

# Final Independent External Peer Review Report Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report

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. W911NF-07-D-0001  
Task Control Number: 10-108  
Delivery Order: 0944

August 12, 2010





**SHORT-TERM ANALYSIS SERVICE (STAS)**

**on**

**Final Independent External Peer Review Report  
Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency  
Corrections) Letter Report**

**by**

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

**for**

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

**August 12, 2010**

**Contract Number W911NF-07-D-0001**

**Task Control Number: 10-108**

**Delivery Order Number: 0944**

**Scientific Services Program**

The views, opinions, and/or findings contained in this report are those of the author and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

This page is intentionally left blank.

**FINAL  
INDEPENDENT EXTERNAL PEER REVIEW REPORT  
for the**

**Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing,  
Deficiency Corrections) Letter Report**

**EXECUTIVE SUMMARY**

Congress authorized the Flood Control Acts of 1936, 1938, and 1946 for the original construction of the 17 Alton to Gale drainage and levee districts that protect against Mississippi River flooding in portions of Illinois and Missouri. Between 1968 and 1978, the U.S. Army Corps of Engineers (USACE) repaired the levee slides by removing all material from the slide area to a depth of 1 to 2 feet below the slide plane, placing a 1-foot thick sand drain and then replacing the original material in a semi-compacted state. Levee slides reoccurred in the same areas after sand drains were constructed. After 1975, the slide repair consisted of removing all of the material from the slide area to a depth of 1 to 2 feet below the slide plane and adding 4 to 5 percent hydrated lime, by weight, to the material as it was replaced. The use of lime in the levee repair reduces the plasticity and shrink-swell potential of the embankment materials. To date, none of slide repairs that have been fixed using the above-mentioned lime stabilization method has failed.

Since October 1979, there has been an increase in the number and severity of levee slides. During the summer and fall of 1983, 119 slides were repaired. All of the 1983 slides were repaired using the lime stabilization method. In the spring of 1985, a levee inspection of the Alton to Gale levee system documented the existence of 97 new slides. After a levee inspection in 1988, an additional 23 levee slides were identified. Most of the levee slides required the excavation of a large portion of the levee embankment slope. After the long inundation of the levees during the 1993 flood, followed by another inundation during the 1995 flood, 117 levee slides occurred throughout the Alton to Gale levee system.

During the summer and fall of 2001, 44 slides were approved to be repaired. Since completion of the levee slide repair contract in 2001, additional levee slides were discovered during the annual slide documentation inspection each spring. During the flooding in the spring and early summer of 2008, many additional slides occurred along the levees in the same levee reaches as prior years and 75 slides were repaired. The current slide count consists of two Wood River riverside slides, five Grand Tower and Degognia landside slides (along the Big Muddy), and two Prairie du Rocher slides.

The Alton to Gale Organized Levee Districts, Illinois and Missouri Project (Continuing, Deficiency Corrections) Letter Report (hereinafter referred to as the Alton to Gale Letter Report) provides an update of the 1986 report, which also addressed a specific design deficiency. The Alton to Gale Letter Report documents the continued failures of the levee embankment slopes within specific reaches of the Alton to Gale Organized Levee Districts (hereinafter referred to as the Alton to Gale levee system) because of the design deficiency. After reviewing the history of

levee slides experienced by the 17 levee districts in the Alton to Gale levee system and those slides that have occurred through 2009, the Alton to Gale Letter Report addresses the specific design deficiencies found within portions of 11 of the levee districts.

USACE is conducting an Independent External Peer Review (IEPR) of the Alton to Gale Letter Report. 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 Alton to Gale Letter Report. 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 IEPR 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 16 identified candidates. Based on the technical content of the Alton to Gale Letter Report and the overall scope of the project, the final panel members were selected for their technical expertise in the following key areas: civil engineering, geotechnical engineering, cost engineering, economics, and National Environmental Policy Act (NEPA) impact assessment. Although the Panel was disclosed to USACE, Battelle made the final decision on selecting the Panel.

The Panel received electronic versions of the Alton to Gale Letter Report documents, along with a charge that solicited comments on specific sections of the documents to be reviewed. The draft charge was prepared by Battelle to assist the USACE in the development of the final charge that was to guide the peer review, according to guidance provided in USACE (2010) and OMB (2004). USACE was given the opportunity to provide comments on the draft charge, and after revisions approved the final charge questions.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the IEPR. Other than this teleconference, there was no direct communication between the Panel and USACE during the peer review process. The Panel produced more than 155 individual comments in response to the 58 charge questions.

IEPR panel members reviewed the Alton to Gale Letter Report 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 the following: (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, 14 Final Panel Comments were identified and documented. Of these, three were identified as having high significance, eight had medium significance, and three had low significance.

Table ES-1 summarizes the Final Panel Comments by level of significance. Detailed information on each comment is contained in Appendix A of this report.

**Table ES-1. Overview of 14 Final Panel Comments Identified by the Alton to Gale IEPR Panel**

<b>Significance – High</b>	
1	Quantitative technical information on levee soil properties should be provided regarding the lime/fly-ash method to support its use as a sound solution for the immediate and long-term performance of the levees.
2	Seepage and stability conditions within the levee and levee foundation require further modeling analysis to address the existing slide problems.
3	The Letter Report should include relevant terminology definitions and backup data to support the estimated real estate, construction, and contingency costs.
<b>Significance – Medium</b>	
4	More data from prior projects regarding similar levee repair issues should be included to support the Recommended Plan.
5	The cumulative effects analysis in the Environmental Assessment (EA) should consider the socio-economic issues associated with implementing the Recommended Plan.
6	The difference in the number and size of slides across individual levee reaches is not sufficiently explained and may impact the allocation of resources.
7	More detail is needed to describe the causal relationship between levee embankment slope failure (slides) and risk of economic and environmental damage.
8	The benefit cost analysis contains inconsistent and potentially conflicting information about damages, potential for damage reduction, and benefit estimation.
9	The reason for eliminating the 1986 least-cost analysis economic approach is not clear.
10	The justification used to eliminate alternatives from further consideration is not described in sufficient detail to support the selection of the Recommended Plan.
11	Further information is required to support the conclusion that the approach of repairing levee slides as they occur is no longer an option.
<b>Significance – Low</b>	
12	A screening process is needed to establish repair priorities for the individual project levee reaches.
13	Key assumptions used in the risk analysis need to be clarified.
14	Some environmental consequences are not fully described, such as contradictory impacts to floodplain habitats, impacts resulting from repetitive repairs, and impacts resulting from the no-action alternative.

The Panel agrees that the Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report was adequate and acceptable in terms of the planning and environmental methods, models, and analyses used. The Alton to Gale Letter Report presents a strong argument for the need of a long-term repair strategy to address recurring deficiencies with the existing levee system side slopes. However, the economic and engineering methods, models, and analyses employed are not complete and will require supplemental evaluations to support the report recommendations.

The following statements provide a summary of the Panel's findings, which are described in more detail in the Final Panel Comments (see Appendix A). The Panel concurs that the project is technically sound from an overall planning and NEPA perspective and that the technical detail supports the need for levee rehabilitation. Furthermore, it was apparent and appreciated that a great deal of effort went into data gathering, the environmental assessment, and the cost evaluation. However, the Panel expressed several reservations including the level of detail in the geotechnical analyses, the use of the fly-ash injection process, the economic analysis, and construction cost/scheduling.

### **Plan Formulation**

The Letter Report lacks information and specific details regarding the pre-screening effort completed to limit the recommended repair zones to only 24.5 miles out of 200 miles of existing levee. An explanation and documentation of the screening process would provide a more complete report. In addition, details of alternative development are not presented. There are no analytical results shown in the document(s) to support the four alternatives evaluated and to demonstrate that the alternatives meet USACE safety criteria. Quantitative data indicating the level of improvement to be expected in the levees for various alternatives, and in particular the Recommended Plan, are absent.

### **Economics**

The economic analysis appears to have been completed following the appropriate national economic development (NED) framework for evaluating flood damage reduction benefits. However, little to no detail is provided regarding the flood probabilities associated with the embankment failures that have occurred, or that are expected to occur in the future. Also, while the benefit results are presented for each drainage and levee district (D&LD), no information is provided about the relationship between the damage reduction (or benefits) calculated, and the original economic and environmental resources protected by each D&LD. Greater explanation of the stated catastrophic consequences of inundation is needed. The amount of crop damage, commercial and industrial damage, transportation and infrastructure, environmental and other sources of damage used in the analysis should be specified either in the main report or an appendix.

### **Engineering**

The Letter Report should present the results of seepage and slope stability analyses that support the development of the four alternatives and also demonstrate that the USACE minimum factor of safety will be met by each of the alternatives. The Letter Report should include the engineering properties of the soils in the levee as they currently exist, along with the properties that are expected to be achieved with each of the alternatives, both of which form the basis for the geotechnical analyses.

The Letter Report does not adequately demonstrate that the lime/fly-ash injection process will achieve the desired results in the Alton to Gale levees. Quantitative information on the efficacy of the process needs to be provided in support of the Recommended Plan. Since the Letter Report cites the use of this method for levee improvements in the Memphis District as the precedent for the Recommended Plan, additional information should be presented on the work

performed in the Memphis District and how the conditions compare to those for the Alton to Gale levees.

The construction schedule of seven years appears to be lengthy, particularly in lieu of the additional costs that will be incurred repairing slides occurring each year until completion. The Panel believes it would be beneficial to the project's construction and funding schedule to refine the schedule, considering the location of previously repaired levee slides and the likelihood of future levee slides.

The estimates presented in the Letter Report provide a basis for cost comparison of the four alternatives considered as solutions to the levee deficiency. For the three alternatives not chosen, (preliminary estimates) the cost methods and analysis are appropriate for the available data and the detail of design given. For the chosen alternative (Recommended Plan) the method and analysis are appropriate. However, the Panel believes a detailed breakdown is needed to justify the lump sum figure given in the Letter Report. Moreover, the Panel recommends that additional discussion be added to the future real estate costs as well as previous and future slide repair costs in order to make the analysis clear.

### **Environmental**

The Environmental Assessment (EA) generally serves the NEPA process. However, the Panel is concerned that the discussion of cumulative effects in the EA lacks elements necessary to fully comply with NEPA requirements. The cumulative effects analysis does not consider, as required, past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. The EA briefly mentions that a positive effect of the project will be enhanced economic growth and development in the study area. The potential environmental consequences of this growth and development are not discussed.

The Panel agreed that a thorough explanation as to why the current practice of repairing individual slides as they occur does not meet the project goal of providing "reliable, trustworthy levee systems." A stronger characterization of the negative environmental effects of repeated or almost continuous construction on the levees versus a one-time, large "fix" would be very helpful in supporting the recommended plan. The Panel agrees that what constitutes an acceptable risk of levee failure has changed post-Katrina and that the Recommended Plan is supportable. Therefore, a stronger case for the Recommended Plan would include a description of the consequences of catastrophic levee failure. Finally, the EA needs to include a description of the residual flood damage risks in the study area even with the levee slide repairs in place.

This page is intentionally left blank.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
1. INTRODUCTION.....	1
2. PURPOSE OF THE IEPR.....	2
3. METHODS.....	2
3.1 Planning and Schedule.....	2
3.2 Identification and Selection of IEPR Panel Members.....	4
3.3 Preparation of the Charge and Conduct of the IEPR.....	6
3.4 Review of Individual Comments.....	7
3.5 IEPR Panel Teleconference.....	7
3.6 Preparation of Final Panel Comments.....	7
4. PANEL DESCRIPTION.....	8
5. SUMMARY OF FINAL PANEL COMMENTS.....	15
6. REFERENCES.....	19

- Appendix A Final Panel Comments on the Alton to Gale Letter Report  
Appendix B. Final Charge to the Independent External Peer Review Panel on the  
Alton to Gale Letter Report

## LIST OF TABLES

Table ES-1. Overview of 14 Final Comments Identified by the Alton to Gale IEPR Panel.....	iii
Table 1. Alton to Gale IEPR Schedule.....	3
Table 2. Alton to Gale IEPR Panel: Technical Criteria and Areas of Expertise.....	10
Table 3. Overview of 14 Final Panel Comments Identified by Alton to Gale IEPR Panel..	18

## LIST OF ACRONYMS

ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
CACFDAS	Computerized Agricultural Crop Flood Damage Assessment System
CON Risks	Construction Risks
D&LD	Drainage and Levee District
DrChecks	Design Review and Checking System
EA	Environmental Assessment
EIS	Environmental Impact Statement
EST	Estimate and Schedule
IEPR	Independent External Peer Review
LD Risks	Lands and Damages Risks
MCACES	Micro-Computer Aided Cost Estimating System
NED	National Economic Development
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
OMB	Office of Management and Budget
O&M	Operation and Maintenance
PDT	Project Delivery Team
PPM	Project & Program Management
SAME	Society of American Military Engineers
TL Risks	Technical Risks
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

## 1. INTRODUCTION

Congress authorized the Flood Control Acts of 1936, 1938, and 1946 for the original construction of the 17 Alton to Gale drainage and levee districts that protect against Mississippi River flooding in portions of Illinois and Missouri. Between 1968 and 1978, the U.S. Army Corps of Engineers (USACE) repaired the levee slides by removing all material from the slide area to a depth of 1 to 2 feet below the slide plane, placing a 1-foot thick sand drain and then replacing the original material in a semi-compacted state. Levee slides reoccurred in the same areas after sand drains were constructed. After 1975, the slide repair consisted of removing all of the material from the slide area to a depth of 1 to 2 feet below the slide plane and adding 4 to 5 percent hydrated lime, by weight, to the material as it was replaced. The use of lime in the levee repair reduces the plasticity and shrink-swell potential of the embankment materials. To date, none of slide repairs that have been fixed using the above-mentioned lime stabilization method has failed.

Since October 1979, there has been an increase in the number and severity of levee slides. During the summer and fall of 1983, 119 slides were repaired. All of the 1983 slides were repaired using the lime stabilization method. In the spring of 1985, a levee inspection of the Alton to Gale levee system documented the existence of 97 new slides. After a levee inspection in 1988, an additional 23 levee slides were identified. Most of the levee slides required the excavation of a large portion of the levee embankment slope. After the long inundation of the levees during the 1993 flood, followed by another inundation during the 1995 flood, 117 levee slides occurred throughout the Alton to Gale levee system.

During the summer and fall of 2001, 44 slides were approved to be repaired. Since completion of the levee slide repair contract in 2001, additional levee slides were discovered during the annual slide documentation inspection each spring. During the flooding in the spring and early summer of 2008, many additional slides occurred along the levees in the same levee reaches as prior years and 75 slides were repaired. The current slide count consists of two Wood River riverside slides, five Grand Tower and Degognia landside slides (along the Big Muddy), and two Prairie du Rocher slides.

The Alton to Gale Organized Levee Districts, Illinois and Missouri Project (Continuing, Deficiency Corrections) Letter Report (hereinafter referred to as the Alton to Gale Letter Report) provides an update of the 1986 report, which also addressed a specific design deficiency. The Alton to Gale Letter Report documents the continued failures of the levee embankment slopes within specific reaches of the Alton to Gale Organized Levee Districts (hereinafter referred to as the Alton to Gale levee system) because of the design deficiency. After reviewing the history of levee slides experienced by the 17 levee districts in the Alton to Gale levee system and those slides that have occurred through 2009, the Alton to Gale Letter Report addresses the specific design deficiencies found within portions of 11 of the levee districts.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Alton to Gale Letter Report in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers 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 Alton to Gale Letter Report. 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 Alton to Gale Letter Report. Detailed information on the Final Panel Comments is provided 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 Alton to Gale Letter Report 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 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**

After receiving the notice to proceed (NTP), 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.

Table 1 defines the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on the NTP date of May 26, 2010. Note that the work items listed in Task 7 occur after the submission of this report. Battelle will enter the 14 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. Alton to Gale IEPR Schedule**

<b>TASK</b>	<b>ACTION</b>	<b>DUE DATE</b>
<b>1</b>	Notice to Proceed (NTP)	5/26/2010
	Review documents available	6/1/2010
	Battelle prepares draft Work Plan <sup>a</sup>	6/15/2010
	USACE provides comments on draft Work Plan	6/22/2010
<b>2</b>	Battelle prepares conflict of interest (COI) questionnaire	6/3/2010
	USACE provides comments on COI questionnaire	6/3/2010
	Battelle provides list of selected panel members <sup>a</sup>	6/10/2010
	USACE provides comments on selected panel members	6/11/2010
	Battelle completes subcontracts for panel members	6/25/2010
<b>3</b>	Battelle submits draft charge <sup>a</sup>	6/15/2010
	USACE provides comments on draft charge	6/22/2010
	Battelle submits final Work Plan, including final charge <sup>a</sup>	6/25/2010
	USACE approves final Work Plan, including final charge	6/28/2010
<b>4</b>	Kick-off meeting convened with USACE and Battelle	6/2/2010
	Battelle sends review documents to panel members	6/28/2010
	Kick-off meeting convened with Battelle and IEPR Panel	6/29/2010
	Kick-off meeting convened with USACE, Battelle, and IEPR Panel	6/29/2010
<b>5</b>	Panel members complete their review	7/14/2010
	Battelle consolidates comments from IEPR Panel	7/16/2010
	Convene Panel review teleconference	7/19/2010
	Panel provides draft Final Panel Comments to Battelle	7/27/2010
	Battelle submits working draft Final Panel Comments to USACE via e-mail (pdf document)	7/30/2010
<b>6</b>	Battelle submits final IEPR Report to USACE <sup>a</sup>	8/12/2010
<b>7<sup>b</sup></b>	Battelle inputs Final Panel Comments to DrChecks	8/13/2010
	USACE provides draft Evaluator Responses via e-mail (Word document)	8/19/2010
	Teleconference convened with USACE, Battelle, and IEPR Panel to discuss Final Panel Comments	8/26/2010

TASK	ACTION	DUE DATE
	USACE inputs final Evaluator Responses to Final Panel Comments in DrChecks	9/2/2010
	Battelle inputs the Panel's BackCheck Responses in DrChecks	9/9/2010
	Battelle submits pdf of DrChecks file and closes out DrChecks <sup>a</sup>	9/9/2010
	Project Closeout	11/15/2010

a Deliverable

b Task 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: civil engineering, geotechnical engineering, cost engineering, economics, and National Environmental Policy Act (NEPA) impact assessment. These areas correspond to the technical content of the Alton to Gale Letter Report and overall scope of the Alton to Gale project.

To identify candidate panel members, Battelle reviewed 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 16 candidates for the Panel, evaluated their technical expertise, and inquired about potential conflicts of interest. Of these, Battelle chose nine of the most qualified candidates and confirmed their interest and availability. Of the nine candidates, five were proposed for the final Panel and four 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 conflicts of interest, or lack of the precise technical expertise required.

The candidates were screened for the following potential exclusion criteria or conflicts of interest.<sup>1</sup> These COI questions were intended to serve as a means of disclosure, and to better characterize a potential 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

---

<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."

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 Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report and supporting plates, appendices, and supporting documentation.
- Involvement by you or your firm<sup>2</sup> in flood control and levee design and evaluation within the Alton to Gale levee system, including the following 11 drainage and levee (D&L) districts: (1) Degognia – Fountain Bluff D&L District, (2) Grand Tower D&L District, (3) Metro East Sanitary District (formerly East St. Louis D&L District), (4) Prairie du Rocher D&L District, (5) Bois Brule D&L District, (6) Clear Creek D&L District, (7) Kaskaskia Island D&L District, (8) Fort Chartres D&L District, (9) East Cape D&L District, (10) Preston D&L District and (11) Wood River D&L District.
- Involvement by you or your firm<sup>2</sup> in Alton to Gale levee system related projects.
- Current employment by the U.S. Army Corps of Engineers (USACE).
- Involvement with paid or unpaid expert testimony related to the Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report.
- Current or previous employment or affiliation with members of the cooperating agencies or local sponsors, notably the 11 levee districts listed above, or other affected parties such as Illinois Dept. of Natural Resources (IDNR), U.S. Forest Service (USFS), and United Nations Educational, Scientific, and Cultural Organization (UNESCO) (for pay or *pro bono*).
- Past, current or future interests or involvements (financial or otherwise) by you, your spouse or children related to the Alton to Gale levee system, and/or the Middle Mississippi River region in the states of Illinois and Missouri.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, 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 control and levee design and evaluation, and include the client/agency and duration of review (approximate dates).

---

<sup>2</sup> Includes any joint ventures in which your firm is involved.

- Pending, current or future financial interests in Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm<sup>2</sup> revenues within the last 3 years came from USACE contracts.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report.  
Participation in relevant prior Federal studies relevant to this project, including:
  - Letter Report, LMSEM/LMSED-DG, 1 October 1979, and
  - Letter Report, LMSED-PK, 21 November 1986.
- Participation in prior non-Federal studies relevant to this project.
- 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 conflicts of interest. 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 conflicts of interest through a signed Conflict of Interest form. Although the Panel was disclosed to USACE, Battelle made the final decision on selecting the Panel. Section 4 of this report provides names and biographical information on the panel members.

Prior to beginning their review and within 2 days 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, and other pertinent information for the Panel.

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

Battelle drafted a preliminary charge document, including specific charge questions and discussion points. The charge was prepared by Battelle to assist the USACE in the development of the charge questions that were to guide the peer review, according to guidance provided in USACE (2010) and OMB (2004). The draft charge was submitted to the USACE for evaluation as part of the draft Work Plan. USACE provided comments and revisions to the draft charge, which were used to produce the final charge. The final charge was submitted to USACE for approval. In addition to a list of 58 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 Alton to Gale Letter Report documents and the final charge. A full list of the

documents reviewed by the Panel is provided in Appendix B of this report. 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**

The Panel produced approximately 155 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 was able to summarize the 155 comments into a preliminary list of 22 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

### **3.5 IEPR Panel Teleconference**

Battelle facilitated a 4-hour teleconference with the Panel so that the panel experts, 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 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 15 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 15 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 Alton to Gale Letter Report:

- **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 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 or justification of the project
  2. Medium: Affects the completeness or understanding of the reports/project
  3. Low: Affects the technical quality of the reports but will not affect the recommendation of the project.
- Guidance for Developing the Recommendation(s): The recommendation was to include specific actions that the 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, 15 Final Panel Comments were prepared and assembled; however, two of the Final Panel Comments were merged, resulting in a total of 14 Final Panel Comments. 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 (which were screened for availability, technical background, and conflicts of interest), 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. Alton to Gale IEPR Panel: Technical Criteria and Areas of Expertise**

	Brown	Kerkes	Greene	Hegre	Crouch
<b>Civil Engineering (one expert needed)</b>	X				
Professional Engineer with a minimum of 10 years demonstrated experience in civil engineering studies and design of flood control works including:	X				
Levee design and construction	X				
Access to work sites	X				
Disposition of excavated soil material	X				
M.S. degree or higher in civil engineering	X				
<b>Geotechnical Engineering (one expert needed)</b>		X			
Professional Engineer with a minimum of 10 years demonstrated experience in geotechnical studies and design of flood control works including:	X	X			
Experience in levee and underseepage control features and design	X	X			
Levee design and construction	X	X			
Familiar with geotechnical practices used in the (Middle) Mississippi River Flood Plain	X	X			
Active participation in related professional engineering and scientific societies is encouraged	X	X			
Minimum M.S. degree or equivalent in geotechnical engineering	X	X			
<b>Economics (one expert needed)</b>			X		
Professional economist with a minimum of 10 years economics work experience directly related to water resource economic evaluation review			X		
Minimum 5 years direct experience dealing with Hydrologic Engineering Center's (HEC) – Flood Damage Analysis (FDA) model			X		
Minimum 5 years direct experience reviewing federal water resource economic documents justifying construction efforts			X		
Minimum 5 years direct experience working for or with USACE is highly recommended			X		
M.S. degree or higher in economics			X		

	Brown	Kerkes	Greene	Hegre	Crouch
<b>Cost Engineer (one expert needed)</b>				<b>X</b>	
Professional Engineer with a minimum of 10 years demonstrated experience in developing and evaluating detailed cost estimates				X	
Demonstrated experience in performing cost engineering in flood control works				X	
Familiar with the latest version of MCACES (MII) (3.02 version 2.0)				X	
Minimum 5 years direct experience working for or with USACE is highly recommended				X	
Degree in engineering				X	
<b>National Environmental Policy Act (NEPA) Impact Assessment (one expert needed)</b>					<b>X</b>
Minimum 10 years demonstrated experience in evaluating and conducting NEPA impact assessments for complex multi-objective public works projects with competing trade-offs					X
Experience in performing cumulative effects analyses for complex multi-objective public works projects with competing trade-offs					X
Experience should encompass determining the scope and appropriate methodologies for impact assessment and analysis for a variety of projects and programs with high public and interagency interests and having project impacts 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

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

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

**Affiliation:** University of North Florida

**Dr. Christopher Brown** 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 of experience as a civil and geotechnical engineer and is a licensed professional engineer in Pennsylvania and Florida. His project background includes civil and geotechnical engineering as well as water resources and flood control. He has direct levee design and construction experience, working on projects in south Florida for the Comprehensive Everglades Restoration Plan. He was also a member of the USACE National Levee Assessment Team responsible for developing a levee inventory and appropriate risk-assessment evaluation tools. Dr. Brown has worked on numerous projects that required access to work sites and developing access roads, lay down areas, and temporary water access. This work has been in support of levee projects on the Delaware River, Lehigh River, Lake Okeechobee, C-111 Canal, L-31N Canal, Alafia River, and St. Johns River, among others. In addition, Dr. Brown has worked on numerous levee and dredged material disposal navigation projects that required development of excavation cut/fill and disposal. During his tenure with USACE, his responsibilities included serving as one of the District's senior technical experts on groundwater hydrology, aquifer storage recovery wells, water resources planning, dredging, confined disposal areas, geotechnical engineering and subsurface structures such as coffer dams and hydraulic barrier walls. He completed projects involving water resources, levee/dam design, hazardous waste, geotechnical design, coastal engineering, port improvements, and environmental restoration. Dr. Brown is a member of the Society of American Military Engineers (SAME), American Society of Civil Engineers (ASCE), International Association of Environmental Hydrologists, and American Water Resources Association.

***David Kerkes, Ph.D., P.E.***

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

**Affiliation:** Independent Consultant

**Dr. David Kerkes** is an independent consultant in Houston, TX, specializing in the evaluation of existing dams, stability analysis of slopes and deep excavations, groundwater seepage analyses, settlement and consolidation analyses of earth structures and shallow foundations, analysis and design of retaining walls and sheetpile structures, and design of flood control levees. He earned his Ph.D. in civil (geotechnical) engineering from the University of Colorado at Boulder in 1990. He has over 35 years of geotechnical and civil engineering experience and is a licensed engineer in Indiana, Texas and Colorado. He is on the roster of consultants to the Asian Development Bank for his expertise and experience in the design and construction of earth and rockfill dams, having worked on major water resource development projects in the U.S., Southeast Asia, and South America, and he has served as a senior review consultant for dam projects in the U.S. and overseas. He has performed over 50 dam safety inspections as part of the Federal Dam Safety

Inspection Program and has prepared structural behavior reports for 10 dams of the U.S. Bureau of Reclamation based on a review of design and construction records, dam safety inspection reports, and instrumentation data. He is experienced in levee and underseepage control features, having taught graduate and undergraduate university courses, as well as technical seminars in seepage modeling and drainage. He is also familiar with computer programs for seepage as well as traditional methods and the fundamental governing equations. Dr. Kerkes has participated in the design and construction of major water resource development projects that involved the control of seepage beneath and through embankments. He is experienced in levee design and construction, having worked on several projects involving analysis and design of levees on the Texas Gulf Coast. He is familiar with geotechnical practices used in the Mississippi Floodplain, having taught civil engineering at Indiana State University and having worked on two related projects for the USACE. He is familiar with the engineering design manuals adopted by the USACE for use on USACE projects, specifically EM 1110-2-1913 "Design and Construction of Levees," and EM 1110-2-1901 "Seepage Control in Earth Foundations." Dr. Kerkes has authored more than 15 engineering-related publications, including "Analysis and Prediction of Stresses and Pore Pressures Associated with Wet Core Construction for Embankment Dams." He is a member of the U.S. Society on Dams.

***Gretchen Greene, Ph.D.***

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

**Affiliation:** Environ International Corporation

**Dr. Gretchen Greene** is a senior economist with Environ International Corporation, specializing in water resources, benefit cost analysis, regulatory analysis, and litigation support. She earned her Ph.D. in food and resource economics from the University of Florida in 1998. Dr. Greene has over 15 years experience related to water resource economics, focusing on environmental valuation, economic development, socioeconomic analysis, recreation demand, cost-benefit analysis, population projections, and forecasting water demand. Dr. Greene has extensive experience with economic analysis of water resource development, having worked on numerous Indian Water Rights litigation cases that hinge on benefit cost analyses following the Principles and Guidelines for Water Resource Development, using the NED approach. She also led the Dredged Material Management Study "Risk-Based Analysis of the Lewiston Levee," which was part of a dredged material management environmental impact statement (EIS) for the Snake River. Dr. Greene estimated the flood damage reduction benefits of the Lewiston Levee system, and prepared a benefit-cost economic analysis of various dredge plans, levee alterations, and dredged material disposal options for the Walla Walla District of the USACE. For this effort, she estimated flood damage reduction benefits using the USACE HEC-FDA model. Environmental benefits and costs were evaluated separately. The model and results were operated and presented in a manner consistent with USACE Engineering Manual 1110-2-1619, Risk Based Analysis for Flood Damage Reduction Studies. Dr. Greene has more than 5 years experience working with USACE. For the Savannah USACE, she worked on a Water Supply Reallocation Report for the City of Thomson, GA with Chasman & Associates. The initial review of the proposed reallocation included an analysis of the cost effectiveness of the proposed action, as well as an analysis of the impacts on other water users and the environment. Based on this review, the city determined that the proposed increase in their water storage contract was not necessary at the present time. Dr. Greene worked on a similar water supply reallocation report

for the City of Lincoln, GA, evaluating proposed increases in their water storage contract at the J. Strom Thurmond Reservoir. This project included analyzing alternative water supply sources and the cost effectiveness of the proposed reallocation. Impacts to the environment and other water users, including hydropower, were analyzed in accordance with USACE guidance documents.

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

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

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

**Mr. Paul Hegre** 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 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 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 the LCR CSO. He is a member of ASCE, SAME, and Construction Specifications Institute.

***Kay Crouch***

**Role:** This panel member was chosen primarily for her National Environmental Policy Act (NEPA) Impact Assessment experience and expertise.

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

**Ms. Kay Crouch** is president of Crouch Environmental Services, Inc. She specializes in NEPA analysis and document preparation, wetlands permitting and mitigation, environmental site assessments, and public involvement for projects with high public and interagency interests. She earned her M.S. in biology/ecology in 1978 from Steven F. Austin State University and received additional academic training in the NEPA process from the Duke University Nicholas School of the Environment (2004-05). Ms. Crouch has 32 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. Her NEPA-related experience includes the development of the EIS for the Bayport Container Terminal; public involvement for the Sabine Neches Waterway Expansion and the Clear Creek Flood Damage Reduction Project; and NEPA documentation for dozens of transportation projects, liquefied natural gas facilities, parks, container terminals, and other facilities, many having potential impacts to nearby sensitive environments. Ms. Crouch routinely performs cumulative effects analyses on public works projects with high public and interagency interests as part of her extensive NEPA practice. She recently drafted an expanded Environmental Assessment (EA) for the Port of Houston Authority and the USACE for a dredged material placement area on the north side of the Houston Ship Channel in Harris County, TX. She has substantial experience working with USACE on flood damage reduction and dam safety projects as well as for local sponsors (e.g., the Harris County Flood Control District, Galveston County, the Brazoria County Drainage District #4, and the City of Alvin, TX). Specific projects include the Clear Creek Flood Damage Reduction Project and the Greens Bayou Flood Damage Reduction Project. Recently, Ms. Crouch planned, organized and executed a public outreach plan for the Addicks and Barker Dam Safety Program in Houston, TX. This effort was declared a “Best Practice” by the USACE, and Ms. Crouch and her staff received a written commendation from the Commander of the Galveston District. Ms. Crouch is a member of the Society of Wetland Scientists and Women in Transportation, and she is the founder and president of fundmyresearch.org.

## **5. SUMMARY OF FINAL PANEL COMMENTS**

The Panel agrees that the Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report was adequate and acceptable in terms of the planning and environmental methods, models, and analyses used. The Alton to Gale Letter Report presents a strong argument for the need of a long-term repair strategy to address recurring deficiencies with the existing levee system side slopes. However, the economic and engineering methods, models, and analyses employed are not complete and will require supplemental evaluations to support the report recommendations.

The following statements provide a summary of the Panel’s findings, which are described in more detail in the Final Panel Comments (see Appendix A). The Panel concurs that the project is technically sound from an overall planning and NEPA perspective and that the technical detail supports the need for levee rehabilitation. Furthermore, it was apparent and appreciated that a great deal of effort went into data gathering, the environmental assessment, and the cost evaluation. However, the Panel expressed several reservations including the level of detail in the geotechnical analyses, the use of the fly-ash injection process, the economic analysis, and construction cost/scheduling.

### **Plan Formulation**

The Letter Report lacks information and specific details regarding the pre-screening effort completed to limit the recommended repair zones to only 24.5 miles out of 200 miles of existing levee. An explanation and documentation of the screening process would provide a more complete report. In addition, details of alternative development are not presented. There are no

analytical results shown in the document(s) to support the four alternatives evaluated and to demonstrate that the alternatives meet USACE safety criteria. Quantitative data indicating the level of improvement to be expected in the levees for various alternatives, and in particular the Recommended Plan, are absent.

### **Economics**

The economic analysis appears to have been completed following the appropriate NED framework for evaluating flood damage reduction benefits. However, little to no detail is provided regarding the flood probabilities associated with the embankment failures that have occurred, or that are expected to occur in the future. Also, while the benefit results are presented for each drainage and levee district (D&LD), no information is provided about the relationship between the damage reduction (or benefits) calculated, and the original economic and environmental resources protected by each D&LD. Greater explanation of the stated catastrophic consequences of inundation is needed. The amount of crop damage, commercial and industrial damage, transportation and infrastructure, environmental and other sources of damage used in the analysis should be specified either in the main report or an appendix.

### **Engineering**

The Letter Report should present the results of seepage and slope stability analyses that support the development of the four alternatives and also demonstrate that the USACE minimum factor of safety will be met by each of the alternatives. The Letter Report should include the engineering properties of the soils in the levee as they currently exist, along with the properties that are expected to be achieved with each of the alternatives, both of which form the basis for the geotechnical analyses.

The Letter Report does not adequately demonstrate that the lime/fly-ash injection process will achieve the desired results in the Alton to Gale levees. Quantitative information on the efficacy of the process needs to be provided in support of the Recommended Plan. Since the Letter Report cites the use of this method for levee improvements in the Memphis District as the precedent for the Recommended Plan, additional information should be presented on the work performed in the Memphis District and how the conditions compare to those for the Alton to Gale levees.

The construction schedule of seven years appears to be lengthy, particularly in lieu of the additional costs that will be incurred repairing slides occurring each year until completion. The Panel believes it would be beneficial to the project's construction and funding schedule to refine the schedule, considering the location of previously repaired levee slides and the likelihood of future levee slides.

The estimates presented in the Letter Report provide a basis for cost comparison of the four alternatives considered as solutions to the levee deficiency. For the three alternatives not chosen, (preliminary estimates) the cost methods and analysis are appropriate for the available data and the detail of design given. For the chosen alternative (Recommended Plan) the method and analysis are appropriate. However, the Panel believes a detailed breakdown is needed to justify the lump sum figure given in the Letter Report. Moreover, the Panel recommends that

additional discussion be added to the future real estate costs as well as previous and future slide repair costs in order to make the analysis clear.

### **Environmental**

The EA generally serves the NEPA process. However, the Panel is concerned that the discussion of cumulative effects in the EA lacks elements necessary to fully comply with NEPA requirements. The cumulative effects analysis does not consider, as required, past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. The EA briefly mentions that a positive effect of the project will be enhanced economic growth and development in the study area. The potential environmental consequences of this growth and development are not discussed.

The Panel agreed that a thorough explanation as to why the current practice of repairing individual slides as they occur does not meet the project goal of providing “reliable, trustworthy levee systems.” A stronger characterization of the negative environmental effects of repeated or almost continuous construction on the levees versus a one-time, large “fix” would be very helpful in supporting the recommended plan. The Panel agrees that what constitutes an acceptable risk of levee failure has changed post-Katrina and that the Recommended Plan is supportable. Therefore, a stronger case for the Recommended Plan would include a description of the consequences of catastrophic levee failure. Finally, the EA needs to include a description of the residual flood damage risks in the study area even with the levee slide repairs in place.

Table 3 lists the 14 Final Panel Comment statements by level of significance.

**Table 3. Overview of 14 Final Panel Comments Identified by Alton to Gale IEPR Panel**

<b>Significance – High</b>	
1	Quantitative technical information on levee soil properties should be provided regarding the lime/fly-ash method to support its use as a sound solution for the immediate and long-term performance of the levees.
2	Seepage and stability conditions within the levee and levee foundation require further modeling analysis to address the existing slide problems.
3	The Letter Report should include relevant terminology definitions and backup data to support the estimated real estate, construction, and contingency costs.
<b>Significance – Medium</b>	
4	More data from prior projects regarding similar levee repair issues should be included to support the Recommended Plan.
5	The cumulative effects analysis in the Environmental Assessment (EA) should consider the socio-economic issues associated with implementing the Recommended Plan.
6	The difference in the number and size of slides across individual levee reaches is not sufficiently explained and may impact the allocation of resources.
7	More detail is needed to describe the causal relationship between levee embankment slope failure (slides) and risk of economic and environmental damage.
8	The benefit cost analysis contains inconsistent and potentially conflicting information about damages, potential for damage reduction, and benefit estimation.
9	The reason for eliminating the 1986 least-cost analysis economic approach is not clear.
10	The justification used to eliminate alternatives from further consideration is not described in sufficient detail to support the selection of the Recommended Plan.
11	Further information is required to support the conclusion that the approach of repairing levee slides as they occur is no longer an option.
<b>Significance – Low</b>	
12	A screening process is needed to establish repair priorities for the individual project levee reaches.
13	Key assumptions used in the risk analysis need to be clarified.
14	Some environmental consequences are not fully described, such as contradictory impacts to floodplain habitats, impacts resulting from repetitive repairs, and impacts resulting from the no-action alternative.

## 6. REFERENCES

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, DC. 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, US Army Corps of Engineers, Washington, DC. 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, DC. Engineer Circular (EC) No. 1165-2-209. January 31.

This page intentionally left blank

**APPENDIX A**

**Final Panel Comments**

**on the**

**Independent External Peer Review (IEPR) of the Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report**

This page is intentionally left blank.

**Comment 1:**

**Quantitative technical information on levee soil properties should be provided regarding the lime/fly-ash method to support its use as a sound solution for the immediate and long-term performance of the levees.**

**Basis for Comment:**

The Letter Report cites the use of lime/fly-ash injection for improvements to the levees in the U.S. Army Corps of Engineers (USACE) Memphis District as the precedent for the recommended alternative. While the effectiveness of the solution has been described in qualitative terms in Section 4.5.5, it is important to present quantitative data that have been obtained for the clays in the Memphis District levees before and after soil stabilization, and comparative information for the soils in the Alton to Gale levees and the levees treated in the Memphis District. The report should contain quantitative data on the soil strength increase and change in hydraulic conductivity of the treated soils based either on studies performed by the St. Louis District, studies performed by the Memphis District, or information in the published literature on the effectiveness of the lime/fly-ash injection method. This information is critical to the seepage and slope stability analyses that need to be provided in the report to demonstrate that the USACE criterion of a safety factor equal to or greater than 1.4 will be met by the recommended alternative.

Unlike the direct application of lime and fly-ash to high plasticity clays, where the lime and fly-ash are subsequently mixed into the soil, the efficacy of the in situ injection process is not as readily apparent. Since the in situ method depends on the distribution of the reagent throughout the soil mass by means of random shrinkage cracks and fractures that have developed in the levees, a discussion should be provided of the criteria for configuring the proposed lateral spacing of injection holes, as well as limits to be placed on the injection pressure to avoid the possibility of hydraulically fracturing the side slopes during the process. A discussion should also be provided of the sampling and testing procedures that will be implemented to verify that the anticipated strength increase has been achieved at locations away from the injection holes, both in terms of lateral extent and depth. A detailed discussion of the injection process and testing protocols could be provided as an appendix with a brief summary of the salient points in the body of the report.

**Significance – High:**

It has not been adequately demonstrated that the lime/fly-ash injection process will achieve the desired results in the Alton to Gale levees. Quantitative information on the efficacy of the process needs to be provided in support of the recommended alternative.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. Comparative information on the engineering properties of soils in the Alton to Gale levees and the levee soils successfully treated using the lime/fly-ash injection method in the Memphis District.

2. Further details on the injection method construction procedures, including anticipated lateral spacing and injection pressures.
3. Criteria for determining acceptability after the injection process has been performed, including quantitative data on the anticipated soil strength increase and change in hydraulic conductivity for the soils.
4. Discussion of the quality control sampling and testing program needed after soil treatment to verify the efficacy of the process.
5. Information on the applicability of any environmental, health and safety regulations to lime/fly ash treatment.

**Comment 2:**

**Seepage and stability conditions within the levee and levee foundation require further modeling analysis to address the existing slide problems.**

**Basis for Comment:**

While the cause of the levee slides is discussed in Section 2.5.2 and an infinite slope analysis is presented, the Letter Report also needs to present the results of seepage and slope stability analyses that support the development of the four alternatives and also demonstrate that the USACE minimum factor of safety of 1.4 will be met by each of the alternatives. The results of these analyses also provide another basis for comparing alternatives.

The report needs to present the engineering properties of the soils in the levee as they currently exist, along with the properties that are expected to be achieved with each of the alternatives. These soil properties form the basis for a series of seepage and slope stability analyses, which are necessary to establish the lateral and vertical extent of the soil treatment required to achieve the USACE minimum safety criterion. The approach is essentially a trial and error process where the thickness of the treated zone is assumed and the section is analyzed to determine the minimum factor of safety, which is then compared to the USACE minimum allowable value of 1.4. If the criterion is not met, the extent of the treated zone is adjusted to achieve the required value.

It is stated that for Alternative 1 the depth of soil treatment will extend to a depth of 5 feet into natural ground. Alternatives 2 and 3 indicate that the levee will be treated to a distance 10 feet beyond the toe and 5 feet into natural ground. No similar provision is specified for Alternative 4. The required safety analyses provide the basis of such recommendations. The results of the analyses can be summarized in the body of the report and details of the analyses can be presented in an appendix.

Tests performed on samples collected from the levees subsequent to soil treatment will confirm that the anticipated values used in the analyses to develop the alternatives have actually been achieved in the field. The above approach of analysis and post-treatment soil testing provides a means of supporting the conclusion that the recommended alternative will provide a long-term solution to the chronic problem of failures in the side slopes of the levees.

**Significance – High:**

The report needs to present the results of seepage and slope stability analyses that support the development of the four alternatives and demonstrate that the USACE criteria for safety will be met by the Recommended Plan.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. The engineering properties (long-term soil strength and hydraulic conductivity) of the soils as they currently exist in the levee and the anticipated properties for soils subsequent to soil treatment or replacement for each of the respective alternatives.
2. Seepage analyses to develop the pore pressure distribution within the levee and foundation for use in slope stability analyses for each of the proposed alternatives.
3. Slope stability analyses that support the recommended extent of treatment for each of the alternatives, and which demonstrate that the USACE criterion of a safety factor equal to or greater than 1.4 for long-term conditions will be met by each of the four alternatives.
4. Definition of a post-treatment field and laboratory soil testing program to confirm that the anticipated level of soil improvement has been achieved.

**Comment 3:**

**The Letter Report should include relevant terminology definitions and backup data to support the estimated real estate, construction, and contingency costs.**

**Basis for Comment:**

There is information within and between the report and the appendices that could be clarified and correlated to provide a more comprehensive document. The Panel offers the following observations:

- In paragraph 5.1 of the Letter Report there is not a clear basis given for the unit pricing of the preferred alternative that is commensurate with the basis given for the preliminary estimates.
- The overall contingencies in the less detailed preliminary estimates are lower than the overall contingency for the more detailed preferred alternative estimate. It is counterintuitive that a more detailed estimate has a higher contingency applied.
- There is no basis given for the 25% contingency used for the Real Estate Costs section in Appendix 5.
- The effective price level stated in paragraph 5.1 (January 2010) of the Letter Report is inconsistent with the effective price levels of the Appendix 5 tables (p. 5-36 to 5-47) (November 22, 2009) and the effective price date of the Micro-Computer Aided Cost Estimating System (MCACES) estimate (November 2, 2009).
- The MCACES estimate notes that the project will be under construction from April to October of each year, avoiding cold weather construction. Contrarily, the Project Schedule section in Appendix 5 shows construction activity from November to March for construction tasks on 5-108, and 5-110 through 5-113.
- The MCACES estimate also states that the schedule assumes that two contracts will be awarded each fiscal year. The contracts will have six months for Planning, Engineering, and Design (P, E, and D) and contract acquisition starting in October and construction will begin in April. The Project Schedule section in Appendix 5 (p. 5-108 to 5-113) does not include tasks for P, E, and D or contract acquisition during this period.
- The Risk Analysis Report, Section 5 (p. 8) in Appendix 5, states a construction duration of 84 months that does not correlate with the Project Schedule duration.
- Total project costs of Alternative 4 in the Letter Report (Table 2 - \$78,216,000) do not agree with the Appendix 5 totals of \$78,454,000 (Summary Tables on p. 5-2 and p. 5-36).
- The costs in the Real Estate Costs section on p. 5-97 of Appendix 5 do not agree with the same costs on p. 62 in Appendix 7.

**Significance – High:**

Figures and information provided in the Letter Report, its appendices, and the MCACES estimates contain inconsistencies that may impact cost and schedule, thereby affecting project funding.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded as follows:

1. Describe/define “detailed estimate” in Section 5.1 more clearly (e.g., labor, material, equipment, and productivity rates and contrast it with bid results and historical costs). Also, providing a detailed MCACES report in Appendix 5 would be helpful.
2. Provide a discussion explaining why there is a contingency difference between the preliminary estimates and the preferred alternative estimate given the difference in the level of detail between the two types of estimates.
3. Provide a discussion on the origin of the 25% contingency for Lands and Damages in the proposed alternative estimate.
4. Either provide discussion to clarify differences, or correlate the effective price dates of the Main Report, Appendix 5, and the MCACES estimate.
5. Provide discussion on why there are construction tasks active from November to March in the Project Schedule section or modify schedule to be consistent with MCACES notes.
6. Include P, E, and D as a task in the Project Schedule.
7. Clarify with discussion in the Risk Analysis Report how 84 months translates to 1,638 days from the Project Schedule.
8. Edit Table 2 in the Letter Report, the Summary Table on p. 5-2 in Appendix 5, and the Summary Table on p. 5-36 so they are consistent.
9. Edit Appendices 5 and 7 so the real estate costs are in agreement.

**Comment 4:**

**More data from prior projects regarding similar levee repair issues should be included to support the Recommended Plan.**

**Basis for Comment:**

The Letter Report revises the recommendations made in the 1986 Letter Report, changing the recommended plan from lime stabilization to lime/fly-ash slurry injection. Because of this, the Panel views data from prior USACE Memphis District projects such as the West Memphis Lime and Fly Ash Injection Slope Stabilization Project as critical evidence in support of the recommended alternative. Moreover, the Panel considers data showing the geographical locations of prior projects that have corrected previous slides in the Alton to Gale Levee Districts as equally important information. Prior slides repaired with lime stabilization methods are stable and unlikely to fail in the future. New slides will require lime stabilization before lime/fly ash injection repair. It is important to the overall project funding, cost, and schedule if currently stable (pre-slide) slopes are given scheduled priority to the lime/fly-ash injection method.

The Panel believes the following information is missing from the Letter Report:

- The report should provide data illustrating that the USACE Memphis District projects correct similar levee deficiencies.
- The report should provide data indicating that the corrective measures taken in the Memphis District resulted in a more cost effective and technically sound solution over that previously used by the USACE St. Louis District.
- A map illustrating levee sections repaired as opposed to levee sections that have not yet failed would be beneficial in supporting the plan formulation of the project.

**Significance – Medium:**

Information from relevant prior projects supporting the recommended alternative would benefit the completeness of the Letter Report.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. Data from USACE Memphis District slope slides that illustrate or identify similarities in the deficiencies of Alton to Gale levee slides.
2. Quantitative soil strength data from USACE Memphis District lime/fly-ash corrected levee sections.
3. Map delineating previously repaired areas.

**Comment 5:**

**The cumulative effects analysis in the Environmental Assessment (EA) should consider the socio-economic issues associated with implementing the Recommended Plan.**

**Basis for Comment:**

Cumulative effects are defined by 40 CFR 1508.7 as “The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions.” Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.<sup>1</sup>

The primary purpose of the cumulative effects analysis in the National Environmental Policy Act (NEPA) process is to ensure that federal decisions consider the full range of consequences. There is increasing evidence that ecosystem degradation and unexpected effects on humans are resulting from combinations of individually minor effects of multiple actions over time. The full range of actions that must be considered includes not only the project proposal, but also all connected and similar actions that could contribute to cumulative effects.

A potential cumulative effect of restoring and continuing the level of protection provided by the levees has been described as enhanced social and economic growth and development. This has been described on page EA-33 of the EA as a positive potential effect of the project. Continued or enhanced development in the Alton to Gale study area will also have adverse environmental effects simply as a result of future development itself (i.e., habitat loss, reduction of air quality, increased noise, etc.). Restoring the levees does not eliminate flood risk, and estimated potential damages from a 100-year flood could increase over time with an increase in economic development. Perceived protection from flood risk could also result in re-development and gentrification of low-income areas.

<sup>1</sup> The terms “impacts” and “effects” are used interchangeably in NEPA practice.

**Significance – Medium:**

The discussion of cumulative effects in the EA lacks elements necessary to meet NEPA requirements.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A more detailed description of the types of enhanced economic development that could reasonably be expected to occur or continue if the project is constructed.
2. A discussion of ordinances enforced by local municipalities that guide development in the project area, and a review of local economic development planning documents, so that future development possibilities are more fully understood.
3. A discussion of the potential adverse social impact of reducing flood risk and a possible incorrect public perception that repairing the levee slides eliminates flood risk. This discussion would need to include a description of flood risk considering the “with project” condition. In a post-Katrina world, it is the Panel’s opinion that the public observes certain risks of structural failures leading to catastrophic flooding as unacceptable. The discussion needs to be detailed enough to assist the public in fully understanding the actual risk, the level of protection being provided, and the full consequences of catastrophic levee failure.
4. A discussion explaining that increased or continued development is an expected consequence of the project and that development has environmental effects associated with each and every project. Such effects include but are not limited to habitat loss, changes in air quality, changes in local aesthetics, changes in noise, and changes in the socio-economic environment that may be positive for some people, but adverse to others.

**Comment 6:**

**The difference in the number and size of slides across individual levee reaches is not sufficiently explained and may impact the allocation of resources.**

**Basis for Comment:**

The Letter Report provides only a brief discussion of the slide history and likely failure mechanisms. As indicated by the USACE in the kick-off teleconference meeting on June 29, 2010, the Panel believes that the information on the levee reaches is available for incorporation into the report.

The Panel agrees that the development of deep shrinkage cracks, enabling water to penetrate to the soil deeper within the levee, is a major factor in strength reduction; however, weathering should also be considered a factor in the strength reduction of high plasticity clays. Furthermore, nature does not provide for perfectly uniform materials; therefore, subtle variations in plasticity, as well as in-place densities, etc., are unknown, but are also factors that bear on the performance of the levees. The Panel recommends further discussion of these factors, which would provide further support for selection of appropriate remedial alternatives.

Based upon Figure 10 in the Letter Report (listing the number of levee failures over a 48-year period), it is possible to calculate the length-normalized levee slide probability per reach. These values are quite different in the various levee reaches. This information should be combined with the risk-adjusted potential damages of each reach to create a ranking table for each reach that could provide a mechanism to allocate limited repair dollars over time. In addition, this ranking table should also be tied to the construction schedule in order to develop optimum construction sequencing. By allocating the resources to those reaches with the highest risk of catastrophic failure and concomitant damages first, the overall project benefits will accrue more quickly.

**Significance – Medium:**

The Letter Report requires further information on the levee reaches to determine if resources have been appropriately allocated.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded as follows:

1. Expand the discussion of slide failure history and geotechnical factors that influence slide failure propensity.
2. Determine the optimum allocation of repair dollars/resources by using the failure history data in combination with the damage assessment. Including a table ranking each levee reach in this manner would be useful.

**Comment 7:**

**More detail is needed to describe the causal relationship between levee embankment slope failure (slides) and risk of economic and environmental damage.**

**Basis for Comment:**

The discussions of inundation risk, slides, potential levee breach, and damage are not linked to show exactly how risk of one leads to risk of the others. Just how slides increase the risk of failure, how failure results in flooding, and how flooding results in damages has not been described. The report should walk through these relationships so that damage reduction benefit estimates may be confirmed. Assuming models were used, the inputs, outputs, and assumptions of the models should be included. Also, the damage levels associated with different probabilistic events should be presented.

The potential impacts of “levee failure and breach” (p. 17) are described as “catastrophic” (p. 17) and itemized by stating that this would be catastrophic to “health, safety, environmental, and economic viability of the protected cities, towns, villages, industry, transportation, and commercial enterprises.” These descriptions are very general and more specifics are needed. A thorough description of the numbers of cities, towns, and villages would be helpful. The value of the buildings and properties – even if provided in terms of ballpark estimates – should be included for each reach and/or Drainage and Levee District (D&LD) in a uniform fashion, or else an explanation provided for why each D&LD is described differently. The population, economic output, and number of jobs in each D&LD should also be estimated or provided. Economic and environmental resources in each D&LD should further be delineated by reach, and by the risk of levee embankment failure and flood event.

The lack of uniformity in providing these descriptions is demonstrated on p. 18 of the Letter Report, where the Wood River Levee district is described in terms of the types of industrial sectors that are protected, and the number of municipalities. There is no mention of the acres protected, the population, number of residences, or the property value. In the subsequent paragraphs describing the other levee reaches, most descriptions include the number of acres protected, one describes the number of residences, one estimate of property value is mentioned for one reach, and one mentions the employment in one two manufacturing facilities. The inconsistency in describing these reaches detracts from the importance of the resources placed at risk.

More supporting evidence is needed to show how slides could become “catastrophic to health, safety, environmental, and economic viability for the protected cities, towns, villages, industry, economies and commercial enterprises” and how “Rural and agricultural economies would be devastated.” It is plausible that inundation will cause damage to the communities located within the floodplain, but the specific risk of inundation, and the risk of additional damages and even catastrophe should be explained. The disruption of roadways is a source of potential damage that is mentioned (p. 19). If this is the primary source of the concern, then it should be more fully explained. In addition, inundation damage to specific cultural and historic resources is mentioned but

not quantified. Although nearly one half of the text in the Economic Considerations section of the Letter Report is devoted to describing in detail the cultural resources at risk, there is little to no explanation of how they might be harmed, or of the specific probabilities of any potential damage.

Aside from concerns about how slides could result in damage, the assumptions for the benefit analysis are not clear in that they assume catastrophic failures will occur, yet the actual probability of full-blow failure appears low given none have occurred in 48 years. An explanation for this apparent inconsistency is needed.

**Significance – Medium:**

Without a detailed discussion of the causal relationship between levee embankment failures (slides) and flood damage, project justification is called into question.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A statement about how the slides specifically relate to potential levee breaches and failures during flood events.
2. Descriptions of the probabilities (or range of probabilities) of anticipated failure or breach.
3. A description of the potential extent of inundation that would occur in the various reaches under different failure or breach scenarios.
4. A table that includes the protected acres, population, regional economic output, the number of firms and employment by sector, the value of property, and the cultural resources in each levee reach at risk.
5. An explanation of the reasons that failure or breaches might occur in the future, though none have occurred over the past 48 years.

**Comment 8:**

**The benefit cost analysis contains inconsistent and potentially conflicting information about damages, potential for damage reduction, and benefit estimation.**

**Basis for Comment:**

The Letter Report states that benefit computations were based on extensive data collected for PIRs [presumably, Project Implementation Reports] representing all Drainage and Levee Districts (D&LDs) that make up the Alton to Gale project area during the 2008 floods (p. 28). Real estate surveys and engineering analysis of future with and without project conditions combined with economic analysis from Computerized Agricultural Crop Flood Damage Assessment System (CACFDAS) model generated the damages. However, this information is not well supported, and at times conflicts with information presented in the Environmental Assessment (EA). Detailed information on expected flood damages without the project, and with the project, presented by D&LD or by reach is the appropriate way to describe benefits of flood reduction.

In the Letter Report, the average annual benefit is approximately \$61.7 million, for a total discounted present value of over \$3 billion covering over the lifetime of the project. The EA economic analysis states, “the loss of the Wood River Levee System would not only have notable economic impacts but in the traditional measurement of losses (current estimate \$1.5 billion)...”. There is no citation for the \$1.5 billion total, and this number does not match the benefits for the Wood River system identified in the Letter Report (which reports \$15.15 million annually, or \$757 million discounted, or \$2.76 billion undiscounted). An explanation for this apparent discrepancy is needed.

Similarly, the property damage for the Metro East Sanitary District is reported in the EA to exceed \$1 billion without explanation. This figure does not match up with the benefit values presented in the Letter Report. Further, the environmental damage is reported, but only in terms of clean up costs and just for the one levee district. Values should state the derivation of the dollar figure, and be reported consistently across all levee districts, if possible.

In the EA, the magnitude of loss is stated as “in excess of \$1 Billion” for the Wood River Levee, yet there is no explanation of the source of this estimate. Overall, there is an emphasis on describing the potentially affected acreage and cultural resources, but the economic resources are not described in sufficient detail to justify this \$1 billion cost estimate. If the reason for the lack of detail in explaining the source of potential flood damages is that this project is to repair a deficiency in construction (and is essentially a least-cost analysis, as was used in the original 1986 Letter Report) then the reasoning should be given. However, if the results of an economic benefit analysis are to be used to explain the selection of the alternative, a more detailed explanation is needed.

**Significance – Medium:**

Due to the lack of detail in the benefit analysis, project justification is called into question.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded as follows:

1. At a minimum, the amount of expected damages reduced should be presented by type, such as
  - a) crop damages,
  - b) residential property damages,
  - c) roadways, transportation, and other public facility damage,
  - d) commercial and industrial damage, and
  - e) environmental or natural resource damages.
2. Each type of damage (see recommendation #1 above) could also be reported by
  - a) the inundation reduction benefit
  - b) the intensification benefit, and
  - c) the location benefitwhere any of these were estimated. Section 6.4, 6.5, and 6.6 suggest that these were estimated but no reference or explanation is provided.
3. Typically the CACFDAS provides estimates for potential damages to crops as a result of flooding. Inclusion of both input details of this modeling and output details would be appropriate.
4. Additional damage estimates from the PIRs should be either described or at a minimum referenced specifically.
5. If a probabilistic approach to flood protection has been conducted, then risks of exceedance should be reported consistent with USACE planning regulations such as ER 1105-2-101.

**Comment 9:**

**The reason for eliminating the 1986 least-cost analysis economic approach is not clear.**

**Basis for Comment:**

In the Letter Report, USACE used an established flood damage reduction economic evaluation methodology (including calculation of both benefits and costs) to support each of the four project alternatives, while in the 1986 Letter Report, a least-cost methodology was utilized. The Panel believes that the least-cost methodology is appropriate for the Letter Report and recommends that the USACE use it in the report revision. If the USACE determines that a full benefit to cost evaluation is required rather than a least-cost analysis, the Panel believes that the following factors must be considered and included in the final analysis:

- Benefits must be risk-adjusted to account for the actual probability of catastrophic failure;
- Benefits accrued must be consistent with the proposed construction schedule.

**Significance – Medium:**

The economic analysis discussion needs a detailed explanation on why a least-cost analysis was not completed as part of the Letter Report.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded as follows:

1. A revised economic analysis that uses a least-cost methodology similar to what was employed for the 1986 Letter Report should be added, or the USACE should revise the economic evaluation to incorporate risk-adjusted benefits.

**Comment 10:**

**The justification used to eliminate alternatives from further consideration is not described in sufficient detail to support the selection of the Recommended Plan.**

**Basis for Comment:**

While the Letter Report addresses the factors that need to be considered in the comparison of alternatives, the information is not presented in a manner that is easy for the Panel to follow. The plan formulation discussion is abbreviated and does not address pre-screening of project alternatives in detail. It is not clear how the USACE conducted its pre-screening of alternatives to limit the recommended repair zones to only 24.5 miles out of 200 miles of existing levee. Also, there is very limited discussion on the Recommended Plan from the 1986 Letter Report, which recommended repairing levee reaches as slides occurred. This alternative is dismissed in the initial alternative screening in the Letter Report.

Furthermore, though it appears that Alternative 4 presents significant advantages over the other alternatives, it would be most helpful if the Letter Report contained a section that summarized the key factors that were considered in selecting the Recommended Plan. The section should identify the key factors (such as environmental impacts, construction costs, construction schedule, real estate costs, impact on flood protection, factors of safety, etc.). The key factors for each alternative could be presented in a tabular format that either lists actual values (dollars, months, safety factors, etc.) or a relative qualitative term (high, medium, low) for those factors that are difficult to quantify. The table could be arranged in column format from most to least advantageous alternative, which would further facilitate the comparison for the reader.

**Significance – Medium:**

The comparison of alternatives and the evaluation process would be enhanced by a section in the Letter Report that identifies and compares the key factors that were used in selecting the Recommended Plan (Alternative 4).

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A brief section that explains the alternative pre-screening process.
2. A discussion regarding the selected alternative from the 1986 Letter Report and why that was not an alternative considered for the Letter Report.
3. A brief section that identifies and/or describes of the key factors that were used in selecting the Recommended Plan.
4. A presentation of the key factors for each alternative that facilitates a comparison, such as a table.

**Comment 11:**

**Further information is required to support the conclusion that the approach of repairing levee slides as they occur is no longer an option.**

**Basis for Comment:**

The Letter Report considers only briefly, in Section 4.4 “Without Project” (Existing) Conditions, the current practice of repairing only the slide areas as slides occur. The Letter Report states that this practice “does not address the vulnerability of continuous and impending levee slide failures prior to and during flood events.” A thorough analysis describing why the current practice of repairing individual slides does not meet this project goal is not included in the report(s).

Since the average annual cost of repairing the levees as slides occur is less than the average annual cost to repair them using the recommended plan, the report needs to clearly explain why that approach is no longer a viable option.

Appendix 6 (EA), as well as Sections 2.3.1.5 and Section 4.4 in the Letter Report, indicate that individual repairs are sometimes not undertaken for years (p. EA-7), leaving the structures vulnerable when and if catastrophic flooding occurs. A stronger characterization of the negative environmental effects of repeated or almost continuous construction on the levees versus a one-time, larger systemic repair project would be very helpful in supporting the recommended plan.

The EA and Letter Report do not describe fully the risk of continuing to repair the levee slides one at a time, and the lengthy process for funding such repairs is not adequately discussed. It is the Panel’s belief that the risk of waiting years to repair slides one at a time in a post-Katrina environment is socially unacceptable. Given the age of the levee system, and the nature of the clays used to construct the levees, failures can occur at anytime, anywhere along the length of the levee, which renders the levee system constantly vulnerable.

**Significance – Medium:**

The justification for discontinuing levee repairs as they occur lacks sufficient detail.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. Additional language describing environmental effects associated with repetitive and/or continuous construction in various reaches of the river versus the environmental effects of performing one large repair project (i.e., the recommended plan).
2. Additional language describing the social environment post-Katrina, the growing public awareness of flood consequences, and the federal government commitment to levee safety (i.e., far less willingness to accept potential loss of life and devastating loss of property due to levee breaches).
3. Further justification of the average annual cost of individual levee repairs versus the cost of the recommended plan.

**Comment 12:**

**A screening process is needed to establish repair priorities for the individual project levee reaches.**

**Basis for Comment:**

If the normalized slide probability is calculated for each levee reach, certain reaches (e.g., Degonia, Fort Chartres, Grand Tower, and Preston) appear to have a much higher chance of slide development. In the 1986 Letter Report, the recommendation was to repair levee reaches with lower chance of slide development on an individual basis, rather than in aggregate or as part of a permanent repair program. The Letter Report identifies the need for such an analysis in Section 8.1.1, which describes the criteria that will be used to determine a sequence of work, and the phased funding expenditures (Section 8.1.2).

Some reaches that have a lower probability of failure may have higher potential for damage in the event of a failure. The current funding plan is to provide funding on a straight-line basis at \$10 million/year until 2019. The slide distribution on selected reaches from year to year will affect obligated dollars, and the Panel could not determine if new slides were accounted for in the cost estimate or if these slides were part of the project cost. If a more comprehensive screening were performed on the individual levee reaches, potential damages and funding priorities may be evaluated.

**Significance – Low:**

Normalized information on the risks of slide, risks of breach, and location of potential damages will allow for prioritization of resource allocation and/or scheduling of project expenditures, and should have been incorporated into the estimation of benefits by reach.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A normalized probability of slide per reach.
2. An analysis of how damage per reach, paired with slide/breach probability per reach, could be used to screen and prioritize project scheduling and funding allocation.
3. A method for incorporation of new slide information into the screening approach described in recommendation #2 (above).

**Comment 13:**

**Key assumptions used in the risk analysis need to be clarified.**

**Basis for Comment:**

The Panel agrees that project funding is one of the key assumptions that influence the risk analysis for the project. However, the Panel believes there are inconsistencies between the Letter Report, the Cost Estimate, and the Risk Analysis Report regarding funding in relation to future real estate and levee repair costs. The following issues are categorized by “Risk/Opportunity Events” shown in the detailed Risk Registers of Appendix 5.

- Project & Program Management (PPM) – The Studied Risk Register in Table 2 indicates that Stakeholder Funding Capability has “Significant” impact on project cost and schedule. Commensurate with the Letter Report, the levee districts will have a difficult time cost sharing and/or funding any portion of the project due to sunk Operation and Maintenance (O&M) costs and the lack of tax revenue income. Taken from the information given in the Letter Report and Appendix 5, it is the Panel’s opinion that PPM-2’s risk level is more than “moderate” to the cost and schedule of the project.
- Estimate and Schedule Risks – Paragraph 4.5.5 in the Letter Report states that existing slides will need to be repaired by the lime stabilization method. New Levee Slide Repair is listed in paragraph 6.2 of the Risk Analysis Report as a risk event that influences the project cost. Based on the impact funding has on the project, and the fact that slide repair is not included in the Alternative 4 cost estimate, it is the Panel’s opinion that New Levee Slide Repair should be included in Table 2, Studied Risk Register, and scrutinized as a possible “Significant” risk event that impacts the cost and schedule of the project.
- Lands and Damages (LD) Risks – Section 7 of the Letter Report states that real estate acquisition is not expected for the levee repairs. However, the levee districts would acquire any needed right-of-way (ROW) to complete deficiency corrections. The Detailed Risk Register in Appendix A of the Risk Analysis Report has real estate listed as a risk event. The cost estimate for Alternative 4 includes costs for real estate associated with lay-down areas during construction. Given the information in the Letter Report, appendices, and cost estimate, it is the Panel’s opinion that real estate will be a cost and should be categorized as “likely” in the risk analysis.
- Technical (TL) Risks – Given that New Levee Slide Repair is included in paragraph 6.2 of the Risk Analysis Report as a sensitive item to the cost contingency, the Panel believes the potential is there for lime/fly-ash injected under pressure to destabilize the slopes and cause new slides before chemical reaction is able to take place. The Panel believes this risk event would be a significant impact to the cost and should be included in the Studied Risk Register in Table 2.
- Construction (CON) Risks – Given that CON-3 Material Availability and Delivery is categorized as “critical,” the Panel believes there is a correlation with

Estimate and Schedule (EST) risk event EST-2 Material Quantity. EST-2 should take into consideration the uncertainty in the lime/fly-ash percentages in the mix design for the slurry thereby affecting the quantity and reflected in the categorization of the impact in the Risk Analysis.

If the preceding issues are investigated and result in a higher project contingency, thereby increasing the cost and prolonging the schedule, this comment could have higher significance.

**Significance – Medium:**

The Risk Analysis Report lacks detail to tie together information in the Letter Report, Appendices, and Cost Estimate.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. The Risk Analysis Report matrix table provided in the Risk Analysis Excel spreadsheet illustrating how the “Risk Level” is determined. Include more information as to why lack of funding from the districts is deemed “significant” as opposed to “critical” regarding the impact of the project.
2. New Levee Slide Repair in the Risk Register as a risk event, with concerns and discussions that support the impact on the project.
3. A change in the categorization of LD-1 and LD-2 as “likely” in the cost and schedule risk analysis for the project.
4. TL-2 in the risk analysis to address lime/fly-ash injection under pressure and its potential effects to the existing soils.
5. Categorization of EST-2 as “significant” and further evaluation of the soil conditions and mix design to refine the estimated quantities.

**Comment 14:**

**Some environmental consequences are not fully described, such as contradictory impacts to floodplain habitats, impacts resulting from repetitive repairs, and impacts resulting from the no-action alternative.**

**Basis for Comment:**

Portions of Appendix 6 (EA) have conflicting statements or provide contradictory information with respect to environmental consequences. Specifically, the following items were noted:

- Statements are made in the Letter Report that flooding of existing national forests and wetlands would result in “pristine wetlands and bottomland hardwoods destroyed” (p. 1) and that impacts would be “devastating” (p. 7). Yet, prior to construction of the levee system, these areas were subject to the natural flood cycle of the Mississippi River. A later statement in the EA indicates that rehydration of the same resources would yield positive impacts (p. EA-27).
- Adequate information regarding potentially occurring listed species has been included in the EA. However, correspondence in the EA (an email between the USACE and the U.S. Fish and Wildlife Service [USFWS]) does not make clear whether the USFWS is satisfied with how listed species have been addressed. According to the USFWS email, listed species habitat has been discovered near the levees during previous slide repairs.
- Impacts to recreation are discussed only with respect to potential environmental consequences (p. EA-34), but recreation resources themselves are not listed or discussed.
- Impacts from the no-action alternative are identified and discussed in general terms. However, these effects are not put in the context of a post-Katrina world. There is an opportunity in Section 3.9 of the EA (Socioeconomic Issues) to fully describe the consequences of a complete levee failure during a period of extremely high flow.
- Impacts from repeated activities (repairing the levee slides one at a time as has been done in the past, which is part of the no-action alternative) are not discussed. Repetitive activities resulting from temporary or continuous repair operations have adverse effects on water quality, wildlife disturbance, noise and other resources.

**Significance – Low:**

Additional language can be added to the EA to clarify or strengthen certain conclusions regarding environmental consequences.

**Recommendation(s) for Resolution:**

To resolve these concerns, the report would need to be expanded to include the following:

1. A statement regarding the consequences of flooding habitats that have been protected by the levees for decades, and how they would therefore be adversely affected by restoration of the natural flood cycle.
2. A brief discussion clarifying or updating agency coordination with respect to protected species.
3. A brief discussion of the types of recreation that may be potentially affected.
4. A discussion of the full effects of a levee breach during a flood, including reference to a new national public awareness of flood consequences in a post-Katrina environment.
5. Expansion of the explanation for discontinuing the practice of repairing individual levee slides one at a time, and a discussion of the adverse effects of repetitive or continuous maintenance on water quality, air quality, aesthetics, wildlife, and other potentially affected resources.

This page intentionally left blank

**APPENDIX B**

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

**as**

**Submitted to USACE on June 25, 2010**

**on the**

**Independent External Peer Review (IEPR) of the Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report**

This page is intentionally left blank.

**Final Charge Guidance and Questions to the Peer Reviewers  
Alton to Gale Organized Levee Districts, Illinois and Missouri Project, (Continuing,  
Deficiency Corrections) Letter Report**

**BACKGROUND**

Congress authorized the Flood Control Acts of 1936, 1938, and 1946 for the original construction of the 17 Alton to Gale drainage and levee districts that protect against Mississippi River flooding in portions of Illinois and Missouri. The Flood Control Act of June 22, 1936 authorized flood protection for the following levee districts: Bois Brule (formerly Perry County) Drainage and Levee District, Clear Creek Drainage and Levee District, Columbia Drainage and Levee District No. 3, Degognia - Fountain Bluff Drainage and Levee District, East Cape Girardeau and Clear Creek Drainage District, Metro East Sanitary District (formerly East St. Louis), Fort Chartres and Ivy Landing Drainage District No. 5, Harrisonville and Ivy Landing Drainage and Levee District, North Alexander Drainage and Levee District, Preston Drainage and Levee District, and the Wilson and Wenkel and Prairie Du Pont Drainage and Levee District. The Flood Control Act of June 28, 1938 authorized flood protection for the Grand Tower Drainage and Levee District, Kaskaskia Island Drainage and Levee District, Miller Pond Drainage District, Springtown – Fort Chartres and Ivy Landing, and the Wood River Drainage and Levee District. The Flood Control Act of July 24, 1946 authorized flood protection for the Prairie du Rocher levee.

The Alton to Gale Organized Levee Districts, Illinois and Missouri Project (Continuing, Deficiency Corrections) Letter Report (hereinafter referred to as the Alton to Gale Letter Report) provides an update of the 1986 report, which also addressed a specific design deficiency. The Alton to Gale Letter Report documents the continued failures of the levee embankment slopes within specific reaches of the Alton to Gale Organized Levee Districts (hereinafter referred to as the Alton to Gale levee system) because of the design deficiency. After reviewing the history of levee slides experienced by the 17 levee districts in the Alton to Gale levee system and those slides that have occurred through 2009, the Alton to Gale Letter Report addresses the specific design deficiencies found within portions of 11 of the levee districts.

The noted deficiencies are found within portions of the following 11 levee districts: (1) Degognia – Fountain Bluff Drainage and Levee (D&L) District, (2) Grand Tower D&L District, (3) Metro East Sanitary District (formerly East St. Louis D&L District), (4) Prairie du Rocher D&L District, (5) Bois Brule D&L District, (6) Clear Creek D&L District, (7) Kaskaskia Island D&L District, (8) Fort Chartres D&L District, (9) East Cape D&L District, (10) Preston D&L District, and (11) Wood River D&L District.

Between 1968 and 1978, USACE repaired the levee slides by removing all material from the slide area to a depth of 1 to 2 feet below the slide plane, placing a 1-foot thick sand drain and then replacing the original material in a semi-compacted state. Levee slides reoccurred in the same areas after sand drains were constructed. After 1975, the slide repair consisted of removing all of the material from the slide area to a depth of one to two feet below the slide plane and

adding 4 to 5 percent hydrated lime, by weight, to the material as it was replaced. The use of lime in the levee repair reduces the plasticity and shrink-swell potential of the embankment materials. To date, none of slide repairs that have been fixed using the above-mentioned lime stabilization method has failed.

Since October 1979, there has been an increase in the number and severity of levee slides. During the summer and fall of 1983, 119 slides were repaired. All of the 1983 slides were repaired using the lime stabilization method. In the spring of 1985, a levee inspection of the Alton to Gale levee system documented the existence of 97 new slides. After a levee inspection in 1988, an additional 23 levee slides were identified. Most of the levee slides required the excavation of a large portion of the levee embankment slope. After the long inundation of the levees during the 1993 flood, followed by another inundation during the 1995 flood, 117 levee slides occurred throughout the Alton to Gale levee system.

During the summer and fall of 2001, 44 slides were approved to be repaired. Since completion of the levee slide repair contract in 2001, additional levee slides were discovered during the annual slide documentation inspection each spring. During the flooding in the spring and early summer of 2008, many additional slides occurred along the levees in the same levee reaches as prior years and 75 slides were repaired. The current slide count consists of two Wood River riverside slides, five Grand Tower and Degognia landside slides (along the Big Muddy), and two Prairie du Rocher slides.

## **OBJECTIVES**

The objective of this work is to conduct an independent external peer review (IEPR) of the Alton to Gale Organized Levee Districts, Illinois and Missouri Project (Continuing, Deficiency Corrections) Letter Report (hereinafter referred to as Alton to Gale Letter Report). The IEPR will be conducted 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.

This purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-209; p. D-4) for the Alton to Gale Letter Report. 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 engineering, economics, and environmental issues relevant to the project.

The panel members will be “charged” with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-209, Appendix D, review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

## **DOCUMENTS PROVIDED**

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

- **Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report**
  - **Executive Summary (February 2010)**
  - **Main Report (March 31, 2010)**
  - **Appendix 1: 1986 Letter Report**
  - **Appendix 2: Letter from Assistant Secretary of the Army (November 8, 2000)**
  - **Appendix 3: Updated Maps**
  - **Appendix 4: Cross Section Alternatives**
  - **Appendix 5: Cost Estimate**
  - **Appendix 6: Environmental Assessment**
  - **Appendix 7: Real Estate**
- 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**

**Alton to Gale Letter Report IEPR Milestones and Deliverables**

<b>TASK</b>	<b>ACTION</b>	<b>DUE DATE</b>
<b>Conduct Peer Review</b>	Battelle submits review documents to panel members	6/28/2010
	Battelle/panel Kick-off Meeting	6/29/2010
	USACE/Battelle/panel Kick-off Meeting with panel members	6/29/2010
	Panel members complete their review	7/14/2010
<b>Prepare Final Panel Comments and Final IEPR Report</b>	Battelle provides panel members merged individual comments and talking points for panel review teleconference	7/16/2010
	Battelle convenes IEPR Panel review teleconference	7/19/2010
	Battelle provides Final Panel Comments directive to IEPR Panel	7/20/2010
	Panel members provide draft Final Panel Comments to Battelle	7/27/2010
	Battelle provides feedback to panel members on draft Final Panel Comments; IEPR Panel provides revised draft Final Panel Comments per Battelle feedback (iterative process)	7/29/2010
	*Battelle submits working draft of Final Panel Comments to USACE as separate pdf	7/30/2010
	Final Panel Comments finalized	8/5/2010
	Battelle provides Final IEPR Report to IEPR Panel for review	8/9/2010
	Panel provides comments on Final IEPR Report	8/11/2010
	*Battelle submits Final IEPR Report to USACE	8/12/2010
<b>Comment/Response Process</b>	Battelle inputs Final Panel Comments to DrChecks; Battelle provides Final Panel Comment Response template to USACE	8/13/2010
	Battelle provides panel members the draft Evaluator Responses and clarifying questions	8/20/2010
	Panel members provide Battelle with draft comments on draft Evaluator Responses (i.e., draft BackCheck Responses)	8/25/2010
	Teleconference with Battelle and panel members to discuss IEPR Panel's draft BackCheck Responses	8/25/2010
	Final Panel Comment Teleconference between Battelle, IEPR Panel, and USACE Project Delivery Team to discuss Final Panel Comments, draft response and clarifying questions	8/26/2010
	USACE inputs final Evaluator Responses in DrChecks	9/2/2010
	Battelle provides Evaluator Responses to panel members	9/3/2010
	Panel members provide Battelle with final BackCheck responses	9/8/2010
	Battelle inputs final BackCheck Responses in DrChecks	9/9/2010
	*Battelle submits printout of DrChecks in pdf format	9/9/2010

Deliverables are noted with an asterisk (\*)

## CHARGE FOR PEER REVIEW

Members of this peer review panel are asked to determine whether the technical approach and scientific rationale presented in the Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report are credible and whether the conclusions are valid. The reviewers are asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The reviewers are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the panel members (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 Alton to Gale Letter Report. 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 (Rachel Sell, [sellr@battelle.org](mailto:sellr@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 Rachel Sell, [sellr@battelle.org](mailto:sellr@battelle.org), no later than COB July 14, 2010 EDT.**

**Independent External Peer Review  
Alton to Gale Organized Levee Districts, Illinois and Missouri Project (Continuing,  
Deficiency Corrections) Letter Report**

**Final Charge Questions**

**GENERAL QUESTIONS**

1. To what extent has it been shown that the project is technically sound, environmentally acceptable, and economically justified?
2. Are the assumptions that underlie the economic, engineering, and environmental analyses sound?
3. Are the economic, engineering, and environmental methods, models, and analyses used adequate and acceptable?
4. In general terms, are the planning methods sound?
5. Are the interpretations of the analysis and the conclusions based on the analysis reasonable?

**SECTION 1.0 – References**

No questions.

**SECTION 2.0 – General Information**

**2.1 Report Purpose and Scope**

6. Have all critically important prior studies performed relative to the study area been described?
7. Have the recommended alternative achieves the desired objectives outlined in ER1165-2-119?

**2.2 Legislative Authorization**

No questions.

**2.3 Modifications Under Existing Authority**

No questions.

## **2.4 Project Locations**

No questions.

## **2.5 Problem Description and History**

8. Please comment on the soundness of engineering evaluation as applicable and relevant to your area of expertise.
9. In your expert opinion, is there sufficient information presented to identify, explain, and comment on assumptions that underlie engineering analyses. Why or why not?
10. Does the physical data and observed data provide adequate information to characterize the project and its performance?
11. Based on your experience, are there any other performance or safety concerns that should be considered and addressed?
12. Have the causes of the levee slides been adequately evaluated, identified and described?
13. To what extent does the infinite slope calculation shown in Figure 3 confirm the known levee slide failure surfaces described in Section 2.5 and shown in Figures 4 through 9?
14. Please comment on the following regarding the incidence of slides by levee district (Figure 10):
  - a. Are the reasons for the differences in frequency of slide occurrence sufficiently explained?
  - b. How might the slide distribution affect priorities, and appropriation and allocation of resources?

## **SECTION 3.0 – Public Law 84-99 Eligibility Status of Existing Levee System**

15. Have the impacts of the Recommended Alternative to ongoing Operations and Maintenance within other levee districts been adequately addressed?

## **SECTION 4.0 – Plan Formulation**

### **4.1 Plan Formulation Rationale**

16. To what extent has the plan formation rationale discussion complete and clear.

## **4.2 Levee Safety Considerations**

17. Please comment on the appropriateness of the slope stability criteria and methods used; do you agree with the use of a minimum factor of safety of 1.4 to ensure long-term slope stability?

## **4.3 Economic Considerations**

18. Have all potential economic impacts been considered and presented in a manner that characterizes their relevance and magnitude of potential loss?

## **4.4 “Without Project” (Existing) Conditions**

19. Is the basis for this statement that “the present approach of repairing slides as they occur places the Alton to Gale Letter Report levee system at great risk for inundation during flooding” supported by the empirical evidence?

## **4.5 Alternative Measures**

20. Is each of the alternative plans clearly described?
21. Are the processes used to compare the alternative plans described in sufficient detail?
22. Are the following design, environmental, and construction considerations outlined for the Recommended Alternative appropriate and adequate:
  - a. The empirical repair history and the proposed use of lime augmentation as a permanent solution
  - b. The use of other technologies (other than soil replacement or chemical modification of high plasticity soils) that should be considered
  - c. A factor of safety of less than 1.4 is unacceptable and how this threshold safety level be validated in the field after project construction
  - d. The ratio of 16 pounds of lime per square yard for each 10-inch lift
  - e. The lateral and vertical extent of the high plasticity clay within the areas to be repaired
  - f. The use of results from the Memphis District with similar physical and chemical clay to support the use of the lime/fly-ash injection method for the high plasticity clays in the Alton to Gale Letter Report levee system
  - g. The general lateral spacing and depth intervals to be used in the lime/fly-ash injection method

- h. The proposed typical injection depth of 10 feet will be sufficient to protect against long-term instability in accordance with the design flood conditions
- i. The reliability of the lime/fly-ash injection method to withstand failure during periods of heavy and prolonged rainfall and seismic loading

#### **4.6 Levee Reaches To Be Repaired**

No questions.

### **SECTION 5.0 – Cost Estimate**

#### **5.1 General**

- 23. To what extent are the costs consistent with and justified by the preliminary cost estimates presented in Appendix 5?

#### **5.2 Reliability of Designs, Quantities, and Unit Prices**

- 24. Do you consider the basis for developing the preliminary cost estimates to be reasonable?

#### **5.3 Contingencies**

- 25. Are the contingencies used in the analysis reasonable and based on sound engineering principles?

#### **5.4 Discussion of Sensitive Items**

- 26. Has the uncertainty associated with those concerns labeled as sensitive to the cost estimate been clearly defined?

#### **5.5 Escalation**

No questions.

#### **5.6 Tabulation of Cost Estimates**

No questions.

### **SECTION 6.0 – Economic Benefit Analysis**

#### **6.1 Introduction**

- 27. Please comment on the project lifetime/period of analysis used for the National Economic Development (NED) evaluation.

## **6.2 General Accounts**

No questions.

## **6.3 National Economic Development Analysis**

No questions.

## **6.4 Inundation Reduction Benefit**

No questions.

## **6.5 Intensification Benefit**

No questions.

## **6.6 Location Benefit**

No questions.

## **6.7 Environmental Quality, Regional Economic Development and Other Social Effects**

No questions.

## **6.8 Economic Benefits**

28. Is the assumption of using a reduced degree of levee protection for a net benefit protection justified based on accepted engineering/hydrology principles and guidelines?

## **6.9 Economic Cost**

No questions.

## **6.10 Economic Analysis**

29. Have all costs and benefits been accounted for and the estimates clearly described?
30. Are these estimates based on sound economic practices?
31. Please consider and comment on interest rate used, years of evaluation, etc.
32. To what extent do you agree with the conclusions of the average annual benefit and average annual cost evaluation?

## **SECTION 7.0 – Real Estate Requirements for Local Cooperation**

### **7.1 General**

No questions.

## **SECTION 8.0 – Project Completion Date and Funding Requirements**

### **8.1 Project Completion Date**

33. Does the project completion date proposed seem reasonable based on the general discussion of engineering/construction requirements?
34. To what extent do you agree with the criteria to be used in establishing the priority for deficient levee sections; should any additional criteria be considered?

### **8.2 Funding**

## **SECTION 9.0 – Local Cooperation**

No questions.

## **SECTION 10.0 – Environmental Compliance and Permits**

No questions.

## **SECTION 11.0 – Conclusions**

No questions.

## **SECTION 12.0 – Recommendations**

35. To what extent does the document support the recommendation of Alternative 4 as the Recommended Alternative?

### **Appendix 1: 1986 Letter Report**

36. To what extent have the historical levee maintenance/repair and alternative remedial measures been included in the Letter Report?
37. To what extent do the four alternatives consider whether old lake beds may be a factor in the problem of excessive slide development in some reaches?

### **Appendix 2: Letter from ASA in 2000**

No questions.

### **Appendix 3: Updated Maps**

No questions.

### **Appendix 4: Cross Section Alternatives**

38. To what extent do the typical cross sections support the four alternatives across each levee reach?

### **Appendix 5: Cost Estimates**

39. Please comment on the rationale and completeness of information provided for both the structural and non-structural components.
40. Have the significant project design, construction and operational costs been adequately identified and described?
41. To what extent do you consider the implementation schedules to be reasonable?
42. Do you agree with the key assumptions used in the risk analysis (page 8)?
43. In your opinion, does the risk register appropriately capture and describe all moderate and high concerns that could significantly affect project cost and schedule?
44. To what extent does the Cost Sensitivity Chart illustrate the significant risk items?
45. To what extent does the Schedule Sensitivity Chart illustrate the significant risk items?
46. To what extent do the data support the major findings of the risk assessment?
47. Do you agree with the mitigation recommendations?

### **Appendix 6: Environmental Assessment**

48. Is the description of project history and maintenance clear?
49. Are the existing conditions clearly and adequately described?
50. Have all relevant engineering and scientific disciplines been effectively integrated into the Environmental Assessment Report?
51. To what extent will the lime/fly-ash injection method be affected by emerging state and federal health and environmental policy rules and regulations concerning the use, storage, handling, placement and disposal of lime and coal combustion wastes (CCW) over the proposed construction timeline?

52. Does the construction methodology provide a comprehensive list of potential impacts and appropriate mitigation?
53. Have all potential economic and socioeconomic impacts been considered and presented in a manner that characterizes their relevance and magnitude under the No Action and Recommended Alternative?
54. Have all potential impacts on environmental resources and recreation activities under the No Action and Recommended Alternative been identified and clearly discussed?

#### **Appendix 7: Real Estate**

55. Does the appendix adequately address all real estate interests and requirements for each Levee District, allowing for appropriate comparisons across all alternatives?
56. In your opinion, are the acquisition costs used in the real estate analysis representative of current market conditions?
57. Does the real estate plan address and plan for the potential concerns of landowners in the project area?
58. Are the contingencies used in the analysis reasonable and based on sound engineering/costing principles?