

# Final Independent External Peer Review Report Melvin Price Wood River Underseepage Limited Reevaluation Report and Environmental Assessment on Design Deficiency Corrections

Prepared by  
Battelle Memorial Institute

Prepared for  
Department of the Army  
U.S. Army Corps of Engineers  
Flood Risk Management Planning Center of Expertise  
St. Louis District

Contract No. W912HQ-10-D-0002  
Task Order: 0009

April 6, 2011



**Final Independent External Peer Review Report  
Melvin Price Wood River Underseepage  
Limited Reevaluation Report and Environmental Assessment  
on Design Deficiency Corrections**

**by**

**Battelle  
505 King Avenue  
Columbus, OH 43201**

**for**

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INDEPENDENT EXTERNAL PEER REVIEW REPORT  
for the**

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Limited Reevaluation Report and Environmental Assessment  
on Design Deficiency Corrections**

**EXECUTIVE SUMMARY**

**Project Background and Purpose**

The purpose of the *Melvin Price Wood River Underseepage Limited Reevaluation Report and Environmental Assessment on Design Deficiency Corrections (Melvin Price Wood River LRR)* is to address the underseepage concerns located in the Wood River Levee District northwest of the Melvin Price Locks and Dam. The Melvin Price Locks and Dam are located in Madison County, Illinois, and St. Charles County, Missouri, at Mississippi River Mile 200.78, two miles below Alton, Illinois, and between the mouth of the Missouri River and the Illinois River. The project is focused on a section of the Wood River Levee from project station 0+00 to 115+00, which is located adjacent to the permanent navigation pool at the Melvin Price Locks and Dam. This portion of the Wood River Levee has experienced uncontrolled underseepage when river levels are near the navigation pool elevation at the Melvin Price Locks and Dam.

Potential work that could provide a long-term solution to the uncontrolled underseepage includes construction of a seepage berm using sand dredged from the Mississippi River, with accompanying adjustments to berms and relief wells; construction of relief wells at lower elevations and closer spacing; and construction of a fully penetrating slurry trench cutoff wall.

**Independent External Peer Review Process**

The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the Melvin Price Wood River LRR. Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the *Melvin Price Wood River LRR*. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007), and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

Five panel members were selected for the IEPR from more than 10 identified candidates. Based on the technical content of the *Melvin Price Wood River LRR* and the overall scope of the project, the final panel members were selected for their technical expertise in the following key areas: geotechnical engineering, civil engineering, National Environmental Policy Act (NEPA)

impact assessment, cost engineering, and economics. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The Panel received electronic versions of the *Melvin Price Wood River LRR* documents, totaling more than 500 pages, along with a charge that solicited comments on specific sections of the documents to be reviewed.

The USACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review. In addition to this teleconference, a teleconference with USACE, the Panel, and Battelle was held halfway through the review period to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. The Panel produced more than 270 individual comments in response to the 57 charge questions.

IEPR panel members reviewed the *Melvin Price Wood River LRR* documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendations on how to resolve the comment. Overall, 11 Final Panel Comments were identified and documented. Of these, one was identified as having high significance, nine had medium significance, and one had low significance.

### **Results of the Independent External Peer Review**

The panel members agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2010; p. D-4) in the *Melvin Price Wood River LRR* document. Overall, the Panel found the *Melvin Price Wood River LRR* and associated attachments presented a compelling argument to support the need for taking corrective action given the limited scope of the project. However, it is not clear that the entirety of the seepage problems can be ascribed to the Melvin Price Locks and Dam project or that there may be design deficiencies associated with the original/overall Wood River Levee system.

Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following statements summarize the Panel’s findings.

**Plan Formulation:** The process used to select the recommended plan is well-stated in the LRR; however, there was minimal information presented for alternative analysis. There was also little data on the use and explanation of key performance metrics for these alternatives. The Panel believes that the recommended plan will result in a feasible solution, correcting the seepage problems and the potential impacts resulting from levee failure. However, it is not clear if the recommended plan is the most economical and/or least costly alternative to reduce damages over the long-term.

**Economics:** The Panel believes that the economics evaluation is lacking in supporting detail. The LRR provides results from analyses but little explanation of the analytical techniques used to reach those results. A revised Economics Appendix was provided during the review process, but further information is needed to confirm the accuracy and adequacy of the appendix. For instance, there is information provided for the lower portion of the Wood River Levee system, but very little is provided for the project study area. It is not clear that the economic damages analyzed are for the study area or for both portions levee system. The potential economic and environmental effects of a levee failure are not supported. The risk analysis is inconsistent with USACE guidance addressing Risk-Based Analysis for Flood Damage Reduction Studies and with observed levee seepage conditions and analyses.

**Engineering:** The engineering models and tools for the geotechnical and civil engineering analyses, notably the seepage analysis, appear to have been used in an appropriate manner. Seep/W results would be stronger if transient or 3D modeling was conducted using existing observation data, instead of steady-state calibration only. The Panel believes it is important to recalibrate the Seep/W model to ensure a robust analysis can be used to evaluate both engineering seepage concerns and environmental effects. Supplemental data (e.g. annotated model outputs, piezometer water level spreadsheets) provided to the Panel after the mid-review teleconference should be integrated into the LRR. For example, the data set for the piezometers should be discussed further in the LRR and used for transient model calibration. Information contained in the Engineering Appendix and LRR is not sufficient to easily differentiate model output/results of project alternatives.

In addition, the tools used for the cost analysis have been used appropriately; however, because of the incomplete tables and missing data, the LRR and appendices are disconnected and would benefit from a description of the construction methods, estimate assumptions, and project schedule. More detail is provided in the Micro-Computer Aided Cost Estimating System (MCACES) regarding construction methods, production rates, and design data than is evident in the LRR and appendices.

**Environmental:** There are data gaps associated with the evaluation of aquatic resources, water quality, subsurface soil, and groundwater along the levee system. With these gaps in data, it is difficult to determine whether sufficient studies have been performed to assess the probable environmental impacts of the proposed project. This lack of data also contributed to the Panel's difficulty in understanding the scope and extent of impacts to aquatic resources, and whether appropriate mitigation has been proposed by the USACE. The Panel believes that a budget should be provided for mitigating the likely effects to the aquatic and upland habitats landside of the levees. Furthermore, the report should clarify the potential impacts on existing wetlands, given that seepage base flow to these areas will be severely reduced if the slurry trench cutoff wall is installed.

**Table ES-1. Overview of 11 Final Panel Comments Identified by the Melvin Price Wood River LRR IEPR Panel**

<b>Significance – High</b>	
1	The performance metrics and alternative screening process are not presented in sufficient detail to justify the selection of the recommended plan.
<b>Significance – Medium</b>	
2	Improvement of the Seep/W model analysis can be achieved through application of transient calibration and through improved linkages to other models used in the study.
3	The risk analysis is inconsistent with USACE guidance addressing Risk-Based Analysis for Flood Damage Reduction Studies and with observed levee seepage conditions and analyses.
4	The project purpose and objectives are not defined clearly and have not been integrated consistently into the plan formulation process.
5	The potential direct and indirect impacts on aquatic resources, water quality, subsurface soil, and groundwater cannot be determined using the data provided in the Environmental Assessment.
6	The socioeconomic conditions are not adequately addressed to understand the impacts associated with this project.
7	The LRR does not include a compensation plan or budget for potential environmental impacts that cannot be avoided or minimized.
8	The long-term performance of the alternatives considered is not discussed in sufficient detail to determine the risk reduction.
9	The recommended plan does not include instrumentation and wetland mitigation costs and the LRR does not include a project schedule to support the Total Project Cost Summary.
10	It is unclear how the project will be integrated with the overall levee system and the project objectives.
<b>Significance – Low</b>	
11	The potential economic and environmental effects of a levee failure under the future without project conditions are not clearly described.

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## LIST OF ACRONYMS

AEP	Annual Exceedance Probability
ASCE	American Society of Civil Engineers
ASFE	American Society of
ATR	Agency Technical Review
CNP	Condition Annual Non-exceedance Probability
COI	Conflict of Interest
CON	Construction Risk
CSI	Construction Specifications Institute
CSRA	Cost and Schedule Risk Analysis
DrChecks	Design Review and Checking System
EA	Environmental Assessment
IEPR	Independent External Peer Review
FEMA	Federal Emergency Management Agency
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
LCR CSO	Little Calumet River Combined Sewer Overflow
LRR	Limited Reevaluation Report
MCACES	Micro-Computer Aided Cost Estimating System
NEPA	National Environmental Policy Act
NED	National Economic Development
NTP	Notice to Proceed
O&M	Operation and Maintenance
OMB	Office of Management and Budget
PE	Professional Engineer
PED	Preconstruction, Engineering, and Design
PUP	Probability of Unsatisfactory Performance
POP	Period of Performance
SAME	Society of American Military Engineers
TPCS	Total Project Cost Summary
USACE	United States Army Corps of Engineers

## 1. INTRODUCTION

The purpose of the *Melvin Price Wood River Underseepage Limited Reevaluation Report* and Environmental Assessment on Design Deficiency Corrections (*Melvin Price Wood River LRR*) is to address the underseepage concerns located in the Wood River Levee District northwest of the Melvin Price Locks and Dam. The Melvin Price Locks and Dam are located in Madison County, Illinois, and St. Charles County, Missouri, at Mississippi River Mile 200.78, two miles below Alton, Illinois, and between the mouth of the Missouri River and the Illinois River. The project is focused on a section of the Wood River Levee from project station 0+00 to 115+00, which is located adjacent to the permanent navigation pool at the Melvin Price Locks and Dam. This portion of the Wood River Levee has experienced uncontrolled underseepage when river levels are near the navigation pool elevation at the Melvin Price Locks and Dam.

Potential work that could provide a long-term solution to the uncontrolled underseepage includes construction of a seepage berm using sand dredged from the Mississippi River, with accompanying adjustments to berms and relief wells; construction of relief wells at lower elevations and closer spacing; and construction of a fully penetrating slurry trench cutoff wall.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the *Melvin Price Wood River LRR* in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE) Engineer Circular *Civil Works Review Policy* (EC No. 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum *Peer Review Process* (USACE, 2007), and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels, was engaged to coordinate the IEPR of the *Melvin Price Wood River LRR*. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the existing environmental, economic, and engineering analyses contained in the *Melvin Price Wood River LRR*. The full text of the Final Panel Comments is presented in Appendix A.

## 2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (2010) and USACE (2007).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions,

methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the *Melvin Price Wood River LRR* was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization under Section 501(c)(3) of the U.S. Internal Revenue Code with experience conducting IEPRs for USACE.

### 3. METHODS

This section describes the method followed in selecting the members for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2010) and in accordance with USACE (2007) and OMB (2004) guidance. Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

#### 3.1 Planning and Schedule

At the beginning of the Period of Performance (POP), Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. Subsequent changes to the schedule were submitted to USACE under separate emails.

Table 1 defines the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on the notice to proceed (NTP) date of January 28, 2011. Note that the work items listed in Task 7 occur after the submission of this report. Battelle will enter the 11 Final Panel Comments developed by the Panel into USACE’s Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle.

**Table 1. Melvin Price Wood River LRR IEPR Schedule**

<b>TASK</b>	<b>ACTION</b>	<b>DUE DATE</b>
<b>1</b>	<b>Notice to Proceed (NTP)<sup>a</sup></b>	1/28/2011
	<b>Review documents available</b>	1/28/2011
	Battelle submits draft Work Plan <sup>b</sup>	2/11/2011
	USACE provides comments on draft Work Plan	2/16/2011

**Table 1. Melvin Price Wood River LRR IEPR Schedule, continued**

<b>TASK</b>	<b>ACTION</b>	<b>DUE DATE</b>
<b>2</b>	Battelle recruits and screens up to eight potential panel members; prepares summary information <sup>a</sup>	2/4/2011
	Battelle submits list of five selected panel members	2/11/2011
	USACE provides comments on five selected panel members	2/15/2011
	Battelle completes subcontracts for panel members	3/2/2011
<b>3</b>	Battelle submits final Work Plan <sup>b</sup>	2/22/2011
	USACE approves final Work Plan	2/23/2011
<b>4</b>	Kick-off meeting convened with USACE and Battelle	2/4/2011
	Kick-off meeting convened with Battelle and IEPR Panel	3/3/2011
	Kick-off meeting convened with USACE, Battelle, and IEPR Panel	3/4/2011
	Mid-review teleconference for the IEPR Panel to ask clarifying questions of USACE	3/10/2011
<b>5</b>	IEPR Panel completes review and provides comments to Battelle	3/17/2011
	Battelle consolidates comments from IEPR Panel	3/17/2011
	Consensus teleconference convened with IEPR Panel and Battelle	3/18/2011
	Panel members finalize Final Panel Comments	4/4/2011
<b>6</b>	<b>Battelle submits Final IEPR Report to USACE<sup>b</sup></b>	<b>4/6/2011</b>
<b>7<sup>c</sup></b>	Battelle inputs Final Panel Comments to DrChecks	4/7/2011
	USACE provides draft Evaluator Responses via e-mail (Word document)	4/11/2011
	Teleconference convened with USACE, Battelle, and IEPR Panel to discuss Final Panel Comments	4/19/2011
	USACE inputs final Evaluator Responses to Final Panel Comments in DrChecks	4/27/2011
	IEPR Panel responds to USACE Evaluator Responses (BackCheck Responses)	
	Battelle submits entire pdf printout of DrChecks project file and closes out DrChecks <sup>b</sup>	4/29/2011
	Project Closeout	7/28/2011

<sup>a</sup> Requested to start on recruitment to meet the aggressive schedule.

<sup>b</sup> Deliverable.

<sup>c</sup> Task 7 occurs after the submission of this report.

### 3.2 Identification and Selection of IEPR Panel Members

The candidates for the Panel were evaluated based on their technical expertise in the following key areas: geotechnical engineering, civil engineering, National Environmental Policy Act (NEPA) impact assessment, cost engineering, and economics. These areas correspond to the technical content of the *Melvin Price Wood River LRR* and overall scope of the Melvin Price Wood River IEPR project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle initially identified more than 10 candidates for the Panel, evaluated their technical expertise, and inquired about potential COIs. Battelle primarily targeted members who had knowledge and familiarity with the levee systems in the area or who had already participated in either the Alton to Gale or East St. Louis IEPRs previously conducted for the St. Louis District. Of the 10 candidates, Battelle chose eight of the most qualified candidates and confirmed their interest and availability. Of the eight candidates, five were proposed for the final Panel and three were proposed as backup reviewers. Information about the candidate panel members, including brief biographical information, highest level of education attained, and years of experience, was provided to USACE for feedback. Battelle made the final selection of panel members according to the selection criteria described in the Work Plan.

The five proposed primary reviewers constituted the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

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

- Involvement by you or your firm<sup>2</sup> in the Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois.

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

<sup>2</sup> Includes any joint ventures in which the expert's firm is involved.

- Involvement by you or your firm<sup>2</sup> in flood control in Wood River Drainage and Levee District, Alton, Illinois, Madison County, Illinois, St. Charles County, Missouri, Wood River, Missouri River, and Mississippi River.
- Involvement by you or your firm<sup>2</sup> in the Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois, related projects.
- Current employment by the USACE.
- Involvement with paid or unpaid expert testimony related to Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois, related projects.
- Current or previous employment or affiliation with members of the cooperating agencies or local sponsors, including Wood River Drainage and Levee District (for pay or pro bono).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse or children related to Wood River Drainage and Levee District, Alton, Illinois, Madison County, Illinois, St. Charles County, Missouri, Wood River, Missouri River, and Mississippi River.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for the USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the St. Louis District.
- Current firm<sup>2</sup> involvement with other USACE projects, specifically those projects/contracts that are with the St. Louis District. If yes, provide title/description, 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<sup>2</sup>) within the last 10 years, notably if those projects/contracts are with the St. Louis District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood management and/or lock and dam design, and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois, related contracts/awards from the USACE.
- A significant portion (i.e., greater than 50%) of personal or firm<sup>2</sup> revenues within the last three years came from USACE contracts.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois.

- Participation in relevant prior federal studies relevant to this project and/or Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois.
  - Design Memorandum No. 16 Wood River Drainage and Levee District Alteration, March 1985
  - 1993 P.L. 84-99 Memorandum. Memorandum, CELMV-CO-E, dated 9 March 1994, Subject: Project Approval/Funding Request, Final Repairs, Wood River Drainage and Levee District, Madison County, Illinois
  - Periodic Inspection No. 7. Periodic Inspection No. 7, Levee and Closure Structures, Wood River Flood Protection Project, dated March 1997
  - Reconnaissance 905(b) Report. Wood River Levee, Illinois, Flood Damage Reduction 905b Report dated April 1999
- Participation in prior non-federal studies relevant to this project and/or Limited Reevaluation Report Melvin Price Wood River Underseepage Design Deficiency Project, Madison County, Illinois.
- 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.

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

Prior to beginning their review and within 1 day of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel.

### **3.3 Preparation of the Charge and Conduct of the IEPR**

Charge questions were provided by USACE and included in the draft and final work plan. In addition to a list of 57 charge questions/discussion points, the final charge included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Battelle planned and facilitated a final kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meeting, the IEPR Panel received an electronic version of the following *Melvin Price Wood River LRR* documents listed below. The panel members also received a copy of the final charge.

- *Limited Reevaluation Report, Melvin Price Wood River Underseepage Design Deficiency Project, Draft Report, Melvin Price Lock and Dam, Madison County, Illinois, Draft Report, September 2010*

- Appendix A: Preliminary Draft, Engineering
- Appendix B: Preliminary Draft, Economics
- Appendix C: Environmental Assessment with Draft of Finding of No Significant Impact
- Appendix D: Quality Control Plan Checklist, Real Estate Plans
- Appendix E: Cost Engineering
- USACE guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 31, 2007
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004

The Panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle.

### **3.4 Review of Individual Comments**

Prior to completion of the review of the *Melvin Price Wood River LRR* documents, a teleconference with USACE, the Panel, and Battelle was held halfway through the review period to provide the Panel an opportunity to ask questions of USACE regarding uncertainties requiring clarification. During the review process, the Panel requested the following supplemental information from USACE:

- Additional annotated Seep/W model results and output
- Levee monitoring data from piezometer and Mississippi River water level testing
- Additional information regarding relief well pump system tests conducted onsite
- Additional figures and maps delineating project features including geologic cross sections and levee sections
- MCACES files with raw data for cost analysis
- Revised Economic Appendix B
- Additional environmental technical data supporting the EA

At the end of the review period, the Panel produced approximately 270 individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. As a result of the review, Battelle summarized the 270 comments into a preliminary list of 25 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

### **3.5 IEPR Panel Teleconference**

Battelle facilitated a 3-hour teleconference with the Panel so that the panel members, many of whom are from diverse scientific backgrounds, could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project,

including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

The Panel also discussed responses to 16 specific charge questions where there appeared to be disagreement among panel members. The conflicting comments were resolved based on the professional judgment of the Panel, and all sets of comments were determined not to be conflicting. Each comment was either incorporated into a Final Panel Comment, determined to be consistent with other Final Panel Comments already developed, or determined to be a non-significant issue.

At the end of these discussions, the Panel identified 11 comments and discussion points that should be brought forward as Final Panel Comments.

### **3.6 Preparation of Final Panel Comments**

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

- **Lead Responsibility:** For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- **Directive to the Lead:** Each lead was encouraged to communicate directly with other IEPR panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- **Format for Final Panel Comments:** Each Final Panel Comment was presented as part of a four-part structure:
  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium, low; see description below)
  4. Recommendation(s) for Resolution (see description below).
- **Criteria for Significance:** The following were used as criteria for assigning a significance level to each Final Panel Comment:
  1. **High:** Describes a fundamental problem with the project that could affect the recommendation, success, or justification of the project. Comments rated as high

- indicate that the Panel analyzed or assessed the methods, models, and/or analyses and determined that there is a “showstopper” issue.
2. Medium: Affects the completeness of the report in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium indicate that the Panel does not have sufficient information to analyze or assess the methods, models, or analyses.
  3. Low: Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate that the Panel identified information (tables, figures, equations, discussions) that was mislabeled or incorrect or data or report sections that were not clearly described or presented.
- Guidance for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

At the end of this process, 11 Final Panel Comments were prepared and assembled. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel’s overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

## **4. PANEL DESCRIPTION**

Candidates for the Panel were identified using Battelle’s Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and referrals. Battelle prepared a draft list of primary and backup candidate panel members (who were screened for availability, technical background, and COIs), and provided it to USACE for feedback. Battelle made the final selection of panel members.

An overview of the credentials of the final five primary members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his or her area of technical expertise is presented in the text that follows the table.

**Table 2. Melvin Price Wood River LRR IEPR Panel: Technical Criteria and Areas of Expertise**

	Hegre	Brown	Rudolph	Nelson	Crouch
<b>Cost Engineering (one expert needed)</b>	X				
Cost Engineer with minimum of 10 years demonstrated experience in preparing cost estimates for civil engineering studies and flood control works	X				
Familiar with the latest version of MCACES (MII) (3.01 version 2.0)	X				
Licensed engineer	X				
<b>Geotechnical Engineering (one expert needed)</b>		X			
Professional engineer with a minimum 10 years demonstrated experience in geotechnical studies and design of flood control works including:		X	X		
Expertise in levee underseepage and design and construction of relief wells		X	X		
Expertise in slurry wall design and construction		X	X		
Familiar with geotechnical practices used in the Mississippi River Flood Plain		X	X		
Active participation in related professional engineering and scientific societies		X	X		
Minimum M.S. degree or equivalent in geotechnical engineering		X	X		
<b>Civil Engineering (one expert needed)</b>			X		
Professional engineer with a minimum 10 years demonstrated experience in civil engineering studies and design of flood control works including:		X	X		
Access to work sites		X	X		
Disposition of excavated contaminated soil material		X	X		
Design and construction of auxiliary features to relief wells and slurry walls		X	X		
Experience with hazardous waste		X	X		
Experience with aquifer protection		X	X		
M.S. degree or higher in civil engineering		X	X		
<b>Economics (one expert needed)</b>				X	
10 years economics work experience				X	
Experience performing benefit cost analysis				X	

	Hegre	Brown	Rudolph	Nelson	Crouch
Experience with evaluation and comparison of benefit and cost recommendations for deficiency correction studies				X	
B.S. degree or higher in economics				X	
<b>NEPA Impact Assessment (one expert needed)</b>					<b>X</b>
Minimum 10 years demonstrated experience in evaluation and conducting NEPA impact assessments for complex, multi-objective public works projects with competing trade-offs					X
Experience in performing cumulative effects analysis for complex, multi-objective public works projects with competing trade-offs					X
Experience in determining scope and methodologies for impact assessment and analyses for a variety of projects and programs with high public and interagency interests and having project impact to nearby sensitive habitats					X
Active participation in related professional societies is encouraged					X
Minimum M.S. degree or higher in appropriate field of study					X

***Paul Hegre, P.E.***

**Role:** This panel member was chosen primarily cost engineering experience and expertise.

**Affiliation:** Short Elliott Hendrickson, Inc.

**Paul Hegre, P.E.**, is a cost engineer for Short Elliott Hendrickson, Inc. in St. Paul, MN specializing in project design engineering, construction documents preparation, cost estimate preparation and asset management condition assessment analysis obtained predominantly from working on flood control projects. He earned his B.S. in civil engineering from the University of Minnesota, Twin Cities in 1997. He has over 12 years experience in civil engineering, is a licensed professional engineer in Minnesota and Wisconsin, and is a Certified Construction Specifier. He has demonstrated experience in performing cost engineering in flood control works on numerous projects such as East Grand Forks, ND Flood Control (Phase 1 and 2), Crookston, MN Flood Control (Stages 1, 2, 3A, 3B, 4, and 5) and the Little Calumet River Combined Sewer Overflow (LCR CSO) West Interceptor. For the LCR CSO, he assisted in the preparation of an alternative analysis report and once the preferred alternative was selected, prepared the final design, plans, specifications, construction cost estimate, and schedule using MCACES MII. His cost estimating experience includes preparing cost estimates for budgets and construction, and he has produced Independent Government Estimates for USACE. He is familiar with the latest version of MCACES (MII) (3.01 version 2.0) having received both formal training in cost estimating software tools and through direct project application. In addition to LCR CSO, he has developed estimates with MCACES MII for projects such as the Stillwater Flood Control Stage 3 and Crookston Flood Control Stage 5. Mr. Hegre has more than five years direct experience working for or with USACE, having worked with St. Paul District on Crookston Stage 1- 2 Flood Control starting in 2001, East Grand Forks Flood Control Phase 1-2, Heartsville Coulee, Stillwater Flood Control, and with the Chicago District on LCR CSO. He is a member of Society of American Military Engineers (SAME), American Society of Civil Engineers (ASCE), and Construction Specifications Institute (CSI).

***Christopher Brown, Ph.D., P.E.***

**Role:** This panel member was chosen primarily for his geotechnical engineering experience and expertise.

**Affiliation:** University of North Florida

**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, PA and Jacksonville, FL, 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 has performed significant embankment dam inspections and design for Prompton Dam, Beltzville Dam, and Jadwin Dam, and assisted other engineers in the scoping of subsurface investigations to explore abutment seepage at the F.E. Walter Dam. Dr. Brown was the project

geotechnical engineer for the CERP L-31 North Seepage Management Pilot Project (Miami-Dade County, FL), responsible for the overall assessment and development of a permanent subsurface groundwater barrier system between Everglades National Park and Miami, FL. The evaluations included feasibility-level design and analysis of over 50 separate barrier wall concepts. Dr. Brown developed a pilot project concept to test a combination of different seepage control technologies for this project. 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 Flood plain, 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 SAME, ASCE, International Association of Environmental Hydrologists, and American Water Resources Association.

***R. William Rudolph, P.E.***

**Role:** This panel member was chosen primarily for his civil engineering experience and expertise.

**Affiliation:** Independent Consultant

**R. William Rudolph, P.E.**, is an independent consultant serving as principal engineer and project manager on a wide variety of geotechnical engineering projects. He earned his M.S. degree in geotechnical engineering from the University of California at Berkeley in 1978 and holds both his Civil and Geotechnical Engineering licenses in California. He has over 30 years of experience in the geotechnical and civil engineering fields, specializing in port and harbor facilities, flood control, earth-fill dams and levees, water resources, dredging and environmental restoration projects, 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, CA; Redwood Shores Levee Evaluation, Redwood City, CA; and Levee Assessment, Bel Marin Keys Unit V, Marin County, CA. His civil engineering projects have included small earth-fill dams, lined and unlined canals, weirs, pump stations, pipelines, flood walls 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, ASFE, and is a corresponding member of the ASCE 7-10 SSC.

***Eric Nelson***

**Role:** This panel member was chosen primarily for his economics experience and expertise.

**Affiliation:** Independent Consultant

**Eric Nelson** is an independent consultant and study manager specializing in plan formulation and economics. He earned his B.A. in economics from the University of Tennessee in 1975 and has over 30 years of experience in water resources planning with a focus on flood damage

reduction. He was a USACE plan formulator/economist for 27 years (1979 – 2006) and is experienced with all phases of the USACE plan formulation standards. His primary field of expertise is in flood damage reduction projects and he is familiar with the USACE ER 1105 series regulations. His experience includes comprehensive water resource planning, deep draft navigation, and environmental restoration, and he has served as both an economist and plan formulator for a number of diverse projects for state, local and international clients. Mr. Nelson's expertise in benefit cost analysis is reflected in his experience as lead economist on the Pearl River Flood Damage Reduction Study in Jackson, MS and the Village Creek Flood Damage Reduction Study in Birmingham, AL. His knowledge and experience in ecosystem restoration and multipurpose planning cumulative effects analyses, and multipurpose planning is reflected in his role as plan formulator and contract manager of the multi-state project Comprehensive Water Resource Planning for the Apalachicola, Chattahoochee and Flint River Basins and the Alabama, Coosa, Tallapoosa River Basins in Alabama, Georgia, and Florida. Every major category of benefits associated with the regulated flows of both basins – navigation, flood control, hydropower, low flows for endangered species and recreation – was analyzed for this project. Among the projects requirements were the planning of water resource demand for inland navigation, hydropower production, municipal and industrial water supply, endangered species, and as other economic and social needs. He also is familiar with USACE hydrologic models and is experienced in the use of HEC-FDA. Mr. Nelson is a graduate of the 1986-87 class of Planning Associates from the Board of Engineers for Rivers and Harbors.

### **Greg Crouch**

**Role:** This panel member was chosen primarily for his NEPA impact assessment experience and expertise.

**Affiliation:** Crouch Environmental Services, Inc.

**Greg Crouch** is vice-president of Crouch Environmental Services, Inc., specializing in NEPA analysis and document preparation, permitting and mitigation, environmental site assessment and public involvement for projects with high public and interagency interests. He earned his M.S. in biology/ecology in 1977 from Steven F. Austin State University, and has received additional academic training in the NEPA process from the Duke University Nichols School of Environmental and Earth Sciences (2004-05). He has over 33 years of nationwide experience in environmental site assessment and inventories, permitting, and evaluation and conducting NEPA impact assessments for complex multi-objective public works projects with competing trade-offs. His NEPA-related experience includes development of the EIS for the Bayport Container Terminal and NEPA documentation for evaluation and effects analysis for offshore platforms, pipelines and federal leases, nuclear power plants, coal-fired power plants, parks, highways, pipelines, transmission lines, dredged material placement areas and liquefied natural gas facilities. Mr. Crouch has completed over 200 Phase I Environmental Site Assessments nationwide for a variety of private and public clients and has experience evaluating and creating sensitive habitats including streams and wetlands. He routinely performs cumulative effects analyses on public works projects with high public and interagency interests as part of his extensive NEPA practice and has substantial experience working with USACE on flood damage reduction projects (including dam safety). Specific projects include the Clear Creek Flood Damage Reduction Project, the Sims Bayou Hike and Bike Trail, Greens Bayou Flood Damage Reduction Project, Addicks and Barker Dam Safety Public Involvement, compliance audits, and

the Jacintoport Dredged Material Placement Area. Recently, Mr. Crouch worked on the biological sections of an EIS for major container terminal on Galveston Bay (Texas) and managed the environmental investigations and permitting for 43,000 acres of planned development on the Texas coast. Mr. Crouch is a member of the Society of Wetland Scientists.

## 5. SUMMARY OF FINAL PANEL COMMENTS

### Results of the Independent External Peer Review

The panel members agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2010; p. D-4) in the *Melvin Price Wood River LRR* document. Overall, the Panel found the *Melvin Price Wood River LRR* and associated attachments presented a compelling argument to support the need for taking corrective action given the limited scope of the project. However, it is not clear that the entirety of the seepage problems can be ascribed to the Melvin Price Locks and Dam project or that there may be design deficiencies associated with the original/overall Wood River Levee system.

Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following statements summarize the Panel’s findings.

**Plan Formulation:** The process used to select the recommended plan is well-stated in the LRR; however, there was minimal information presented for alternative analysis. There was also little data on the use and explanation of key performance metrics for these alternatives. The Panel believes that the recommended plan will result in a feasible solution, correcting the seepage problems and the potential impacts resulting from levee failure. However, it is not clear if the recommended plan is the most economical and/or least costly alternative to reduce damages over the long-term.

**Economics:** The Panel believes that the economics evaluation is lacking in supporting detail. The LRR provides results from analyses but little explanation of the analytical techniques used to reach those results. A revised Economics Appendix was provided during the review process, but further information is needed to confirm the accuracy and adequacy of the appendix. For instance, there is information provided for the lower portion of the Wood River Levee system, but very little is provided for the project study area. It is not clear that the economic damages analyzed are for the study area or for both portions levee system. The potential economic and environmental effects of a levee failure are not supported. The risk analysis is inconsistent with USACE guidance addressing Risk-Based Analysis for Flood Damage Reduction Studies and with observed levee seepage conditions and analyses.

**Engineering:** The engineering models and tools for the geotechnical and civil engineering analyses, notably the seepage analysis, appear to have been used in an appropriate manner. Seep/W results would be stronger if transient or 3D modeling was conducted using existing observation data, instead of steady-state calibration only. The Panel believes it is important to recalibrate the Seep/W model to ensure a robust analysis can be used to evaluate both

engineering seepage concerns and environmental effects. Supplemental data (e.g. annotated model outputs, piezometer water level spreadsheets) provided to the Panel after the mid-review teleconference should be integrated into the LRR. For example, the data set for the piezometers should be discussed further in the LRR and used for transient model calibration. Information contained in the Engineering Appendix and LRR is not sufficient to easily differentiate model output/results of project alternatives.

In addition, the tools used for the cost analysis have been used appropriately; however, because of the incomplete tables and missing data, the LRR and appendices are disconnected and would benefit from a description of the construction methods, estimate assumptions, and project schedule. More detail is provided in the Micro-Computer Aided Cost Estimating System (MCACES) regarding construction methods, production rates, and design data than is evident in the LRR and appendices.

**Environmental:** There are data gaps associated with the evaluation of aquatic resources, water quality, subsurface soil, and groundwater along the levee system. With these gaps in data, it is difficult to determine whether sufficient studies have been performed to assess the probable environmental impacts of the proposed project. This lack of data also contributed to the Panel’s difficulty in understanding the scope and extent of impacts to aquatic resources, and whether appropriate mitigation has been proposed by the USACE. The Panel believes that a budget should be provided for mitigating the likely effects to the aquatic and upland habitats landside of the levees. Furthermore, the report should clarify the potential impacts on existing wetlands, given that seepage base flow to these areas will be severely reduced if the slurry trench cutoff wall is installed.

**Table 3. Overview of 11 Final Panel Comments Identified by the Melvin Price Wood River LRR IEPR Panel**

<b>Significance – High</b>	
1	The performance metrics and alternative screening process are not presented in sufficient detail to justify the selection of the recommended plan.
<b>Significance – Medium</b>	
2	Improvement of the Seep/W model analysis can be achieved through application of transient calibration and through improved linkages to other models used in the study.
3	The risk analysis is inconsistent with USACE guidance addressing Risk-Based Analysis for Flood Damage Reduction Studies and with observed levee seepage conditions and analyses.
4	The project purpose and objectives are not defined clearly and have not been integrated consistently into the plan formulation process.

**Table 3. Overview of 11 Final Panel Comments Identified by the Melvin Price Wood River LRR IEPR Panel, continued**

<b>Significance – Medium</b>	
5	The potential direct and indirect impacts on aquatic resources, water quality, subsurface soil, and groundwater cannot be determined using the data provided in the Environmental Assessment.
6	The socioeconomic conditions are not adequately addressed to understand the impacts associated with this project.
7	The LRR does not include a compensation plan or budget for potential environmental impacts that cannot be avoided or minimized.
8	The long-term performance of the alternatives considered is not discussed in sufficient detail to determine the risk reduction.
9	The recommended plan does not include instrumentation and wetland mitigation costs and the LRR does not include a project schedule to support the Total Project Cost Summary.
10	It is unclear how the project will be integrated with the overall levee system and the project objectives.
<b>Significance – Low</b>	
11	The potential economic and environmental effects of a levee failure under the future without project conditions are not clearly described.

## 6. REFERENCES

EM 1110-2-1913, Design and Construction of Levees, USACE, 2000

ER 1110-2-1302 Civil Works Cost Engineering, USACE, 14 July 08

ETL 1110-2-573 Construction Cost Estimating Guide for Civil Works, USACE, 30 Sept 08

ETL 1110-2-556, Risk-Based Analysis in Geotechnical Engineering for Support of Planning Studies, USACE, May 1999, with Errata Sheet in March 2003

IWR Report 01-R-01, A Practical Guide on Conducting Expert-Opinion Elicitation of Probabilities and Consequences for Corps Facilities, USACE, January 2001

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

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

USACE (2007). Peer Review Process. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. CECW-CP Memorandum. March 30.

USACE (2010). Water Resources Policies and Authorities: Civil Works Review Policy. Department of the Army, US Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-209. January 31.

**APPENDIX A**

**Final Panel Comments**

**on the**

**Melvin Price Wood River LRR IEPR**

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**Comment 1:**

**The performance metrics and alternative screening process are not presented in sufficient detail to justify the selection of the recommended plan.**

**Basis for Comment:**

The plan formulation process did not include an appropriate diversity of alternatives to demonstrate that the least cost, environmentally acceptable and economically justified alternative was selected. The Melvin Price Wood River Underseepage Limited Reevaluation Report and Environmental Assessment on Design Deficiency Corrections (Melvin Price LRR and EA) (Section 5.6.1.1) contains a discussion of four primary alternatives including a fully-penetrating barrier wall, seepage berms, relief wells, and a single hybrid alternative seepage berm-relief wells. The LRR does not include an evaluation of other potential hybrid alternatives such as the barrier wall-seepage berm or barrier wall-relief well combinations. Therefore, based upon the information presented in the LRR, the Panel concludes that the recommended plan cannot be justified. The Panel understands that schedule constraints may require that further alternative optimizations occur during the Preconstruction, Engineering, and Design (PED) phase of the project.

In addition, the four alternatives that were developed were not all evaluated to the same level of detail. For example, the relief well alternative was not carried forward to the full cost analysis due to concerns regarding required close well spacing (Appendix A and Appendix E). The Panel agrees that a spacing of less than 50 feet for the relief well alternative may be excessive and, in fact, may result in a lesser outcome for this alternative. However, when considered in a hybridized system, relief well spacing of 50 to 100 feet may be feasible and cost effective. This projected spacing is consistent with some of the previous modeling completed by the St. Louis District for the relief well only alternative. In order to compare all alternatives side-by-side, each must have a similar level of analysis completed, including full cost estimates.

The performance metrics used to screen alternatives are not clearly defined and their use is not well documented. Metrics such as cost, exit gradient, and uplift pressures are mentioned in Appendix A (Section 1, paragraphs C, and E) but the cutoff wall alternative is not included. The Panel assumes that performance metrics were established and compared/contrasted for each alternative; however, these evaluations are not presented in the LRR nor completely detailed in Appendix A. For instance, information given in Appendix A (Sections 1 through 4) could be used to develop performance metrics to distinguish the alternatives. The Panel's understanding regarding the impetus for the recommended plan is that the barrier wall alternative is reliable and can be implemented quickly, thereby providing more efficient risk reduction for the levee system. Considerations including alternative reliability, implementation time, and risk reduction are all important metrics and the Panel agrees that these may in fact be more important than cost. Additional discussion of these metrics would provide further clarity in the LRR and provide better support for alternative selection.

**Significance – High:**

The selection of the recommended plan is not supported by the alternative analysis process.

**Recommendations for Resolution:**

1. Complete the alternative analysis with a full array of hybrid alternatives. Since hybrid alternatives may be considered part of design optimization, the Panel believes that this evaluation could be completed during PED phase if schedule constraints preclude full alternative reassessment as part of a revision to the LRR under review by the Panel. Ensure that each alternative is evaluated using the same level of detail and completeness.
2. Develop a complete set of performance metrics to differentiate the alternatives and include this in the Appendices A and E.
3. Provide further details on the performance metrics that were used for the selection of the recommended plan. If further alternative reassessment is completed, use the same performance metrics to evaluate any new hybrid alternatives.

**Comment 2:**

**Improvement of the Seep/W model analysis can be achieved through application of transient calibration and through improved linkages to other models used in the study.**

**Basis for Comment:**

The seepage modeling using the two-dimensional code Seep/W model evaluated a variety of cases (e.g., different sections, different geometries), boundary conditions, and possible remedial alternatives, but relied exclusively on steady-state flow conditions. Based upon trends that are evident in the piezometer and river pool hydrographs discussed in Appendix A, it is apparent that transient flow conditions generally prevail. Therefore, the Panel recommends that the seepage model be calibrated under transient conditions. Including transient seepage conditions would lead to an improved model capable of further optimizing the remedial alternatives and evaluation of environmental effects to adjacent wetlands/forests including changes in groundwater base flow that could affect wetland hydroperiod.

In addition to transient calibration issues, the Seep/W modeling has not been entirely integrated or linked with other numerical models used for project assessment and evaluation. The analysis of the Seep/W model does not include linkage with the Hydraulic Engineering Center River Analysis System (HEC-RAS) modeling described in the hydrologic section of Appendix A. The Panel recognizes this appears to be an oversight, as the ponding conditions modeled by HEC-RAS are actually one of the two primary boundary conditions for the Seep/W model. Similarly, there is not a clear linkage to the possible environmental effects of the various alternatives. It is clear to the Panel that seepage provides one source of water to the wetland systems present and may be an important regulator of the wetland hydroperiod. A transient Seep/W model would enable the U.S. Army Corps of Engineers (USACE) to more completely assess the possible impacts to wetlands as it relates to the recommended plan or other project alternatives. Lastly, the Seep/W water level results could be useful input to link to habitat assessment models used by USACE biologists.

**Significance – Medium:**

It is important to recalibrate the Seep/W model to ensure a robust analysis can be used to evaluate both engineering seepage concerns and environmental effects.

**Recommendations for Resolution:**

1. Recalibrate the Seep/W model using abundant transient data available.
2. When evaluating alternatives, ensure that boundary conditions related to landside ponding is consistent with results shown for HEC-RAS.
3. Export water levels from Seep/W model for input into habitat assessment models or for further consideration by USACE biologists in regard to wetland evaluations.

**Comment 3:**

**The risk analysis is inconsistent with USACE guidance addressing Risk-Based Analysis for Flood Damage Reduction Studies and with observed levee seepage conditions and analyses.**

**Basis for Comment:**

The risk analysis presented in Appendix B (Section 5, Analysis of the Underseepage Project) relates surface water level in the river to probability of levee failure. The section presents Probability of Unsatisfactory Performance (PUP); however, the specific details of this analysis are not described. The risk analysis results do not correlate with observed seepage conditions at various river stages, nor are they supported by a discussion of the seepage analyses and specific seepage gradient and levee/seepage blanket uplift pressure criteria. It appears that the PUP analyses may have been adapted from the general assessment of the overall Wood River Levee system and it is not clear if these PUPs are meant to be specific to the Mel Price Wood River project area.

EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, defines risk outputs in terms of Annual Exceedance Probability (AEP) and Condition Annual Non-exceedance Probability (CNP). The PUP terminology is not defined in this guidance document; however, this terminology is used in other USACE guidelines including the Expert-Opinion Elicitation of Probabilities and Consequences for Corps Facilities (January 2001). It is the Panel's opinion that the AEPs and CNPs should be computed for the without project condition and the alternatives considering the design flood elevation, as well as lesser exterior stage water levels in accordance with the guidance provided in EM 1110-2-1619. Furthermore, the risk analysis and calculation of PUPs and CNPs are engineering-based analyses, and as such would be more appropriate in the Engineering Appendix instead of the Economics Appendix where they currently are presented.

The LRR also assumes that all the alternatives will provide the same or similar probabilities of satisfactory performance, yet does not provide discussion, rationale or evidence to support the assumption. The Panel suggests that the evaluation of AEPs and CNPs be applied to all the alternatives.

The exterior stage river water levels presented in Tables 3 and 4 of Appendix B are not consistent with the water levels described in the LRR in Section 5.1.3.2, Underseepage and Sand Boils, or Section 5.1.4.4, Hydrologic and Hydraulic Conditions. These inconsistencies are also present in Appendix A regarding the discussion and analyses in Section A5, Discovery of Uncontrolled Seepage and Sand Boils, as well as the maximum pool elevations used in the geotechnical seepage analyses described in Sections B5 and B6, Geotechnical Seepage Analyses and Model Calibration, respectively.

The LRR and Appendix A indicate that heavy seepage with sand movement was observed at the normal pool elevation of 419 feet and landside ponding at 402.9 feet. Additionally, active sand boils were observed when the river elevation was at 421.93 feet and landside ponding at 409 feet. These observations, as evidenced by sand boils, suggest levee failure due to internal erosion is dependent on the landside ponding and will be initiated at a river level somewhere between elevation 419 feet and 422 feet.

Accordingly, the PUP should then be approximately 1.0 for this range of river levels. However, Table 2 presents PUP values for “Exterior Stage” river water levels that vary from 0.0 (at elevation 432.0 feet) to 1.0 (at elevation 443.8 feet). Table 3 suggests that underseepage will not cause levee failure until the water levels reach the maximum design flood profile of about elevation 443 feet. This elevation is 23 feet higher than observed water levels, indicating levee distress, and significantly understating the probability of unsatisfactory performance.

**Significance – Medium:**

The river water levels used in the risk analysis are not consistent with observed seepage conditions and the terms used to describe risk are not consistent with USACE guidelines. These inconsistencies affects the completeness of the report in describing the without project condition, and in addressing the benefits of the various alternatives.

**Recommendations for Resolution:**

1. Evaluate the probable levee performance for the existing condition, and all alternatives in terms of AEPs and CNPs associated with levee underseepage for the appropriate range of river water level as described in EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies.
2. Relate the computed AEPs and CNPs to observed seepage conditions at various river water levels.
3. Provide seepage analysis results that corroborate performance consistent with USACE Engineer Technical Letter (ETL) 1110-2-556 for Risk-Based Analysis in Geotechnical Engineering for Support of Planning Studies.
4. Provide justification for the assumptions that risk levels for all three alternatives will be virtually the same.

**Literature Cited:**

ETL 1110-2-556, Risk-Based Analysis in Geotechnical Engineering for Support of Planning Studies, USACE, May 1999, with Errata Sheet in March 2003

EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, USACE, 1996

IWR Report 01-R-01, A Practical Guide on Conducting Expert-Opinion Elicitation of Probabilities and Consequences for Corps Facilities, USACE, January 2001

<b>Comment 4:</b>
<b>The project purpose and objectives are not defined clearly and have not been integrated consistently into the plan formulation process.</b>
<b>Basis for Comment:</b>
<p>The LRR states that the project purpose is to correct an underseepage design deficiency and that the main objective is to restore operational functionality of the levee (Section 5.4). However, the supporting objectives, both stated and implied, are not consistently presented and measurements of their success are not defined. For example:</p> <ul style="list-style-type: none"> <li>• An objective of urgency is stated in Section 5.4, but the timeline is not defined.</li> <li>• An objective of high reliability is implied in Section 5.4.1; however, an acceptable level of risk of failure is not defined.</li> <li>• Appendix C, Section 1.4 states that Federal Emergency Management Agency (FEMA) certification is a project objective; however, this is not presented as an objective in the main report.</li> </ul> <p>In order to attain the main objective, the LRR defines and evaluates four alternative plans. The Panel has found that criteria used to compare the alternatives are described inconsistently within the LRR.</p> <ul style="list-style-type: none"> <li>• Section 5.4 cites the criteria as least cost, environmentally acceptable, and economically justified;</li> <li>• Section 5.6 cites the criteria as reasonableness, efficiency, and effectiveness; and</li> <li>• Section 5.6.1.1 presents engineering experience, cost effectiveness, and efficiency as the stated criteria.</li> </ul> <p>It is the Panels' opinion that consolidating the objectives and their corresponding measurements of success and the alternatives and their criteria for comparison would strengthen the selection of the recommended plan.</p>
<b>Significance – Medium:</b>
By defining success measurements for the project objectives and by using consistent criteria for alternative comparison, the alternative analysis will be more complete.
<b>Recommendations for Resolution:</b>
<ol style="list-style-type: none"> <li>1. State the criteria used to measure the success of the objectives in Section 5.4 of the LRR.</li> <li>2. Summarize the results in Section 5.6 of the LRR to distinguish the alternatives.</li> <li>3. Edit the LRR to provide consistent terminology when comparing the alternatives.</li> </ol>

**Comment 5:**

**The potential direct and indirect impacts on aquatic resources, water quality, subsurface soil, and groundwater cannot be determined using the data provided in the Environmental Assessment.**

**Basis for Comment:**

The Environmental Assessment (EA) presented in Appendix C does not provide a detailed description of potential impacts to aquatic resources, including emergent wetlands, wet bottomland forest, scrub-shrub wetland habitat and shallow ponded water. The Panel believes that the acreages of these areas should be provided in order to assess the magnitude/severity of potential environmental effects of implementation of the recommended plan. Since the current conditions are only minimally described, it is difficult to predict the project impacts on these resources. For example, a formal wetland delineation report, a listed species report, Phase I and Phase II Environmental Site Assessments, and a general biological assessment of the project area were not provided. In turn, without understanding the scope and extent of impacts to aquatic resources, it is difficult to determine appropriate mitigation.

The EA discusses documented impacts to the environment that have resulted from preliminary work along the levee system, including 0.5-acre of non-woody wetlands that have been adversely affected. In addition, the EA states that approximately 20-30 acres of wet bottomland forest are currently showing symptoms of a hydroperiod change and will be adversely affected within 4-5 years. Scrub-shrub habitat is currently stressed by prolonged inundation, and may be adversely affected in the near future. These impacts have not been addressed in a mitigation plan nor are mitigation costs addressed in the project budget.

The EA discusses the potential for subsurface soil and groundwater contamination in the project area, but does not map the locations of these potential contaminants. Therefore, it is difficult for the Panel to determine the distance of these known contaminated areas from the project site. The EA does not discuss a plan for mitigating subsurface soil and groundwater contamination should it be encountered during construction activities nor does it discuss a plan for determining the level and extent of contamination.

**Significance – Medium:**

Addressing both known and potential environmental impacts of the project will enable the calculation of an accurate budget and schedule for mitigating direct and indirect losses.

**Recommendations for Resolution:**

1. Provide a wetland mitigation plan, budget estimate and schedule for compensation of foreseeable wetland losses.
2. Provide a plan for determining the level and extent of potential contamination, including a contingency plan in the event contaminants are encountered during the construction process.

**Comment 6:**

**The socioeconomic conditions are not adequately addressed to understand the impacts associated with this project.**

**Basis for Comment:**

The Panel believes that the discussion and analysis of the socioeconomic conditions should be expanded to include the following:

1. The LRR does not focus on the floodplain being protected by the upper portion of the Wood River Levee system. There is information presented concerning the relative economic conditions of the residents currently protected by both portions of the levee system, yet there are no residential structures extant behind this portion of the levee system. The LRR alludes to future growth potential for oil refining and other manufacturing and/or service industry activity, but does not provide any location information to verify that this growth would actually occur behind this portion of the levee system.
2. The depth versus percent damage relationships for commercial properties were extracted from information used in the analyses from recent damage in the New Orleans area. The Panel agrees that the mix of commercial properties may be similar to that of the New Orleans area; however, these relationships may also contain consideration of items which are unique to the New Orleans area and not to this project, such as consideration for biological and/or chemical contamination (mold, mildew, oil/gas/grease), or the length of time before any clean-up can commence.
3. The Panel agrees that the types of data used in the HEC-FDA model are appropriate; however, the discussion of these data do not include information relative to the stage versus frequency data, specifically how that data were adjusted for geography or topography. Additionally, the report does not define the three reaches into which the study area was divided, and the Panel is unable to verify that the LRR is concerned with only the upper portion of the levee system.
4. The LRR indicates that the failure of the upper portion of the levee system would constitute significant potential for the failure of lower portion of the levee system as well as other levee systems downstream, but does not provide any evidence that such would actually occur. The LRR speculates that failure could impact commercial navigation without providing any rationale that this would or could occur, or any information concerning the sequence of events that must occur prior to such impacts becoming a reality.
5. The computations of interest during construction are generally correct, but a monthly convention seems to indicate a degree of certainty of construction expenditures which may not be achievable.

**Significance – Medium:**

It cannot be verified that the reduction in damages from the implementation of the recommended plan, the impacts that may result from levee failure, or the description of the economic activity forecasts are specific to the project floodplain.

**Recommendations for Resolution:**

1. Focus solely on the floodplain for this project area. Information extracted from prior reports should be specific to this project.
2. Confirm that the depth versus damage relationships for commercial property are completely appropriate for this floodplain and do not contain considerations for the extent of potential damages from conditions that do not exist in this floodplain.
3. Document that the extent of potential future economic activity is that which may occur in this floodplain and not in neighboring areas.
4. Provide the rationale and physical evidence that catastrophic impacts could occur as a direct result of levee failure.
5. Compute interest during construction based on realistic assumptions with respect to the uncertainties inherent in the construction schedule as determined in the MCACES cost estimate.

**Comment 7:**

**The LRR does not include a compensation plan or budget for potential environmental impacts that cannot be avoided or minimized.**

**Basis for Comment:**

Compensation for environmental effects is an integral part of the National Environmental Policy Act (NEPA) process. NEPA, as well as other state and federal regulations, requires that the issues of avoidance, minimization and mitigation of effects on natural resources be addressed for all foreseeable impacts. In addition to discussing the specific environmental effects that will or may occur as a result of implementation of the recommended plan, a detailed discussion describing how, when, and where compensatory mitigation for these effects will be undertaken. Mitigation has a cost. The cost should be included in the project budget. For example, Page C-62, last sentence of third paragraph of the EA (Appendix C) indicates that tree seedlings will be planted throughout a 20-30 acre wet bottomland forest that is currently expected to be adversely affected in the next 4 to 5 years. This only addresses one area that is currently being adversely affected by construction activities in the project area.

Once the recommended plan is implemented, there will be additional environmental effects on natural resources on the land side of the levee system. These potential deleterious effects have been mentioned but not described fully. Compensation for any losses that are likely to occur should be determined and described, in terms of both a mitigation plan and a budget.

On Page C-59 of the EA (Appendix C) states that 42 trees were cleared in April 2010, including one large, hollow cottonwood. There is no mention of compensation for the loss of trees or adhering to conditions of the Migratory Bird Act. In addition, there is no compensation plan or budget line item for such adverse effects.

Page C-60 of the EA (Appendix C) states that as early as October 2010, effects on vegetation have been noted in scrub-shrub and wet bottomland forest wetlands. It appears that these stress conditions will continue for approximately 4-5 years and during that time it is reasonable to assume that these vegetation communities will be adversely affected. A mitigation plan and budget were not included as part of the discussion of these likely losses.

**Significance – Medium:**

A more complete discussion of likely adverse environmental effects on aquatic resources and forested areas will more fully address the requirements of NEPA. In addition, compensatory mitigation, including cost estimates, would add strength to the analysis.

**Recommendations for Resolution:**

1. Include a qualitative discussion of aquatic and forested areas that have been and are likely to be adversely affected to the LRR and the EA.
2. Include line item cost estimates in the budget for compensatory mitigation.

**Comment 8:**

**The long-term performance of the alternatives considered is not discussed in sufficient detail to determine the risk reduction.**

**Basis for Comment:**

In the Economics Appendix, a note is provided stating that the alternatives are designed to provide the same level of protection. However, the evidence is not provided to support this statement or the idea that the design factors that contribute to the success of each alternative have been adequately considered in order to achieve identical results.

There is no discussion of the risks associated with the construction of a deep slurry cutoff wall, only a listing on the detailed risk register. It is probable that difficulties with the construction will impact the length of the construction schedule and/or contractor claims.

For an urban levee that approaches a standard project flood (SPF) level of protection (approximately 700-year level of protection), residual damages on the order of 20% seem very large. The LRR does not provide any inundation mapping or an explanation to support this percentage.

The LRR states that the probability of unsatisfactory performance of the levee would increase over time in the absence of a design deficiency correction. The Panel agrees that this is most probably the case, but no explanation is provided for the lack of analysis of this condition.

In the Economics Appendix, there is a general discussion of the derivation of the probabilities of unsatisfactory performance, without and with project, as well as the conditional probability of design non-exceedance. Tables 3, 4, and 5 present these data in an inconsistent manner using pool elevation in the first two instances and frequency in the last instance. There is no consistent correlation provided for pool elevation and frequency recurrence to verify the accuracy of the data presented. There is no explanation of the differences between the probability of unsatisfactory performance of the with project condition and the conditional probability of design non-exceedance.

**Significance – Medium:**

Without a complete discussion of the risks and uncertainties associated with the long-term performance of the alternatives considered, it is not possible to verify the technical adequacy of the analyses nor to confirm that the recommended plan is the most economical and/or least costly alternative.

**Recommendations for Resolution:**

1. Provide evidence that the level of protection and/or the performance of each alternative is identical or, if not, provide the appropriate analyses of the different degrees of success.
2. Provide adequate and appropriate consideration of the construction risks related to the slurry wall depth in both the construction schedule and cost estimate.
3. Present the rationale and analyses to support the estimate of residual damages.
4. Provide the assumptions, methodology, and calculations utilized to estimate the probability of unsatisfactory performance of the levee with respect to time or provide an explanation as to why the calculations are not performed.
5. Provide a consistent presentation of the data relative to the performance statistics.

**Comment 9:**

**The recommended plan does not include instrumentation and wetland mitigation costs and the LRR does not include a project schedule to support the Total Project Cost Summary.**

**Basis for Comment:**

The Panel believes the report and appendices will benefit from describing the construction methods, estimate assumptions, and project schedule as guided by USACE ER 1110-2-1302 and ETL 1110-2-573 for feasibility phase level estimates. More detail is provided in the Micro-Computer Aided Cost Estimating System (MCACES) regarding production rates, construction methods, and design data than is evident in the LRR and appendices. By including information from MCACES, questions that arise from the current incompleteness of the report and appendices will be clarified.

Appendix E lacks discussion of the assumptions used to backup the Government Estimate Work Sheets and MCACES estimate. Furthermore, a representative construction schedule that supports the Total Project Cost Summary (TPCS) and the Cost and Schedule Risk Analysis (CSRA) is missing. The following were also noted by the Panel:

- In review of the benefit and cost analysis in Appendix B, paragraph 06 and the Government Estimate Work Sheets and TPCS of Appendix E, it was unclear how the operation and maintenance (O&M) costs were developed.
- The adaptive management of wetlands and instrumentation costs associated with the selected alternative should be part of the comparative costs.

Section 8 of the LRR report contains blank tables (8-1 and 8-2) and text to be added once the Cost Engineering Appendix E is complete. It is difficult to determine what has been considered and appropriately accounted for without narratives describing the assumptions of needs for additional technical/design data, uncertainty of construction methods, and costs beyond construction completion.

For example, it was noted by the Panel in review of the Seep/W groundwater model in Appendix A, that additional piezometers at varying elevations would benefit the robustness of the model by improving accuracy of calibration and understanding of boundary conditions as well providing additional surveillance capability to monitor the performance of the slurry wall after construction. Although the MCACES estimate in Appendix E includes costs for 11 new relief wells, it does not provide narrative regarding costs of monitoring or maintenance after construction.

In review of the LRR Section 8, the Panel recognizes that the implementation schedule is tentative at best. However in consideration of schedule, the Panel noted that descriptions of construction methods in Appendix A, Section 2, Section E were general in nature. The descriptions provided in Section E6 alluding to deep wall depths and global stability concerns are not commensurate with the CSRA where the detailed risk register categorizes technical risk TL-1 at marginal and low and construction risk CON-1 at negligible and low for impact and risk level, respectively. The general descriptions in Appendix A suggest uncertainty and the low risk levels in the detailed risk register suggest certainty.

**Significance – Medium:**

Satisfying the requirements of ER 1110-2-1302 and ETL 1110-2-573 will improve the understanding and completeness of the comparative cost estimates, TPCS, MCACES, and CSRA.

**Recommendations for Resolution:**

1. Include information in the text placeholders and Tables 8.1 and 8.2 of Section 8 in the LRR.
2. Include a project schedule in Appendix E.
3. Include further narrative discussion regarding the method of construction and estimate assumptions described in Appendix E.
4. In Appendix B paragraph 06, elaborate on the O&M computations used in the referenced LRR.
5. Provide agreement between the discussion in Appendix A, Section 2, paragraph E, p. A-47 regarding construction methods and concerns and the Detailed Risk Register in Appendix E for risk events TL-1 and CON-1.

**Literature Cited:**

ER 1110-2-1302 Civil Works Cost Engineering, USACE, 14 July 08

ETL 1110-2-573 Construction Cost Estimating Guide for Civil Works, USACE, 30 Sept 08

**Comment 10:**

**It is unclear how the project will be integrated with the overall levee system and the project objectives.**

**Basis for Comment:**

The LRR indicates that the levee affected by the Melvin Price Locks and Dam Project is a portion of the overall Wood River Levee system. Appendix C indicates that the USACE has also identified underseepage design deficiencies at other locations within the Wood River Levee system and that another LRR and Supplemental Environmental Assessment for the additional locations will likely be completed in 2011. In addition, Appendix C, Section 1.4 - Public Concerns, indicates that the top priority of local interests is to maintain 100-year flood protection certification so that FEMA will not revise the Flood Insurance Rate Maps and change the designation of the areas behind the levees from protected area to flood hazard area. The LRR is unclear if this is an objective of the project or a subsequent issue that will be addressed by the local levee district.

It is also unclear what additional levee improvement measures, if any, will be required within the subject levee reach or to adjacent reaches. These measures could be associated with deficiencies identified in the LRR set for completion by 2011 or by the 100-year FEMA certification process. In addition, the LRR does not address what measures will be necessary at the transitions between the proposed cutoff walls and existing levee conditions. The installation of the cutoff walls may alter seepage conditions at the transitions and typically additional features, such as supplemental relief wells are included at the transitions. USACE discussed the incorporation of additional relief wells at the transitions during a conference call on March 18, 2011 with the Panel and Battelle. However, these measures are not discussed in the report or shown on the drawing.

The geotechnical evaluation of the levees has focused primarily on underseepage as the potential mode of failure based on visual levee inspection. USACE has identified underseepage as a known deficiency in the levee section under consideration for this LRR; however this does not preclude the existence of other potential failure modes. It does not appear that sufficient investigation has been conducted to address all potential levee failure mechanisms that need to be addressed for FEMA certification. Little is known about the characteristics of the levee itself, specifically the adequacy of the riverside clay blanket to mitigate through-seepage. It is the Panel's opinion that other potential failure modes, including through-seepage and associated steady-state seepage stability, have not been considered. EM 1110-2-1913 Design and Construction of Levees is used as the basis of levee assessment and states that levees need to be analyzed for these failure modes.

Ultimately consideration of through-seepage and its impacts on internal erosion, as well as the effect of steady state seepage on embankment stability, will need to be considered in the geotechnical evaluation for FEMA certification. Since the proposed cutoff trench will be at the riverside toe, it will have little effect on the mitigation of through-seepage, if the clay blanket is not sufficient. These further assessments could result in additional mitigation

measures, such as modification of the clay blanket, which would need to be integrated with the recommended plan to correct underseepage.

Ultimately, the overall Wood River Levee needs to be considered as a complete system that integrates measures implemented as part of the Melvin Price Locks and Dam Project Wood River Levee LRR (the subject of this IEPR), The LRR for the Wood River Levee system (scheduled to be completed in 2011), and any additional measures identified by the professional engineer retained by the Wood River Drainage and Levee District to address FEMA certification issues. The LRR could be improved by discussing this integration and conceptually describing how the recommended plan would be integrated with existing or future levee conditions.

**Significance – Medium::**

The details regarding how the project will be integrated with other existing and future levee conditions affects the understanding of the project as it relates to a systems approach to Risk-based Flood Damage Reduction Studies,

**Recommendations for Resolution:**

1. Incorporate discussion of on-going or planned studies (LRR for the Wood River Levee system and FEMA certification) that may result in additional modifications to the levee system.
2. Address the need for and details of additional project element, such as a relief well, at the project transitions.
3. Clarify if one of the project objectives is FEMA certification of the levee or if that is the responsibility of the local levee district.

**Literature Cited:**

EM 1110-2-1913, Design and Construction of Levees, USACE, 2000

**Comment 11:**

**The potential economic and environmental effects of a levee failure under the future without project conditions are not clearly described.**

**Basis for Comment:**

The LRR and appendices do not clearly describe the potential economic and environmental effects of a levee failure under the future without project conditions. The economic damages to the specific project area are not clear and the Panel understands the focus of the analysis to be from a much broader area including the Upper and Lower Wood River Levee and vicinity. Also in the LRR, some of the listed environmental effects refer to unsubstantiated environmental damage in the “billions of dollars” and cleanup costs of “\$125,000 per acre.” These numbers are not supported by references nor are they thoroughly documented in the Economics Appendix.

Similarly, it is not clear to the Panel if direct environmental effects and environmental justice issues reference broader community issues for the entire Wood River Project, or just the specific 11,500 feet long area under consideration by this LRR. For example, the Environmental Assessment information refers to environmental justice issues in general; however, specific areas of the community where these issues are pertinent to the LRR under review are not presented.

**Significance – Low:**

The economic and environmental conditions under the future without project scenario require further clarity to enhance the understanding of the report.

**Recommendations for Resolution:**

1. Add further narrative discussion in Appendix B (Economic Appendix) and Appendix C (EA) that describes the possible effects of levee failure, focusing solely on the specific project area under consideration. Adopt key portions of this new narrative as new text for the main report.
2. Add narrative to support the estimated per acre cleanup costs and potential widespread economic damages from flooding or loss of navigation infrastructure.
3. Either delete references to regional environmental justice issues or provide further clarification regarding environmental justice issues specifically related to the 11,500 feet of levee recommended for repair in the LRR.

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**APPENDIX B**

**Final Charge to the Independent External Peer Review Panel**

**as**

**Submitted to USACE on February 22, 2011**

**on the**

**Melvin Price Wood River LRR IEPR**

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**APPENDIX B**  
**Final Charge Questions and Guidance to the Peer Reviewers**  
**for the**  
**Melvin Price Wood River Underseepage**  
**Limited Reevaluation Report (LRR) and Environmental Assessment**  
**on Design Deficiency Corrections IEPR**

**BACKGROUND**

The purpose of the Limited Reevaluation Report is to address the underseepage concerns located in the Wood River Levee District adjacent to the Melvin Price Locks and Dam. The Melvin Price Locks and Dam is located in Madison County, Illinois and St. Charles County, Missouri at Mississippi River Mile 200.78, 2 miles below Alton, Illinois, between the mouth of the Missouri River and the Illinois River. The project is focused on a section of the Wood River Levee from project station 0+00 to 115+00, which is located opposite the permanent navigation pool at the Melvin Price Locks and Dam. This portion of the Wood River Levee has experienced uncontrolled underseepage caused by the navigation pool at the Melvin Price Locks and Dam.

Potential work that could provide a long-term solution to the uncontrolled underseepage include construction of a seepage berm using sand dredged from the Mississippi River, with accompanying adjustments to berms and relief wells; construction of relief wells at lower elevations and closer spacing; and construction of a fully penetrating slurry trench cutoff.

**OBJECTIVES**

The objective of this work is to conduct an independent external peer review (IEPR) of the *Melvin Price Wood River Underseepage Limited Reevaluation Report (LRR)* and Environmental Assessment On Design Deficiency Corrections (*Melvin Price Wood River LRR*) in accordance with the Department of the Army, U.S. Army Corps of Engineers, 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 this IEPR is to “assess the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (EC 1165-2-209; p. D-4) for the *Melvin Price Wood River LRR*. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in geotechnical engineering, civil engineering, NEPA impact assessment, cost engineering, and economics relevant to the project.

The IEPR Panel will be “charged” with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. The Panel will identify, examine, and comment upon the assumptions underlying the analyses as well as evaluate the soundness of models and analytic methods. The Panel will evaluate whether the interpretations of analyses and conclusions are technically sound and reasonable, provide effective review in terms of both usefulness of results and credibility, and have the flexibility to bring important issues to the attention of decision makers. The panel members may also offer opinions as to whether there are sufficient analyses upon which to base a recommendation.

The objectives of this task are to (a) prepare a Work Plan that will describe the process for conducting the IEPR of the *Melvin Price Wood River LRR*, (b) identify potential external peer review panel members, and (c) execute the Work Plan to conduct the external peer review.

## **DOCUMENTS PROVIDED**

The following is a list of documents and reference materials that will be provided for the review. **The documents and files presented in bold font are to be reviewed.** All other documents are provided for reference.

- **Limited Reevaluation Report and Environmental Assessment on Design Deficiency Corrections, Melvin Price Wood River Underseepage, Wood River, Illinois, Flood Protection Project**
  - **Main Report**
  - **Appendix A: Engineering**
  - **Appendix B: Economics**
  - **Appendix C: Environmental Assessment**
  - **Appendix D: Real Estate Plans**
  - **Appendix E: Cost Engineering**
- USACE guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 31, 2007
- Office of Management and Budget’s *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

**SCHEDULE**

<b>TASK</b>	<b>ACTION</b>	<b>DUE DATE</b>
<b>Conduct Peer Review</b>	Battelle sends review documents to panel members	3/3/2011
	Battelle/IEPR panel kick-off meeting (#2)	3/4/2011
	USACE/Battelle/IEPR panel kick-off meeting (#3)	3/4/2011
	Battelle convenes mid-review teleconference for the IEPR Panel to ask clarifying questions of USACE	3/10/2011
	Panel members complete their individual reviews	3/17/2011
<b>Prepare Final Panel Comments and Final IEPR Report</b>	Battelle provides Panel merged individual comments and talking points for panel review teleconference	3/21/2011
	Battelle convenes panel review teleconference	3/22/2011
	Panel members finalize Final Panel Comments	3/29/2011
	Battelle provides Final IEPR Report to Panel for review	3/30/2011
	Panel provides comments on Final IEPR Report	3/31/2011
	*Battelle submits Final IEPR Report to USACE	4/4/2011
<b>Comment/Response Process</b>	Battelle inputs Final Panel Comments to DrChecks <sup>SM</sup> ; Battelle provides Final Panel Comment response template to USACE	4/6/2011
	USACE provides draft Evaluator responses and ask clarifying questions	4/8/2011
	Battelle provides the panel the draft Evaluator responses and clarifying questions	4/12/2011
	Panel provides Battelle with draft comments on draft Evaluator responses (i.e., draft BackCheck responses)	4/14/2011
<b>Comment/Response Process, Continued</b>	Teleconference with Battelle and panel to discuss draft BackCheck responses	4/14/2011
	Teleconference between Battelle, IEPR Panel, and USACE to discuss Final Panel Comments, draft Evaluator responses, and clarifying questions	4/15/2011
	USACE inputs final Evaluator responses in DrChecks	4/20/2011
	Battelle provides Evaluator responses to panel	4/21/2011
	Panel members provide Battelle with final BackCheck responses	4/26/2011
	Battelle inputs the Panel's BackCheck responses in DrChecks <sup>SM</sup>	4/27/2011
	*Battelle submits entire pdf printout of DrChecks project file and closes out DrChecks <sup>SM</sup>	4/27/2011

## CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the *Melvin Price Wood River Underseepage Limited Reevaluation Report (LRR)* and Environmental Assessment on Design Deficiency Corrections (*Melvin Price Wood River LRR*) documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, and environmental resources. The panel members are not being asked whether they would have conducted the work in a similar manner.

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

### General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the *Melvin Price Wood River LRR*. Please focus on your areas of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-209; Appendix D).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluation of economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please **do not** comment on or make recommendations on policy issues and decision making.

Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Independent Technical Review.
2. Please contact the Battelle deputy project manager (Lauren Baker-Hart, [bakerhartl@battelle.org](mailto:bakerhartl@battelle.org)) or project manager (Karen Johnson-Young, [johnson-youngk@battelle.org](mailto:johnson-youngk@battelle.org)) for requests or additional information.
3. In case of media contact, notify the Battelle project manager immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

**Please submit your comments in electronic form to Lauren Baker-Hart, [bakerhartl@battelle.org](mailto:bakerhartl@battelle.org) no later than March 17, 2011, 10 pm EDT.**

**Independent External Peer Review  
Melvin Price Wood River Underseepage  
Limited Reevaluation Report (LRR) and Environmental Assessment  
On Design Deficiency Corrections IEPR**

**Final Charge Questions**

**General**

1. Were all models in the analyses used in an appropriate manner?
2. Are the models used sufficiently discriminatory to support the conclusions drawn from them (i.e., identify meaningful differences between alternatives)?
3. Were risk and uncertainty sufficiently considered?
4. Are potential life safety issues accurately and adequately described under existing, future without project, and future with project conditions?
5. In your opinion, are there sufficient analyses upon which to base the recommendation?

**Problem, Opportunities, Objectives, and Constraints**

6. Are the problems, opportunities, objectives, and constraints adequately and correctly defined?
7. Do the identified problems, opportunities, objectives, and constraints reflect a systems, watershed, and/or ecosystem approach, addressing a geographic area large enough to ensure that plans address the cause and effect relationships among affected resources and activities that are pertinent to achieving the study objectives; i.e., evaluate the resources and related demands as a system?
8. Did the study address those resources identified during the scoping process as important in making decisions relating to the study?

**Existing and Future Without Project Resources**

9. Has the character and scope of the study area been adequately described and is the identified study area appropriate in terms of undertaking a systems/watershed/ecosystem based investigation?
10. Do you agree with the general analyses of the existing social, financial, and natural resources within the study area?
11. For your particular area of expertise, provide an in-depth review of whether the analyses of the existing social, financial, and natural resources within the project area are sufficient to support the estimation of impacts of the array of alternatives.

12. Given your area of expertise, does this section appropriately address the existing conditions of all resources pertinent to the study?
13. Were there surveys conducted to evaluate the existing social, financial, and natural resources adequately? If not, what types of surveys should have been conducted?
14. Were socioeconomic conditions adequately addressed? Were specific socioeconomic issues not addressed?
15. Was the hydrology discussion sufficient to characterize current baseline conditions and to allow for evaluation of how forecasted conditions (with and without proposed actions) are likely to affect hydrologic conditions? Please comment on the completeness of the discussion on the relationship between subsurface hydrology and the hydrodynamics of the project area.
16. Was the discussion of natural resources sufficient to characterize current baseline conditions and to allow for evaluation of forecasted conditions (with and without proposed actions)?
17. Were the assumptions used as the basis for developing the most probable future without project conditions reasonable? Were adequate scenarios effectively considered (applied during analyses where relevant and/or reasonably investigated)? Were the potential effects of climate change addressed?
18. Are the future conditions expected to exist in the absence of a Federal project logical and adequately described and documented?
19. Please comment on the conclusion of the most probable future without project condition. Do you envision other potential probable outcomes?

#### **Plan Formulation/Alternative Development**

20. Was a reasonably complete array of possible measures considered in the development of alternatives?
21. Did the formulation process follow the requirement to avoid, minimize, and then mitigate adverse impacts to resources?
22. Does each alternative meet the formulation criteria of being effective, efficient, complete, and acceptable?
23. Were the assumptions made for use in developing the future with project conditions for each alternative reasonable? Were adequate scenarios considered? Were the assumptions reasonably consistent across the range of alternatives and/or adequately justified where different?
24. Are the changes between the without and with project conditions adequately described for each alternative?

25. Are the uncertainties inherent in our evaluation of benefits, costs, and impacts, and any risk associated with those uncertainties, adequately addressed and described for each alternative?
26. Are future Operation, Maintenance, Repair, Replacement, and Rehabilitation efforts adequately described and are the estimated costs of those efforts reasonable for each alternative?
27. Please comment on the screening of the proposed alternatives. Are the screening criteria appropriate? In your professional opinion are the results of the screening acceptable? Were any measures or alternatives screened out too early?
28. Were the engineering, economic, and environmental analyses used for this study consistent with generally accepted methodologies? Why or why not?
29. Does any alternative include identified separable elements (a portion of a project that is physically separable, and produces hydrologic effects or physical or economic benefits that are separately identifiable from those produced by other portions of the project)? If so, is each identified separable element independently justified and are the benefits, costs, and effects of the separable elements correctly divided?

### **Recommended Plan**

30. Comment on whether you agree or disagree with how the selected alternative was formulated and selected. Comment on the plan formulation. Does it meet the study objectives and avoid violating the study constraints?
31. Are there any unmitigated environmental impacts not identified, and if so, could they impact plan selection?
32. Please comment on the likelihood of the recommended plan to achieve the expected outputs.
33. Please comment on the completeness of the recommended plan, i.e. will any additional efforts, measures, or projects be needed to realize the expected benefits?
34. Please comment on the appropriateness of location, sizing, and design of plan features.

### **Flood Risk Management and Damages Reduction**

35. Are residual risks adequately described and is there a sufficient plan for communicating the residual risk to affected populations?
36. Are the magnitudes and timeframes assumed for damages related to expected future losses reasonable?

## **Levee Safety**

37. Is there sufficient information presented to identify, explain, and comment on assumptions that underlie engineering analyses?
38. Do the physical data and observed data provide adequate information to characterize the project and its performance?
39. Have all characteristics, conditions, and scenarios leading to failure, along with the potential consequences, been identified? Have all pertinent factors, including population at risk, been considered in the estimation of risk for the baseline condition? Have all the levee safety issues and opportunities been identified?
40. Have the potential impacts of each alternative been clearly and adequately presented, including expected risk reduction, residual risk, changes in existing outputs of the project, potential mitigation, implementation schedules, and costs?

## **Economics**

41. Are all costs (internal and external) of the deficiency correction that are necessary to realize the benefits appropriately identified and included in the investment analysis?
42. Are valuations of project outputs consistent with economic theory and explained sufficiently to support the recommended improvement?
43. Are economic assumptions about the future with and without project conditions reasonable and considered consistent with other economic forecasts?
44. Has time preference of capital (interest during construction, benefits during construction, discounting of future benefits) been adequately addressed in the investment evaluation?
45. Has the timing of the investment been appropriately addressed in the investment analysis?
46. Have costs been appropriately discriminated among financial and economic costs?
47. Have critical economic problems and opportunities been described and are they consistent with current economic investment considerations?
48. Based on current economic thought and investment decision criteria, has a plan been clearly demonstrated to provide an optimum economic investment?
49. Have the key economic assumptions affecting economic justification been identified and are they consistent with current economic thought?
50. Are there economic considerations that were not investigated or were and need additional scrutiny before implementation of the recommended improvement?

51. Has the document fully communicated the physical and fiscal risks with and without implementation of the proposed improvement?
52. Has the assessment of risk been accomplished consistently with appropriate analytical tools and acceptable industry practices?
53. Are physical and fiscal risk management solutions comprehensive, complete, and effective?
54. Are the proposed risk management solutions optimal measures for minimizing the physical and fiscal risks?
55. Has the document fully communicated the uncertainty that exists in the valuation of flood risks?
56. Are the analytical tools used to identify and account for uncertainty in the evaluation and decision support consistent with preferred industry techniques?

**FINAL OVERVIEW QUESTION**

57. What is the most important concern you have with the document or its appendices that was not covered in your answers to the questions above?