments on draft Work Plan	11/11/2019
	Battelle submits final Work Plan ^a	11/14/2019
2	Battelle submits list of selected panel members ^a	11/12/2019
	USACE confirms the panel members have no COI	11/20/2019
3	Battelle convenes kick-off meeting with USACE	NA
	Battelle convenes kick-off meeting with panel members	12/10/2019
	Battelle convenes kick-off meeting with USACE and panel members	12/11/2019
4	Panel members complete their individual reviews	1/17/2020
	Panel members provide draft Final Panel Comments to Battelle	1/30/2020
5	Panel finalizes Final Panel Comments	2/7/2020
	Battelle submits Final IEPR Report to USACE ^a	2/17/2020
6 ^b	Battelle convenes Comment Response Teleconference with panel members and USACE	3/20/2020
	Battelle submits pdf printout of DrChecks project file ^a	4/15/2020
	Agency Decision Milestone (ADM) meeting ^c	3/26/2020
	Contract End/Delivery Date	11/8/2020

^a Deliverable.

^b Task 6 and the public comment activities occur after the submission of this report.

^c The ADM meeting was listed in the Performance Work Statement under Task 3 but was relocated in this schedule to reflect the chronological order of activities.

At the beginning of the Period of Performance for the WBV Draft GRR IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any

revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 34 charge questions provided by USACE, two overview questions added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the 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 IEPR Panel received an electronic version of the final charge, as well as the review documents and reference/supplemental materials listed in Table A-2.

In addition to the materials provided in Table A-2, the panel members were provided the following USACE guidance documents.

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018 and PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)
- Procedures to Evaluate SLR Change Impacts Responses Adaptation (ETL 1100-2-1 – June 30, 2014)
- Incorporating SLR Change in CW Programs (ER 1100-2-8162 – December 31, 2013).

About halfway through the review, a teleconference was held with USACE, Battelle, and the Panel so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 61 panel member questions to USACE. USACE was able to provide responses to all the questions during the teleconference and provided written responses to all the questions prior to the end of the review.

Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information

Review Documents	No. of Review Pages
Integrated General Reevaluation Report/EIS	231
Appendix A: Civil Engineering	25
Appendix B: Geotechnical Engineering	32
Appendix C: Hydrology and Hydraulics	42
Appendix D: Semi-Quantitative Risk Assessment	306
Appendix E: Structural Engineering	27
Appendix F: Real Estate	13
Appendix G: Environmental	51
Appendix H: HTRW	5
Appendix I: Cost Engineering	8
Appendix J: Economics	22
Appendix K: Mitigation Plan	76
Appendix L: Coordination	74
Total Number of WBV Review Pages	912
Public Comments ^a	100
Supplemental Information ^b	No. of Review Pages
Risk Register	20
Total Number of Reference Pages	20

^a USACE will submit public comments to Battelle upon their availability according to the schedule in Table A-1. Battelle will in turn submit the comments to the IEPR Panel for review. A separate Addendum to the Final Report will be submitted if additional Final Panel Comments are necessary.

^b Supporting documentation only. These documents are not for Panel review and were used as information sources only. They were not included in the total page count.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form 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. At the end of the review, Battelle summarized the individual comments into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

A.3 IEPR Panel Teleconference

Battelle facilitated a 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 should 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 significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed 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 WBV Draft GRR 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 a summary email 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 members 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/high, medium, medium/low, and 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:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.
 5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- Guidelines 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).

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, nine 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 full text of the Final Panel Comments is presented in Section 4.2 of the main report.

A.5 Final IEPR Report

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings. Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

A.6 Comment Response Process

As part of Task 6, Battelle will enter the nine Final Panel Comments developed by the Panel into USACE's 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 IEPR results.

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APPENDIX B

Identification and Selection of IEPR Panel Members for the
WBV Draft GRR Project

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B.1 Panel Identification

The candidates for the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project, Draft General Reevaluation Report (hereinafter: WBV Draft GRR IEPR) Panel were evaluated based on their technical expertise in the following key areas: economics, environmental resources, hydrology and hydraulic (H&H) engineering, geotechnical engineering, and civil/structural engineering. These areas correspond to the technical content of the review documents and overall scope of the WBV Draft GRR project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected five experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or COIs. These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate's employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

“...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.”

The term “firm” in a screening question referred to any joint venture in which a firm was involved. It applied to any firm that serves in a joint venture, either as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project Draft General Reevaluation Report

1. Previous and/or current involvement by you or your firm in the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project Draft General Reevaluation Report (GRR) (hereinafter: WBV Draft GRR) and Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS) related projects.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project Draft General Reevaluation Report

2. Previous and/or current involvement by you or your firm in coastal storm risk management and the general area surrounding New Orleans, Louisiana, from Lake Pontchartrain to the West Bank.
3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the vicinity of the WBV Draft GRR project, including Greater New Orleans HSDRRS-related projects.
4. Current employment by the U.S. Army Corps of Engineers (USACE).
5. Previous and/or current involvement with paid or unpaid expert testimony related to the WBV Draft GRR project and Greater New Orleans HSDRRS-related projects.
6. Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups (*for pay or pro bono*):
 - Louisiana Coastal Protection and Restoration Authority
 - Southeast Louisiana Flood Protection Authority – East
 - Southeast Louisiana Flood Protection Authority – West
 - Lake Pontchartrain Basin Foundation
 - Pontchartrain Levee District
 - Orleans Levee District
 - East Jefferson Levee District
 - Lake Borgne Levee District
 - West Jefferson Levee District
 - Levees.Org
 - Jefferson Parish
 - Orleans Parish
 - St. Bernard Parish
 - St. Charles Parish
 - Plaquemines Parish
7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the general area surrounding New Orleans, Louisiana, from Lake Pontchartrain to the West Bank.
8. 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.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project Draft General Reevaluation Report

9. Previous or current involvement with the development or testing of models that were used for, or in support of, the WBV Draft GRR project.

Note: This project included the following models – Hydrologic Engineering Center’s (HEC) – Flood Damage Reduction Analysis (FDA) 1.4.2; HEC-LifeSim Version 1.0.1; Wetland Value Assessment (WVA) Coastal Marsh Community Models for Civil Works (CW), Version 2.0; WVA Bottomland Hardwoods Community Model for CW, Version 1.2; WVA Swamp Community Model for CW, Version 2.0; HEC-River Analysis System (RAS) 5.0.6

10. Current firm 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. Please explain.

11. Any previous employment by 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.

12. Any previous employment by USACE as a contractor (either as an individual or through your firm) 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.

13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning coastal storm risk management and include the client/agency and duration of review (approximate dates).

14. Pending, current, or future financial interests in contracts/awards from USACE related to the WBV Draft GRR project and Greater New Orleans HSDRRS-related projects.

15. Significant portion of your personal or office’s revenues within the last three years came from USACE contracts.

16. Significant portion of your personal or office’s revenues within the last three years came from Louisiana Coastal Protection and Restoration Authority contracts.

17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the WBV Draft GRR project and Greater New Orleans HSDRRS-related projects.

18. Participation in relevant prior and/or current Federal studies related to the WBV Draft GRR project and Greater New Orleans HSDRRS-related projects.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project Draft General Reevaluation Report

19. Previous and/or current participation in prior non-Federal studies related to the WBV Draft GRR project and Greater New Orleans HSDRRS-related projects.

20. Has your research or analysis been evaluated as part of the WBV Draft GRR project?

21. 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? If so, please describe.

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.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. 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 selected the final Panel.

Table B-1. WBV Draft GRR IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Economics					
Susan Walker	Harvey Economics	Denver, CO	M.S., Forest Economics	N/A	16
Environmental Resources					
David Young	Blanton & Associates, Inc.	Houston, TX Area	B.S., Marine Biology	N/A	26
H&H Engineering					
David Love	Independent consultant	Boulder, CO	B.S., Engineering Physics	Yes	45
Geotechnical Engineering					
Abdul Shakoor	Independent consultant	Kent, OH	Ph.D., Engineering Geology	N/A	45+
Civil/Structural Engineering					
Michael Lambert	Independent consultant	Pulaski, TN	M.E., Civil Engineering	Yes	30

Table B-2 presents an overview of the credentials of the final five members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information on the panel members and their areas of technical expertise is given in Section B.3.

Table B-2. WBV Draft GRR IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Walker	Young	Love	Shakoor	Lambert
Economist					
Minimum M.S. degree or higher	X				
At least 10 years of demonstrated experience in applied economics related to water resources economic evaluation and review	X				
Familiarity with USACE Civil Works policy and procedure, including flood risk management projects as well as the cost benefit evaluation process	X				
Knowledge of the USACE Hydraulic Engineering Center (HEC) - FDA (Flood Damage Analysis) and LifeSim models	X				
Environmental Resources Specialist					
Minimum M.S. degree or higher in a related field		W ¹			
At least 10 years of experience directly related to environmental evaluation or review		X			
Knowledge and experience with National Environmental Policy Act (NEPA) processes including mitigation analysis using the Wetland Value Assessment methodology		X			
Knowledge and experience evaluating environmental effects of proposed projects along coastal systems		X			
Familiarity with the habitat, and fish and wildlife species that may be affected by the project alternatives in this study area		X			
H&H Engineer					
Registered Professional Engineer			X		
Minimum of 10 years of experience in their area of expertise			X		
Experienced with all aspects of hydrology and hydraulic engineering including design experience with multi-million dollar flood risk or coastal storm risk management projects			X		

Table B-2. WBV Draft GRR IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Walker	Young	Love	Shakoor	Lambert
Familiarity with Hydraulic Engineering Center (HEC) modeling computer software or equivalent commercial software including HEC - River Analysis System (RAS)			X		
Familiarity with the ADCIRC model, MATLAB, and levee and floodwall overtopping equations			X		
Geotechnical Engineer					
Registered Professional Engineer				W ¹	
Minimum of 10 years of experience in geotechnical engineering				X	
Minimum M.S. degree or higher				X	
Demonstrated experience in the design and construction of multi-million dollar flood risk or coastal storm risk management projects including levees and floodwalls				X	
Experience in risk assessment of levees, evaluation of risk reduction measures				X	
Knowledge of current levee safety design standards as well as USACE dam safety guidance				X	
Civil/Structural Engineer					
Registered Professional Engineer					X
Minimum of 10 years of experience in civil or structural engineering					X
Minimum M.S. degree or higher					X
Demonstrated experience in the design and construction of critical infrastructure including levee and floodwall design and construction					X
Experience in risk assessment of levees and evaluation of risk reduction measures					X
Knowledge of current levee safety design standards as well as USACE dam safety guidance					X
Safety Assurance Review					X

¹ USACE agreed to waive this discipline criteria based on additional years of experience.

B.3 Panel Member Qualifications

Detailed biographical information on each panel members’ credentials and qualifications and areas of technical expertise are summarized in the following paragraphs.

Name	Susan Walker
Role	Economist
Affiliation	Harvey Economics

Ms. Walker is the Director of Harvey Economics located in Denver, Colorado. She has a M.S. in forest economics from Colorado State University and a B.S. in forest management from the University of Vermont. She has over 16 years of experience in applied economics and planning and 14 years of experience working with Federal agencies, including USACE, on environmental impact statement (EIS) projects. Her work largely focuses on planning activities related to water, energy, tourism, and other natural resource sectors.

Ms. Walker’s project work includes quantification of benefits, cost-benefit analysis, financial research and data analysis, economic modeling, socioeconomic impact analysis, flood damage assessment, and demographic research, among other capabilities. She has extensive project experience evaluating economic benefits and impacts resulting from changes in water quality/availability and from water development and infrastructure projects. Ms. Walker has completed work for municipalities, utilities, special districts, private industry, and county, state, and Federal agencies. Her expertise includes development of custom models to meet the specific needs of individual clients, as well as utilization of existing models to evaluate economic impacts. She is familiar with the HEC-FDA and LifeSim models, having worked on similar types of models related to flood damage.

Since 2005, Ms. Walker has been working to complete various components of the Halligan Water Supply Project EIS, Colorado. This project, led by USACE, focuses on the expansion of the reservoir. Early on, she developed water demand projections for the City of Fort Collins to support the purpose and need analysis and has updated those projections in recent years. Her work included analyses of project costs and socioeconomic impacts, including construction benefits, impacts to water rates and tap fees, and agricultural effects. She also completed evaluations of recreational and land use impacts, including the impacts on recreational activity and quality of experience. Ms. Walker quantified project impacts and determined the geographic extent, duration, and magnitude of resource effects.

Between 2005 and 2016, Ms. Walker also completed a socioeconomic impact analysis for the Denver Water’s Moffat Collection System EIS under the direction of USACE. This project focused on the potential expansion of Gross Reservoir and several alternatives. She reviewed the purpose and need for the project and evaluated the socioeconomic impacts, addressing construction benefits, tourism and business impacts, public facility and social service impacts, fiscal impacts, water rate effects, changes in property values, and environmental justice issues.

Ms. Walker estimated the value of benefits to water providers, recreational users, and habitat and aquatic life from a reduction in nutrients in lakes and streams for the Nutrient Regulation Cost/Benefit Study, conducted for the Water Quality Control Division of Colorado. For that 2012 effort, she developed detailed cost-benefit models incorporating the annual capital and operating costs to point source dischargers and

estimated benefits of nutrient reduction over a 20-year period. Cost-benefit models were developed by region and at the statewide level for three levels of regulation.

For an interstate stream commission’s cost-benefit study, conducted in 2014 and 2015, Ms. Walker identified project beneficiaries, annual water yields, and detailed cost schedules that provided an economic basis for the prioritization and funding of 15 individual water development projects in New Mexico. She quantified the economic benefits of each project to municipal and industrial uses, recreational activity, environmental uses, and the agricultural industry; she also addressed non-monetary project benefits. Her cost-benefit model for that project compared project-specific costs and benefits over a 50-year period.

For the White River Reservoir Feasibility Study (FS), Ms. Walker evaluated the need for and economic benefits of a potential new reservoir in western Colorado. She conducted an analysis of future water demands for municipal use, energy development, and recreation and environmental purposes and worked to quantify benefits to each sector from additional regional water storage. Using projected capital and operating costs, Ms. Walker completed a cost-benefit analysis for three alternatives. A financing plan identified potential project partners, associated benefits, and cost shares. This work began in 2014 and is ongoing.

In 2016, Ms. Walker completed an economic analysis for Wyoming’s New Fork Lake Dam Enlargement project that was intended to increase storage volume in New Fork Lake, located on U.S. Forest Service land. For three alternatives, she evaluated the potential benefits to recreation, fisheries, public safety, flood damage and control, fire suppression, and agricultural operations resulting from reservoir enlargement and rehabilitation. She developed long-term cost-benefit models, incorporating all project costs and benefits over a 50-year period.

Working for the Wyoming Water Development Commission on the Glendo Reservoir Full Utilization Study – Benefits and Costs, Ms. Walker quantified the economic costs and benefits associated with re-operation of the reservoir that is located in southeastern Wyoming. Flood damage and related benefits were considered in this project. She evaluated costs and benefits to recreational amenities and State Park finances; hydropower generation; agricultural productivity and access to irrigation water supplies; and environmental amenities. This 2018 project involved the Bureau of Reclamation, USACE, the States of Wyoming and Nebraska, and several State of Wyoming agencies.

Name	David Young
Role	Environmental Resource Specialist
Affiliation	Blanton & Associates, Inc.

Mr. Young is an environmental/NEPA impact assessment consultant with Blanton & Associates who earned his B.S. in marine biology from Texas A&M University at Galveston in 1993. He has 26 years of experience in wetland delineation, environmental assessments (EAs), water quality, and NEPA, and has been directly involved with water resource evaluation and NEPA assessments for more than 15 years. He is familiar with the coastal systems of the Gulf Coast and with evaluating environmental effects of proposed projects along coastal systems, including familiarity with the habitat, fish and wildlife that may be affected by various project alternatives. He has experience with the United States Fish and Wildlife Service’s (USFWS) Habitat Evaluation Procedure (HEP), from which the Wetland Value Assessment (WVA) methodology was developed in Louisiana. The metrics used in WVA are community focused and

the communities identified in the WVA are similar, if not identical, to those in other wetland assessment methodologies that Mr. Young has utilized and is intimately familiar with in Texas and throughout the Gulf Coast. These include, but are not limited to, the Wetland Evaluation Technique and Wetland Rapid Assessment Procedure, as well as the Hydrogeomorphic Approach in Texas. He has an extensive understanding of wetland assessment methodologies and techniques that are interrelated with the WVA methodology. Throughout his career, he has been tasked with performing cumulative effects analyses for multi-objective public works projects, which include dam safety, flood control and management, navigation channel improvement projects, transportation, linear (utility), seismic exploration (geophysical exploration) on Federal lands, nuclear waste, and oil and gas prospect development on Federal lands.

Mr. Young has served as a NEPA, biology/ecology, and environmental expert for six IEPR reviews: the Mohawk Dam Major Rehabilitation Report, Chatfield Storage Reallocation Study and EIS Statement, Isabella Lake Dam Safety Modification Project, Leon Creek Watershed FS, Hunting Bayou Flood Risk Management Study (for the Harris County Flood Control District), and Whittier Narrows Dam Safety Modification IEPR. Several of these studies included HEP evaluation, for which he was responsible for reviewing and identifying any potential technical issues. As stated above, the HEP was the founding methodology used to develop the WVA. Mr. Young has also managed and provided technical support for the Houston Ship Channel-Placement Areas 14 and 15 navigational dredging project (USACE Galveston District). This project involved maintenance dredging of the Houston Ship Channel and the placement of dredged material for beneficial uses at Placement Areas 14 and 15. The project had potential impacts on environmental, estuarine, and coastal processes and on affected sensitive habitats such as oyster reef, seagrass beds, wetlands, and shallow-water estuarine ecosystems. HEP evaluations were performed for the project. It required the development of scope and appropriate methodologies for assessing impacts and involved a multitude of public and private (non-governmental) interests. As stated above, the HEP was the founding methodology used to develop the WVA.

Mr. Young also managed and provided technical support for two flood control projects for Harris County Flood Control District: Hunting Bayou Detention Basin and White Oak Bayou Detention Basin. In both projects, an EA/Finding of No Significant Impact (FONSI) was prepared to evaluate the potential effects from the construction of a proposed regional stormwater retention/detention area to provide flood protection and enhance water quality to the citizens within the watershed. Federal Emergency Management Agency (FEMA) was the Federal sponsor, and the EA/FONSI was prepared in accordance with FEMA guidelines. The preparation of the EA/FONSI also included various environmental technical documents and public involvement activities.

Mr. Young has prepared several EA/FONSIs for proposed three-dimensional (3D) seismic survey projects, which involved extensive coordination with the National Park Service, U.S. Forest Service, and USFWS. These 3D seismic surveys included cumulative effects analysis for seismic exploration and oil and gas field development over extensive project areas (one project exceeded 80 square miles). Pre-plot surveys were conducted to provide avoidance measures to seismic drilling activities. An assessment for vegetation communities within the project area was documented using spatial and statistical analyses that were coordinated with the Federal agency. Impacts on sensitive habitats (freshwater marsh, freshwater cypress/tupelo swamp, and brackish marshes) were also assessed. All activities, including scoping, were coordinated with various Federal, state, local, and non-governmental stakeholders.

Mr. Young's experience in the management and preparation of EA/FONSIs also includes transportation projects for the Texas Department of Transportation. These projects required the preparation and technical review of various technical reports, including, but not limited to, hazardous materials; regulatory

permitting; management of archeological and historic resources studies in central Texas (including tribal interests); biological assessments and other sensitive habitats (including habitat for central Texas indigenous fish and wildlife species); socio-economical/community resources reviews; indirect and cumulative impact assessments; and public involvement. These projects involved various project trade-offs, such as avoidance/minimization of impacts for one constraint versus others, balancing the purpose and need, and public-perceived controversy. His project experience routinely involved Clean Water Act and Endangered Species Act compliance and coordination.

Mr. Young has been directly involved with water resource environmental evaluation or review and NEPA for more than 10 years, having prepared numerous NEPA documents for public and private clients, including USACE. His experience is highlighted by managing, preparing, and/or providing support on numerous Programmatic Categorical Exclusions, Categorical Exclusions, EAs/FONSI, and EISs. He has attended numerous training efforts on various aspects of NEPA, including Section 106 coordination, and state (Florida, Arizona, Texas) Department of Transportation processes related to NEPA compliance.

Name	David Love, P.E.
Role	H&H Engineering
Affiliation	Independent consultant

Mr. Love has more than 45 years of experience in civil and water resource engineering specializing in drainage and flood control projects. He holds a B.S. in engineering physics from the Colorado School of Mines and has completed graduate coursework in hydraulics at the University of Colorado. He is also certified as a Professional Engineer (P.E.) in Colorado.

Mr. Love has completed dozens of floodplain and major drainageway master plans, all of which have included H&H engineering related to flood risk. The South Platte River Flood Control Improvement project in Denver, Colorado, is an example of many large, complex projects with multiple project stakeholders on which he has worked. Mr. Love was the Engineer of Record for the 2009 South Platte River Globeville and North Areas Flood Control and Greenways Project. This project was the single largest flood control project undertaken by either the Urban Drainage and Flood Control District or the City and County of Denver. It included master planning, final design, construction oversight, hydraulic modeling, and floodplain remapping for the project and obtained a Letter of Map Revision from FEMA. This project removed more than 300 acres of land within Denver from the 100-year floodplain through the design and construction of flood levees, while improving fish passage and constructing greenway trails and aquatic and terrestrial habitats. As a result, the project was named the Outstanding Flood Control Project constructed in 2009 by the Colorado Association of Stormwater and Floodplain Managers.

Mr. Love is fluent in the use of HEC-RAS. He is qualified in Federal Court as an expert witness in the use of HEC-RAS for hydraulic analysis and floodplain definition. His former firm, where he was President and Principal Engineer (Love & Associates, Inc.), was a Limited Map Maintenance Program Study Contractor for FEMA Region 8 for limited map revisions, and he is the Engineer of Record for dozens of regulatory flood studies which utilized HEC-RAS. Mr. Love has also testified in court on a flood levee failure in Adams County, Colorado, and irrigation dam failure in Boulder County, Colorado. His testimonies required the utilization of levee overtopping equations and analysis as well as levee failure and analysis. Approximately half of Mr. Love's project history has been related to the design and preparation of construction documents, followed by a quality assurance (QA) role during construction activities. The QA

experience has ranged from periodic site visits to observe construction activities to full-time construction management.

Mr. Love is familiar with the ADCIRC storm surge and flooding prediction model and has found it to be similar in nature to the two-dimensional (2D) floodplain models he has worked with to define floodplains. He is also familiar with the technical computing capabilities of MATLAB.

Mr. Love has been a featured speaker at several professional conferences and has given multiple engineering-related lectures at the University of Colorado’s Schools of Engineering and Environmental Design at Boulder, Colorado. He has also taught construction inspection courses to multiple public works employees. Mr. Love is a previous member of the American Society of Civil Engineers, American Council of Engineering Consultants, Colorado Association of Stormwater and Floodplain Managers, Association of State Floodplain Managers, and National Society of Professional Engineers, and was past president of the Professional Engineers of Colorado, Boulder Chapter.

Name	Abdul Shakoor, Ph.D., P.G.
Role	Geotechnical Engineer
Affiliation	Independent consultant

Dr. Shakoor is an emeritus professor of engineering geology at Kent State University and an independent consultant. He earned a M.S. in engineering geology from The University of Leeds (England) in 1968 and a Ph.D. in engineering geology from Purdue University in 1982. He is a registered professional geologist (P.G.) in Pennsylvania and a certified professional geologist (CPG) by the American Institute of Professional Geologists. He has more than 45 years of academic and practical experience in engineering geology/geotechnical engineering, environmental geology, hydrogeology, dam engineering, soil mechanics, rock mechanics, rock slope stability, foundation engineering, and remote sensing.

Dr. Shakoor’s research interests include the engineering behavior of weak rocks (shales, claystones, mudstones, etc.); stability of slopes in both soils and rocks; evaluation of construction materials; influence of geologic characteristics on engineering properties/behavior of soils and rocks; piping problems associated with dams, river banks, and lakes; and environmental hazards such as lakeshore erosion, mine subsidence, and structural damage due to expansive soils and blasting operations. Many of his research projects are conducted in collaboration with local engineering firms or government organizations such as the Ohio Department of Transportation, state geological surveys, the National Park Service, and the U.S. Environmental Protection Agency. He is a co-author of the book *Geology Applied to Engineering*, published by Waveland Press.

Having served as an engineering geology expert on IEPR panels for the Dover, Bolivar, and Mohawk Dams (Ohio), Zoar Levee and Diversion Dam (Ohio), Bluestone Dam (West Virginia), the Lake Isabella Dam (California), the Center Hill Dam (Tennessee), and the Westminster, East Garden Grove, California, Flood Risk Management FS, Dr. Shakoor has gained considerable experience in flood control and storm risk management, failure mode analysis for embankment dams and levees, risk assessment for embankment dams and levees, and evaluation of risk reduction measures for dams and levees. He has extensive experience in design and construction of multi-million dollar flood risk or coastal storm risk management projects, including levees, seawalls, and diversion techniques. He is familiar with all applicable USACE guidance criteria, including USACE dam safety guidance and procedures and current levee safety design standards.

Dr. Shakoor is an honorary member of the Association of Environmental and Engineering Geologists, a fellow of the Geological Society of America, and a member of the American Society of Civil Engineers.

Name	Michael Lambert, P.E.
Role	Civil/Structural Engineering
Affiliation	Independent consultant

Mr. Lambert is an independent consultant with more than 30 years of direct geotechnical and soil engineering experience. As a former geotechnical engineer with Shannon and Wilson, Inc., he oversaw site investigations, developed geotechnical-related design and construction recommendations, developed and reviewed project plans and specifications, and monitored compliance with project plans and specifications. He earned his M.E. in civil engineering from the University of Louisville in 1988 and is a registered P.E. in Missouri, Arkansas, Oregon, Tennessee, and California.

Mr. Lambert has been involved with pre-construction flood risk management projects such as Howard Bend Levee, Missouri; Yakima River Levee, Washington; and the Missouri Bottom Levee System, Missouri. Post-construction flood risk management projects include St. Louis City Flood Wall Evaluation; Stockton, California, Levee Evaluation/Design for the Department of Water Resources; Lewiston, Idaho, Levee; Chesterfield Levee, Missouri; East St. Louis Flood Protection Project, Illinois; Marine Corps Base Camp Pendleton Air Station Levee, California; City of Reedsport Levee, Oregon; and Coweeman Levee, Washington. For each of these projects, design activities were conducted in accordance with USACE methods and criteria. In addition, risk and fragility analysis concepts, uncertainty, residual risk, and the potential for loss of life were considered as part of each project.

Mr. Lambert is experienced with the geotechnical aspects of urban levees, floodwalls, earthen levees, and channel structures along large river systems, including the Mississippi River, Ohio River, Missouri River, and Illinois River. Relevant urban levee projects have included support for the Howard Bend Levee System in Maryland Heights, Missouri, and the City of St. Louis Floodwall along the Mississippi River. He has also performed inspections for more than 484 miles of USACE levees and over 56 miles of U.S. Bureau of Reclamation irrigation canals. His experience with floodwall design and construction is demonstrated by the Howard Bend Levee System in Maryland Heights. As senior geotechnical engineer and project manager, he was responsible for reconstruction and upgrading to provide protection from a 500-year flood event. The flood protection system included earthen levee floodwalls, closure structures, and a pump station. Engineering and design evaluations of channel structures conducted by Mr. Lambert include several locks and dams (L&D) along the Mississippi River (L&D 25 and Mel Price), and Ohio River (Olmsted, L&D 52, L&D 53, Canelton Lock, and Markland Lock).

All of these projects, including the non-USACE projects, were completed in accordance with USACE guidance, including USACE’s safety assurance review (SAR) policy and guidance and applicable risk assessment methodology. Mr. Lambert has served on the Type I IEPR for the Phase II Post-Authorization Decision Documents for the Sacramento River Bank Protection Project, California; the Delaware River Basin Comprehensive Flood Risk Management Interim FS and Integrated Environmental Assessment for New Jersey; the Aliso Creek Mainstem Ecosystem Restoration Study Draft integrated Feasibility Report, Orange County, California; and multiple Type II IEPR teams for levee projects, including two projects for the Chesterfield-Monarch Levee, six projects for the Wood River Levee System, three projects for the East St. Louis Flood Protection System, and one project for the mainline Mississippi River Levee in Tunica, Mississippi. For each of these reviews Mr. Lambert addressed the SAR requirements.

APPENDIX C

Final Charge for the WBV Draft GRR IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the West Bank and Vicinity (WBV), Louisiana Coastal Storm Risk Management Project, Draft General Reevaluation Report

This is the final Charge to the Panel for the WBV Draft GRR IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on November 14, 2019. The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

The West Bank and Vicinity (WBV) project is part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). The WBV project currently spans four sub-basins (i.e., geographic areas protected by a specific component of HSDRRS and are independent hydrologic units) and includes 61 miles of perimeter levee, floodwalls, and other appurtenant facilities roughly bordering Lake Cataouatche on the south, and wrapping around to the Mississippi River and Tributaries (MR&T) levee on the east. On the east and north, the MR&T project levee, as an ancillary benefit, provides perimeter hurricane and storm damage risk reduction. The project area is highly urbanized.

The WBV project is authorized to provide risk reduction from a storm surge that has 1% annual probability of exceedance under the authority provided by the 4th and 6th supplemental appropriations (P.L. 109-234 and P.L. 110-252) in order to provide the level of risk reduction required for participation in the National Flood Insurance Program (NFIP). While the project currently provides this 1% level of risk reduction, if future measures to address the combined effects of consolidation, settlement, subsidence, and sea level rise are not carried out to maintain the project, it can be concluded that in the future the system may not provide a 1% level of risk reduction.

Current project authorities do not include future efforts to address the aforementioned combined effects on the WBV system. However, Section 3017 of P. L. 113-121 does provide this authorization, until it terminates on January 10, 2024. The purpose of the study is to identify whether a National Economic Development (NED) plan exists to reduce life safety risk, economic damages, and risk to the environment and human health due to the combined effects of subsidence, consolidation, and sea level rise on the WBV levee system.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the West Bank and Vicinity (WBV), Louisiana, Coastal Storm Risk Management Project Draft General Reevaluation Report (hereinafter: WBV Draft GRR IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Review Policy for Civil Works* (Engineer Circular [EC] 1165-2-217, dated February 20, 2018), and the Office of Management and Budget's (OMB'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 products.

The purpose of the IEPR is to “assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions” (EC 1165-2-217; p. 39) for the decision 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) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be “charged” for each project with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-217 (p. 41), 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 each project review. The review assignments for the panel members may vary slightly according to discipline.

Review Documents	No. of Review Pages	Subject Matter Experts				
		Economist	Environmental Resources Specialist	Hydrology and Hydraulic Engineer	Geotechnical Engineer	Civil/ Structural Engineer
West Bank and Vicinity Report Documentation						
Integrated General Reevaluation Report/EIS	231	231	231	231	231	231
Appendix A: Civil Engineering	25					25
Appendix B: Geotechnical Engineering	32				32	32
Appendix C: Hydrology and Hydraulics	42			42		
Appendix D: Semi-Quantitative Risk Assessment	306	306	306	306	306	306
Appendix E: Structural Engineering	27					27
Appendix F: Real Estate	13	13	13			
Appendix G: Environmental	51		51			
Appendix H: HTRW	5		5			
Appendix I: Cost Engineering	8	8				8

Review Documents	No. of Review Pages	Subject Matter Experts				
		Economist	Environmental Resources Specialist	Hydrology and Hydraulic Engineer	Geotechnical Engineer	Civil/ Structural Engineer
Appendix J: Economics	22	22				
Appendix K: Mitigation Plan	76		76			
Appendix L: Coordination	74		74			
Total Number of WBV Review Pages^a	912	580	756	579	569	629
Public Review Comments ^b	100	100	100	100	100	100
Supplemental Information						
Risk Register	20	20	20	20	20	20
Total Number of Reference Pages	20	20	20	20	20	20

^a Option 2 will be implemented if the total number of review pages exceeds 1,160 ± 20%.

^b The public comment page count was not included in the overall review pages because those hours will be considered separately and Options 1 or 3 will be implemented if they increase.

Documents for Reference

- Review Policy for Civil Works, (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018; PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)
- ETL 1100-2-1 – Procedures to Evaluate SLR Change Impacts Responses Adaptation
- ER 1100-2-8162 – Incorporating SLR Change in CW Programs.

SCHEDULE & DELIVERABLES

This schedule is based on the receipt date of the final review documents for each review and may be revised if review document availability changes. This schedule may also change due to circumstances out of Battelle's control, such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel members will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with MS Word (Office 2003).

Task	Action	Due Date
Meetings	Subcontractors complete mandatory Operations Security (OPSEC) training	1/2/2020
	Battelle sends review documents to panel members	12/10/2019
	Battelle convenes kick-off meeting with panel members	12/11/2019
	Battelle convenes kick-off meeting with USACE and panel members	12/12/2019
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	1/6/2019
Review	Panel members complete their individual reviews	1/13/2020
	Battelle provides talking points for Panel Review Teleconference to panel members	1/15/2020
	Battelle convenes Panel Review Teleconference	1/16/2020
	Battelle provides Final Panel Comment templates and instructions to panel members	1/17/2020
	Panel members provide draft Final Panel Comments to Battelle	1/24/2020
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	1/25/2020 - 2/2/2020
	Panel finalizes Final Panel Comments	2/3/2020
Public Comment Review	Battelle receives public comments from USACE	2/12/2020
	Battelle sends public comments to Panel	2/13/2020
	Panel completes its review of public comments	2/19/2020
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	2/20/2020
	Panel drafts Final Panel Comment for public comments, if necessary	2/25/2020
	Panel finalizes Final Panel Comment regarding public comments, if necessary	2/27/2020
Final Report	Battelle provides both Final IEPR Reports to panel members for review	2/7/2020
	Panel members provide comments on both Final IEPR Reports	2/12/2020
	*Battelle submits both Final IEPR Reports to USACE	2/14/2020**
	USACE Risk Management Center (RMC) provides decisions on both Final IEPR Reports acceptance	2/24/2020
Comment Response Process	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	2/26/2020
	Battelle convenes teleconference with Panel to review the Comment Response process	2/26/2020

Task	Action	Due Date
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE RMC for review	3/13/2020
	USACE RMC reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	3/19/2020
	USACE RMC provides draft PDT Evaluator Responses to Battelle	3/20/2020
	Battelle provides draft PDT Evaluator Responses to panel members	3/24/2020
	Panel members provide draft BackCheck Responses to Battelle	3/27/2020
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	3/30/2020
	Battelle convenes Comment Response Teleconference with panel members and USACE	3/31/2020
	USACE inputs final PDT Evaluator Responses to DrChecks	4/7/2020
	Battelle provides final PDT Evaluator Responses to panel members	4/8/2020
	Panel members provide final BackCheck Responses to Battelle	4/13/2020
	Battelle inputs panel members' final BackCheck Responses to DrChecks	4/14/2020
	*Battelle submits pdf printout of DrChecks project file	4/15/2020
	Contract End/Delivery Date	11/8/2020

* Deliverables

** Assumes USACE awards a Mod to the Contract for an Addendum to the Final Report for the Public Comment Review

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and 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 decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Some sections have no questions associated with them; however, you may still 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 that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-217).

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 each 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 Lynn McLeod (mcleod@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod (mcleod@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 the Project Manager, no later than 10 pm ET by the date listed in the schedule above.

**Independent External Peer Review of the
West Bank and Vicinity (WBV), Louisiana,
Coastal Storm Risk Management Project
Draft General Reevaluation Report**

Charge Questions and Relevant Sections as Supplied by USACE

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject studies and identifies specific items for consideration for the IEPR Review Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject studies. The IEPR Review Panel is requested to offer a broad evaluation of the overall study decision documents in addition to addressing the specific technical and scientific questions included in the Review Charge. The Review Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Review Panel can use all available information to determine what scientific and technical issues related to the decision documents may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances, the Review Panel would have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

The Review Panel is asked to consider the following items as part of its review of the decision documents and supporting materials.

Broad Evaluation Review Charge Questions

1. Is the need for and intent of the decision document clear?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical issues?
3. Given the need for and intent of the decision document, assess the adequacy and acceptability of the project evaluation data used in the study analyses.
4. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, and engineering assumptions that underlie the study analyses.

5. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, and engineering methodologies, analyses, and projections.
6. Given the need for and intent of the decision document, assess the adequacy and acceptability of the models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives.
7. Given the need for and intent of the decision document, assess the adequacy and acceptability of the methods for integrating risk and uncertainty.
8. Given the need for and intent of the decision document, assess the adequacy and acceptability of the formulation of alternative plans and the range of alternative plans considered.
9. Given the need for and intent of the decision document, assess the adequacy and acceptability of the quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans.
10. Given the need for and intent of the decision document, assess the adequacy and acceptability of the overall assessment of significant environmental impacts and any biological analyses.
11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.
13. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

Safety Assurance Review Charge Questions

Since project designs are initiated in the decision document phase, a Safety Assurance Review (SAR) is incorporated into Type I IEPR. For the Tentatively Selected Plan, assess whether:

14. The models used to assess life safety hazards are appropriate.
15. The assumptions made for the life safety hazards are appropriate.
16. The quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards.
17. The analysis adequately addresses the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.
18. From a public safety perspective, the proposed alternative is reasonably appropriate, or are there other alternatives that should be considered.

Specific Technical and Scientific Review Charge Questions

Plan Formulation/Evaluation

19. Was a reasonably complete array of possible measures considered in the development of alternatives, including non-structural measures?
20. Does each alternative meet the formulation criteria of being effective, efficient, complete, and acceptable per USACE definitions? Do they meet the study objectives and avoid violating the study constraints? Is the evaluation and comparison of the alternative appropriate and are the results of the screening acceptable?

Geotechnical Engineering

21. Are the design assumptions adequate and consistent to support the engineering analysis? Is there sufficient information presented to identify, explain, and comment on assumptions that underlie engineering analyses?
22. Have the foundation gradients, both horizontal and vertical, been properly analyzed?
23. Has the geologic profile been properly characterized, and has it been adequately represented in the models and cross sections being evaluated?
24. In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design?
25. Were risk and uncertainty sufficiently estimated and characterized for the existing project conditions? Has enough evidence and discussion been provided to state that the “with-project” condition reduces life safety risk below tolerable levels?
26. Has the condition of the project, including the design and construction of the project and appurtenant features, project maintenance, and the levee’s performance over time, been clearly described?
27. Are the models used to assess hazards appropriate?
28. Are the assumptions made for the hazards appropriate?
29. Does the analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project?

Environmental

30. Was the discussion of natural resources sufficient to characterize current baseline conditions and to allow for evaluation of forecasted conditions (with and without proposed actions)?
31. Are the analyses of the human environment, including socio-economic and natural resources within the project area, sufficient to support the estimation of impacts of the final array of alternatives?

32. Did the formulation process follow the requirement to avoid, minimize, and then mitigate adverse impacts to resources?
33. Does the conceptual mitigation compensate for unavoidable impacts as appropriate?
34. Does the Environmental Assessment meet the NEPA requirements and implementing ER 200-2-2?

Battelle Summary Charge Questions to the Panel Members¹

Summary Questions

35. Please identify the most critical concerns (up to five) 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.
36. Please provide positive feedback on the project and/or review documents.

¹ Questions 35 and 36 are Battelle-supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

APPENDIX D

Conflict of Interest Form

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David Kaplan
USACE, Institute for Water Resources
October 21, 2019
C-2

Conflicts of Interest Questionnaire
Independent External Peer Review

**West Bank and Vicinity (WBV) and Lake Pontchartrain and Vicinity (LPV), Louisiana,
Coastal Storm Risk Management Projects Draft General Reevaluation Reports**

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**
REPRESENTATIVE'S NAME: **Courtney Brooks**
TELEPHONE: **614-424-5623**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **brooksc1@battelle.org**

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) **No** Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? **No** Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? **No** **Yes** (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? **No** Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

No additional information to report.

Courtney M. Brooks
Courtney Brooks

October 21, 2019
Date

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal

BATTELLE

It can be done