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Final Independent External Peer Review Report

Independent External Peer Review of Greater New Orleans Hurricane and Storm Damage Risk Reduction System
WBV 14e.2 – V-Line Levee, East of Vertex– Phase 2

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Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Damage Reduction Planning Center of Expertise
Baltimore District

Contract No. W911NF-07-D-0001
Task Control Number: 11026
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SHORT TERM ANALYSIS SERVICE (STAS)

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for the

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ACRONYMS

A/E	Architect/Engineer
ASCE	American Society of Civil Engineers
ASFE	Association of Soil and Foundation Engineers
ASR	Aquifer Storage Recovery
CECW-CP	Corps of Engineers Civil Works – Coastal Protection
CIL	Critical Items List
COI	Conflict of Interest
CPT	Cone Penetrometer Testing
DrChecks	Design Review and Checking System
EC	Engineer Circular
ER	Engineer Regulation
FEMA	Federal Emergency Management Agency
HSDRRS	Hurricane and Storm Damage Risk Reduction System
IEPR	Independent External Peer Review
IPET	Interagency Performance Evaluation Task
OMB	Office of Management and Budget
O&M	Operations and Maintenance
PCX	Planning Center of Expertise
PDT	Project Delivery Team
PRQCP	Peer Review Quality Control Plan
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
RCC	Roller-Compacted Concrete
USACE	United States Army Corps of Engineers
WBV	West Bank and Vicinity
WRDA	Water Resources Development Act

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Final Independent External Peer Review Report

for
Independent External Peer Review of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System, WBV 14e.2 – V-Line Levee, East of Vertex– Phase 2

Executive Summary

The U.S. Army Corps of Engineers (USACE) is currently designing and constructing the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). One of the vital components of this system is the West Bank and Vicinity (WBV) 14e.2 – V-Line Levee, East of Vertex – Phase 2 (hereinafter WBV 14e.2) project. An integral part of the HSDRRS is the conduct of an Independent External Peer Review (IEPR) to ensure the reliability of scientific information and engineering analysis contained within the project documents. In consideration of the importance of this project to USACE, an IEPR of the WBV 14e.2 was conducted. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis and engineering utilized for flood management project execution.

Battelle Memorial Institute (hereinafter Battelle), as a 501(c) (3) non-profit science and technology organization experienced in establishing, administering, and conducting expert peer reviews, was engaged by the USACE Coastal Storm Damage Reduction Planning Center of Expertise (PCX) to conduct the IEPR of the WBV 14e.2 project. Subject matter experts with knowledge of specific technical disciplines and project knowledge similar to the WBV 14e.2 project were engaged to form a Battelle IEPR Panel and specifically address key criteria associated with the design and engineering of this project.

Battelle developed processes and procedures for the IEPR to be in compliance with the procedures described in the Department of the Army- Corps of Engineers Civil Works – Coastal Protection Memorandum dated March 30, 2007; *Engineering and Design, Quality Management* (Engineer Regulation [ER] 1110-1-12) dated July 21, 2006; *Engineering and Design, DrChecks* (ER 1110-1-8159) dated May 10, 2001, and *Civil Works Review Policy* (Engineer Circular [EC] 1165-2-209) dated January 31, 2010.

This final WBV 14e.2 report describes the IEPR process developed by Battelle and followed by Battelle's external peer review experts (also known as peer reviewers), including a summary of final comments from the peer reviewers. It also describes the peer reviewers' qualifications and the selection process.

Battelle uses both an established internal resource database and external resources to identify candidate peer reviewers. From a list of potential candidates, Battelle initially identified candidate peer reviewers, confirmed their availability, evaluated their technical expertise, and inquired about potential conflicts of interest (COIs). The credentials of the available candidate peer reviewers were evaluated according to the overall scope of the WBV 14e.2 project requirements. Participation in previous USACE technical review committees and other related

technical review expertise and experience was considered. Battelle identified a draft list of peer review candidates, selected the final IEPR panel members based on availability, technical background, and COIs. Battelle provided the selected list of peer review candidates to USACE to review for COI. Battelle selected the final IEPR panel members based on their specific experience in the areas of expertise specified in the scope of work. Other candidates that were interested and available were proposed for participation on other HSDRRS IEPR Panels.

The two reviewers selected for the WBV 14e.2 IEPR Panel (the Panel) were independent engineering consultants. Corresponding to the technical content of the WBV 14e.2 IEPR project, the areas of technical expertise of the selected IEPR panel members included geotechnical engineering (one panel member) and civil engineering (one panel member).

The IEPR panel members were provided electronic copies of the WBV 14e.2 plans, reports, and supporting documentation listed in Table ES-1, along with the charge for conducting the review.

Table ES-1. WBV 14e.2 IEPR Project Review Documents

Documents Provided at Start of the Review
Geotechnical Investigation, 100-Year Design, West Bank H.P.P., WBV 14e.2, October 2010
Geotechnical Investigation, 100-Year Design, West Bank H.P.P., WBV 14e.2, Addendum 2, January 2011
Construction Solicitation and Specifications, Westwego to Harvey Canal, Hurricane and Storm Damage Risk Reduction System (HSDRRS), WBV 14e.2, Phase 2 First Enlargement, December 2010
Construction Plans, Westwego to Harvey Canal, Hurricane and Storm Damage Risk Reduction System (HSDRRS), WBV 14e.2, Phase 2 First Enlargement, January 2011
Documents Provided by USACE in Response to Panel Review Comments
Design Elevation Report, Hurricane and Storm Damage Risk Reduction System, Draft Report, Version 4.0, August 2010
Geotechnical Report, 100% Submittal, West Bank and Vicinity Hurricane Protection Project, WBV 14e.2, Hurricane Protection for 1% Storm, December 2008
Engineering Alternative Report, WBV 14e.2, Hurricane Protection Project, Westwego to Harvey Canal
Culvert Sizing Study, Westwego to Harvey Canal, Hurricane Protection Project, April 2008

In addition, the following supporting documents were provided to the IEPR panel members:

- HSDRRS Quality Management Plan, 30 October 2009
- HSDRRS Design Guidelines, June 2008
- ER 1110-1-12, Engineering and Design, Quality Management, 21 July 2006
- ER 1110-1-8159, Engineering and Design, DrChecks, 10 May 2001
- EC 1165-2-209, Water Resources Policies and Authorities, Civil Works Review Policy, 31 January 2010

On June 22, 2011, the IEPR panel members participated in an orientation briefing via teleconference, during which they were briefed by the USACE on the WBV 14e.2 IEPR project. The IEPR panel members started their review on June 22, 2011, and produced seven individual written comments. The comments were initially discussed by Battelle and the Panel to prevent overlapping comments. In addition, Battelle conducted a quality review to resolve contradictory comments and to ensure that all comments were of acceptable quality. The Panel's comments were documented and uploaded into the Design Review and Checking System (DrChecks) by Battelle, consistent with the processes for this IEPR.

IEPR panel member review comments included recommendations for the addition of details describing mechanisms to monitor the ongoing construction for the Phase 2 project and the future lift project. The items listed below were noted by the Panel as being key issues and were entered into DrChecks. The Panel designated two comments as being critical issues.

- The stability evaluations completed for the project did not use the appropriate specific weight of water.
- The settlement evaluation is not supported by the appropriate calculations (Critical).
- There is no discussion of the various instrumentation monitoring point triggers (Critical).
- The seepage analysis outlined in the report is limited and does not examine other key failure mechanisms, including uplift of drainage canal sediments or piping through uncompacted clay trench
- The Basis-of-Design is not clearly presented for the project.
- There is no explanation as to how the project is to be phased.
- The interface between the WBV 14e.2 project and the adjacent contract (WBV 33) should be reviewed.

On August 9, 2011, the USACE Project Delivery Team (PDT) evaluated and responded to the Panel comments in DrChecks. Upon review of the USACE PDT responses and additional project information supplied with the responses, the Panel determined that the comments required further discussion. Therefore, Battelle conducted an IEPR comment review conference via teleconference on August 25, 2011, for the Panel and USACE PDT to discuss the Panel's review comments and the PDT's responses.

Upon completion of the IEPR comment review conference and subsequent evaluation input by the USACE PDT, the Panel determined that three comments were not fully addressed by the USACE PDT and the Panel provided additional language as a final comment for Battelle to enter into DrChecks. Battelle then closed DrChecks to further comment.

In general, the IEPR panel members agreed that the WBV 14e.2 project documents contained sufficient design-engineering information to provide a level of safety assurance for the engineering aspects of the project. However, the Panel recommended that three project elements/reviews be considered to ensure safety for the ongoing construction and for the future levee lift for the WBV 14e.2 project: 1) the armoring design, 2) the interface with the WBV 33 project, and 3) the monitoring of levee settlement. These recommended project elements were noted in DrChecks during the IEPR process.

1 INTRODUCTION

1.1 Program Background

The U.S. Army Corps of Engineers (USACE) is currently designing and constructing the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). One of the vital components of this system is the West Bank and Vicinity (WBV) 14e.2 – V-Line Levee, East of Vertex – Phase 2 (hereinafter WBV 14e.2) project. An integral part of the HSDRRS is the conduct of an Independent External Peer Review (IEPR) to ensure the reliability of scientific information and engineering analysis contained within the project documents. Battelle Memorial Institute (hereinafter Battelle), as a non-profit science and technology organization experienced in conducting expert peer reviews, was engaged by the USACE Coastal Storm Damage Reduction Planning Center of Expertise (PCX) to conduct the IEPR of the WBV 14e.2. Subject matter experts with knowledge of specific technical disciplines and project knowledge similar to WBV 14e.2 were engaged to form an IEPR Panel (also referred to as the Panel) and specifically address key criteria associated with the design and engineering of WBV 14e.2.

Battelle developed processes and procedures for the IEPR to be in compliance with the procedures described in the Department of the Army, Corps of Engineers Civil Works – Coastal Protection (CECW-CP) Memorandum dated March 30, 2007; *Engineering and Design, Quality Management* (Engineer Regulation [ER] 1110-1-12) dated July 21, 2006; *Engineering and Design, DrChecks* (ER 1110-1-8159) dated May 10, 2001 and *Civil Works Review Policy* (Engineer Circular [EC] 1165-2-209) dated January 31, 2010.

This final IEPR report describes the IEPR process developed by Battelle and followed by the IEPR Panel, summarizes final comments of the Panel, and describes the panel members and their selection.

1.2 Project Description

The WBV 14e.2 project consists of raising the elevation of approximately 3.5 miles of existing earthen levee to the 100-year level of protection. The levee improvements will be implemented from the Old Estelle Pumping Station south to the intersection of the levee and Highway 45 in Jefferson Parish. The WBV 14e.2 levee has a 10-foot-wide crown with a design elevation between +13.5 and +14.0 feet (approximately equal to the 100-year design level of protection elevation). Where necessary, geotexile reinforcement fabric was installed along segments of the levee. Construction of the levee to the 100-year design elevation was completed in May 2011, and Phase 2 levee construction is anticipated to be completed in December 2011. As the WBV 14e.2 levees are expected to settle below the 100-year design elevation, USACE is in the process of preparing a "Future Levee Lifts Project Description Document Project Management Plan" to schedule future levee lifts.

1.3 Purpose of the IEPR

The purpose of the IEPR is to strengthen USACE's safety assurance as outlined in Water Resources Development Act (WRDA) 2007, Section 2035 (Type II IEPR) for the HSDRRS program in the Greater New Orleans area. Independent, objective external peer review is regarded as a critical element in ensuring the reliability of scientific and engineering analyses. To help ensure that USACE documents are supported by the best scientific, technical, and engineering information, a peer review process has been implemented by USACE that utilizes an IEPR to complement the agency technical review, as described in the Department of the Army, USACE, guidance Civil Works Review Policy (EC 1165-2-209), dated January 31, 2010. In this case, the IEPR of the WBV 14e.2 project was conducted and managed using contract support from an independent 501(c)(3) organization, Battelle, to ensure independent objectivity, along with a high degree of flexibility and responsiveness, which was essential for USACE to meet deadlines.

2 IEPR PROCESS

This section describes the approach for selecting IEPR panel members and for planning and conducting the IEPR. The IEPR followed the process described in the Peer Review Quality Control Plan (PRQCP) (Appendix A) that Battelle developed specifically for this project and was conducted in accordance with procedures described in USACE's guidance (cited in Section 1.1) and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. Supplemental guidance on the evaluation of conflicts of interest (COIs) from the National Academies' *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports*, dated May 12, 2003, was also followed.

2.1 Planning and Schedule

Table 1 defines the schedule followed by Battelle in executing the WBV 14e.2 IEPR. Actions in bold represent deliverables.

Table 1. WBV 14e.2 IEPR Project Schedule

Task	Action	Due Date
1	WBV 14e.2 IEPR Start Date	5/9/2011
	USACE provides WBV 14e.2 project review documents	5/26/2011
	Battelle submits draft PRQCP	6/3/2011
	USACE provides comments on draft PRQCP	6/23/2011
	USACE/Battelle kick-off meeting	6/1/2011
	Battelle submits final PRQCP	6/29/2011
	Battelle submits final PRQCP- Rev1	7/27/2011

Task	Action	Due Date
2	**Battelle submits list of final experts for Panel**	6/1/2011
	USACE confirms Panel has no COI	6/14/2011
	Battelle completes subcontracts for Panel	6/20/2011
3	**Battelle submits Critical Items List (CIL)**	7/7//2011
4	USACE provides materials for orientation briefing teleconference	6/15/2011
	Battelle/Panel kick-off meeting	6/21/2011
	Orientation briefing teleconference (USACE/Battelle/Panel)	6/22/2011
6	Panel members complete their individual reviews	7/15/2011
	Battelle enters Panel review comments into Design Review and Checking System (DrChecks)	7/25/2011
	USACE evaluates Panel review comments and enters responses into DrChecks	8/9/2011
	Battelle enters Panel's BackCheck responses into DrChecks	8/18/2011
	Battelle convenes comment review conference	8/25/2011
	USACE enters Evaluator responses based on comment review conference discussions	8/25/2011
	Panel members submit BackCheck responses; Battelle enters responses in DrChecks and closes all comments	8/26/2011
7	**Battelle submits draft final report to USACE**	9/27/2011
	USACE provides comments on draft final report	10/18/2011
	Battelle submits final report to USACE	11/2/2011
	Project closeout	4/11/2012

Notes: Task 5 represents monthly reporting activity and is not shown in the above schedule.
Activities in bold text represent deliverables.

2.2 Identification and Selection of IEPR Panel Members

Battelle initially identified 10 candidates for the IEPR Panel, confirmed their availability, evaluated their technical expertise, and inquired about potential COIs. Of those initially contacted, two external peer review candidates confirmed their interest and availability. The remaining candidates were not proposed because they were unavailable, disclosed COIs, lacked the precise technical expertise required, or were being proposed for participation on another HSDRRS IEPR Panel.

The credentials of the available candidates were evaluated according to the overall scope of the project, focusing on the key technical areas of geotechnical engineering and civil engineering. Participation in previous USACE technical review committees and other technical review panel experience was also considered.

The peer reviewer candidates were screened for the following *potential* exclusion criteria or COIs. Past participation in USACE peer reviews and other technical reviews did not automatically preclude a candidate from serving on the Panel.

- Financial or litigation association with USACE, "The State" (defined as the State of Louisiana and Local governing entities including Southeast Louisiana Flood Protection Authority any Levee District under their supervision), the Design Architect/Engineer (A/E), their engineering teams, subcontractors, or construction contractors.
- Current employment by the USACE.
- Current employment by any federal or state government organization.
- Current personal or firm involvement as a cost-share partner on USACE projects. If yes, provide description.
- Participation in developing the hurricane and storm damage risk reduction system (HSDRRS) project.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to any HSDRRS project.
- Involvement with paid or unpaid expert testimony or litigation related to the work of the USACE.
- Past, current or future interests or involvements (financial or otherwise) by self or immediate family related to any HSDRRS project, notably the WBV 14e.2 project or future benefits from the project.
- Current personal or firm involvement with other USACE projects. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by the USACE as a direct employee or contractor (either as an individual or through your firm[2]) within the last 10 years. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous direct employment by the USACE, New Orleans District. If yes, provide title/description, dates employed, and position/role.
- A significant portion (i.e., greater than 50%) of personal or firm revenues within the last 3 years came from USACE contracts.
- Pending, current or future financial interests in any projects that are *specifically* with the New Orleans District.
- Repeatedly serving as a peer reviewer for Task Force Hope projects (please list).
- Personal relationships with USACE staff in Mississippi Valley Division Headquarters, Task Force Hope, New Orleans District (Protection Restoration Office), Hurricane Protection Office, or officials from the State of Louisiana and Local governing entities including Southeast Louisiana Flood Protection Authority.

- Participation in the Interagency Performance Evaluation Task (IPET) Force, American Society of Civil Engineers External Review of IPET, the Louisiana Coastal Protection and Restoration Study, and/or National Research Council Committee on New Orleans Regional Hurricane Protection Projects.
- Past, present or future activity, relationship or interest (financial or otherwise) that could make it appear that it would be unable to provide unbiased services on this project. If so, please describe.
- Any other perceived COI not listed.

In selecting final IEPR panel members from the list of peer review candidates, experts who best fit the criteria for the required expertise and did not have any actual or perceived COIs were selected. Based on these considerations, two peer reviewers were selected from the list of candidates for the final Panel (Section 3 provides biographical information on the selected panel members). The two selected panel members were independent engineering consultants. Corresponding to the technical content of the WBV 14e.2 project, the areas of technical expertise of the two selected panel members represented geotechnical engineering (one expert) and civil engineering (one expert). Battelle established subcontracts with each of the selected panel members after confirming the absence of COIs for each panel member through a signed COI form.

2.3 IEPR Kick-Off Teleconference and Orientation Briefing Teleconference

Battelle held a project kick-off teleconference with USACE on June 1, 2011, to review the preliminary schedule, discuss the IEPR process, and address any questions regarding the scope. On June 21, 2011, Battelle staff conducted a kick-off teleconference with the Panel for the review of the WBV 14e.2 project. During the teleconference, Battelle provided an overview of the IEPR process, reviewed project and reference materials, and discussed overall schedule dates and milestone activities.

USACE conducted the orientation briefing for Battelle and the Panel on June 22, 2011 via teleconference. During the meeting, USACE briefed the panel members on the WBV 14e.2 project, and the panel members were provided an opportunity to ask questions. The USACE agenda for the orientation briefing teleconference is shown in Appendix B.

2.4 Preparation of the Charge to Peer Reviewers

The charge to the IEPR panel members was provided by USACE based on guidance provided in Civil Works Review Policy (EC 1165-2-209), dated January 31, 2010, and the OMB's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. The WBV 14e.2 IEPR charge consisted of five questions applicable to all review documents.

2.5 Conduct of the Peer Review

The review of the WBV 14e.2 project was conducted according to the schedule shown in Table 1. The IEPR panel members were provided electronic copies of the WBV 14e.2 project review documents listed in Table 2, along with the charge for conducting the review of the project documents (Appendix C).

Table 2. WBV 14e.2 Review Documents

Documents Provided at Start of the Review
Geotechnical Investigation, 100-Year Design, West Bank H.P.P., WBV 14e.2, October 2010
Geotechnical Investigation, 100-Year Design, West Bank H.P.P., WBV 14e.2, Addendum 2, January 2011
Construction Solicitation and Specifications, Westwego to Harvey Canal, Hurricane and Storm Damage Risk Reduction System (HSDRRS), WBV 14e.2, Phase 2 First Enlargement, December 2010
Construction Plans, Westwego to Harvey Canal, Hurricane and Storm Damage Risk Reduction System (HSDRRS), WBV 14e.2, Phase 2 First Enlargement, January 2011

To maintain independence and control, the Panel did not have direct or unmonitored e-mail or phone contact with the USACE Project Delivery Team (PDT). All interactions between the Panel and USACE occurred during an orientation briefing conference or during a subsequent IEPR comment review conference with Battelle in attendance.

Battelle (with input from the IEPR panel members) developed a Critical Items List (CIL) for the peer review, which listed specific items that are critical to the successful completion and function of the construction project. The intended purpose of the CIL was to assist the Panel and focus their review. The CIL considered:

- Information provided at the USACE orientation briefing teleconference for the WBV 14e.2 project on June 22, 2011
- Project review documents (see Table 2)
- Greater New Orleans HSDRRS Design Guidelines, dated June 2008
- Greater New Orleans HSDRRS Quality Management Plan, dated October 30, 2009.

The development of a CIL is important to conducting an analysis and identifying critical components, subcomponents, or systems whose malfunction can cause a cascading failure of the entire structure and pose a risk of serious injury, loss of life, or loss of mission objectives. The CIL is a living document that the IEPR panel members could continue to develop throughout the life of the project to focus the review of the design documents towards critical issues. With the aid of the CIL, a more effective and efficient peer review was conducted because the Panel was able to focus on those items that must not fail, rather than reviewing all details of design.

Table 3 shows an example of a critical item for the WBV 14e.2 project.

Table 3. Example of a Critical Item from the WBV 14e.2 IEPR

Critical Item: Primary Levee		
1	**Component Name**	Primary Levee
2	**Component Function**	Retain flood water in the flow-way and prevent flood water from entering the protected side
3	**Failure Mode**	Slope-stability Failure
4	**Cause of Failure**	Slope-stability – failure due to weak foundation soils, inadequate embankment compaction, or excess pore pressures.
5	**Effects of Failure**	Damage or collapse of primary levee and possible inundation of protected area.
		Inundation may lead to considerable loss of property and possible life safety.
6	**Criticality of Effects**	Full failure of levee (**severe**): safety and economic effects
		☐Mild ☐Moderate ☒Severe
		Partial failure of levee (**moderate**): Repair will be required and prior to repair, probability of full failure is much increased.
		☐Mild ☒Moderate ☐Severe
7	**What are the safeguards against significant failures:** **a) Redundancy**	Adequate safety factor in design parameters; diligence in construction quality control and QA procedures; incorporation of adequate post-construction long-term monitoring/engineering inspection; comprehensive design analyses.
	b) Resilience	Incorporation of levee embankments with stability berms and/or flatter slopes.
	c) Robustness	Monitoring during construction and operational phases using instrumentation.

In total, the IEPR panel members produced seven individual comments, which were entered into the Design Review and Checking System (DrChecks) on July 25, 2011. Two of these comments were considered to be critical. USACE completed its initial Evaluator responses to these seven comments by August 9, 2011. As part of the Evaluator responses, the PDT provided additional documentation (which was entered in DrChecks and also sent under separate cover to Battelle) for distribution to the Panel (Table 4). The IEPR panel members then conducted an initial round of Backcheck responses, which were entered into DrChecks by Battelle on August 18, 2011.

Table 4. USACE PDT Response Documents

Documents Provided by USACE in Response to Panel Review Comments
Design Elevation Report, Hurricane and Storm Damage Risk Reduction System, Draft Report, Version 4.0, August 2010
Geotechnical Report, 100% Submittal, West Bank and Vicinity Hurricane Protection Project, WBV 14e.2, Hurricane Protection for 1% Storm, December 2008
Engineering Alternative Report, WBV 14e.2, Hurricane Protection Project, Westwego to Harvey Canal
Culvert Sizing Study, Westwego to Harvey Canal, Hurricane Protection Project, April 2008

2.6 IEPR Comment Review Conference

On August 25, 2011, Battelle facilitated an IEPR comment review conference via teleconference between the Panel and USACE PDT members who responded to the Panel's DrChecks comments. State agencies and local stakeholders were also invited to attend. The purpose of the IEPR comment review conference was to provide an interactive, real-time forum for discussion of all comments, including various comments that the IEPR panel members considered were inadequately addressed during the first round of PDT responses.

This conference provided an opportunity for the IEPR panel members to ask clarifying questions regarding some of the Evaluator responses and the additional review material provided by the USACE PDT. Of the seven IEPR comments generated, responses to four of the comments were determined sufficient for closure during the teleconference and three were determined to need additional clarifying language from the USACE PDT. The IEPR panel members determined that these responses required further information to fully address the comment and provided final information for Battelle to enter into DrChecks.

Overall, the teleconference was successful in clarifying and establishing actions to resolve the open comments. Once the second round of USACE Evaluator responses and Panel BackCheck responses was completed in DrChecks, the IEPR panel members considered all of the comments to be adequately addressed, and the comments were closed. Section 4 of this report contains a detailed description of the issues.

Figure 1 shows an example of an IEPR panel member critical comment that was entered into DrChecks, evaluated by the USACE PDT, further discussed with IEPR panel members, and then agreed upon and closed. The names of the reviewer and USACE PDT members providing the comment and response have been removed in this example.

Figure 1: Example of Panel Member Review and USACE PDT Evaluator Entries in DrChecks[1]

4094674	Geotechnical	Oct 2010 Geotech Report	13	n/a

(Document Reference: Instrumentation)

There is no discussion of the various instrumentation monitoring point triggers. What are the instrumentation monitoring trigger values? Who is responsible for collecting the instrumentation data to evaluate trigger values? Once the data is collected, how will it be utilized? The instrumentation included is appropriate for this type of project, however, critical threshold "trigger" points should be clearly determined and detailed. The instrumentation types include piezometers, settlement points, and inclinometers. These three different types of instrumentation are used to assess seepage, pore pressure development, settlement, and lateral movement of the levee. Each has a different set of critical thresholds that should be delineated. This comment is ranked as significant since it does affect the long-term performance and safety of the levee system. Instrumentation concerns were listed on the CIL. Specifically, inadequate surveillance and monitoring of levee can result in progressive failure from all identified mechanisms including overtopping, seepage/piping, and slope stability. The various instruments installed by the USACE monitor settlement, lateral movement and excess pore water pressures during and post construction. Since it is not clear how instrumentation will be used or what data will be collected, this comment is deemed critical.

1-0	Evaluation **Concurred** Concur that there are three types of instrumentation in the field, the piezometers and inclinometers are being read by the Geology Section of the USACE New Orleans District while the settlement plates were installed by the Construction Contractor and will be read at the end of construction so he can be paid for excess material placed. The during construction settlement will be recorded and periodic surveys of the levee centerline will be taken to monitor after construction settlement to insure that levee is settling at or less than rate predicted. Piezometers are fitted with automatic data recorders and have were read several times prior to construction, during construction and will be read after construction is complete to insure that recorded values are not in excess of phreatic surfaces used in design. Pore pressures increased during fill placement as expected and dissipation of these pore pressures are being monitored, and will give indication of ongoing settlement as well. Inclinometers were installed to monitor lateral spread and as indicator of sloughs or rotational failures. Inclinometers have been read 4 times since installation in March, 2010, two of these readings have been during construction. The inclinometers have shown some indication of lateral spread, but no abrupt horizontal indications of slide or slough.
1-1	Backcheck Recommendation **Open Comment** Do not concur. The USACE still has not addressed the original comment regarding "trigger" values for each instrumentation type. What specific triggers dictate an USACE response and what would that response be ? The Panel believes that outlining the trigger points for each type of instrumentation has considerable value for USACE technical staff assigned to evaluate the data and for future sponsor staff that need to understand trigger thresholds also. The trigger points for the inclinometers are helpful in determining how much lateral movement constitutes a progressive failure significant enough to warrant repairs during construction or during long-term operation and maintenance. The trigger points for piezometers and settlement monitoring points tie directly to predicted performance of the system as designed and are critical to the performance of the levee in regards to seepage concerns and overtopping by storm surge or waves. Do any trigger values lead to advancement of the levee raising schedule as compared to the planned schedule as depicted on plate 43 of the Addendum Geotechnical Report ? How would such a situation play out institutionally? The Panel believes that the instrumentation trigger values and actions required if trigger values are exceeded can be outlined in the "Future Levee Lifts Project Description Document Project Management Plan" and will clarify how instrument data will be used.
2-0	Evaluation **Concurred** Concur that specific "trigger" values and appropriate response is very important. These instrument trigger values and appropriate response will be included in the final Operation and Maintenance Manual, in the Project Geotechnical and Concrete Material Completion Report, as well as in Future Levee Lifts Project Description Document Project Management Plan.
2-1	Backcheck Recommendation **Close Comment** Concur
	Current Comment Status: **Comment Closed**

1Note: Output modified to remove attribution of comment to any individual peer reviewer.

2.7 IEPR Final Report

After concluding the review, Battelle prepared a draft IEPR report on the overall IEPR process and the IEPR panel members' findings. The draft IEPR report was reviewed by each IEPR panel member and Battelle technical and editorial experts prior to submission to USACE for review. USACE comments on the draft IEPR report were considered in preparing this final IEPR report. The final IEPR report was reviewed by each IEPR panel member and by Battelle technical and editorial experts prior to submission to USACE.

3 IEPR PANEL MEMBER SELECTION

Potential peer review candidates were identified through Battelle's IEPR database of experts, trade organizations, engineering societies, targeted recruitment using key expertise (e.g., terms focusing on technical area and geographic region), recruitment at universities or other compiled expert recruitment mechanisms, and referrals.

Both IEPR panel members met the following minimum requirements:

- Experience with design and construction of projects similar in scope to the WBV 14e.2 project
- Familiarity with the HSDRRS Design Guidelines
- Master's degree or hands-on relevant engineering experience in the listed disciplines (see following bullet)
- Minimum 20 years of experience and responsible charge of engineering work
- Registered professional engineer

Panel members in each discipline also were required to have specific technical experience in the areas summarized in Table 5.

Table 5. Required Technical Experience for IEPR Panel Members

Discipline (Number of Reviewers)	Required Experience
Geotechnical Engineer (1 expert reviewer)	• Very soft Louisiana-type clay soil foundations • Subsurface investigations in very soft soil • Seepage design • Wave impact/armoring • Slope stability analyses for very soft soils
Civil Engineer (1 expert reviewer)	• Design utilizing soft soils • Design of levees • Design of earthen structures • Construction procedures (means and methods) • Erosion control

Battelle identified a draft list of peer review candidates, selected the final IEPR panel members based on availability, technical background, and COIs. Battelle provided the selected list of peer review candidates to USACE to review for COI . Battelle selected the final IEPR panel members (Table 6) based on their specific experience in the areas of expertise specified in the scope of work (Table 7).

Table 6. Final IEPR Panel Members

Discipline/Name	Affiliation	Location	Education	Years of Experience
Geotechnical Engineer				
Christopher J. Brown	University of North Florida	Jacksonville, FL	BSCE, MSCE, Ph.D. CE	24
Civil Engineer				
R. William Rudolph	Independent Consultant	Tahoe City, CA	BSCE, MSCE	33

Table 7. Specific Experience of IEPR Panel Members Requested in Scope of Work

Expertise	Total	Brown	Rudolph
Geotechnical Engineer			
Very soft Louisiana-type clay soil foundations	2	1	1
Subsurface investigations in very soft soil	2	1	1
Seepage design	2	1	1
Wave impact/armoring	2	1	1
Slope stability analyses for very soft soils	2	1	1
Civil Engineer			
Design utilizing very soft soils	2	1	1
Design of levees	2	1	1
Design of earthen structures	2	1	1
Construction procedures (means and methods	2	1	1
Erosion control	2	1	1

The credentials and qualifications of the two reviewers selected for the Panel are summarized in the following paragraphs. Appendix D includes a resume for each reviewer that provides detailed biographical information and the reviewer's technical areas of expertise.

Christopher Brown, Ph.D., is an assistant professor at the University of North Florida in the civil engineering department, specializing in civil engineering, fluid mechanics, hydraulics, foundation engineering, and engineering geology. He earned his Ph.D. in civil engineering from the University of Florida in 2005 and worked with the USACE from 1991-2006. He has over 22 years experience as a civil and geotechnical engineer and is a licensed professional engineer in Pennsylvania and Florida with project backgrounds including civil and geotechnical engineering, as well as water resources and flood control. As a previous employee for the USACE in Philadelphia, Pennsylvania, and Jacksonville, Florida, he has worked on levee projects requiring seepage modeling, seepage remediation (relief wells), and seepage collection in large dams. He has worked on relief wells and slurry walls for flood control projects and hazardous waste facilities. He was a member of the USACE National Levee Assessment Team responsible for developing a levee inventory and for developing appropriate risk-assessment evaluation tools. He is familiar with geotechnical practices used in the Mississippi Floodplain, with experience on the USACE Levee Assessment Team and as a member of the peer review team for the New Orleans District Hurricane Protection Project Design Manual focused on Mississippi River Flood Plain deposits and geotechnical construction techniques. Dr. Brown is a member of the Society of American Military Engineers, American Society of Civil Engineers (ASCE), International Association of Environmental Hydrologists, and American Water Resources Association.

R. William Rudolph is a registered civil and geotechnical engineer with over 30 years of experience. He earned his M.S. degree in geotechnical engineering and specializes in flood control, earth-fill dams and levees, water resources, dredging and environmental restoration projects, port and harbor facilities, and mass transit, bridge and highway improvements. Mr. Rudolph has provided consulting services for more than 150 small, earth-fill dam and reservoir projects involving site selection, geologic and seismic assessment, material sources and design alternatives, and supervision of the construction management. Examples include the Galbraith Upland Dredge Material Disposal Facility Port of Oakland, California; Redwood Shores Levee Evaluation, Redwood City, California; and Levee Assessment, Bel Marin Keys Unit V, Marin County, California. His civil engineering projects have included small earth-fill dams, lined and unlined canals, weirs, pump stations, pipelines, floodwalls and bulkheads. Mr. Rudolph is experienced with design and construction of levee auxiliary features and slurry trench cutoff walls, having designed levee-top roadways, penetrations through slurry walls, drainage facilities, underdrains, and relief wells. Mr. Rudolph is an active member of ASCE and the Geo-institute, and the Association of Soil and Foundation Engineers (ASFE). He is a corresponding member of the ASCE 7-10 Seismic Subcommittee.

4 RESULTS — SUMMARY OF REVIEW

The IEPR panel members followed the processes described in Sections 2.5 through 2.7 to conduct their review, execute the comment review teleconference, and finalize remaining comments in DrChecks. These processes were in accordance with the PRQCP and the USACE guidance documents cited in Section 1.1. This section of the report summarizes the review approach by the peer review experts (Section 4.1), the IEPR panel member comments that were entered into DrChecks (Section 4.2), and the important issues identified by the two panel members from their overall review (Section 4.3).

4.1 Review Approach

The IEPR panel members were encouraged to work independently according to their assigned expertise and, based on the overlapping Panel expertise and project review requirements (provided in Table 7), contribute to the review being conducted by their fellow IEPR panel member. In general, the reviewers chose to work independently in reviewing the project documents; however, the IEPR panel members engaged in project discussions throughout the IEPR review process. For instance, IEPR panel members discussed their comments with each other before Battelle entered their comments in DrChecks and before the IEPR comment review teleconference call. The IEPR panel members were also able to discuss their BackCheck responses before entered into DrChecks by Battelle.

4.2 Summary of Panel Comments

Using the CIL as a guide, the Panel developed seven comments on the WBV 14e.2 project. All comments were subjected to a quality assurance (QA) review by Battelle prior to submission to USACE to ensure clarity and lack of redundancy.

The IEPR panel members developed comments both in their assigned discipline and in the allied discipline. Two of the seven comments prepared by the IEPR panel members were identified as critical.

Geotechnical Engineering Panel Member Comments

The geotechnical engineer, in collaboration with the civil engineer, provided the geotechnical engineering comments listed below. Two of the geotechnical engineer's comments were considered to be critical.

- The stability evaluations completed for the project did not use the appropriate specific weight of water.
- The settlement evaluation is not supported by the appropriate calculations (Critical).
- There is no discussion of the various instrumentation monitoring triggers (Critical).
- The seepage analysis outlined in the report is limited and does not examine other key failure mechanisms including uplift of drainage canal sediments or piping through uncompacted clay trench.

Civil Engineering Panel Member Comments

The civil engineer, in collaboration with the geotechnical engineer, provided the civil engineering comments listed below. There were no critical civil engineering comments.

- The Basis-of-Design and design criteria are not clearly presented for the project.
- There is no explanation as to how the project is to be phased.
- The interface between the WBV 14e.2 project and the adjacent contract (WBV 33) should be reviewed.

4.3 Discussion of Comments

The USACE PDT reviewed, evaluated, and responded (i.e., concurred or non-concurred) to the seven IEPR comments in DrChecks with a "concur" response. USACE also provided additional project information to the Panel as part of its response to the reviewers' comments. The additional information was submitted via two avenues: the DrChecks response and file transfer to Battelle. After USACE completed its initial Evaluator responses, Battelle instructed the IEPR panel members to prepare draft Backcheck responses, responding with either a concur (i.e., comment resolution or comment closeout) or non-concur, including a written response to the USACE Evaluator response.

Battelle held a teleconference with the IEPR panel members to discuss the initial Evaluator responses and the Panel's draft Backcheck responses. Battelle facilitated comment review conference between the panel members and the PDT because three of the seven comments were not adequately addressed. Based on this comment review conference, the three comments described below required a second round of DrChecks USACE Evaluator and Panel BackCheck responses.

- **Levee Turf and Armoring.** One issue identified during the review of the design criteria was the removal and replacement of turf for future levee raises and its impact on the armoring of the levee. The Panel noted that USACE is currently assessing the need for armoring on all levees within the system and commented that it would be helpful to address the armoring design in the "Future Levee Lifts Project Description Document Project Management Plan".
- **Interface with the WBV 33 Project.** The IEPR panel members were concerned that the specific details associated with the design of the transition between the WBV 14e.2 project and the future WBV 33 project should be reviewed as part of the WBV 33 project design.
- **Settlement Analysis.** The Panel noted that the maximum settlement determined is probably a conservative estimate. The Panel indicated that a more accurate settlement analysis could be performed using the loading data from the Phase 1 levee raise, surveys performed after completion of construction for the Phase 1 project, and the existing consolidation testing data. Using the actual observed settlement from Phase 1, the predicted settlements for Phase 1 could be compared against actual values. In this manner, the Panel believed that the subsequent estimates of settlement for Phase 2 would be superior to those already performed by USACE (Critical).

Although the panel members concurred with the second round Evaluator responses, they felt that further clarification was necessary and provided additional language and detail on the three comments for entry into DrChecks. Battelle entered the Panel's comments, and then closed DrChecks.

4.4 Critical Comments and Any Other Open Issues that Remain to be Resolved

The IEPR comment review teleconference provided an effective forum to communicate and discuss peer review comments on the WBV 14e.2 IEPR project with the USACE PDT. This teleconference was a critical component of the IEPR process, especially since there was no unmonitored e-mail or additional telephone contact between the USACE PDT and the IEPR panel members. As a result of the IEPR comment review teleconference, all issues included in DrChecks were resolved.

5 CONCLUSIONS

The two IEPR panel members were selected using pre-defined technical qualifications criteria and COI standards, and the IEPR process was conducted in strict compliance with USACE peer review guidance documents (see Section 1.1) and the Battelle PRQCP.

In general, the IEPR panel members agreed that the WBV 14e.2 project documents contained sufficient information to provide a level of safety assurance for the project. However, the Panel recommended that three project elements be considered for the ongoing construction and for the future levee lift for the WBV 14e.2 project: 1) the armoring design, 2) the interface with the WBV 33 project, and 3) the monitoring of levee settlement. These project elements were noted in DrChecks during the IEPR process.

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APPENDIX A

Peer Review Quality Control Plan- Rev 1
July 27, 2011
(separate pdf)

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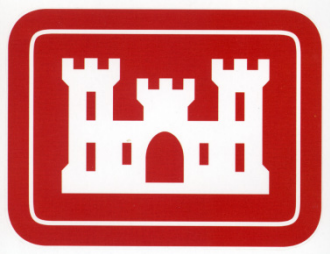

US ARMY CORPS OF ENGINEERS

PEER REVIEW QUALITY CONTROL PLAN
Revision 1
for
INDEPENDENT EXTERNAL PEER REVIEW OF WBV 14e.2 – V-LINE LEVEE, EAST OF VERTEX– PHASE 2

Battelle Memorial Institute
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Prepared for
U.S. Army Corps of Engineers
Coastal Storm Damage Reduction Planning Center of Expertise
Baltimore District

Contract No. W911NF-07-D-0001
Delivery Order: 1054
Task Control Number: 11-026
Scientific Services Program

July 27, 2011

PEER REVIEW QUALITY CONTROL PLAN
Revision1

Independent External Peer Review
of
WBV 14e.2 – V-Line Levee, East of Vertex – Phase 2

Submitted to:

Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Damage Reduction Planning Center of Expertise
Baltimore District

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July 27, 2011

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1. Background

The U.S. Army Corps of Engineers (USACE) is currently designing and constructing the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). One of the vital components of this system is the West Bank and Vicinity (WBV) 14e.2 – V-Line Levee, East of Vertex – Phase 2 (hereinafter WBV 14e.2). An integral part of the HSDRRS process is the conduct of an Independent External Peer Review (IEPR) to ensure the reliability of scientific information and engineering analysis contained within the project documents. Battelle Memorial Institute (hereinafter Battelle), as a non-profit science and technology organization experienced in conducting expert peer reviews, was engaged by the USACE Coastal Storm Damage Reduction Planning Center of Expertise (PCX) to conduct the IEPR of the WBV 14e.2. Subject matter experts with knowledge of specific technical disciplines and project knowledge similar to WBV 14e.2 are engaged to form a Battelle IEPR Panel and specifically address key criteria associated with the design and engineering of WBV 14e.2.

This Peer Review Quality Control Plan (PRQCP) describes the quality control process that will be conducted by the Battelle Team during the IEPR of the design for WBV 14e.2. The approach described in this PRQCP incorporates guidance included in the USACE Greater New Orleans HSDRRS Quality Management Plan, Battelle's internal quality and management programs, and the Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010. The project will follow the process outlined in the sections below.

Specific background on the overall USACE project, objectives of this IEPR, and the key tasks for the IEPR are defined in detail in the USACE Project Statement of Work (SOW) (Appendix A), received in the award notification on May 9, 2011[1]. In general, the purpose of the review is to determine if the design of the WBV 14e.2 project is consistent with the HSDRRS Design Guidelines and standard practice (Safety Assurance Review). Details on the key components of the WBV 14e.2 IEPR are described in the following sections. These tasks are based on the USACE SOW.

1.1. Schedule

The due dates for milestones and deliverables (Table 1) are based on the notice to proceed of May 9, 2011, and on discussions with USACE regarding document availability. The bold text indicates deliverables. Dates identified in the schedule below may change due to document, IEPR panel member, and USACE availability. USACE will be provided with monthly updates that include the status of efforts associated with the SOW, as well as any changes to scope and schedule. These updates will be informal and conducted through electronic mail (e-mail) messages.

[1] Received award notification from Battelle's Army Research Office (ARO) office via e-mail on May 9, 2011.

Table 1. WBV 14e.2 IEPR Milestones and Deliverables

TASK	ACTION	DUE DATE
1	**WBV 14e.2 IEPR NTP**	5/9/2011
	USACE provides Final Geotechnical Investigation Report and Addendum 2 of the report, Final Plans, and Final Specifications	5/26/2011
	Battelle submits draft PRQCP	6/3/2011
	USACE provides comments on draft PRQCP	6/23/2011
	USACE/Battelle kick-off meeting	6/2/2011
	Battelle submits final PRQCP	6/29/2011
2	**Battelle submits list of final experts for IEPR Panel**	6/1/2011
	USACE confirms Panel has no conflict of interest (COI)	6/14/2011
	Battelle completes subcontracts for IEPR Panel	6/20/2011
3	**Battelle submits Critical Items List (CIL)**	7/7//2011
4	USACE provides materials for orientation briefing teleconference	6/15/2011
	Battelle/Panel kick-off meeting	6/21/2011
	Orientation briefing teleconference (USACE/Battelle/Panel)	6/22/2011
6	Panel members complete their individual reviews	7/15/2011
	Battelle enters Panel review comments into DrChecks	7/25/2011
	USACE evaluates Panel review comments and enters Responses into DrChecks	8/3/2011
	Battelle enters Panel's BackCheck Responses into DrChecks	8/10/2011
	Battelle convenes Peer Review Teleconference 1 of 2	8/12/2011
	USACE enters Evaluator Responses based on Peer Review Teleconference 1 of 2 discussions	8/19/2011
	Battelle enters second round of BackCheck Responses into DrChecks	8/24/2011
	Battelle convenes Peer Review Teleconference 2 of 2	9/1/2011
	Panel members submit BackCheck Responses; Battelle enters Responses in DrChecks and closes all comments	9/7/2011
7	**Battelle submits Draft Report to USACE**	10/3/2011
	USACE provides comments on Draft Report	10/11/2011
	Battelle submits Final Report to USACE	10/25/2011
	Project Closeout	4/11/2012

Notes: Task 5 represents monthly reporting activity and is not shown in the above schedule.
Activities in bold text represent deliverables.

1.2. Selection of Peer Review Panel

To accomplish the IEPR, Battelle will recruit subject matter experts to participate in the IEPR Panel (the Panel) based on the technical areas requested in the SOW.

The final Panel will consist of members with the following broad expertise:

- Geotechnical engineering

- Civil engineering

To identify candidate panel members, Battelle will consider experts in Battelle's Peer Reviewer Database, evaluate recommendations from colleagues, consider previous panel members, and conduct targeted Internet searches. We will screen candidates for the Panel for availability, interest, and technical experience in defined areas of expertise, and any actual or perceived conflicts of interest (COIs) will be determined. The selection/COI criteria used to identify candidate panel members are provided in Appendix B to this PRQCP. Battelle will develop a detailed COI screening questionnaire to be included in recruiting communications based on the selection/COI criteria included in Appendix B. USACE will provide input to, review, suggest changes (if needed), and approve the COI screening questionnaire before it is sent to any candidate panel members.

Preliminary information about all candidate panel members, including brief biographical information, will be provided to USACE. Following USACE feedback on the panel members provided, Battelle will select the final panel members according to the selection criteria in Appendix B.

For each panel member, Battelle will prepare a scope of work that includes activities for this project. Battelle will send each one a request for quotation along with the scope of work and a COI inquiry form (Appendix C). Upon receipt of the panel members' written quotations indicating willingness to participate and the absence of a COI, Battelle will establish contracts with the panel members at agreed-upon rates and hours to ensure/secure participation.

1.3. Review Documents

The IEPR level of effort (LOE) is based on the information provided in the USACE SOW and by USACE during the proposal process. Table 2 lists the materials that are to be reviewed by the IEPR Panel. Battelle estimates that the time commitment required for the IEPR will be 84 hours, to review the project documents, participate in kick-off meetings and other teleconferences, participate in the orientation teleconference, respond to USACE Evaluator Responses, and review the Draft and Final Report, among other activities. Increased LOE may occur if quantity of materials or unforeseen events arise which my increase the required time commitment.

Table 2. WBV 14e.2 Documents to Be Reviewed

Title	No. of Pages	Required Disciplines
WBV 14e.2 Final Geotechnical Report, October 2010	2,130	Geotechnical engineer
WBV 14e.2 Final Geotechnical Report, Addendum 2, January 2011	216	Geotechnical engineer
WBV 14e.2 Final Specifications, December 2010	435	Geotechnical engineer Civil engineer
WBV 14e.2 Final Plans, January 2011	40	Geotechnical engineer Civil engineer

The following supporting documentation and reference materials will also be supplied to the Panel:

- HSDRRS Quality Management Plan, 30 October 2009
- HSDRRS Design Guidelines, June 2008
- ER 1110-1-12, Engineering and Design, Quality Management, 21 July 2006
- ER 1110-1-8159, Engineering and Design, DrChecks, 10 May 2001
- EC 1165-2-209, Water Resources Policies and Authorities, Civil Works Review Policy, 31 January 2010

The following Public Law (110-114) will be followed relative to the establishment of the IEPR process:

- Water Resources Development Act (WRDA) 2007, Section 2035.

This Public Law directs that projects associated with hurricane, storm, and flood damage risk reduction be reviewed by independent experts to assure the health, safety, and welfare of the public. All projects that meet these criteria are subject to an independent review.

2. Design Quality and Control Plan

During the IEPR, there are numerous instances when quality assurance and/or quality control (QA/QC) practices and project procedures will be implemented to ensure that products of the highest quality are being provided to USACE. These QA/QC practices and project procedures are described below.

2.1. Peer Review Panel Recruitment

As described in Section 1.2, a detailed review of qualifications and potential COI issues is conducted for each candidate panel member. The Battelle recruitment team presents each candidate panel member's technical qualifications and COI screening responses to the Project Manager and Program Manager. The candidate's qualifications are compared to the SOW and to the pool of potential candidates. If there are any outstanding questions regarding the candidates' responses to the COI screening, the candidate is contacted and the questions resolved prior to submitting the candidate's name to USACE. If the questions about the candidate's COI are not resolved, the candidate is removed from consideration and another candidate is proposed. As part of the subcontracting process, each potential panel member must complete and sign the COI inquiry form (see Appendix C).

2.2. Prepare and Finalize Charge to Panel Members

Battelle will prepare a charge to the panel members (see Appendix D) that will contain the instructions regarding the objective of the IEPR and specific input sought based on Type II peer review requirements noted in Appendix E of USACE's *Civil Works Review Policy* (EC 1165-2-209). This charge will request that the panel members look at the design for:

1. Redundancy (the duplication of critical components of a system with the intention of increasing reliability of the system, usually in the case of a backup or failsafe).

2. Resiliency (the ability to avoid, minimize, withstand, and recover from the effects of adversity, whether natural or manmade, under all circumstances of use).
3. Robustness (the ability of a system to continue to operate correctly across a wide range of operational conditions [the wider the range of conditions, the more robust the system], with minimal damage, alteration, or loss of functionality, and to fail gracefully outside of that range).

Guidance provided in EC 1165-2-209 and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004) will be followed in the development of the charge guidance to the Panel.

2.3. Critical Items List (CIL)

A list of items that are critical to the successful design and construction of the WBV 14e.2 project will be developed at the start of the project with input from each of the panel members, USACE, and possibly the State of Louisiana. The CIL will include all project components that are critical to the project mission. The criticality of each item will be discussed along with possible failure scenarios. The CIL will be developed based on the information available at the start of the IEPR process; however, as the task progresses, the list may be modified. At a minimum, the design will be reviewed for resiliency, robustness, and redundancy, as well as for adherence to the appropriate national and international standards and regulations.

2.4. Standards and Regulations

The review of the design submittals during the project will be performed in accordance with the HSDRRS Design Guidelines and applicable national and international design and construction standards and regulations. Each panel member will be required to identify the specific standards and regulations that are relevant to his or her review of the design submittals and construction documents.

2.5. Compilation and Dissemination of Panel Members' Comments

2.5.1. Compilation of Review Comments

After receipt of all IEPR individual panel member comments in response to the charge, Battelle will review each of the Panel's comments for conformance to the guidance provided for developing Panel comments. Each Panel review comment will be reviewed by Battelle to ensure that it contains the following components: (1) a clear statement of the comment; (2) the basis for the comment; (3) a statement as to whether the comment is a "Critical" level comment; and (4) recommendations to resolve the comment (including additional research or analysis that may influence the conclusions). Battelle will work with the Panel to ensure that the members' comments follow the guidance provided to them in their charge (Appendix D). Only Panel review comments that have been found in conformance will be loaded into DrChecks by Battelle. Items deemed "Critical" in nature by panel members will be so marked upon entry into DrChecks.

2.5.2. Dissemination of Review Comments

For each Panel review comment, a unique DrChecks comment number will be provided and a discipline related to the comment will be identified. Each Panel review comment will be

uploaded into DrChecks. USACE will then evaluate the comments, and the Evaluator Responses will be provided to the Panel for review. The Panel will then provide BackChecks, which will be uploaded into DrChecks. After the BackChecks are entered, USACE, Battelle, and the Panel will meet via teleconference to discuss the Panel review comments (Peer Review Teleconference). Following the input of the Panel BackChecks and the teleconference, it may be determined that there are "open" comments that have not been responded to/resolved. The following steps describe the method for addressing these "open comments".

- Following the Peer Review Teleconference #1, USACE will enter Evaluator Responses to any open comments, based on the teleconference discussions. These comments will be entered into DrChecks.
- Battelle will download the Evaluator Responses from DrChecks and provide the Responses to the Panel to determine if the comments can be closed or if further discussion is required.
- Battelle will enter the Panel's BackCheck Responses into DrChecks.
- If necessary, Battelle will convene Peer Review Teleconference #2 with USACE and the Panel to discuss comments and responses.
- There will be one round, or at most two rounds, of Evaluator Response and Panel BackCheck Response required for Panel review comments that are not closed out in the first round.
- Battelle will close out DrChecks.
- Battelle will notify USACE of DrChecks closeout and will provide a pdf printout of the DrChecks project file.

2.6. Control of Non-Conforming Design

Areas (e.g., findings) where the design does not conform to the HSDRRS Design Guidelines or national or international standards and regulations will be documented immediately to minimize the potential impact. The areas or findings where there is non-conformance will be documented as follows:

- DrChecks – This software program will be used by Battelle to manage all design-related project reviews. Additional guidance on the implementation of DrChecks is provided in ER 1110-1-8159.
- Peer Review Teleconferences – The identification of areas of non-conformance (e.g., findings) associated with the design that are entered into DrChecks will be presented during the peer review teleconference. If a finding has been resolved during the period between when it was entered into DrChecks and the peer review teleconference, the panel member should address his/her finding and then identify the resolution that was reached.
- Final Design Review Report – The final report will summarize the outcome of all activities performed on the design phase of the project. This includes summarizing all non-conforming areas identified during the design reviews and identifying any unresolved non-conforming issues/areas. The panel members will provide their reviews and conclusions to Battelle for input into the draft and final report.

2.7. Milestone and Teleconference Review

Teleconferences are an important component of conducting the IEPR. They are critical to developing the Panel review comments and discussing the Panel review comments with USACE. Thus, accurate recording of action items, resolutions, and other information discussed during these teleconferences is critical to the process. To ensure that important information is captured, Battelle provides at least two note-takers for all teleconferences and kick-off meetings with USACE and/or the Panel. All sets of notes taken by Battelle staff are compared and consolidated after each teleconference to provide one set of official notes. These notes are retained in the project files. Prior to distribution of materials for milestones, such as teleconferences between Battelle and USACE, or Battelle and the Panel, these materials are reviewed by the Project Manager for consistency.

2.8. Deliverable Review

Battelle policy requires that every deliverable be independently reviewed to ensure that it is accurate and technically sound; has objective interpretation, solid conclusions, and satisfactory presentation; and meets or exceeds client expectations. The review may include a technical, editorial, and/or QA component, depending on the document and project requirements. The Project Manager will determine the type(s) of review appropriate for each deliverable. In addition, following Battelle policy, all deliverables must have a one-over-one review and approval by the appropriate Resource Manager prior to external distribution. All reviews are documented in the project files. All draft and final versions of deliverables will be provided to USACE electronically only, with the exception of the Final Report, Peer Review panel member list, and CIL, which will be sent to the USACE PCX Program Manager in hard copy (in addition to electronically). The draft PRQCP and charge to the panel members will be provided to USACE in Microsoft Word (Office 2003) to facilitate their review. All other documents will be provided in pdf format.

3. Documentation and Reports

Battelle will be responsible for maintaining and storing all documentation associated with performing the IEPR for 10 years after the project. These records will include, at a minimum, the following documents developed during the execution of the program:

- PRQCP (this document; note, Battelle's responses to USACE comments on the draft PRQCP are detailed in Appendix E)
- CIL (as noted in Section 2.3 of this PRQCP)
- DrChecks final review comments (in pdf format with all entries included)
- PowerPoint briefings (including briefings on the panel members)
- Final Report
- E-mail communications documenting decisions
- Notes from teleconferences with Panel

Battelle's Deputy Project Manager is responsible for the following deliverables: the PRQCP, the CIL, the panel member review comments entered into DrChecks, and the Final Report. The Battelle Project Manager is responsible for ensuring that the reviewer findings and reports are

prepared on time and communicate the activities, findings, and responses in a clear and concise manner. All deliverables will be reviewed by Battelle's Project Manager, as well as a Battelle QA/QC person and editor prior to submission.

The Final Report submission will include a completed SF 298 Form. The final report and the form will be submitted to the Army Research Office (ARO) via e-mail at the same time it is provided to the USACE PCX Project Manager.

4. Communications Plan

The role and contact information for the key persons who will be working on the IEPR are presented in Table 3 (Battelle) and Table 4 (USACE). Battelle staff work as a team for each task, providing backup to keep the project moving at all times. If a problem should arise, such as with review documents, COIs, panel member issues, delivery dates, or USACE requests, the Program Manager or Project Manager provides the Deputy Project Manager with the resources to resolve the issue without impact on the performance and delivery of the IEPR.

Table 3. Battelle Staff for the WBV 14e.2 IEPR

Name	Role	Phone	E-mail
Karen Johnson-Young	Program Manager	(561) 656-6304	johnson-youngk@battelle.org
Mario Lopez	Project Manager	(703) 416-5878	lopezma@battelle.org
Lauren Baker-Hart	Deputy Project Manager and DrChecks Lead	(781) 952-5363	bakerhartl@battelle.org
Richard Uhler	Recruiting Lead and Assist with DrChecks	(561) 656-6301	uhlerr@battelle.org
Anne Gregg	Subcontracting Lead	(614) 424-7419	gregga@battelle.org

Table 4. USACE Staff for the WBV 14e.2 IEPR

Name	Role	Phone	E-mail
Sheila Rice-McDonnell	PCX Project Manager (New York District)	(917) 790-8297	Sheila.Rice-McDonnell@usace.army.mil
Julie Fritz	PCX Program Manager/Alternate Point of Contact (POC) (Baltimore District)	(410) 962-4895	Julia.A.Fritz@usace.army.mil

Name	Role	Phone	E-mail
Tawanda Wilson-Prater	Program Manager- Task Force Hope POC (Mississippi Valley Division)	(504) 862-2926	Tawanda.R.Wilson-Prater@usace.army.mil
Harvey Johnson	Contracting Officer's Representative (Baltimore District)	(410) 962-4447	Harvey.L.Johnson@usace.army.mil

4.1. Communication with USACE

Battelle's Point of Contact (POC) is the USACE Project Manager who represents the Coastal Storm Damage Reduction PCX. The alternate PCX POC will be copied on all e-mails to the POC. If the PCX POC is not available (e.g., on vacation), Battelle will contact the alternate PCX POC directly. Communications may include questions and requests for additional information from the Panel. Working with USACE, Battelle will respond to any panel member questions or information requests during the review process.

4.2. Communication with the IEPR Panel

Battelle will be the main point of contact between USACE and panel members. Direct contact between USACE and panel members will occur only during teleconferences or in-person meetings with a Battelle representative present. All other communications will be directed through Battelle's Project Manager and Deputy Project Manager. The panel members will be briefed that they are to have no direct communication with USACE and that if they are contacted by USACE, they are to inform Battelle immediately.

4.3. Communication with Sponsors

USACE is understood as the responsible party for communications with the State of Louisiana (hereinafter the Sponsor). The Sponsor, along with a number of individuals and groups, will be invited to attend the various meetings held between USACE and the Panel. They may also be provided copies of the Final Report through USACE Task Force Hope. All communications with the State of Louisiana or other outside sponsors will be managed by Task Force Hope and the USACE Project Manager for the WBV 14e.2 project. Any contact by a sponsor to the Panel or Battelle will be redirected to USACE. These individuals or groups may supply information to the panel members; however, this communication will occur through USACE.

4.4. Meetings

A project kick-off meeting will be held between USACE and Battelle in accordance with the schedule in Table 1. The purpose of the meeting is to review the schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., CIL, panel members, etc.). Within a few days of the panel members being under subcontract, Battelle will conduct a kick-off meeting with the Panel to review the IEPR schedule, discuss the IEPR process and confidentiality agreement, and address any questions regarding the Panel's scope of work. The final kick-off meeting (Orientation Briefing Teleconference), which will include USACE,

Battelle, and the Panel, will be held after the panel members have been selected, but before the actual review of the documents takes place. The purpose of this meeting is to familiarize the panel members with the project and allow them to ask questions directly of USACE. All of the panel members will attend. This teleconference will be conducted in accordance with the schedule in Table 1.

Several additional meetings have been specified throughout the SOW (see Appendix A). The meetings are required and are specific to the IEPR task activities. The meetings will be held in accordance with the schedule in Table 1. If the need for additional meetings arises, Battelle will schedule these with USACE and the Panel.

4.5. Monthly Progress Updates and Conference Call Discussions

A monthly update on the progress and status of the review will be developed by Battelle's Deputy Project Manager and supplied, via e-mail, to the USACE PCX Project Manager and Alternate POC. The update will describe work conducted over the previous month by task. As needed, Battelle's Program Manager, Project Manager, and Deputy Project Manager will participate in conference call discussions to maintain progress and collect/exchange critical information.

4.6. Methods or Technologies for Information Communication

Methods that are expected to be used to convey information (and a general description of its use) are described in the following sections.

4.6.1. Informal Communications

- E-mails – general notifications of project status, meeting/conference call scheduling, distribution of small reports (<5 megabytes [MB]); submittal of panel member comments to Battelle (for consolidation into a report).
- File Exchange Server – When needing to receive or distribute large reports (>5 MB) or zip files of any size electronically, Battelle will use and request that agencies use Battelle's File Exchange Server (https://fx.battelle.org). This system is used for these files due to constraints on Battelle's e-mail system required by our virus protection software.
- Conversations
  - Scheduled meetings – meetings will be scheduled when appropriate as determined by the Project Managers from the various organizations when they feel there is a need. Battelle will obtain approval from the USACE PCX prior to attending any face-to-face meetings with other agencies.
  - Conference calls – as needed for progress discussions, panel member discussions.
  - Telephone calls – as needed for general discussions of schedules, questions on project deliverables, clarifications of review comments.

4.6.2. Formal Communications

The formal communications for this task will include the hard copy submittal of the final report deliverable. Table 5 indicates the various types of both informal and formal communications and the appropriate mode of communication.

Table 5. Types of Communication and Appropriate Recipients

Type	From	To	cc
Program Matter	Karen Johnson-Young & Mario Lopez	Julie Fritz	NA
Significant Project Matter	Karen Johnson-Young & Mario Lopez	Julie Fritz	Lauren Baker-Hart
Routine Project Coordination	Lauren Baker-Hart	Project Manager	Mario Lopez & Select Battelle Members
Coordination within Battelle	Lauren Baker-Hart	Battelle Members	Mario Lopez
Coordination with Panel Members	Lauren Baker-Hart	Panel Members	Mario Lopez
Invoicing Matters	Anne Gregg	Panel Members	Lauren Baker-Hart and Karen Johnson-Young

4.7. Information Communicated

4.7.1. Project Management

Battelle's Deputy Project Manager, Lauren Baker-Hart, is responsible for all communications with the USACE PCX with regard to overall project management, including:

- Scope of program
- Schedule
- Deliverables/reports
- Budget

4.7.2. Panel Members

Battelle's Deputy Project Manager is responsible for communicating information regarding the status of this project to Battelle's Project Manager, Mario Lopez, and Program Manager, Karen Johnson-Young. This includes:

- Progress towards completing the project scope
- Project schedules (overall schedule, due dates, actual date of submittals)
- Deliverables/reports
- Budget analysis (remaining budget versus remaining scope)
- Performance

The Battelle Deputy Project Manager is also responsible for the ongoing project management outlined above, developing the IEPR, and obtaining and communicating all information necessary to conduct the IEPR. The Panel will consist of two (2) members:

- Geotechnical engineer
- Civil engineer

Panel members are responsible for communicating their findings on each document to the Battelle Project Manager based on their area of expertise. Communications will include e-mails, conference calls, telephone calls, reports, and memorandums.

4.7.3. Information Provided to the Panel Members

The USACE PCX is responsible for supplying the Final Geotechnical Report, including Addendum 2, and Final Plans and Specifications to the Battelle Project Manager and Deputy Project Manager. The Battelle Deputy Project Manager will then supply those submittals to the panel members, who will be responsible for reviewing and commenting on the design documents. Battelle will also supply a charge and guidance document (Appendix D) to inform the Panel of their duties and responsibilities. Additional information may be supplied directly to the panel members during the orientation briefing on the project; however, this will occur in the presence of the Battelle Project Manager and Deputy Project Manager.

4.7.4. IEPR Team Interactions

The panel members may communicate with each other to address any issues or findings that may be clarified through internal team discussions; however, the resulting findings are specific to the respective discipline and shall not be compared to results of other members' findings. Conclusions made by one panel member may be similar to conclusions of other panel members but must be derived independent of one another. Subsequently, similar findings are incidental. This approach will be the most effective method of resolving all issues, findings, and questions that may arise during the review of the design submittals.

APPENDIX A

WBV 14e.2 IEPR:
USACE Statement of Work
Provided to Battelle on May 9, 2011

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1. TITLE.
INDEPENDENT EXTERNAL PEER REVIEW OF WBV 14e.2 - V-LINE LEVEE, EAST OF VERTEX – PHASE 2.

2. GENERAL.
The U.S. Army Corps of Engineers is currently designing and constructing the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). One of the vital components of this system is the WBV 14e.2 project which consists of raising the elevation of approximately 3.5 miles of existing earthen levee to the 100-year level of protection. These levee improvements will occur south from Old Estelle Pumping Station to the intersection of the levee and Highway 3134 in Jefferson Parish, Louisiana. The design guidelines used to design the project is posted on the Internet at http://www.mvn.usace.army.mil/eng/hurrdesign.asp. The term "State" refers to both the State of Louisiana and Local governing entities including Southeast Louisiana Flood Protection Authorities and any Levee District under their supervision.

3. OBJECTIVE.

The objective of this work is to conduct an Independent External Peer Review (IEPR) of the design for WBV 14e.2 in accordance with the Water Resources Development Act (WRDA) 2007 (Public Law 110-114), Section 2035. The purpose of the review is to determine if the design of the WBV 14e.2 project is consistent with the HSDRRS Design Guidelines and standard practice (Safety Assurance Review). The following documents will be provided by the Corps for review:

- Final WBV 14e.2 Geotechnical Report and Addendum 2
- Final WBV 14e.2 Plans and Specifications

The following supporting documentation will be provided by USACE:

- HSDRRS Quality Management Plan - 30 October 2009
- HSDRRS Design Guidelines - June 2008

The following references to regulations shall be followed in conducting the IEPR. The Engineering Regulation (ER) documents are available at http://www.usace.army.mil/library

- ER 1110-1-12, Engineering and Design, Quality Management, 21 July 2006;
- ER 1110-1-8159, Engineering and Design, DrChecks, 10 May 2001.

4. SPECIFIC TASKS.
The following general tasks shall be performed independent of government supervision, direction or control:

Task 1. Peer Review Quality Control Plan: The Contractor shall prepare a final peer review quality control plan (PRQCP) for the work covered under this task order. The Contractor shall conduct the IEPR in accordance with this PRQCP to assure that all services are performed, evaluated/reviewed and provided in a manner that meets professional engineering quality standards. As a minimum, the PRQCP shall be prepared in accordance with HSDRRS Quality Management Plan, and include the following:

a) Design Quality Control Plan

b) Documentation and Reports

c) Site Field Visits and Reports

d) Communications Plan (All communication to the WBV 14e.2 project team and sponsors will come through Julie Vignes, Senior Project Manager.)

Task 2. Independent External Peer Review Panel: The Contractor shall identify and select two (2) peer reviewers to serve on the IEPR Panel. The selection will be based on availability, technical credentials, and absence of perceived or actual conflict of interest. The IEPR members shall not have any financial or litigation association with USACE; the State; their engineering teams, subcontractors or construction contractors. The panel members shall fully disclose any known or potential conflict of interest that may arise from the performance of the work. Areas of conflict may include current employment by the Federal or State governments, participation in developing the subject project, a publically documented statement advocating for or against the subject project, current or future interests in subject project or future benefits from the project, paid or unpaid participation in litigation against the Corps, and/or repeatedly serving as a peer reviewer for Task Force Hope projects.

The Contractor will provide the Corps with the final independent external peer reviewer list, including their credentials. Peer reviewers shall have experience in design and construction of projects similar in scope to the WBV 14e.2 project. Familiarity with the HSDRRS Design Guidelines is also preferable. Peer reviewers shall be registered professional engineers in the United States, or similarly credentialed in their home country. A master's degree is preferable, but not required, as hands-on relevant engineering experience in the listed disciplines is more important. Peer reviewers shall have a minimum of 20 years experience and responsible charge of engineering work in the following disciplines:

(1) Geotechnical Engineer with extensive experience in very soft Louisiana-type clay soil foundations, subsurface investigations in very soft soil, seepage design, wave impact/armoring and slope stability analyses for very soft soils.

(1) Civil Engineer with extensive experience in designs utilizing very soft soils and in design of levees, earthen structures, construction procedures (means and methods), and erosion control.

The Contractor will prepare scopes of work for each peer reviewer. A request for quotation, including the scope of work and conflict of interest inquiry will be prepared and sent to each reviewer. Upon receipt of the reviewers' written quotations indicating willingness to participate and the absence of a conflict of interest, the Contractor will establish contracts with the peer reviewers at agreed upon rates and hours to ensure/secure participation.

Task 3. Peer Review Critical Items List: The Contractor shall prepare an IEPR critical items list that shall include all project components which are critical to the project mission. The criticality of each item shall be evaluated/reviewed and discussed along with possible failure scenarios. The critical factors of resiliency, robustness and redundancy will be evaluated and reviewed. Procedures for peer reviewing the critical items in the design shall be addressed. The critical item list will be a final list that should be the best effort given the information available at the start of the peer review process. As the task progresses, the final list may be modified and the

Contractor will prepare a revised final list. The State may also provide a critical items list for consideration by the peer reviewers.

Task 4. Orientation Briefing: The Contractor and peer reviewers will participate in an orientation briefing conducted by the Corps. Briefing materials will be provided by the Corps one (1) week prior to the briefing. The briefing will take place via teleconference. The State will be notified of such briefings and may attend.

Task 5. Monthly Progress Updates and Conference Call Discussions: A monthly update of progress and status of the review shall be sent via e-mail to the USACE Technical Representative. This update should describe the work accomplished that month by task. Conference call discussions may also be required to maintain progress and collect/exchange critical information.

Task 6. Peer Review of Design Submittals: Processes shall be consistently utilized by the Contractor to maintain independence and individuality of each expert reviewer's respective discipline, comments, assessment, and reports of design, engineering, and construction components pertinent to the expert reviewers' respective discipline to ensure the integrity of the safety assurance review criteria. Expert reviewers shall analyze and assess various components identified, but not limited to, the critical items list (further described in the appendices) and interrelated components that affect or may affect the critical items list. The Contractor's peer reviewers shall evaluate/review the final Geotechnical Report, Plans, and Specifications in accordance with the General Charge Guidance (Appendix B) and provide technical comments and recommendations in DrChecks. Comments requiring resolution shall be addressed in DrChecks. The Contractor shall review the expert reviewer comments prior to placing them in DrChecks, remove any duplicate comments, resolve all contradicting comments, and enter any additional appropriate analysis or assessment into DrChecks. The Contractor and the expert reviewers shall BackCheck the Corps' responses. The Contractor and peer reviewers shall participate in comment review conferences via teleconference for the purpose of closing and resolving comments. It is assumed that two (2) peer review conferences will be conducted for this effort; the first after initial review of the documents has been completed by the IEPR Team and the second after the DrChecks comments have been evaluated by the Corps. Comments that are unresolved may remain open and may require further discussion and exchange of information to, if possible, resolve and remaining comments in DrChecks. The Contractor shall present and discuss findings with Corps and State engineers. The State will be notified and may participate in these review conferences.

Task 7. Prepare Final Design Review Report: The Contractor shall prepare a final design review report to include the peer review of the Geotechnical Report and the Plans and Specifications for the subject project. The report shall have an executive summary describing the recommendations and resolutions. Following the executive summary the report shall list in detail all the critical items reviewed, referenced criteria, computations, and all other pertinent information along with IEPR Panel recommendations and final resolution. If recommendations are not accepted, the reported reason for the rejection shall be documented. The reports are intended to provide final documentation of the review process. The report shall also include the

methodology for conducting peer reviews. The final report outline previously approved by the Government will be used for all reports; with any agreed to modifications required.

5. REPORTING REQUIREMENTS.
The Contractor shall provide all reproduction. The Contractor shall provide two (2) hard copies and two (2) electronic copies of the PRQCP (Task 1), IEPR Panel (Task 2), Critical Items List (Task 3), and Final Report (Task 7) to the Contracting Officer's Representative (COR). Electronic submittals shall contain all electronic files in both Microsoft Word and Adobe PDF formats on DVD or CD. The briefings for the conferences will be furnished in Microsoft PowerPoint. Reports generated by the Contractor, peer reviewers, or their subcontractors shall not be released for publication or dissemination without the ARO contracting officer's written approval following coordination with the COR. The Corps shall own solely all reports and information, will provide to the State and publish on the Public Domain. See Appendix A for table of Deliverables and Milestones by task.

6. QUALIFICATION REQUIREMENTS.
The Contractor shall have the following qualifications:

a. Experience establishing and administering engineering and construction peer review panels,
b. Shall be a non-profit (501(c)(3)) organization with experience in peer review,
c. Free from conflicts of interest with the WBV 14e.2 project and all HSDRRS projects that will undergo IEPR,
d. Independent science and technology organization with Corps experience, and
e. Proven ability to deliver under significant time constraints.

7. PLACE AND PERIOD OF PERFORMANCE, WORK DAYS AND TRAVEL.

a. Place of Performance. The majority of the work will be conducted at the Contractor's facilities
b. Estimate Travel. There is no travel currently planned for this work effort. The Orientation Briefing (Task 4) and the two (2) Peer Review Conferences (Task 5) will be conducted as telephone conference calls.
c. Period of performance. The period of performance shall be from the effective date of the delivery order and continuing for 12 months. See Appendix A.

8. RESTRICTIONS. There shall be no known conflicts of interest with the WBV 14e.2 Project, the HSDRRS projects, or the IEPR members that are assembled.

9. SECURITY. Security clearance is not required.

10. HUMAN SUBJECTS. No human subjects are involved.

11. CONTRACTING OFFICER'S REPRESENTATIVE.
Harvey Johnson, PE
Phone Number: 410-962-4447
Email: Harvey.L.Johnson@usace.army.mil

12. USACE TECHNICAL REPRESENTATIVE.
Julie Fritz, P.E.
Program Manager, PCX-CSDR
Baltimore District
(410) 962-4895 (Office)
Email: Julia.A.Fritz@usace.army.mil

13. USACE ALTERNATE TECHNICAL REPRESENTATIVE
Tawanda Wilson-Prater
Program Manager
Task Force Hope
Mississippi Valley Division
Office: (504) 862-2926
BB: (504) 388-2892
Tawanda.R.Wilson-Prater@usace.army.mil

14. RECOMMENDED SOURCE.
Mario A. Lopez, PMP
Senior Program Manager/Business Manager
1550 Crystal Drive
Suite 601
Arlington, VA 22202
(703)416-5878 (office)
(202)731-9678 (cell)
Lopezma@battelle.org

Karen Johnson-Young, PMP
Vice President
Battelle Memorial Institute
1440 Centrepark Boulevard
Suite 1005
West Palm Beach, FL 33410
(202)302-0516 (cell)
(561)656-6304 (office)
Johnson-youngk@battelle.org

15. RELEVANCE.
Representatives of the Non-Federal Sponsor have requested that an Independent External Peer Review of this project be conducted in accordance with public law WRDA 2007 (Public Law 110-114), Section 2035.

16. CAPABILITY STATEMENT.
By public law WRDA 2007 the peer review must be done by reviewers external to the Government, thus the requesting agency does not have the necessary in-house capability to perform the tasks specified in this statement of work.

17. PAYMENT PROCEDURES.

a. The contract must cite the U.S. Army Corps of Engineers line of accounting as provided on the funding document

b. The contract should reflect the paying office as:

USACE Finance Center
5722 Integrity Drive
Millington, TN 38054

c. Invoices should be submitted to the USACE Finance Center at the address in 17b.

d. Invoices need to reference the MIPR number.

APPENDIX A. IEPR Reporting and Milestone Schedule.
The schedule will be adjusted based on the actual Notice to Proceed. Due Date refers to Calendar Days. All dates are subject to change.

WRDA External IEPR Schedule of Deliverables for WBV 14e.2

Task	Deliverable (D) or Milestone (M)	Action/Activity	Cumulative Task Duration	Date	Comments
	M	DESIGN Phase Peer Review NTP		1-Sep-10	Estimated date, subject to change
1	D	Submit Final Peer Review QCP (PRQCP)	14	15-Sep-10	Within 14 calendar days of NTP
2	D	Submit list of final IEPR Panel		15-Sep-10	Within 14 calendar days of NTP
2	M	Peer reviewers under contract	28	29-Sep-10	Within 28 calendar days of NTP
3	D	Submit Critical Items List	38	6-Oct-10	
4	M	Corps provides material for orientation briefing	21	22-Sep-10	Corps provides 7 days prior to briefing
4	M	Orientation Briefing Teleconference	28	29-Sep-10	When reviewers are under contract
6	M	Corps provides Design Package	21	22-Sep-10	With orientation briefing material
6		Peer Review Conference 1 of 2 (Teleconference)	21	13-Oct-10	Conducted after IEPR Team has completed initial review of Design Package
6	D	IEPR Team submits comments on Design Package in DrChecks	7	20-Oct-10	Within 7 calendar days of Peer Review Conference #1
6	M	Corps evaluates DrChecks comments from IEPR Team	21	10-Nov-10	Within 21 calendar days of IEPR completing DrChecks comments
6	M	Peer Review Conference 2 of 2 (Teleconference)	28	24-Nov-10	Conducted after IEPR Team has completed initial review of Corps Evaluations
6		IEPR Team subs final comments in DrChecks and closes all comments	28	22-Dec-10	Within 28 calendar days of Peer Review Conference #2
7	D	Submit IEPR Final Report	7	29-Dec-10	Within 28 calendar days of Peer Review Conference #2

APPENDIX B. General Charge Guidance from EC 1165-2-209

For a Type II – IEPR, the design and construction phases, the Safety Assurance Review should focus on unique features and changes from the assumptions made and conditions that formed the basis for the concept design. The Panel should address the following questions:

1. Do the design assumptions made during the decision document phase (interpreted as the EAR, PDD, DDR, or similar appropriate design document for the specific project--to be provided to Panel) for hazards remain valid through the completion of design as additional knowledge is gained and the state-of-the-art evolves?
2. Do the project features adequately address redundancy, robustness, and resiliency?
   (1) Redundancy. The use of multiple lines of defense that are linked to potential failure modes. The most vulnerable failure modes need the greatest redundancy.
   (2) Resilience. The use of enhancements to improve the ability of the system to sustain loads greater than the design load to achieve gradual failure modes over some duration rather than sudden failure modes.
   (3) Robustness. The use of more conservative assumptions to increase capacity to compensate for greater degrees of uncertainty and risk.
3. Do the project features and/or components effectively work as a system?
4. Do the design assumptions made during design remain valid through construction? (Final DDRs, CO QMPs, site visits, and other similar appropriate documents to be provided to Panel for this assessment.)
5. For O&M manuals, do the requirements adequately maintain the conditions assumed during design and validated during construction; and will the project monitoring adequately reveal any deviations from assumptions made for performance? (Understood that monitoring plans and O&M manuals may be developed after construction and before project turnover. Must determine how to retain Panel or issue new task order for this work.)

APPENDIX B

WBV 14e.2 IEPR:
Peer Review Panel Considerations and Proposed Selection/Exclusion Criteria

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Appendix B
Independent External Peer Review of WBV 14e.2 –
Peer Review Panel Considerations and Proposed Selection/Exclusion Criteria

Based on the design documents provided for the WBV 14e.2 Independent External Peer Review (IEPR), the overall IEPR scope includes the following areas of expertise:

- Geotechnical engineering
- Civil engineering

1. Technical Criteria /Areas of Expertise for Candidate Panel Member

Technical criteria applicable to all candidate panel members:

- Design and construction of projects similar in scope to the WBV 14e.2 project
- Familiarity with the Hurricane and Storm Damage Risk Reduction System (HSDRRS) Design Guidelines is preferable
- Master's Degree is preferable but not required as hands-on relevant engineering experience in the listed disciplines is more important
- Minimum 20 years of experience and responsible charge of engineering work
- Registered professional engineer

Technical areas related to **geotechnical engineering** (one expert):

- Extensive experience in very soft Louisiana-type clay soil foundations, subsurface investigations in very soft soil, seepage design, wave impact/armoring, and slope stability analysis for very soft soils

Technical areas related to **civil engineering** (one expert):

- Extensive experience in designs utilizing very soft soils and in design of levees, earthen structures, construction procedures (means and methods), and erosion control

Other considerations:

- Participation in previous U.S. Army Corps of Engineers (USACE) technical review panels
- Other technical review panel experience

Reviewer Categories [candidate may fit into more than one category]

- Academic
- Consultant (company-affiliated, e.g., architect-engineer or consulting firm)
- Consultant (independent)
- Non-governmental organization (e.g., road and bridge-related public agency)

2. Potential Exclusion Criteria/Conflicts of Interest

- Financial or litigation association with USACE, "The State" (defined as the State of Louisiana and Local governing entities including Southeast Louisiana Flood Protection Authority any Levee District under their supervision), the Design A/E, its engineering teams, subcontractors, or construction contractors.
- Current employment by USACE.
- Current employment by any federal or state government organization.
- Current personal or firm[1] involvement as a cost-share partner on USACE projects. If yes, provide description.
- Participation in developing the HSDRRS project.
- Any publicly documented statement made by you or your firm[1] (including, for example, advocating for or discouraging against) related to any HSDRRS project.
- Involvement with paid or unpaid expert testimony or litigation related to the work of the USACE.
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or children related to any HSDRRS project, notably the WBV 14e.2 project or future benefits from the project.
- Current personal or firm[1] involvement with other USACE projects. If yes, provide titles of documents or description of project, dates, location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role.
- Any previous employment by USACE as a direct employee or contractor (either as an individual or through your firm[1]) within the last 10 years. If yes, provide title/description, dates employed, place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous direct employment by the USACE, New Orleans District. If yes, provide title/description, dates employed, and position/role.
- A significant portion (i.e., greater than 50%) of personal or firm[1] revenues within the last three years came from USACE contracts.
- Pending, current, or future financial interests in any projects that are *specifically* with the New Orleans District.
- Repeatedly serving as a peer reviewer for Task Force Hope projects (please list).
- Personal relationships with USACE staff in Mississippi Valley Division Headquarters, Task Force Hope, New Orleans District (Protection Restoration Office), Hurricane Protection Office, or officials from the State of Louisiana and Local governing entities including Southeast Louisiana Flood Protection Authority.
- Participation in the Interagency Performance Evaluation Task (IPET) Force, American Society of Civil Engineers External Review of IPET, the Louisiana Coastal Protection

[1] Includes any joint ventures in which your firm is involved and if your firm serves as a prime or as a subcontractor to a prime. Please clarify which relationship exists.

and Restoration Study, and/or National Research Council Committee on New Orleans Regional Hurricane Protection Projects.

- 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:
- Any other perceived COI not listed.

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APPENDIX C

Peer Reviewer Conflict of Interest Inquiry

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Appendix C
Peer Reviewer Conflict of Interest Inquiry

Dear (Peer Reviewer -- insert name):

You have been requested by the U.S. Army Corps of Engineers (USACE) to serve as an external peer reviewer for the Independent External Peer Review of WBV 14e.2 – V-Line Levee, East of Vertex – Phase 2. Your participation in this review will be greatly appreciated. However, it is possible that your personal affiliations and involvement in particular activities could pose a conflict of interest or create the appearance that you lack impartiality in your involvement for this peer review. Although your involvement in these activities is not necessarily grounds for exclusion from the peer review, you should consult the contact named below or other appropriate official to discuss these matters. Affiliations or activities that could potentially lead to conflicts of interest might include:

a) current work or arrangements concerning future work in support of industries or other parties that could potentially be affected by developments or other actions based on material presented in the document (or review materials) that you have been asked to review
b) your personal benefit (or benefit of your employer, spouse, or dependent child) from the developments or other actions based on the document (or review materials) you have been asked to review
c) any previous involvement you have had with the development of the document (or review materials) you have been asked to review
d) any financial interest held by you (or your employer, spouse, or dependent child) that could be affected by your participation in this matter
e) any financial relationship you have or have had with USACE such as employment, research grants, or cooperative agreements
f) significant portion (i.e., greater than 50%) of your personal or firm's revenues within the last three years came from USACE contracts
g) you or your firm made a publicly documented statement advocating for or against the subject project
h) litigation associated with USACE
i) past, present, or future activity, relationship, or interest (financial or otherwise) that could potentially be perceived by a third party, or give the appearance that you would be unable to provide independent unbiased subject matter knowledge, expertise, and/or services on this project.

Note: The above affiliations and activities include any joint ventures in which your firm is involved.

If you have any concerns over a potential conflict of interest, please contact Mr. Mike Genovese, Battelle (GenoveseM@Battelle.org, (614) 424-4007) to discuss any potential conflict of interest issues at your earliest convenience, but no later than two (2) days after receiving this request.

If you agree to be on this peer review panel, please check one of the following boxes, sign this form, and fax to Mr. Mike Genovese, Battelle, at (614) 458-4007 no later than two (2) days after receiving this request.

This form does not constitute an authorization to participate in this review; authorization for performance will come from Battelle's Government Subcontracts office.

[ ] I have no known existing or potential conflicts of interest associated with this task.

[ ] I have identified and disclosed in writing all known existing or potential conflicts of interest associated with this task.

_____		_____
Signature	Date	Printed Name

APPENDIX D

WBV 14e.2 IEPR
Charge Questions and Guidance to the Panel Members

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Charge Questions and Guidance to the Panel Members
for the
Independent External Peer Review of
WBV 14e.2 – V-Line Levee East of Vertex, Phase 2

BACKGROUND

The U.S. Army Corps of Engineers is currently designing and constructing the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). One of the vital components of this system is the WBV 14e.2 – V-Line Levee East of Vertex, Phase 2 (hereinafter WBV 14e.2) project. An integral part of the HSDRRS process is the conduct of an Independent External Peer Review (IEPR) to ensure the reliability of scientific information and engineering analysis contained within the project documents. In general, the project will follow the process outlined in the sections below.

OBJECTIVES

The objective of this work is to conduct an IEPR of the design for WBV 14e.2 in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

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

The purpose of the review is to determine if the design of the WBV 14e.2 project is consistent with the HSDRRS Design Guidelines and standard practice (Safety Assurance Review) (EC 1165-2-209; Appendix E). 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., panel members) with extensive experience in geotechnical engineering and civil engineering issues relevant to the project. They will also have experience with the HSDRRS Design Guidelines and applying their subject matter expertise to flood risk management.

The IEPR Panel (the Panel) will be "charged" with reviewing the documents and the project in relation to items identified as part of a Critical Items List (CIL) as well as providing a broad technical evaluation of the overall project in relation to significant threats to human safety. Per EC 1165-2-209, Appendix E, 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 the "adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring that good science, sound engineering, and public health, safety, and welfare" [e1] (EC 1165-2-209, Appendix E Section 1a, page E-1) have been taken

into account. These "are the most important factors that determine a project's fate" (EC 1165-2-209, Appendix E Section 1a, page E-1). The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

GENERAL GUIDANCE

Throughout this project, there will be a variety of formal and informal opportunities to interact with USACE in the presence of project sponsors, including representatives of the State of Louisiana. Battelle is providing each panel member with the following guidance on how various portions of the project will be conducted:

- Orientation Briefing Teleconference – During this meeting, USACE will provide an overview of the project. Panel members will not render any opinions or recommendations at this time, but they are encouraged to ask questions to assist in their understanding of the review documents.

- Design Review Teleconference – Panel members will participate in a design review teleconference following their review of the final geotechnical report (including Addendum 2of the report), and the final plans and specifications. Following teleconference, panel members are to provide written feedback to the Battelle Deputy Project Manager on what discussion and input they provided at the design conference.

- Design Reviews and Comment/Response Process – Each panel member will assess the provided documents and prepare panel review comments for Battelle. Panel members can openly discuss their reviews with other panel members; however, they should not discuss their findings with anyone outside of the team (except when requested to do so by the Battelle Project Manager or Battelle Deputy Project Manager). Individual findings from each respective expert reviewer must remain as an individual finding; no consolidation of similar findings will be developed to form a joint finding. However, notation of independent panel members arriving at similar conclusion(s) through independent means will be highlighted.

- Clarifying Questions – If USACE/Contractor responds in DrChecks with a clarification question to the panel member, the panel member will answer the question. In providing comments, the panel member must refer to the specific reference so that the representative can easily access the information in question.

- Handling of Non-Conforming Design and Construction Issues – At times, the panel member and the USACE design engineer may end up having a difference of opinion. It is not the purpose of the IEPR to resolve these non-conforming issues. These unresolved non-conforming issues will be clearly noted in DrChecks, at Design Review Conferences, and in Design Review Reports.

- All comments are to remain within the scope of the project to be reviewed.

- To maintain an IEPR, it is important that at all times the panel members maintain their independence. If they feel that any representative is trying to unduly interfere with this

independence in providing an opinion, this is to be brought immediately to the attention of the Battelle Project Manager and Battelle Deputy Project Manager.

DOCUMENTS PROVIDED

The following documents and reference materials will be provided for the review. **The documents and files presented in bold font are to be reviewed**. All other documents are provided as supporting documentation or for reference.

- **Final WBV 14e.2 Geotechnical Report, October 2010**
- **Final WBV 14e.2 Geotechnical Report, Addendum 2, January 2011**
- **Final WBV 14e.2 Plans**
- **Final WBV14e.2 Specifications**
- HSDRRS Quality Management Plan, 30 October 2009
- HSDRRS Design Guidelines, June 2008
- ER 1110-1-12, Engineering and Design, Quality Management, 30 September 2006
- ER 1110-1-8159, Engineering and Design, DrChecks, 10 May 2001
- EC 1165-2-209, Water Resources Policies and Authorities, Civil Works Review Policy, 31 January 2010
- CECW-CP Memorandum, 31 March 2007
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review,* 16 December 2004.

CHARGE FOR PANEL MEMBERS

Members of this Panel should understand that they are being asked to review "the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring that good science, sound engineering, and public health, safety, and welfare" [e1] (EC 1165-2-209, Appendix E Section 1a, page E-1) have been taken into account.

Per EC 1165-2-209 (page E-1), "The following excerpt from The American Society of Civil Engineers (ASCE), *Civil Engineering* magazine, February 2009, Volume 79, Number 2, Guiding Principles for Critical Infrastructure, page 58, column one, by ASCE's Critical Infrastructure Guidance Task Committee should serve as a back drop for conducting Safety Assurance Reviews. It captures the essence of the challenge and purpose of the review:

> For example, critical infrastructure must be designed to provide a balanced level of protection based on hazard level and reliability, and designs must be sufficiently conservative to accommodate unforeseen conditions. With the rapid expansion of knowledge and the spread of practices that have proved to be extremely effective ("best practices"), we must review the adequacy of existing infrastructure within the context of that new knowledge and ensure that processes are in place to respond quickly to any performance problems that arise. Resilience to prevent catastrophic failures must be a component of all designs. Performance monitoring should be rigorously employed in the operation and maintenance of protection systems."

The panel members are not being asked whether they would have conducted the work in a similar manner. Specific questions for the Panel are derived from the Critical Items List (CIL) and included in the general charge questions below.

General Charge Guidance

Please answer the questions listed below and conduct a Safety Assurance Review of the WBV 14e.2 project design and construction documents. Please feel free to make any relevant and appropriate comment on any of the information you were asked to review. In addition, please note the following guidance.

1. Your response to the charge questions and CIL should not be limited to a "yes" or "no." Please provide complete answers to fully explain your response. Note that for each review comment entered into DrChecks, you will be responsible for providing the following information: (1) a clear statement of the comment; (2) the basis for the comment; (3) a statement as to whether the comment is a "critical" level comment; and (4) recommendations to resolve the comment (including additional research or analysis that may influence the conclusions).
2. The project design requires redundancy, resiliency, and robustness.
    a) Redundancy is the duplication of critical components of a system with the intention of increasing reliability of the system, usually in the case of a backup or failsafe.
    b) Resiliency is the ability to avoid, minimize, withstand, and recover from the effects of adversity, whether natural or manmade, under all circumstances of use.

c) Robustness is the ability of a system to continue to operate correctly across a wide range of operational conditions (the wider the range of conditions, the more robust the system), with minimal damage, alteration or loss of functionality, and to fail gracefully outside of that range.

Please **do not** make recommendations on whether the design/construction method 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. Panel review 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 Independent Technical Review.
2. Please contact the Battelle Project Manager (Mario Lopez, lopezm@battelle.org) or Deputy Project Manager (Lauren Baker-Hart, bakerhartl@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnsonyoungk@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 DrChecks entries but will remain anonymous.

Charge Questions

1. Do the assumptions made during the decision document phase for hazards remain valid through the completion of design as additional knowledge is gained and the state-of-the-art evolves?
2. Do the project features adequately address redundancy, resiliency, or robustness with an emphasis on interfaces between structures, materials, members, and project phases?

   - **Redundancy**: The use of multiple lines of defense that are linked to potential failure modes. The most vulnerable failure modes need the greatest redundancy.
   - **Resilience:** The use of enhancements to improve the ability of the system to sustain loads greater than the design load to achieve gradual failure modes over some duration rather than sudden failure modes.
   - **Robustness**: The use of more conservative assumptions to increase capacity to compensate for greater degrees of uncertainty and risk.

3. Do the project features and/or components effectively work as a system?
4. Do the assumptions made during design remain valid through construction?
5. For operations and maintenance (O&M) manuals, do the requirements adequately maintain the conditions assumed during design and validated during construction? Will the project monitoring adequately reveal any deviations from assumptions made for performance?

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APPENDIX E

WBV 14e.2 IEPR:
Comment Resolution Form

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Comment No.	Page No.	Para. No.	Line No.	Comment	Battelle Response
edit	Universal	n/a	n/a	Change Flood Risk management to Coastal Storm Damage Reduction	Change accepted.
edit	Universal	n/a	n/a	Change design, engineering, and construction for WBV 14e.2 to design and engineering	Change accepted.
1	2	Table 1	Task 2	Concerned about the use of "approved" or "accepted" here because we technically don't have a say' we provide feedback on COI and any other questions as stated in section 1.2; can a better word be chosen here?	Changed to "USACE confirms Panel has no conflict of interest (COI)"
2	2	Table 1	Task 6	Need to allow USACE time to respond	Fixed schedule to allow USACE response time
edit	3	Table 2	n/a	Change construction solicitation specifications to Final Specifications	Change accepted.
edit	3	Table 2	n/a	Change Award Plans to Final Plans	Change accepted.
3	5, 6	2.5.2	3	Is the intent here that the USACE inputs an initial evaluator response but then has the ability to go back and modify and/or add to it after the responses are discussed in the telecon before going through BackChecks?	Reworded section to be more clear as USACE does not go back and modify and/or add to the response
4	6	2.5.2	5th bullet	Is USACE to provide evaluation before telecon?	Reworded section to be more clear. Evaluations and BackChecks go in before teleconference. Only open comments are discussed.
edit	Universal	2.8	n/a	Change USACE Technical Representative to PCX Program Manager	Change accepted.
5	8	Table 3	5	Deputy Program Manager is not listed in the table below	Mario Lopez's title is revised to Project Manager to reflect his correct project role.
edit	8	Table 4	n/a	Change Alternative Point of Contact to PCX Program Manager	Change accepted.
edit	8	Table 4	n/a	Change Alternative Point of Contact/Program Manager Task Force Hope to Program Manager Task Force Hope POC	Change accepted.
edit	9	4.3	5, 6	Change Angela Desoto, Chief, Technical Support Branch, USACE New Orleans	Change accepted.

				District to Task Force Hope and the USACE Project manager for the WBV 14e.2 project	
6	10	4.6.1	n/a	None called for in SOW	Reworded sentence to reflect this change.
7	D-1	Last paragraph	Last 2 sentences	Incomplete sentence	Quote taken from EC, but fixed to be a complete sentence
8	D-2	5th bullet	n/a	Clarify 'representative'	Changed to 'USACE design engineer'
9	D-4	First paragraph	2-3	Incomplete sentence	Quote taken from EC, but fixed to be a complete sentence.

APPENDIX B

IEPR Orientation Briefing Teleconference Agenda
June 22, 2011

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US Army Corps of Engineers ®

WBV 14e.2 – V-Line Levee, East of Vertex, Phase 2 Orientation Briefing

Wednesday, 22 JUN 11
1000 – 1200

Location: USACE New Orleans District Office, Room 341

Purpose: To hold an orientation briefing with independent external peer reviewers on WBV 14e.2 for providing 100-year level of risk reduction to the West Bank of Greater New Orleans

AGENDA

1000	Welcome and Introductions	
1010	IEPR Coordination	Julia Fritz
1020	Hurricane and Storm Damage Risk Reduction System Flyover Video	
1040	Overview of WBV 14e.2 (30 mins)	Lauren Fagerholm/John Templeton
1110	Discussions with Key Design Personnel (1 hrs)	PDT
1150	Wrap Up/Final Questions	All
1200	Adjourn	

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APPENDIX C

Charge for the WBV 14e.2 IEPR

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June 21, 2011
Charge Questions and Guidance as Provided to the Panel Members
for the
Independent External Peer Review of
WBV 14e.2 – V-Line Levee East of Vertex, Phase 2

BACKGROUND

The U.S. Army Corps of Engineers is currently designing and constructing the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). One of the vital components of this system is the WBV 14e.2 – V-Line Levee East of Vertex, Phase 2 (hereinafter WBV 14e.2) project. An integral part of the HSDRRS process is the conduct of an Independent External Peer Review (IEPR) to ensure the reliability of scientific information and engineering analysis contained within the project documents. In general, the project will follow the process outlined in the sections below.

OBJECTIVES

The objective of this work is to conduct an IEPR of the design for WBV 14e.2 in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

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The purpose of the review is to determine if the design of the WBV 14e.2 project is consistent with the HSDRRS Design Guidelines and standard practice (Safety Assurance Review) (EC 1165-2-209; Appendix E). 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., panel members) with extensive experience in geotechnical engineering and civil engineering issues relevant to the project. They will also have experience with the HSDRRS Design Guidelines and applying their subject matter expertise to flood risk management.

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Charge Questions

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APPENDIX D

IEPR Panel Member
Resumes

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Christopher J. Brown, Ph.D., P.E.
Geotechnical Engineer

Experience
24 years

Expertise
Water resources engineering
Aquifer storage recovery (ASR)
Geotechnical engineering
Ports/waterways
Dredging
Hazardous wastes
Computer modeling
Water resources planning
Environmental impact statements

Education
Ph.D., Civil Engineering, University of Florida, 2005
M.S., Civil Engineering, Villanova University, 1997
B.S., Civil Engineering, Temple University, 1991

Registration
Professional Engineer:
Florida (No. 65308)
Pennsylvania (No. 049758-E)

Professional Affiliations
American Society of Civil Engineers
International Association of Environmental Hydrologists
American Water Resources Association

Honors/Awards
U.S. Army Corps of Engineers:
Jacksonville District Engineer of the Year, 2002
Geotechnical Branch Engineer of the Year, 2000
Philadelphia District Engineer of the Year, 1998
Player of the Month, 1999
Panel members work awards, 1996 and 2004

Publications
Authored ~20 journal articles, presentations, and reports on topics in geotechnical engineering.

Summary of Experience

A senior consultant with Golder Associates in Jacksonville, Florida, Dr. Brown developed his extensive expertise in the U.S. Army Corps of Engineers (USACE), where he was a senior technical expert on groundwater hydrology, aquifer storage recovery (ASR) wells, water resources planning, dredging, confined disposal areas, levees, geotechnical engineering, and subsurface structures such as cofferdams and hydraulic barrier walls. He frequently provided recommendations where existing guidance was not adequate or literature was incomplete. Dr. Brown also worked on numerous civil engineering projects involving levees, dams, and retaining walls.

Relevant Projects

- Beltzville Dam Periodic Inspection, northeast Pennsylvania. Responsible for both annual and periodic inspections of the earth and rock fill embankment dam near Lehighton. Led multidisciplinary panel members from the USACE to inspect the dam and all associated infrastructure including reservoir control tower, main conduit, spillway, access roads, bridges, and control buildings following USACE and Federal Emergency Management Agency (FEMA) protocols.
- General Edgar Jadwin Dam Annual Inspections, northeast Pennsylvania. Responsible for several annual dam inspections of the USACE-owned earth and rock fill embankment dam near Scranton. Led a multidisciplinary panel members of engineers from the USACE to inspect the dam and all appurtenant structures for safety and operational & maintenance issues.
- Prompton Dam Modification Study, northeast Pennsylvania. Responsible for evaluating new spillway options at the USACE-owned Prompton Dam, whose spillway capacity was inadequate based on new hydrologic studies. Developed a range of alternatives for safely passing the design flows through the spillway, and evaluated adding roller-compacted concrete (RCC) to the embankment crest, new spillway through bedrock, and modifying the existing spillway via blasting and excavation to enlarge its capacity.
- Molly Ann's Brook Flood Control Project, Paterson, New Jersey. Responsible for segments of the T-wall retaining structures for a USACE flood mitigation project located this densely-populated urban area. Design evaluated the overall global stability of the retaining wall, as well as the geotechnical slope stability for certain key segments. Other design features included reinforced earth walls, underpinning of an existing building, and several large culverts and bridge replacements.
- Everglades Agricultural Reservoir, Palm Beach County, Florida. Primary duties included the oversight of geotechnical subsurface investigations to characterize the site geology and hydrogeology, evaluation of potential rock quarry sources, embankment design, and evaluation of embankment dam safety and stability. Multiple types of foundation improvement were considered for the project including jet grouting, slurry walls, and dental concrete. The overall feasibility

study also evaluated various embank-ment types including homogeneous earth, zoned earth/rock fill, rock fill, and RCC. The Groundwater Modeling System, MODFLOW, and SEEP/W Key were used to evaluate embankment dewatering and seepage.

- Water Preserve Area Feasibility Study, Broward County, Florida. Responsible for feasibility-level evaluations of multiple new reservoirs in support of the Everglades Restoration project. Responsible for embankment design, erosion protection, surveillance, subsurface explorations, and report preparation. Oversaw a panel of civil engineers who prepared the engineering appendices for the USACE and the District. The evaluations included calculations, design drawings, and a final engineering appendix for eight separate proposed reservoir impoundments. Many of the projects are now under construction as part of the "Acceler8" program including the Site 1 Impoundment, C-9 Reservoir, and C-11 Reservoir.
- Portugues Dam Groundwater Model, Ponce, Puerto Rico. Together with another hydrologic modeler, developed a MODFLOW model in support of the Portugues Dam project. The Portugues Dam is a thick arch RCC concrete dam located in the uplands of Puerto Rico. The dam foundation includes a complicated geologic regime including major near-vertical shear zones. The model development and calibration was difficult since the foundation was probably a combination of porous media and fracture flow systems. The numerical model was compared against older existing models and compared very favorably. The model was used to estimate uplift pressures, under seepage, through seepage, and to help with the design of drainage galleries and grout curtains.
- Levee Assessment Panel members, Louisville, Kentucky. Member of a USACE National Levee Assessment; panel members were charged with the inventory and development of a national levee database, as well as the development of risk-based assessment methodologies to be used for levee assessment and evaluation across the entire United States.
- L-31 North Seepage Management Pilot Project, Miami-Dade County, Florida. Responsible for the overall assessment and development of a permanent subsurface groundwater barrier system between Everglades National Park and Miami. The evaluations included feasibility-level design and analysis of over 50 separate barrier wall concepts including soil-bentonite and soil-cement-bentonite slurry walls; polyvinyl chloride (PVC) sheetpile; steel sheetpile; jet grouting; canal lining; and many others. Developed the concept of a pilot project to test a combination of different seepage control technologies.
- C&D Canal Deepening Feasibility Study, Maryland and Delaware. Responsible for the development of a site selection methodology for the disposal of dredged material throughout the study area. The site selection study used linear optimization techniques and various spatial map coverages to screen through over 350 different possible disposal area locations. Spatial map coverages included wetlands, parks,

cultural resources, bird habitat, endangered species, and land use. Linear optimization analysis was performed on combinations of disposal areas to arrive at the least cost disposal option considering pumping distances, access, and other required infrastructure.

- Delaware Main Channel Deepening Project, Pennsylvania and New Jersey. Responsible for exploration, evaluation, and design for proposed channel and harbor deepening study. Work included evaluation of dredgability of sediments, beneficial reuse of dredged material, and design of new confined disposal areas in New Jersey. Oversaw explorations of site "17G" to determine the overall geological and geotechnical foundation properties, and assisted the project engineer with evaluation of potential impacts to groundwater from confined disposal operations.

Education

M.S., Civil Engineering, University of California, Berkeley, 1978 (specialization: geotechnical engineering)

B.S., Civil Engineering, University of California, Berkeley, 1977

Registrations

Geotechnical Engineer in California, 1987 (#741)

Civil Engineer in California, 1980 (#32136)

Specializations

Port and harbor facilities
Dredging and environmental restoration projects
Levee and flood protection
Mass transit, bridge and highway improvements

Affiliations

ASCE – American Society of Engineers

Summary of Experience

Mr. Rudolph has served as Principal Engineer and Project Manager on a wide variety of geotechnical projects throughout California and the West for the past 33 years. Mr. Rudolph specializes in port and harbor facilities; flood control; earth fill dams and levees; water resources; dredging and environmental restoration projects; mass transit, bridge and highway improvements. Mr. Rudolph founded and sold two successful geotechnical engineering firms in the San Francisco Bay Area. These firms included Subsurface Consultants, Inc. (SCI), which was acquired by Fugro West in 2001. He later founded Land Marine Geotechnics (LMG) which merged with ENGEO Inc. in 2006. Mr. Rudolph now lives in Lake Tahoe California and is an Independent Consultant. Mr. Rudolph's relevant experience includes:

Success Dam Seismic Remediation Project, Porterville, California

- Member of the Independent External Review Panel (IERP) for the Remediation of Success Dam under subcontract to Battelle Memorial Institute
- Review including:
    - The technical basis for the risk assessment, engineering, economic, and environmental methods, models, data, and analyses, and assumptions supporting the draft Letter Report on Remediation of Success Dam, Porterville, CA and Environmental Impact Statement with all supporting documents
- Specific geotechnical review included:
    - site exploration and characterization
    - geotechnical engineering analysis of seepage and piping
    - liquefaction assessment
    - Seismic slope deformation modeling
    - Geotechnical aspects of spillway design
- Reviewed geotechnical models including FLAC analysis of embankment seismic deformation and interaction with control structure
- Evaluated dam remediation alternatives

Economic and Environmental Review of the Geotechnical and Economic Aspects of the Limited Reevaluation Report and Environmental Assessment on Design Deficiency Corrections, East St. Louis Flood Protection Project, East St. Louis, Illinois

- Member of the Independent External Review Panel (IERP) for the East St. Louis Flood Protection Project under subcontract to Battelle Memorial Institute
- Review including
    - site exploration and characterization
    - geotechnical engineering analysis of under-seepage and through seepage

- seepage mitigation alternative inducing relief wells and cutoff walls review of historic embankment seepage an piping problems
- HTRW (Hazardous, Toxic and Radioactive Waste) issues and proposed mitigations

- Reviewed geotechnical models including application of blanket theory approach to under-seepage analysis and relief well design, and finite element seepage analyses (Seep/W)
- Evaluated alternative seepage/piping cutoff wall alternatives including soil/bentonite (SB), soil/cement/bentonite (SBC) and cement/bentonite (C/B) walls

American River Common Features Project GRR Report IERP, USACE Sacramento District, California

- Member of the Independent External Review Panel (IERP) for the American River Common Features project under subcontract to Battelle Memorial Institute
- geotechnical review including
  - site exploration and characterization
  - geotechnical engineering analysis of seepage, slope stability under seepage conditions rapid drawdown and seismic conditions.
  - erosion
  - settlement
- Reviewed geotechnical models using UTEXAS4, Seep/W, Quad4M, Slope/W
- Geotechnical earthquake engineering expert reviewing
  - ground motions studies,
  - liquefaction analyses and,
  - seismic deformation analyses.

West Bank and Vicinity Hurricane Projection Project, Plaquemines Parish, Louisiana, Hero Canal Reach 1 IERP

- Member of the Independent External Review Panel (IERP) for the American River Common Features project under subcontract to Battelle through ENGEO, Inc
- geotechnical review including
  - site exploration and characterization
  - geotechnical engineering analysis slope stability and seepage
  - settlement
  - evaluated strength line interpretations for geotechnical design
- Reviewed geotechnical slope stability models using Spencer's method with Slope/W and UTEXAS4 as well as analyses using the USACE Method of Planes (MOP) with uplift computer program

Vineyard Development Water Supply Reservoirs, Napa, Sonoma,

Lake, Mendocino and San Luis Obispo Counties, CA

- Principal Consultant on more than 150 small, earth-fill dams and reservoirs.
- Consulted on site selection, including geologic and seismic assessment, material sources and design alternatives.
- Projects involved diversion structures within nearby rivers to supply off stream impoundments.
- Investigations were conducted in sensitive environments and required the coordination with the Department of Fish and Game
- Provided recommendations for spillway design and modification, and seepage cutoffs.
- Several projects were conducted under the jurisdiction of the California Department of Water Resources Division of Safety of Dams.
- Supervised the construction management of many of these projects.

Galbraith Upland Dredge Material Disposal Facility Port of Oakland, CA

- Design and construction of levees on landfill and very soft estuarine soils
- Extensive subsurface investigation on soft soils
- Slope stability analyses for levee embankments on soft soils using UTEXAS4 and Slope/W
- Slurry wall cutoff design for seepage control
- Developed stability and seepage monitoring plans during construction
- Regulatory interface with State Division of Dam Safety, and Regional Water Quality Control Board

Berths 55 & 56, Port of Oakland, Oakland, CA

- Extensive onshore and offshore geotechnical investigation for widening of Oakland estuary dominated by very soft soils (Bay Mud)
- Evaluated alternatives for shoreline stabilization including: various marginal wharf designs , bulkhead walls, rock buttress dikes and Cement Deep Soil Mixing (CDSM)
- Designed CDSM shoreline buttress. Evaluated global and internal buttress stability using a variety analytical methods
- Developed site specific earthquake ground motions for wharf design
- Conducted static and seismic slope deformation analyses using geotechnical model Slope/W
- Evaluated rock slope protection for wave and tug prop-wash conditions
- Designed and monitored extensive CDSM test sections
- Designed high capacity marginal wharf piles for both

lateral and vertical loads
- Conducted vertical and lateral pile load tests to confirm design
- Designed extensive onsite confined dredge disposal site which was stabilized using wick drains and surcharge for development as a container yard
- Provided geotechnical quality control during construction

Hamilton Wetlands Restoration Plan, Novato, CA
- Provided peer review of extensive levee system underlain by very soft soils
- Conducted extensive static and seismic slope stability analyses for new levees adjacent to movement sensitive pipelines and structures
- Interpreted strength lines from insitu vane shear and TXUU testing, applied SHANSEP methodology to strength interpretation
- Evaluated seepage potential and mitigation measures
- Used a variety of slope stability methods including Spencer's Method, interpreted computer outputs for Slope/W, UTEXAS4, and other slope stability programs
- Evaluated undrained soil deformation/heave using finite element analysis
- Developed a staged construction program to maintain stability during construction
- Designed and interpreted geotechnical monitoring program including clustered vibrating wire piezometers, settlement plates, Casagrande piezometers, slope inclinometers and survey monuments to evaluate levee performance
- Coordinated flood fight and emergency levee repairs to an adjacent levee during flood of January 2006
- Close interaction with San Francisco District USACE

Inner Harbor Turning Basin, Port of Oakland, Oakland, CA
- Conducted extensive onshore and offshore investigation of soft soil site
- Designed a 50-foot high tied-back waterfront sheet-pile bulkhead for static and seismic forces.
- Evaluated liquefaction induced lateral pressures on wall
- Provided lateral design criteria for sheet and axial capacity design for anchor piles
- Conducted pile load tests on contractor proposed alternative tension pile anchors
- Developed a program to monitor tension loads in piles using strain gauges
- Close interaction with San Francisco District USACE

MOTEMS Audits Shell Martinez, IMTT and BP Richmond, CA

- Conducted onshore and offshore geotechnical investigation in soft soil to support structural/geotechnical evaluation of marine oil terminals
- Characterized subsurface condition with extensive laboratory and insitu testing programs
- Developed soil structure interaction design parameters for structural evaluation of pile supported wharf structures, including p-y, t-z and Q-w relationship for various pile types and sizes
- Conducted lateral pile analyses of large diameter piles for wharf retrofit and mooring dolphin design
- Developed seismic design criteria for analyses
- Conducted slope stability analyses for shoreline and pipe support routes

Redwood Shores Levee Evaluation, Redwood City CA

- Conducted review and preliminary geotechnical engineering for FEMA certification of 17-mile levee system on very soft soils
- Conducted slope stability analyses using Spencer's method
- Evaluated levee seepage
- Provided conceptual design alternative for "I" and "T" flood wall design

Levee Assessment, Bel Marin Keys Unit V, Marin County, CA

- Developed the conceptual interim repair measures for 14,900 feet of inboard and outboard levee repairs.
- Provided rapid response emergency levee breach assessment, design and repairs following the 2006 New Year storms.

Middle Harbor Enhancement Area, Port of Oakland, Oakland, CA

- Conducted a harbor-wide investigation that relied on reviewing several hundred existing environmental core samples and test boring logs
- Conducted a "bottom deployed" Cone Penetrometer Test (CPT) investigation to supplement existing data.
- Collaborated with USCAE laboratory in Vicksburg, Mississippi to conduct column settling and odometer testing of dredge slurry
- Characterized 12.8 million cubic yards of dredge material and provided consulting services regarding the issues associated with its reuse.
- Developed a digitally developed terrain model from the resulting data compilation to aid in dredge sequencing and allocation evaluations.
- Conducted geotechnical engineering studies to evaluate in water placement of 3+ million yard of

dredge material for shallow water habitat creation including:

- fill retention alternatives
- estimate short- and long-term bulking and settlement during and following placement.
- developed adaptive management strategies to monitor the behavior of the dredge materials and adjusted the construction processes to assure that the critical final target elevations were attained for the habitat areas.