

Final Independent External Peer Review Report for St. Johns Bayou and New Madrid Floodway, Draft Environmental Impact Statement (DEIS), Phase 3

Prepared by
Battelle Memorial Institute

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

Contract No. W912HQ-10-D-0002
Task Order: 0022

December 8, 2011



**Final Independent External Peer Review Report
St. Johns Bayou and New Madrid Floodway,
Draft Environmental Impact Statement (DEIS), Phase 3**

by

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

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

**St. Johns Bayou and New Madrid Floodway Project, Missouri, Draft
Environmental Impact Statement (DEIS), Phase 3**

EXECUTIVE SUMMARY

Project Background and Purpose

The St. Johns Bayou Basin and New Madrid Floodway project area is located in Mississippi and New Madrid counties in southeastern Missouri along the right descending bank of the Mississippi River floodplain. The project area encompasses portions of two drainage basins separated by the Mississippi River and Tributaries Project's Birds Point-New Madrid Setback Levee. The St. Johns Bayou Basin is protected from Mississippi River floodwaters by means of the Mississippi River Frontline Levee and the Setback Levee. During high Mississippi River stages, the existing flood control/drainage structure located at the lower end of the St. Johns Bayou Basin is closed, thus preventing the Mississippi River from inundating the basin. Although closing the structure prevents Mississippi River flooding, it severs drainage and floodwaters begin to rise due to impounded interior runoff caused by base flow and precipitation.

With the exception of the 1,500-foot gap located at the lower end of the New Madrid Floodway, the entire New Madrid Floodway is protected from Mississippi River flooding. However, during high Mississippi River stages, flooding occurs in the New Madrid Floodway through this gap in the levee system. Although flooding contributes to the ecological functions of the project area, it also disrupts the lives of the people who live and work in this area. There are numerous small communities rich in history located throughout the New Madrid Floodway that must contend with the constant hardship of flooding.

Over 80% of the project area is devoted to agricultural production and agribusiness is a significant portion of the project area's economy. Most producers manage flood risk by delaying their planting until after the spring flood season has ended. Although delayed planting manages some risk due to predictable floods that occur in the earlier part of the growing season, it does not manage the risk for late season or unpredicted floods.

The Flood Control Act of 1954 authorized the closure of the 1,500-foot gap and construction of a gated outlet in the Mississippi River levee at the lower end of the New Madrid Floodway. The St. Johns Bayou and New Madrid Floodway, Missouri Project was authorized for construction by the Water Resources Development Act (WRDA) of 1986, P.L. 99-662. The Department of the Army, U.S. Army Corps of Engineers (USACE) prepared evaluation studies for this project, culminating in a 2002 Revised Supplemental EIS and the 2006 Revised Supplemental EIS 2. However, both the 2002 and the 2006 NEPA documents were set aside by a U.S. District Court decision in September 2007.

In April 2010, USACE approved a project review plan that significantly expanded the level of effort normally required for an Independent External Peer Review (IEPR). Although an IEPR is typically conducted at the conclusion of a study/NEPA process and the review, the IEPR conducted for this study was expanded to four separate phases (Consolidated NEPA Document, Project Work Plan, Draft EIS, and Final EIS) and included nationally-recognized experts in fields that represented significant project resource categories.

The Phase 1 IEPR (Consolidated NEPA Document) was conducted by Battelle prior to USACE making a formal decision on whether or not to proceed with a new Environmental Impact Statement (EIS) for the project. Based on the Panel's Phase 1 IEPR comments, USACE decided to prepare a new NEPA document. This decision was based on the Panel's recommendations that a clear, concise, updated stand alone document was imperative to the public's understanding of the project.

Following the completion of the Phase 1 IEPR, USACE prepared a Project Work Plan that outlined the methodologies and assumptions that would be used to formulate the new EIS, including proposed ecological models. The Project Work Plan also contained preliminary alternatives and mitigation options that would likely be analyzed. The Project Work Plan, as well as the interagency comments, were submitted to the Panel for review during the Phase 2 IEPR. The results of the Phase 2 IEPR were used by USACE to prepare the new NEPA document, the Draft EIS. The purpose of the Phase 3 IEPR is to ensure that the scope of the Draft EIS is complete and scientifically accurate.

Independent External Peer Review Process

USACE is conducting an IEPR of the St. Johns Bayou and New Madrid Floodway, Draft Environmental Impact Statement (DEIS), Phase 3 (hereinafter: St. Johns Bayou Phase 3 IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2010). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the St. Johns Bayou Phase 3 project. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007), and OMB (2004).

This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the Panel. Review of the DEIS was conducted as Phase 3 of the overall IEPR; only Phase 3 of the review is discussed in this report. The results of this IEPR report will be taken into consideration prior to USACE preparing the Final EIS. Review of the Final EIS will be conducted as Phase 4 of the overall IEPR. This approach seeks to fully consider all analytical efforts within the DEIS that contained significant deficiencies or erroneous conclusions as recognized by the panel members.

The eight panel members from the St. Johns Bayou Phase 1 (Consolidated NEPA Document) and Phase 2 (Project Work Plan) IEPR efforts were selected for the St. Johns Bayou Phase 3

IEPR to ensure continuity and validity and to ensure that expert opinion remains intact. Based on the technical content of the St. Johns Bayou Phase 3 IEPR and the overall scope of the project, the final panel members were selected for their technical expertise in the following key areas: water quality, fisheries biology, hydrologic and hydraulic engineering, economics, NEPA, waterfowl biology, shorebird biology, and wetland ecology. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The Panel received electronic versions of the St. Johns Bayou Phase 3 documents, totaling more than 900 pages, along with a charge that solicited comments on specific sections of the documents to be reviewed. The charge was prepared by USACE according to guidance provided in USACE (2010) and OMB (2004). Charge questions were provided by USACE, reviewed by Battelle, and included in the draft and final Work Plans.

The USACE Project Delivery Team briefed the Panel and Battelle during kick-off meetings held via teleconference prior to the start of the review. In addition to the kick-off meetings, two teleconferences with USACE, the Panel, and Battelle were held halfway through the review period to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. The Panel produced more than 350 individual comments in response to the 80 charge questions.

The IEPR panel members reviewed the St. Johns Bayou Phase 3 documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendations on how to resolve the comment. Overall, 27 Final Panel Comments were identified and documented. Of these, 16 were identified as having high significance, 9 had medium significance, and 2 had low significance.

Results of the Independent External Peer Review

The panel members agreed among one another on their assessment of the adequacy and acceptability of the hydrologic and hydraulic engineering and water quality methods, models, and analyses used in the St. Johns Bayou Phase 3 DEIS. Table ES-1 lists the Final Panel Comments statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following statements summarize the Panel's findings.

The DEIS reflects significant improvements over the previous NEPA documents. The period-of-analysis for the hydrologic and hydraulic simulation studies has been extended to cover 1943-2009. Additional water quality analyses have been performed. Economic evaluations have been improved. Environmental studies, such as the fish and shorebird analyses, have been refined and expanded. Additionally, the DEIS has been more carefully prepared.

A number of the issues highlighted in the Phase 1 and Phase 2 IEPR final panel comments have been effectively addressed in the DEIS. However, some of the key economic and environmental

issues still remain unresolved. The Panel is not convinced that the investigations presented in the DEIS adequately demonstrate if the project is environmentally acceptable and economically justified. The environmental and economic issues governing project feasibility are complex, and the analyses necessarily involve great uncertainties. The Panel's review of the DEIS identified significant concerns regarding the breadth and detail of the environmental and economic studies and the development of compensatory mitigation plans. The Panel also has concerns regarding the adequacy of the DEIS in addressing uncertainties in plan formulation and alternative evaluation.

Economics: The purpose of the project is primarily flood protection for agricultural crops and to a lesser extent preventing flooding of roads and buildings. Estimating future economic benefits of flood risk management involves significant uncertainties that, in the opinion of the Panel, are not adequately addressed in the DEIS. The assessment of impacts of the proposed project on crop production is also not clearly presented. The May 2011 flood provides an excellent opportunity to document such changes, but has received only cursory attention. The future costs associated with environmental mitigation plans are not adequately detailed. There should be a clear explanation and presentation of the sensitivity of the estimated benefit-cost ratios, which are presented as point estimates, to the vast array of uncertainties inherent in dealing with future climatic, social, economic, and environmental conditions.

Environmental: The DEIS incorporates suggestions from the Phase 1 and Phase 2 IEPR regarding scientific investigation methods and data. Examples include improved techniques for analyzing fish habitat, a new model for analyzing shorebirds, and expanded water quality modeling. However, there are several overriding fundamental issues that are still unresolved.

The wetland acreage and quality have not been clearly documented and Appendix E is poorly organized and difficult to comprehend. The presented mitigation estimates are not meaningful without a resolution of wetland acreage. The Hydrogeomorphic Model (HGM) assessment is an important component of analyzing the impacts of the project on wetlands, but is poorly organized, lacks detail, and has not been finalized. The adaptive management plans are lacking in specific details regarding monitoring frequency, implementation strategies, costs, and funding sources.

In addition, the descriptions of shorebird and fishery resources are inconsistent and inaccurate. The feasibility of the mitigation needed to compensate for the impacts on waterfowl, fisheries, and wetlands has not been demonstrated. The environmental models do not consider the qualitative and quantitative uncertainties and associated variances when used to predict project impact and therefore the mitigation requirements are unclear. The issue of carbon footprint is addressed in the DEIS, but the impact of global climate change and the economic opportunities and ecological benefits of carbon sequestration are not adequately addressed.

Table ES-1. Overview of 27 Final Panel Comments Identified by the St. Johns Bayou Phase 3 IEPR Panel

Final Panel Comment	
No.	Final Panel Comment
Significance – High	
1	The estimate of current yields is not clearly explained or based on currently accepted agricultural production modeling.
2	The project need, which is based on economic losses due to agricultural flood damage, is not quantified.
3	The economic benefit of the project is unclear because uncertainty is not considered in the analysis.
4	The assumptions associated with food availability for waterfowl are not appropriate and provide unreliable estimates of biomass for waterfowl.
5	The wetland cover (acreage) and quality are poorly documented.
6	The HGM methodology lacks the appropriate detail to validate the analysis results.
7	The feasibility of the mitigation plan to compensate for impacts on environmental resources is not demonstrated.
8	It is unclear if the proposed mitigation plan will compensate for impacts on environmental resources because the models do not incorporate uncertainty.
9	The feasibility of the mitigation needed to compensate for the impacts on fisheries resources is not demonstrated.
10	The shorebird mitigation plan contains inconsistencies that make its goal unclear.
11	The adaptive management plan lacks the details necessary to ensure that environmental resources affected by the project are appropriately mitigated.
12	The adaptive management plan does not provide specific details on the source(s) of funding needed to implement the plan.
13	The fisheries adaptive management plan requires additional fish passage studies and lacks the detail needed to establish monitoring frequency.
14	The shorebird adaptive management plan lacks the detail needed to establish monitoring frequency and to determine the habitat value of rice agriculture.
15	The new shorebird habitat model, Assessment of Shorebird Habitat within the St. Johns-New Madrid Basins, Missouri, should be validated to ensure that the HSI values are correct.
16	The calculation of economic and ecological benefits does not consider the impact of global climate change and the economic opportunities for carbon sequestration and bottomland hardwood forest management.
Significance – Medium	
17	The assumptions for the No-Action Alternative are not justified.
18	A detailed justification for eliminating project alternatives from further consideration is not provided.

No.	Final Panel Comment
19	The methods and model used to assess the impacts on fish and to estimate the compensatory mitigation are not clearly described.
20	The description of fisheries resources is inconsistent and is not adequately explained.
21	The species used to construct the Habitat Evaluation Procedure (HEP) model analysis for assessing terrestrial wildlife are not representative of the affected species.
22	The positive ecological effects of the flood pulse on the landscape are not considered and the flood pulse is applied inaccurately in a social impact context.
23	The cumulative impacts analysis does not consider the value of ecosystem services that have diminished over time.
24	The project's direct and indirect impacts on ecosystem services are not fully addressed.
25	It is unlikely that the warm season grass buffers proposed for use on the project channel will be successfully established.
Significance – Low	
26	The description of shorebird resources includes inconsistencies and inaccuracies.
27	The impacts/benefits to water quality are not thoroughly discussed in the DEIS, nor are they consistently treated in Section 4.11 of DEIS and Appendix I.

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LIST OF ACRONYMS

AAHU	Average Annual Habitat Units
ADFA	Average Daily Flooded Area
ATR	Agency Technical Review
BMP	Best Management Practices
CEQ	Council on Environmental Quality
COI	Conflict of Interest
DEM	Digital Elevation Model
DrChecks	Design Review and Checking System
DUDM	Duck-use-Days Manual
EIS	Environmental Impact Statement
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
ERDC	Engineer Research and Development Center
FCA	Flood Control Act
FCI	Functional Capacity Index
FCU	Functional Capacity Unit
FEMA	Federal Emergency Management Agency
HEP	Habitat Evaluation Procedure
HGM	Hydrogeomorphic Model
HSI	Habitat Suitability Index
HU	Habitat Units
IBI	Index of Biotic Diversity
IEPR	Independent External Peer Review
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
NED	National Economic Development
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NOI	Notice of Intent
NTP	Notice to Proceed
OEO	Outside Eligible Organization
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WRDA	Water Resources Development Act

1. INTRODUCTION

The St. Johns Bayou Basin and New Madrid Floodway project area is located in Mississippi and New Madrid counties in southeastern Missouri along the right descending bank of the Mississippi River floodplain. The project area encompasses portions of two drainage basins separated by the Mississippi River and Tributaries Project's Birds Point-New Madrid Setback Levee. The St. Johns Bayou Basin is protected from Mississippi River floodwaters by means of the Mississippi River Frontline Levee and the Setback Levee. During high Mississippi River stages, the existing flood control/drainage structure located at the lower end of the St. Johns Bayou Basin is closed, thus preventing the Mississippi River from inundating the basin. Although closing the structure prevents Mississippi River flooding, it severs drainage and floodwaters begin to rise due to impounded interior runoff caused by base flow and precipitation.

With the exception of the 1,500-foot gap located at the lower end of the New Madrid Floodway, the entire New Madrid Floodway is protected from Mississippi River flooding. However, during high Mississippi River stages, flooding occurs in the New Madrid Floodway through this gap in the levee system. Although flooding contributes to the ecological functions of the project area, it also disrupts the lives of the people who live and work in this area. There are numerous small communities rich in history located throughout the New Madrid Floodway that must contend with the constant hardship of flooding.

Over 80% of the project area is devoted to agricultural production and agribusiness is a significant portion of the project area's economy. Most producers manage flood risk by delaying their planting until after the spring flood season has ended. Although delayed planting manages some risk due to predictable floods that occur in the earlier part of the growing season, it does not manage the risk for late season or unpredicted floods.

The Flood Control Act of 1954 authorized the closure of the 1,500-foot gap and construction of a gated outlet in the Mississippi River levee at the lower end of the New Madrid Floodway. The St. Johns Bayou and New Madrid Floodway, Missouri Project was authorized for construction by the Water Resources Development Act (WRDA) of 1986, P.L. 99-662. The Department of the Army, U.S. Army Corps of Engineers (USACE) prepared evaluation studies for this project, culminating in a 2002 Revised Supplemental EIS and the 2006 Revised Supplemental EIS 2. However, both the 2002 and the 2006 NEPA documents were set aside by a U.S. District Court decision in September 2007.

In April 2010, USACE approved a project review plan that significantly expanded the level of effort normally required for an Independent External Peer Review (IEPR). Although an IEPR is typically conducted at the conclusion of a study/NEPA process and the review, the IEPR conducted for this study was expanded to four separate phases (Consolidated NEPA Document, Project Work Plan, Draft EIS, and Final EIS) and included nationally-recognized experts in fields that represented significant project resource categories.

The Phase 1 IEPR (Consolidated NEPA Document) was conducted by Battelle prior to USACE making a formal decision on whether or not to proceed with a new Environmental Impact

Statement (EIS) for the project. Based on the Panel's Phase 1 IEPR comments, USACE decided to prepare a new NEPA document. This decision was based on the Panel's recommendations that a clear, concise, updated stand alone document was imperative to the public's understanding of the project.

Following the completion of the Phase 1 IEPR, USACE prepared a Project Work Plan that outlined the methodologies and assumptions that would be used to formulate the new EIS, including proposed ecological models. The Project Work Plan also contained preliminary alternatives and mitigation options that would likely be analyzed. The Project Work Plan, as well as the interagency comments, were submitted to the Panel for review during the Phase 2 IEPR. The results of the Phase 2 IEPR were used by USACE to prepare the new NEPA document, the Draft EIS. The purpose of the Phase 3 IEPR is to ensure that the scope of the Draft EIS is complete and scientifically accurate.

The objective of the work described here was to conduct an St. Johns Bayou and New Madrid Floodway, Draft Environmental Impact Statement (DEIS), Phase 3 (hereinafter: St. Johns Bayou Phase 3 IEPR), in accordance with procedures described in the USACE Engineer Circular *Civil Works Review Policy* (EC No. 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum *Peer Review Process* (USACE, 2007), and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). 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 St. Johns Bayou Phase 3 DEIS. Review of the DEIS was conducted as Phase 3 of the overall IEPR; only Phase 3 of the review is discussed in this report. The results of this IEPR report will be taken into consideration prior to USACE preparing the Final EIS. Review of the Final EIS will be conducted as Phase 4 of the overall IEPR. This approach seeks to fully consider all analytical efforts within the DEIS that contained significant deficiencies or erroneous conclusions as recognized by the panel members. The full text of the Final Panel Comments is presented in Appendix A.

2. PURPOSE OF THE IEPR

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

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

In this case, the IEPR of the St. Johns Bayou Phase 3 was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC No. 1165-2-209) under Section 501(c)(3) of the U.S. Internal Revenue Code with experience conducting IEPRs for USACE.

3. METHODS

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

3.1 Planning and Schedule

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 Award/Effective Date of September 29, 2011. Note that the work items listed in Task 6 occur after the submission of this report. Battelle will enter the 27 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.

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: water quality, fisheries biology, hydrologic and hydraulic engineering, economics, NEPA, waterfowl biology, shorebird biology, and wetland ecology. These areas correspond to the technical content of the St. Johns Bayou Phase 3 project.

The eight panel members that participated in the St. Johns Bayou Phase 1 and 2 IEPRs were selected for the St. Johns Bayou Phase 3 IEPR to ensure continuity and validity and to ensure that expert opinion remains intact. No other primary or backup panel members were identified for the St. Johns Bayou Phase 3 IEPR project. 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.

Table 1. St. Johns Bayou Phase 3 IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date (NTP)	9/29/2011
	Review documents available	10/11/2011
	*Battelle submits draft Work Plan	10/10/2011
	USACE provides comments on draft Work Plan	11/14/2011
	*Battelle submits final Work Plan	12/9/2011
2	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	9/28/2011
	USACE provides comments on COI questionnaire	10/3/2011
	*Battelle submits list of selected panel members	9/28/2011
	USACE confirms the Panel has no COIs	10/3/2011
	Battelle completes subcontracts for panel members	10/11/2011
3	Battelle convenes kick-off meeting with USACE	10/3/2011
	Battelle sends review documents to Panel	10/12/2011
	USACE/Battelle convenes kick-off meeting with Panel ¹	10/12/2011
4	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	10/20/2011 and 10/21/2011
	Panel members complete their individual reviews	11/9/2011
	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	11/16/2011
	Panel members provide draft Final Panel Comments to Battelle	11/28/2011
5	*Battelle submits Final IEPR Report to USACE	12/8/2011
6²	Battelle convenes teleconference with USACE to review the comment response process (if necessary)	12/12/2011
	USACE provides draft Evaluator Responses to Battelle	12/15/2011
	Battelle convenes up to three teleconferences with Panel and USACE to discuss Final Panel Comments and draft responses	12/20/2011, 12/21/2011, and 12/22/2011
	USACE provides final Evaluator Responses	1/4/2012
	Battelle inputs the Panel's BackCheck Responses into the comment template	1/9/2012
	*Battelle submits pdf printout of Comment/Response project file	1/11/2012
	USACE In-Progress Vertical Review Meeting	1/11/2012
	Contract End/Delivery Date ³	9/28/2012

Deliverables are noted with an asterisk (*)

¹ Due to Panel availability, separate USACE/Panel Kick-off meetings were held on October 14, 2011 (Economics) and October 18, 2011 (Waterfowl Biology)

² Task 6 activities will be completed after the delivery of the Final IEPR Report

³ Contract Period of Performance expires at the close of Phase 4

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

- Involvement by you or your firm^b in any part of the St. Johns Bayou and New Madrid Floodway Environmental Impact Statement process, including:
 - Final Environmental Impact Statement titled Mississippi Rivers and Tributaries, Mississippi River Levees (MRL) and Channel Improvement (1976);
 - Final EIS entitled St. John's Bayou/New Madrid Floodway Project Final EIS (1982);
 - Draft Supplemental EIS (1999);
 - Final Supplemental EIS (2000);
 - Revised Supplemental EIS (2002); or,
 - Second Revised Supplemental EIS (2006).
- Any involvement by you or your firm^b in the conceptual or actual design, construction or O&M of the St. Johns Bayou and New Madrid Floodway, Missouri, Project or related projects.
- Involvement as an expert for or provided testimony for the civil action (04-1575) Environmental Defense, et al. v. U.S. Army Corps of Engineers, et al.
- Involvement as an expert or provided testimony for Water Quality Certification for the St. Johns Bayou and New Madrid Floodway Project (06-0421) Missouri Coalition for the Environment, et al. v. Missouri Department of Natural Resources et al.
- Current employment by the USACE.
- Current or previous employee or affiliation with members of the interagency mitigation team or the local sponsor, including the U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), Missouri Department of Natural Resources (MDNR), Missouri Department of Conservation (MDC), and the St. Johns Levee and Drainage District.
- Current or previous employment or affiliation with Environmental Defense, National Wildlife Federation, or Missouri Coalition for the Environment (for pay or pro bono).
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes,

^a 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."

^b Includes any joint ventures in which your firm is involved and if your firm serves as a prime or as a subcontractor to a prime. Please clarify which relationship exists in the rows above.

provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are *specifically* with the Memphis District.

- Current firm^b involvement with other USACE projects, *specifically* those projects/contracts that are with the Memphis District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Previous employment by the USACE as a direct employee or contractor (either as an individual or through your firm^b) within the last 10 years, *notably* if those projects/contracts are with the Memphis 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 water resource development projects involving levees, channel modifications, and pumping stations, and include the client/agency and duration of review (approximate dates).
- A significant portion (i.e., greater than 50%) of personal or firm^b revenues within the last 3 years came from USACE contracts.
- Any publicly documented statement made advocating for or against the Mississippi River and Tributaries Project, including subject project.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the St. Johns Bayou project.
- Past, current or future interests or involvements (financial or otherwise) by you, your spouse or children related to the St. Johns Bayou project or future benefits from the project.
- Any other perceived COI not listed, such as:
 - Repeatedly served as USACE technical reviewer
 - Paid or unpaid participation in litigation related to the work of the USACE
 - Prior repeated service as a technical advisor to, or expert witness for, Environmental Defense, National Wildlife Federation, and the Missouri Coalition for the Environment.
 - Any other perceived COI not listed

Other considerations:

- Participation in previous USACE technical review panels
- Other technical review panel experience

In selecting the final members of the Panel from the list of candidates, Battelle chose experts who best fit the expertise areas and had no COIs. The eight final reviewers were either affiliated with academic institutions or consulting companies or were independent engineering consultants. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was

given the list of candidate panel members, but Battelle made the final selections of the Panel. Section 4 of this report provides names and biographical information on the panel members.

All members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Due to Panel availability, two kick-off meetings were conducted for the Phase 3 IEPR.

3.3 Preparation of the Charge and Conduct of the IEPR

Charge questions were provided by USACE and included in the draft and final Work Plans. In addition to a list of 80 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 three kick-off meetings via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR panel members received an electronic version of the final charge as well as the St. Johns Bayou Phase 3 documents and reference materials listed below. The documents and files in bold font were provided for review; the other documents were provided for reference or supplemental information only.

- USACE guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 30, 2007
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004

Table 2 presents a list of the review material supplied by USACE.

Table 2. St. Johns Bayou Phase 3 IEPR Documents for Review

Review Documents		Document Review by Panel Member Discipline							
Title	Pp.	Water Quality	Fish	H&H	Econ	NEPA	Wildlife	Shorebird	Wetland
Volume I									
DEIS	250	X	X	X	X	X	X	X	X
Appendix A - Figures	20	X	X	X	X	X	X	X	X
Appendix B – Econ. and Social Analysis	65	X	X	X	X	X	X	X	X
Appendix C - H&H text	20	X	X	X	X	X	X	X	X
Appendix C - H&H figures	150	X	X	X	X	X	X	X	X
Appendix D - Historic	R	X	X	X	X	X	X	X	X
Appendix E - Wetlands EMAP	25	X	X	--	--	X	X	X	X
Appendix E - Wetlands HGM	45	--	--	--	--	--	X	X	X

Review Documents		Document Review by Panel Member Discipline							
Title	Pp.	Water Quality	Fish	H&H	Econ	NEPA	Wildlife	Shorebird	Wetland
Appendix E - Wetlands 404(b)(1)	15	X	X	--	--	X	X	X	X
Appendix F - Waterfowl	25	--	X	--	--	X	X	X	--
Appendix G - Fisheries	50	--	X	X	--	X	X	X	--
Appendix I - Water Qual	45	X	--	X	--	X	--	--	X
Appendix I - Water Qual. program code	50	X	--	X	--	--	--	--	--
Appendix J - Threatened Endang. Species	30	--	--	--	--	X	--	--	X
Appendix K - HTRW	10	X	--	--	X	X	--	--	--
Appendix K - HTRW ref	R	X	X	X	X	X	X	X	X
Appendix L - Floodway Oper.	30	X	X	X	X	X	X	X	X
Appendix M - WRP*	10	--	X	--	--	X	X	X	X
Appendix M - WETSORT*	50	--	X	--	--	--	X	X	X
Appendix M - Shorebird Sensitivity*	10	--	--	--	--	--	X	X	--
Volume II									
Public Scoping ¹	R	X	X	X	X	X	X	X	X
Interagency Coordination ²	R	X	X	X	X	X	X	X	X
Volume III³	R	X	X	X	X	X	X	X	X

¹ Volume II: Public Scoping-200 pages of comment for reference (R) only

² Volume II: Agency Coordination- 125 pages for Reference (R) only

³ Volume III- Reference (R) only

About halfway through the review of the St. Johns Bayou Phase 3 document, two teleconferences were held with USACE, the Panel, and Battelle so that USACE could answer any clarifying questions the Panel had concerning either the review documents or the project. In addition, throughout the review period, USACE provided additional documents at the request of panel members. These additional documents were provided to Battelle and then disseminated to the Panel as supplemental information only and were not part of the official review. During the review process, the Panel requested the following supplemental information from USACE:

- Duck Use Days Manual, May 2010
- Carbon Storage of Bottomland Hardwood Afforestation in the Lower Mississippi Valley, USA, June 2009

3.4 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle. At the end of the review period, the Panel produced approximately 350 individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. As a result of the review, Battelle summarized the 350 comments into a preliminary list of 23 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 two 4-hour teleconferences with the Panel so that the panel members, many of whom are from diverse scientific backgrounds, could exchange technical information. The main goal of the teleconferences was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

The Panel also discussed responses to two 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 27 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 St. Johns Bayou Phase 3 IEPR.

- **Lead Responsibility:** For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

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

At the end of this process, two Final Panel Comments with overlapping issues were merged; therefore, 27 Final Panel Comments were prepared and assembled. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel’s overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Eight panel members from the St. Johns Bayou Phase 1 and 2 IEPR efforts were selected for the St. Johns Bayou Phase 3 IEPR to ensure continuity and validity and to ensure that expert opinion

remains intact. No other primary or backup panel members were identified for the St. Johns Bayou Phase 3 IEPR project. 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.

An overview of the credentials of the final eight primary members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table 3. 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 3. St. Johns Bayou Phase 3 IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Mitsch	Eichholz	Jackson	Brown	Bierman	Wurbs	Shaw	Souther-land
Wetland Ecologist								
Nationally recognized expert (e.g., authored books, invited speaker at national conferences/meetings, professional society memberships)	✓							
Experience performing wetland delineations (Years of experience)	✓ (20)							
Experience developing wetland mitigation plans (Years of experience)	✓ (25)							
Experience restoring wetlands/floodplains within the floodplain of large river systems (Years of experience)	✓ (25)							
Number of peer-reviewed publications related to wetlands	(70)							
Ph.D. (field of study) – Environmental engineering	✓							
Waterfowl Biologist								
Nationally recognized expert (e.g., authored books, invited speaker at national conferences/meetings, professional society memberships)		✓						
Experience studying waterfowl biology of large river systems (Years of experience)		✓ (11)						
Familiar with caloric models for determining waterfowl usage of various land uses within floodplains of large river systems (Years of experience)		✓ (11)						
Number of peer-reviewed publications related to waterfowl		(12)						
Ph.D. (field of study) – Wildlife/waterfowl ecology		✓						

Fishery Biologist								
Nationally recognized expert (e.g., authored books, invited speaker at national conferences/meetings, professional society memberships)			✓					
Experience studying fisheries biology of large river systems (Years of experience)			✓ (14)					
Familiar with issues relating to fish passage through culverts or similar structures (Years of experience)			a					
Number of peer-reviewed publications related to studying fishes of large river systems			(8)					
Ph.D. (field of study) – Fisheries management			✓					
Shorebird Biologist								
Nationally recognized expert (e.g., authored books, invited speaker at national conferences/meetings, professional society memberships)				✓				
Experience studying shorebird ecology (Years of experience)				✓ (15)				
Number of peer-reviewed publications related to studying shorebird ecology				(16)				
Ph.D. (field of study) – Natural resources				✓				
Water Quality Expert								
Nationally recognized expert (e.g., authored books, invited speaker at national conferences/meetings, professional society memberships)					✓			
Experience studying water quality within large river systems (Years of experience)					✓ (21)			
Experience studying Gulf of Mexico Hypoxia (Years of experience)					✓ (18)			
Number of peer-reviewed publications related to studying water quality within large river systems					✓			
Ph.D. (field of study) – Environmental engineering					✓			
Hydrologic and Hydraulic Engineer								
Extensive experience in hydrology and hydraulics (minimum of 10 years requested)						✓ (38)		
Experience in hydraulic engineering with an emphasis on large public works projects on large river systems (registered professional engineer)						✓ (38)		
Extensive background in hydraulic theory and practice (professor from academia)						✓ (29)		
Familiar with standard USACE hydrologic and hydraulic computer models						✓		
Registered professional engineer						✓		
Ph.D. (field of study) – Civil engineering/water resources						✓		

^a No direct experience; experience with floodplain connectivity and fish use of floodplains

Technical Criterion	Mitsch	Eichholz	Jackson	Brown	Bierman	Wurbs	Shaw	Souther-land
Economist								
Experience in agricultural-economics (Years of experience)							✓ (14)	
Experience in water resource economic evaluation or review (Years of experience)							✓ (29)	
Ph.D. (field of study) -- Economics							✓	
NEPA Expert								
Experience in evaluating and conducting controversial water resource development Environmental Impact Statements (minimum of 10 years requested)								✓ (20)
Familiar with research and theories relating to adaptive management of wetlands mitigation (Years of experience)								✓ (10)
Ph.D. (field of study) – Biology/ecology								✓

William Mitsch, Ph.D., PWS

Role: This reviewer was chosen primarily for his expertise in wetland ecology and experience involving wetland delineation, mitigation, and restoration within the floodplains of large river systems.

Affiliation: The Ohio State University

Dr. William Mitsch is a Professional Wetland Scientist and a Certified Senior Ecologist with 38 years of diverse experience in wetland ecology. His areas of expertise span wetland ecosystems, ecological engineering, and ecosystem restoration, with particular interest in performing wetland delineations, mitigation plans, and restoring wetlands/floodplains within large rivers systems. Dr. Mitsch, who holds a Ph.D. in environmental engineering sciences (systems ecology) from the University of Florida, is currently a Distinguished Professor of Environment and Natural Resources, Professor of Evolution, Ecology, and Organismal Biology, and Professor of Civil and Environmental Engineering at The Ohio State University (OSU). He is also Director of the Wilma H. Schiermeier Olentangy River Wetland Research Park at OSU in Columbus, Ohio. In addition, he is a nationally recognized water quality expert with 30 years of experience studying large river system water quality and 12 years of experience studying hypoxia in the Gulf of Mexico.

Dr. Mitsch served on the National Technical Review Committee and the Post-Hurricane Katrina Review Committee for the restoration of the Louisiana coastal area. He has served on several National Research Council Committees, where he has provided expertise related to river basins and coastal systems, wetland mitigation, and wetland characterization. He also has presented oral and written testimony to Congress on wetlands. Dr. Mitsch has provided consulting services

related to water quality and wetland monitoring, modeling, restoration, conservation, mitigation, delineation, and creation to numerous agencies and companies.

Michael Eichholz, Ph.D.

Role: This reviewer was chosen primarily for his expertise in waterfowl biology of large river systems.

Affiliation: Southern Illinois University Carbondale

Dr. Michael Eichholz has a Ph.D. in wildlife/waterfowl ecology from the University of Alaska-Fairbanks. He is a nationally recognized expert in waterfowl biology and has 11 years of experience in waterfowl biology of large river systems and caloric modeling for determining waterfowl use of various land uses within floodplains of large river systems. He is currently an Associate Professor of zoology at Southern Illinois University Carbondale, and holds a position as a Waterfowl/Wetland Ecologist at the University's Cooperative Wildlife Research Laboratory. His research interests include investigating the influence of resource availability during the spring on productivity and population dynamics of waterfowl and the influence of waterfowl density on reproductive and survival rates. In addition, Dr. Eichholz has conducted research on macroinvertebrate response to floodplain wetland habitat rehabilitation and the impact on migrating waterfowl.

John Jackson, Ph.D.

Role: This reviewer was chosen primarily for his expertise in fisheries biology of large river systems.

Affiliation: Arkansas Tech University

Dr. John Jackson, an Associate Professor of Fisheries Biology at Arkansas Tech University's Department of Biological Sciences, holds a Ph.D. in fisheries management from Mississippi State University. He teaches a variety of biology and ecology courses, including population dynamics, stream ecology, limnology, and ichthyology. Dr. Jackson is a nationally recognized expert in fisheries biology and has 14 years of experience in studying fisheries biology of large river systems. He also has several years of experience dealing with issues of floodplain connectivity and fish use of floodplains. He has authored numerous technical reports relating to fish biology in streams and rivers, including a report for USACE characterizing floodplain fish assemblages in a large river system. In addition, Dr. Jackson has researched the relationship between fish and environmental variables in large river-floodplain ecosystems, microhabitat partitioning by multiple fish species, and urban fisheries management.

Stephen Brown, Ph.D.

Role: This reviewer was chosen primarily for his expertise in shorebird ecology.

Affiliation: Manomet Center for Conservation Sciences

Dr. Stephen Brown is the Director of Shorebird Science at the Manomet Center for Conservation Sciences in Manomet, Massachusetts. He has a Ph.D. in natural resources from Cornell University. Dr. Brown is a recognized national expert on shorebird biology/ecology with 15 years of experience in shorebird ecology. He has authored numerous publications on topics related to shorebird abundance, distribution, and population trends. His current role at the

Manomet Center involves designing, funding, and managing a research program on shorebird ecology and conservation. He previously held the position of U.S. Shorebird Conservation Plan Coordinator at the Manomet Center, which involved developing a national conservation plan for all U.S. shorebird species among all 50 states, Federal agencies, non-governmental organizations, and academic institutions, including research priorities, population trend monitoring program, habitat management recommendations, and public education and outreach.

Victor J. Bierman, Jr., Ph.D , BCEEM

Role: This reviewer was chosen primarily for his expertise in water quality in large river systems and Gulf of Mexico Hypoxia.

Affiliation: LimnoTech

Dr. Victor J. Bierman, Jr., a Senior Scientist with LimnoTech in Oak Ridge, North Carolina, holds a Ph.D. in Environmental Engineering from the University of Notre Dame. He has 38 years of experience in the development and application of water quality models, leading to his publication of more than 100 technical papers and reports. He is a former EPA National Expert in Environmental Exposure Assessment and a former Associate Professor in the Department of Civil Engineering at the University of Notre Dame. He is a Board Certified Environmental Engineering Member of the American Academy of Environmental Engineers. Dr. Bierman has 21 years of experience studying water quality in large river systems and 18 years of experience studying hypoxia in the Gulf of Mexico. Projects of note include the Gulf of Mexico Hypoxia Assessment completed for the White House Committee on Environment and Natural Resources in which Dr. Bierman developed a water quality model to assess hypoxia responses to reductions in nutrient loadings from the Mississippi River Basin. He also conducted transport and fate modeling studies for PCB-contaminated sediments to investigate the impacts of continued No Action and various remedial scenarios in the Upper Hudson River.

As a Senior Scientist for LimnoTech, Dr. Bierman conducts research and development on projects for Federal, state, and regional government clients. He also provides scientific peer review, litigation support, and expert testimony on a variety of government issues. Dr. Bierman is a leading expert in the assessment and solution of problems related to nutrients, nuisance algal blooms, nitrogen fixation, hypoxia, exotic species, and ecosystem processes. He has conducted studies in watersheds, lakes, rivers, estuaries, and coastal marine systems. Dr. Bierman is also a leading expert in toxic chemical transport, fate, partitioning, and bioaccumulation. He has conducted assessment studies in major river systems, estuaries, and the Great Lakes, and remedial investigations at U.S. EPA Superfund sites.

Ralph Wurbs, Ph.D., P.E.

Role: This reviewer was chosen primarily for his expertise in hydrologic and hydraulic engineering and his extensive background in hydraulic theory.

Affiliation: Texas A&M University

Dr. Ralph Wurbs is a Registered Professional Engineer in Texas and a Diplomate of the American Academy of Water Resources Engineers. He has a Ph.D. in civil engineering-water resources from Colorado State University. Dr. Wurbs has 40 years of experience in hydrology and hydraulics, including experience in hydraulic engineering working on large public works

projects on large river systems. He has experience in hydraulic theory and practice and is familiar with standard USACE hydrologic and hydraulic computer models. He has authored numerous technical reports involving simulation studies, water availability monitoring, flood control, river/reservoir system modeling, water resource planning and management, and other topics related to hydrology and/or hydraulics, including several reports for USACE.

Dr. Wurbs has held positions as Professor, Associate Professor, and Assistant Professor since 1980 in the Civil Engineering Department at Texas A&M University. He also is the Associate Director for Engineering at the Texas Water Resources Institute. Dr. Wurbs has been the principal investigator for university research contracts and grants funded by numerous agencies, including the USACE.

W. Douglass Shaw, Ph.D.

Role: This reviewer was chosen primarily for his expertise in water resource economic evaluation or review.

Affiliation: Texas A&M University

Dr. W. Douglass Shaw is a tenured Full Professor in the Department of Agricultural Economics, and a Research Fellow at the Hazard Reduction and Recovery Center at Texas A&M University. He has a Ph.D. in economics from the University of Colorado. Dr. Shaw has more than 30 years of experience in general water resource economic evaluation or review and five years of experience in studying water quality issues within large river systems. He regularly teaches environmental and natural resource economics at both the undergraduate and PhD levels at Texas A&M University and is a member of the University's interdisciplinary program in Hydrologic Science and Policy. He also developed and taught new coursework for the Hydrologic Science Program at University of Nevada-Reno in water resource economics. Dr. Shaw is the author of "Water Resource Economics and Policy: an Introduction" published by Edward Elgar Press, and is the former associate editor for the journal *Water Resources Research*. He has published many peer-reviewed articles on water quality topics such as drinking water and arsenic, and dissolved oxygen, turbidity, and their role in recreational fishing demand.

Dr. Shaw recently served as a reviewer to evaluate the economics (i.e., benefits and costs) of programs, relocation plans, and potential facilities to enhance safety and improve coastal response to future hurricanes. He also evaluated the risk analysis for the programs and projects, and similarly, was recently a reviewer of the U.S. EPA's safe drinking water risk model. His research specialties are environmental and water resource economics, with emphasis on valuing environmental amenities, as well as valuing and modeling changes in health risks associated with contamination of resources and human health effects.

Mark T. Southerland, Ph.D.

Role: This reviewer was chosen primarily for his NEPA-related experience and expertise.

Affiliation: Versar, Inc.

Dr. Mark T. Southerland is a Principal Ecologist and NEPA Director with Versar, Inc. in Columbia, Maryland. He is also Chair of the Maryland Water Monitoring Council and a member of the Howard County Environmental Sustainability Board. His current position with

Versar, Inc. involves directing major programs in the monitoring, assessment, and restoration of freshwater and terrestrial ecosystems. He is a Certified Senior Ecologist and Project Management Professional. He holds a Ph.D. in biology (ecology) from the University of North Carolina-Chapel Hill. Dr. Southerland has 10 years of experience each performing wetland delineations, developing wetland mitigation plans, and restoring wetlands/floodplains within the floodplains of large river systems. In addition, he has 20 years of experience in evaluating and conducting controversial water resource development Environmental Impact Statements and 10 years of familiarity/experience with research and theories relating to adaptive management of wetlands mitigation. His areas of expertise include NEPA guidance and compliance. He is considered a national expert on NEPA analysis, representing the Council on Environmental Quality throughout the United States. Since 1993, Dr. Southerland has been involved with USACE reconnaissance and feasibility studies for environmental restoration of the Susquehanna River, Delaware River, Anacostia River, and Barnegat Bay watersheds.

5. SUMMARY OF FINAL PANEL COMMENTS

The panel members agreed among one another on their assessment of the adequacy and acceptability of the hydrologic and hydraulic engineering and water quality methods, models, and analyses used in the St. Johns Bayou Phase 3 DEIS. Table 4 lists the Final Panel Comments statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following statements summarize the Panel's findings.

The DEIS reflects significant improvements over the previous NEPA documents. The period-of-analysis for the hydrologic and hydraulic simulation studies has been extended to cover 1943-2009. Additional water quality analyses have been performed. Economic evaluations have been improved. Environmental studies, such as the fish and shorebird analyses, have been refined and expanded. Additionally, the DEIS has been more carefully prepared.

A number of the issues highlighted in the Phase 1 and Phase 2 IEPR final panel comments have been effectively addressed in the DEIS. However, some of the key economic and environmental issues still remain unresolved. The Panel is not convinced that the investigations presented in the DEIS adequately demonstrate if the project is environmentally acceptable and economically justified. The environmental and economic issues governing project feasibility are complex, and the analyses necessarily involve great uncertainties. The Panel's review of the DEIS identified significant concerns regarding the breadth and detail of the environmental and economic studies and the development of compensatory mitigation plans. The Panel also has concerns regarding the adequacy of the DEIS in addressing uncertainties in plan formulation and alternative evaluation.

Economics: The purpose of the project is primarily flood protection for agricultural crops and to a lesser extent preventing flooding of roads and buildings. Estimating future economic benefits of flood risk management involves significant uncertainties that, in the opinion of the Panel, are not adequately addressed in the DEIS. The assessment of impacts of the proposed project on crop production is also not clearly presented. The May 2011 flood provides an excellent opportunity to document such changes, but has received only cursory attention. The future costs associated with environmental mitigation plans are not adequately detailed. There should be a clear

explanation and presentation of the sensitivity of the estimated benefit-cost ratios, which are presented as point estimates, to the vast array of uncertainties inherent in dealing with future climatic, social, economic, and environmental conditions.

Environmental: The DEIS incorporates suggestions from the Phase 1 and Phase 2 IEPR regarding scientific investigation methods and data. Examples include improved techniques for analyzing fish habitat, a new model for analyzing shorebirds, and expanded water quality modeling. However, there are several overriding fundamental issues that are still unresolved.

The wetland acreage and quality have not been clearly documented and Appendix E is poorly organized and difficult to comprehend. The presented mitigation estimates are not meaningful without a resolution of wetland acreage. The Hydrogeomorphic Model (HGM) assessment is an important component of analyzing the impacts of the project on wetlands, but is poorly organized, lacks detail, and has not been finalized. The adaptive management plans are lacking in specific details regarding monitoring frequency, implementation strategies, costs, and funding sources.

In addition, the descriptions of shorebird and fishery resources are inconsistent and inaccurate. The feasibility of the mitigation needed to compensate for the impacts on waterfowl, fisheries, and wetlands has not been demonstrated. The environmental models do not consider the qualitative and quantitative uncertainties and associated variances when used to predict project impact and therefore the mitigation requirements are unclear. The issue of carbon footprint is addressed in the DEIS, but the impact of global climate change and the economic opportunities and ecological benefits of carbon sequestration are not adequately addressed.

Table 4. Overview of 27 Final Panel Comments Identified by the St Johns Bayou Phase 3 IEPR Panel

No.	Final Panel Comment
Significance – High	
1	The estimate of current yields is not clearly explained or based on currently accepted agricultural production modeling.
2	The project need, which is based on economic losses due to agricultural flood damage, is not quantified.
3	The economic benefit of the project is unclear because uncertainty is not considered in the analysis.
4	The assumptions associated with food availability for waterfowl are not appropriate and provide unreliable estimates of biomass for waterfowl.
5	The wetland cover (acreage) and quality are poorly documented.
6	The HGM methodology lacks the appropriate detail to validate the analysis results.
7	The feasibility of the mitigation plan to compensate for impacts on environmental resources is not demonstrated.

No.	Final Panel Comment
8	It is unclear if the proposed mitigation plan will compensate for impacts on environmental resources because the models do not incorporate uncertainty.
9	The feasibility of the mitigation needed to compensate for the impacts on fisheries resources is not demonstrated.
10	The shorebird mitigation plan contains inconsistencies that make its goal unclear.
11	The adaptive management plan lacks the details necessary to ensure that environmental resources affected by the project are appropriately mitigated.
12	The adaptive management plan does not provide specific details on the source(s) of funding needed to implement the plan.
13	The fisheries adaptive management plan requires additional fish passage studies and lacks the detail needed to establish monitoring frequency.
14	The shorebird adaptive management plan lacks the detail needed to establish monitoring frequency and to determine the habitat value of rice agriculture.
15	The new shorebird habitat model, Assessment of Shorebird Habitat within the St. Johns-New Madrid Basins, Missouri, should be validated to ensure that the HSI values are correct.
16	The calculation of economic and ecological benefits does not consider the impact of global climate change and the economic opportunities for carbon sequestration and bottomland hardwood forest management.
Significance – Medium	
17	The assumptions for the No-Action Alternative are not justified.
18	A detailed justification for eliminating project alternatives from further consideration is not provided.
19	The methods and model used to assess the impacts on fish and to estimate the compensatory mitigation are not clearly described.
20	The description of fisheries resources is inconsistent and is not adequately explained.
21	The species used to construct the Habitat Evaluation Procedure (HEP) model analysis for assessing terrestrial wildlife are not representative of the affected species.
22	The positive ecological effects of the flood pulse on the landscape are not considered and the flood pulse is applied inaccurately in a social impact context.
23	The cumulative impacts analysis does not consider the value of ecosystem services that have diminished over time.
24	The project's direct and indirect impacts on ecosystem services are not fully addressed.
25	It is unlikely that the warm season grass buffers proposed for use on the project channel will be successfully established.
Significance – Low	
26	The description of shorebird resources includes inconsistencies and inaccuracies.

No.	Final Panel Comment
27	The impacts/benefits to water quality are not thoroughly discussed in the DEIS, nor are they consistently treated in Section 4.11 of DEIS and Appendix I.

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APPENDIX A

Final Panel Comments

on the

St. Johns Bayou Phase 3 IEPR

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Comment: 1

The estimate of current yields is not clearly explained or based on currently accepted agricultural production modeling.

Basis for Comment:

The Panel believes that the yields are calculated using a simple linear regression model and national-level crop output and input indices. The two regression equations conducted for the analysis are reported, but not explained, in the St. Johns Bayou and New Madrid Floodway, Environmental Impact Statement, Phase 3 Preliminary Working Draft IEPR Submittal (hereinafter: DEIS). In addition, the variables (Y and X) in each of two regressions are not defined, nor are the indices. Explaining the nature of the indices allows the reader to discern whether the crop output model includes key variables such as temperature and natural precipitation.

Justification for use of national indices for this region of the United States is not provided, nor is the use of the linear functional form in the regression analysis. National-level indices may be formulated by including regions of the United States that heavily depend on irrigation, and thus may be poorly suited for modeling yields in regions where precipitation is natural.

Standard production analysis begins with use of a non-linear production model of yields that allows for diminishing marginal returns. These can often be transformed into log-linear models. A linear model of yield implies that one may increase inputs as high as desired, and always get a constant yield. This runs counter to conventional production analysis. This is important since the project primarily focuses on the issue of excess water from flooding, and the use of a linear model would correspond to the assumption that there is no such thing as excess water.

The current yields are estimated with a lack of precision, as are all statistical estimates, but confidence intervals are not provided in the report. Underlying assumptions about how current yields are estimated, as well as changes in these yields, are not provided.

Agricultural production under conditions of risk necessarily should be modeled in the presence of such risk. These not only include the usual risk in agricultural prices in the future, but also risks associated with flooding. An expected production or expected utility framework can be used, but the Panel finds no such framework is being used to model yields.

The project's benefits in the agricultural sector involve a large amount of risk. The report does model this using a conventional software program that introduces probability distributions for key random variables, enabling some risk analysis. However, the justification for the assumed form for the probability distribution function (which is normal) is not provided, and there is no justification for the assumed levels of variation (i.e., percentages used in introducing a standard deviation).

Significance: High

The majority of claimed net benefits for the project pertain to changes in agricultural yields that correspond to lower flood risks, but the DEIS does not include the justification to corroborate these findings.

Recommendations for Resolution:

1. Explain the variables used in the regression model, as well as the linear functional form for the model and upon what this is based in theory. Include whether national crop yield models should be used for this region of the United States.
2. Explain the assumptions underlying comparison between “low risk” and “higher risk” land production and why the former can be used to represent the latter after flood risks are reduced by the project.
3. Document actual losses in yields due to large flooding events in past years.
4. Model uncertainties, explain underlying assumptions, and describe how these affect estimates of the benefit-cost ratios. Provide justification for all assumptions using existing literature or data.
5. Present estimates of benefit-cost ratios with their confidence intervals, or present a range of estimated ratios corresponding to various levels of risk.

Comment: 2

The project need, which is based on economic losses due to agricultural flood damage, is not quantified.

Basis for Comment:

The DEIS presents the project need by describing a variety of flood impacts; however, these are qualitative descriptions and are not tied to the calculation of the estimated net project benefits. The net benefits estimated for the project are monetized agricultural benefits based on quantified estimated differences between current and expected future yields. The report does not provide an estimate of past and current economic damage due to flooding, which might include economic damage from flooding roadways or homes, as well as the actual past losses in the agricultural sector. Including as many economic damage estimates as possible would demonstrate the need for the project.

Significance: High

The majority of the quantified estimated benefits from the proposed project derive from avoiding flood damage to agriculture. These benefits need to be demonstrated to justify the project need.

Recommendation for Resolution:

1. Provide estimates of past and present economic damage for as many years as is possible, documenting the source of the estimates of this damage and the years in which the damage occurred.

Comment: 3

The economic benefit of the project is unclear because uncertainty is not considered in the analysis.

Basis for Comment:

The assessment of the net benefits of the project is dependent on the estimate of yield variations in the agricultural sector due to lower flood risks. In turn, the assessment of future agricultural production usually incorporates uncertainties regarding future crop prices. The proposed project provides potential benefits 50 years into the future, but does not include uncertainties, such as climate change conditions, the level of mitigation needed, and the costs related to the mitigation.

The project analysis does explore the effects of risk by using a standard software package (At Risk), which is applied to the benefits estimates. However, this same procedure is not applied to future mitigation and monitoring costs, which also involve current and future uncertainties. For instance, habitat needed for mitigation cannot be estimated as point estimates with certainty.

As both the benefits and costs for this project involve risk, they each involve probability distributions. The benefit-cost ratio itself is not a point estimate, but refers to a ratio that has a distribution of outcomes. The risk outcomes presented in the report might be quite sensitive to assumptions about underlying probability distributions. However, the assumptions do not include justification for the specific underlying distributions, with the exception of the normal distribution for some of the variables. The normal distribution may not be suitable for modeling variables affected by variation in weather, such as temperature or precipitation. For example, the log normal distribution is often used to characterize precipitation. The estimated economic benefits are quantified for the agricultural sector only, which assumes certainty in the calculations; therefore, the justification for the project currently relies on the single point estimates for the benefit-cost ratios for each alternative considered

Significance: High

Uncertainty must be incorporated into the analysis for a full understanding of the project's economic benefits.

Recommendations for Resolution:

1. Document sources of uncertainty for agricultural and other benefits for this project at present and into the future (50 years forward).
2. Develop a model of agricultural production (yield) that demonstrates that such uncertainties are factors in production decisions. Report variation in estimates that depend on the uncertainties using confidence intervals or other documentation of statistical errors.
3. Document uncertainties related to mitigation costs. These arise from both the quantity of mitigation habitat that is needed, and the variation in future expected costs of that mitigation.
4. Report benefit-cost ranges that correspond to the uncertainties for the project using either models that directly incorporate uncertainty, or ex-post risk analysis of point estimates.
5. Allow for other distributions than the normal for some of the random variables. Show the

effect that making different assumptions has on estimates of confidence intervals or standard deviations.

6. Explain the robustness of final decisions regarding project implementation to uncertainties. Discuss the range or extent to which the basic assumptions and information supporting the economic analyses can vary without affecting the ultimate conclusions and recommendations of the study.

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Comment: 4

The assumptions associated with food availability for waterfowl are not appropriate and provide unreliable estimates of biomass for waterfowl.

Basis for Comment:

In the Phase 2 IEPR and the Duck-use-Days Manual (DUDM) certification review, the Panel stated that the estimates of food availability in moist soil habitat used in modeling the spring migratory period (February and March) and potentially the fall and winter period were inappropriate. The DUDM uses an average of estimates resulting from multiple studies of habitat being managed by professionals with abundant funding, manifesting from multiple regions throughout the fall and winter; the DUDM then models depletion and decomposition to estimate food availability during spring. These estimates are appropriate only if moist soil mitigation is managed by professional wetland ecologists with adequate funding to properly manage hydrology and succession of vegetation. With the current level of ambiguity in the mitigation plan, there is little evidence that management by professional wetland ecologists will occur. In addition, rates of decomposition were estimated from studies conducted primarily from fall until the first of January, making estimates of decomposition into February and March unreliable. More recent studies provide an actual estimate of food availability in moist soil habitat during spring (Pankau 2008, Straub 2008) from a region near the study area. The Panel believes this estimate would be more appropriate for modeling resource loss and mitigation.

Similarly, in the DUDM, the estimate of invertebrate biomass in agricultural fields (primarily soybean or corn fields) during February and March is assumed to be the same as for rice fields during fall and winter (5 kg/ha). A recent study (Schultheis et al. in revision) indicates invertebrate biomass during February and March in flooded soybeans and corn is actually 20 kg/ha, 4 times greater than the parameter estimates used in the model based on this assumption. The author of the DUDM used an assumption of food availability based on the best available data at that time; however, use of this now-outdated assumption has led to an underestimate of waterfowl resources provided by flooded agriculture. In turn, the mitigation requirements for waterfowl resources are also underestimated.

Significance: High

The DUDM analysis does not properly account for the natural resources required by waterfowl that are dependent on the natural resources provided by this habitat, likely leading to an underestimate of required mitigation.

Recommendation for Resolution:

1. Reassess the estimates of food availability for February and March, moist soil vegetation, and flooded agriculture using the most recent research (Pankau 2008, Straub 2008, and Schultheis et al. in revision).

Literature cited

Pankau, A. K. (2008). Examining the cost effectiveness of actively and passively managed wetlands for migrating and wintering waterfowl in Southern Illinois. M.S. Thesis, Southern Illinois University, Carbondale.

Schultheis, R., M. W. Eichholz, and M. Whiles (in revision). Invertebrate communities in agricultural wetlands of the Upper Midwestern United States. Wetlands 00:000-000.

Straub, J. N. (2008). Energetic carrying capacity of habitats used by spring-migrating waterfowl in the Upper Mississippi River and Great Lakes Region. M.S. Thesis. The Ohio State University.

Comment: 5

The wetland cover (acreage) and quality are poorly documented.

Basis for Comment:

In the February 2011 Appendix E, Part 1 Report, USEPA identified 149,802 acres of wetlands in the St. Johns/New Madrid Bayou/Floodway. The statistical design of the study that estimated this amount of wetlands included 300 sites above the 5-year flood zone and included farmed (79%) and naturally vegetated (21%) wetlands. The Panel agrees that the Environmental Monitoring and Assessment Procedure (EMAP), which has been a tool used by the USEPA for decades, was used correctly, although there may be arithmetic errors in the tables. The Panel also agrees that it was appropriate for USEPA to include farmed wetlands in their wetland survey.

However, in an April 2011 memorandum, the USEPA acknowledged that the agency was not obligated to estimate wetlands subject to the Clean Water Act regulations. Therefore, there appears to be an unresolved disagreement between the USEPA and USACE on the estimated acreage of affected natural wetlands and wet farmland. This conflict involves up to 117,573 acres of farmed wetlands. The variance and confidence intervals (e.g., 90 or 95%) associated with each estimate needs to be clarified by USEPA in future generations of their report.

Significance: High

Without a firm resolution of the total area of wetlands affected by this project, few of the wetland impact or mitigation estimates are meaningful.

Recommendations for Resolution:

1. Resolve the dispute between the two Federal agencies regarding total wetland acreage. The Panel suggests that the two agencies should contract a third party to estimate wetland area, impacts, and mitigation for this project.
2. Provide additional detail on the wetland estimating methodology used by both agencies.
3. Include the basis of the quantitative assignments of indices to different types of wetlands in the body of the DEIS, along with ecological descriptions of these different types. The wetland "quality" is determined through the use of Functional Capacity Index (FCI) in the HGM technique.

Comment: 6

The HGM methodology lacks the appropriate detail to validate the analysis results.

Basis for Comment:

The Panel appreciates that the HGM analysis in Appendix E, Part 2, is an important document for estimating the impacts of the project on wetlands and determining how much mitigation for those losses is needed. The HGM model concludes that the minimum wetland impact for the project occurs with Alternative 3.1. Functional losses and mitigation gains are estimated for detaining floodwater, detaining precipitation, cycling nutrients, exporting organic carbon, maintaining plant communities, and providing habitat. However, some of the functions not included in this study include nutrient retention and carbon sequestration.

The Panel believes that there are several assumptions of the HGM analysis that lead to uncertainty in the validity of the results.

- The Panel understands that the analysis is a working draft, not a complete report as it appears that it is waiting for USEPA to finalize estimates of wetland area. A completed estimate of study area wetlands by wetland hydrogeomorphic type is essential for HGM to provide valid results.
- The assignment of Functional Capacity Indices (FCIs) for the various wetland types within the study area seems to have a large amount of uncertainty. For instance, the Panel questions the FCI value of 0.97 for a riverine overbank wetland, but only 0.25 for agricultural wetlands. In addition, agricultural wetlands are given FCIs of 0.0 for providing plant communities and fish and wildlife support, a fact that concerns the Panel. Furthermore, ranges or probabilities are not assigned to these indices and the report contains little justification of the numbers, other than reference to other DEIS reports. For example, FCI assumptions allow conclusions that the project will have economic benefits to farmers by reducing agricultural flooding and that the same hydraulic modification will have little impact on the function of the wetlands.
- The report gives the Panel little information to determine the validity of the FCI values.
- The Panel strongly believes that the HGM report, while exhaustive in detail, is difficult to read and interpret. There are 50 or more tables of results (counting the often divided sub tables) that have poor table legends, far too many abbreviations that are poorly defined in the tables (e.g. LGRB, RGRO, UCD) and poor use of significant figures (e.g. 75.981% should be 76%) in all of these tables. The FCIs contain too many significant figures as well. This is not an indication that less information is needed in the report, but the report needs to better emphasize the pertinent information so it does not get lost in all the details. The report should have enough detail for someone to duplicate the analysis and results that provide the FCI values. Referral to yet other reports is not appropriate for such an important analysis. Overall, presentation of all the calculation details does not add rigor to the report conclusions.

Significance: High

The lack of detail in the HGM methodology leads to uncertainty in the validity and application of the results, and thus in the calculations for mitigation of the project

Recommendations for Resolution:

1. Revise the draft HGM report to further condense the material.
2. Provide additional documentation of the assignment of FCI indices and their variability.
3. Include detailed methods and results from field work that provided data used in the development of the FCIs and a list of all implicit and explicit assumptions regarding the FCIs.
4. Consider using an alternative method to complement the HGM analysis to better describe the effects of the alternatives on the ecosystem services of wetlands. The USACE could collaborate with the USEPA and other agencies on this effort.

Comment: 7

The feasibility of the mitigation plan to compensate for impacts on environmental resources is not demonstrated.

Basis for Comment:

The Panel believes that there is a high level of uncertainty regarding the implementation of the wetland mitigation plan. The DEIS contains mitigation plans for all impacted resources that are in the early stages of development. Substantial acreage (>5,000 acres) will be affected by the project, so substantial acreage will be required to mitigate for loss of environmental resources (wetland, waterfowl, shorebird, fish), along with long-term needs for management. The DEIS indicates this property will be purchased from willing sellers, but there is no indication there is an adequate number of willing sellers available for needed purchases or permanent easements. For example, the wetland mitigation proposed at Big Oak Tree State Park cannot be achieved without property acquisition; however, a back-up plan was not presented if the property acquisition does not occur.

In addition, the DEIS does not contain a consensus between USEPA and USACE as to the extent of wetland area within the study area. In addition, the Panel has concerns with the documentation of the HGM indices used to estimate the impact of the alternatives on wetland function. Based on all of these uncertainties, the Panel does not have confidence in the estimates provided in the DEIS on the amount of wetland mitigation needed for the project, nor is the Panel confident that the mitigation will take place as described.

Significance: High

Project success is dependent on the development and implementation of a thorough mitigation plan that accounts for the loss of natural resources in the project area. Without more detail, the Panel is unable to make an accurate assessment of the likely success of the mitigation.

Recommendations for Resolution:

1. Develop the details of the wetland mitigation to include the provision of alternative plans if land cannot be purchased or otherwise acquired.
2. Consider developing a wetland mitigation bank within the project area, perhaps in the vicinity of Big Oak State Park. This should increase the probability of wetland success and provide a secure mitigation future.
3. Develop preliminary agreements between land owners and USACE for land purchase or easements prior to the initiation of the project.

Comment: 8

It is unclear if the proposed mitigation plan will compensate for impacts on environmental resources because the models do not incorporate uncertainty.

Basis for Comment:

The environmental models used to estimate resource impacts and required mitigation are deterministic and do not include estimates of variance or confidence intervals. This limitation was also recognized during the certification review of the DUDM. While the models may provide the most likely estimates of impacts on resources, there is an equal likelihood the results may either under or overestimate needed mitigation. The Panel believes that there is an unacceptable amount of uncertainty associated with the estimates of required mitigation predicted by the models due to variance associated with a number of the data-based parameter estimates. In addition to this overall uncertainty, many parameter estimates are based on educated guesses with little or no data available for support. For example, the DUDM estimate of invertebrate biomass in agricultural fields (primarily soybean or corn fields) during February and March is assumed to be the same as for rice fields during fall and winter (5 kg/ha). A recent study (Schultheis et al. in revision) indicates invertebrate biomass during February and March in flooded soybeans and corn is actually 20 kg/ha, 4 times greater than the parameter estimates used in the model based on this assumption. Although the author of the model made an assumption based on the best available data at that time, that assumption led to an underestimate of waterfowl resources being provided by flooded agriculture, thus, an underestimate of needed mitigation. Similarly, mitigation for terrestrial wildlife is based on the habitat needs of a few key species, with no supporting evidence that the habitat needs of those species adequately represent all the species typically found in the terrestrial environments. For example, none of the species used in the model requires adjacent wetlands and terrestrial habitat, while many amphibians and reptiles (none of which are in the model) do.

Significance: High

An accurate estimate of the impact of the project on environmental resources within the project area is required to determine the amount of mitigation needed.

Recommendations for Resolution:

1. There are two potential alternatives to resolving this issue:
 - a. Preferred resolution: Incorporate variance estimates with parameters for each of the models, allowing for 95% confidence intervals with the model point estimates. The upper 95% confidence limit could then be used as an estimate of required mitigation. Although this approach would not account for error due to invalid assumptions, it would likely ensure most impacted resources are appropriately mitigated. Important assumptions could be assessed later during the adaptive management phase and an appropriate modification to the mitigation could be made as needed. The Panel acknowledges that there are data limitations that may prevent the use of this approach.
 - b. Alternate resolution (suggested in the Phase 1 and Phase 2 IEPR): Identify an increase in the level of mitigation required to ensure the level of mitigation is

adequate for all impacted resources. In the past, Federal agencies have increased mitigation by a ratio of 2:1 to 4:1, estimated level of resource mitigation to estimate level of resource loss, to account for uncertainty in the estimates.

Comment: 9

The feasibility of the mitigation needed to compensate for impacts on the fisheries resources is not demonstrated.

Basis for Comment:

The previously authorized project (Alternative 2) would result in a fish spawning/rearing habitat loss of Average Annual Habitat Units (AAHU) in the New Madrid Floodway of 92.4%, 91.7%, and 88.3% for early, mid, and late seasons, respectively. This improves to 61.6%, 71.2%, and 79.4% of pre-project AAHUs with Alternative 3.1 (tentatively recommended plan). The St. Johns Bayou AAHU habitat loss is the same for both Alternatives 2 and 3.1. Early, mid, and late season loss to fishery resources are 28.5%, 31.1%, and 31.7%, respectively, of pre-project AAHUs. This needs to be clearly stated in terms of both the percentages and changes in AAHUs for each alternative for each season. With this amount of habitat loss and the uncertainty of mitigation due to unknown land acquisition prospects, the project becomes environmentally questionable until a mitigation plan is in place with specific AAHU compensation.

The DEIS uses the Ten Mile Pond Conservation Area modifications as part of the mitigation plan for fish spawning/rearing habitat, but mitigation details are lacking and AAHUs have not been quantified.

Fish access to Big Oak Tree State Park Restoration through the proposed hydrologic connection to the Mississippi River near Big Oak Tree State Park is not addressed. If fish do not have access or use of this area for spawning/rearing, then this area should not be considered a mitigation feature for fish.

As stated in the Phase 1 and Phase 2 IEPRs, gate and pump management was a main feature of the previous NEPA documents. However, examples of potential increases in AAHUs due to holding water during rearing/spawning season have not been provided in the DEIS.

Tables 2.5 and 2.6 show the hypothetical gains the AAHUs for fisheries; however, seasonal comparisons are needed to properly evaluate differences between impacts and mitigation gains. Additionally, the AAHU gains for batture land reforestation and floodplain lakes (located on the batture) are the major (56.3%) mitigation feature outlined for the New Madrid Floodway. This AAHU mitigation is high, considering that fish passage reduction into the floodway is anticipated to be 27%.

The DEIS states that riparian buffer strips are proposed to compensate for the impacts associated with channel modifications, as well as spawning and rearing habitat. However, quantification of channel modification, AAHU loss, and compensation from mitigation needs to be presented in more detail. Plant communities that will naturally revegetate will vary based on slope and elevation. For example, riverfront forest species are not likely to be found at an elevation greater than 20 ft of the surrounding area since this area would never flood. This elevation would more likely revegetate to terrace hardwood forest species.

It is unclear if Table 5.1 takes into account the timing of the flood. For example, if habitat does not meet water duration and depth requirements during the fish spawning/rearing periods, it will not provide mitigation habitat for fish.

Significance: High

With the potential amount of habitat loss and the uncertainty of mitigation due to unknown land acquisition prospects, the project will be considered environmentally questionable unless a feasible mitigation plan is developed with specific AAHU compensation.

Recommendations for Resolution:

1. Finalize development of land acquisition and mitigation plans prior to construction. This is due to the large amount of fish spawning/rearing habitat loss expected.
2. Explain the AAHU mitigation gains for fish spawning/rearing habitat at Ten Mile Pond.
3. Clarify the required fish access to Big Oak State Park and recommend monitoring of this mitigation feature.
4. Develop mitigation scenarios that show potential gains in AAHUs by holding water on fish spawning/rearing habitat for the entire spawning periods. Revise Tables 2.5 and 2.6 so that they are based on fish spawning/rearing seasons.
5. Limit the percentage of mitigation in the batture to no more than fish passage reduction (27%) of all mitigation in the New Madrid Floodway.
6. Quantify and clearly present the channel modification impacts and riparian buffer mitigation to compensate for loss.
7. Provide details of water depth and duration criteria for Table 5.1.

Comment: 10

The shorebird mitigation plan contains inconsistencies that make its goal unclear.

Basis for Comment:

The DEIS provides a detailed plan to compensate for impacts on shorebird habitat area (pp. 147-152), but then later states (p. 152) that “Additional mitigation for shorebird habitat will not be required, as any needed mitigation will be provided through compensatory actions for impacts to waterfowl, fish, wetlands, and terrestrial wildlife.” The references to “additional mitigation” or “any needed mitigation” in this statement are unclear. If this is intended to convey that no mitigation will be performed to replace shorebird habitat lost to other mitigation projects, this issue is no longer relevant with respect to shorebird mitigation. The Panel raised the issue in the earlier versions of the mitigation plan in the Phase 2 IEPR relative to several different resources because that plan did not compensate for all of the impacts on each resource, including shorebird habitats. Since the goal of the current mitigation plan is to compensate for all impacts on shorebird habitats, the discussion about additional mitigation is no longer relevant with respect to shorebird habitat mitigation. As discussed in the Mid-Review Teleconference on 10/31/2011 with USACE, Battelle, and the Panel, this section could be simplified by removing the text starting on p. 151 with “USACE’s position...” up to Section 4.8.5. This would help reduce the uncertainty and inconsistency of the presentation of the plan.

Significance: High

The mitigation plan should be described clearly and consistently so that its adequacy can be determined.

Recommendation for Resolution:

1. Remove the text on p. 151 starting with “USACE’s position...” through Section 4.8.5.

Comment: 11

The adaptive management plan lacks the details necessary to ensure that environmental resources affected by the project are appropriately mitigated.

Basis for Comment:

Additional detail is needed on the type of parameters to be monitored and what objective criteria will be used to determine if mitigation wetlands for waterfowl have reached their desired objectives. Further, the adaptive management approach requires both a monitoring and response phase. There is no indication as to what type of modification would occur in the mitigation plan (e.g., increase in mitigation acreage) if the mitigation actions do not meet objectives.

Significance: High

Without more detail, it is impossible to determine whether the DEIS meets resource mitigation requirements.

Recommendation for Resolution:

1. Provide a detailed monitoring plan that accounts for more frequent monitoring of herbaceous wetlands (moist soil habitat, e.g., every 3 years throughout the life of the project), identification of specific parameters that will be monitored (preferably food availability in each of the habitat types), objective criteria or thresholds for assessment of success (e.g., kilogram of food per hectare), and potential responses if mitigation does not reach objectives (e.g., additional mitigation).

Comment: 12

The adaptive management plan does not provide specific details on the source(s) of funding needed to implement the plan.

Basis for Comment:

Adaptive management is a widely accepted practice, allowing for mid-course corrections when the original mitigation goals are not achieved. Use of adaptive management can significantly increase the effectiveness of mitigation efforts. However, it requires considerable data input on project conditions, because the data are used as the basis for future mitigation decisions. Effectively implementing adaptive management requires a commitment to collect data on which to base ongoing management decisions.

The Panel supports the use of adaptive management as described in the DEIS. However, the cost to implement adaptive management can be high, given the need for repeated iterations of management action, collection of field data on site conditions, and reanalysis of approaches required to provide the necessary mitigation. In an era of increasingly tight agency budgets, the costs for implementation need to be determined and appropriate sources of funding identified.

The DEIS suggests that the management responsibility for some of the proposed mitigation sites should be transferred to other agencies. However, the source of the funding is not clear. Without a source of funding, crucial adaptive management activities would likely be halted, jeopardizing the success of the project.

Significance: High

The source of funding is a critical aspect of the adaptive management plan that needs to be identified to ensure that the project goals are achieved.

Recommendation for Resolution:

1. Specify the funding source(s) to support ongoing adaptive management of the mitigation projects, and include these costs in the overall cost of the project.

Comment: 13

The fisheries adaptive management plan requires additional fish passage studies and lacks the detail needed to establish monitoring frequency.

Basis for Comment:

The index of biotic integrity (IBI) may not be an appropriate method to monitor the resident fish community in the St. Johns Bayou Basin and the New Madrid Floodway due to the difficulty in finding reference streams and/or a diversity of stream conditions. As stated throughout the DEIS, the ditches, streams, and bayous are highly modified habitats, and this may limit the use of an IBI approach. In addition, IBI is a general indicator of stream condition and may not be precise enough to assess changes in individual fish populations.

The proposed fish passage studies do not combine fish access with spawning/rearing habitats used by fish that pass through culverts in the St. Johns Bayou Basin and New Madrid Floodway. Additionally, no fish passage studies are planned for Big Oak Tree State Park.

The DEIS (Section 6.4.5) indicates that monitoring of the resident fish community will be conducted prior to each assessment report. Specific details relating to the length of monitoring prior to each report and triggering points for adaptive management changes are not included in the DEIS. In addition, specific monitoring details for connectivity, access, hydrograph, and Habitat Suitability Index (HSI) values were not provided in the DEIS and are needed to evaluate mitigation as part of the adaptive management process.

Significance: High

Without scientifically based monitoring, the fisheries adaptive management plan cannot be assured of success.

Recommendations for Resolution:

1. Identify the agency responsible for conducting the monitoring program and writing the adaptive management reports. Include alternatives to IBI development for resident fish monitoring. For example, monitoring commonly used IBI fish matrices through time may be an appropriate alternative if a full IBI is deemed inappropriate.
2. Conduct fish passage studies that identify spawning/rearing habitats used by fish that pass through the culverts in the St. Johns Bayou Basin and New Madrid Floodway.
3. Conduct fish passage/access through culverts at Big Oak Tree State Park if it is used for mitigation of spawning/rearing habitat.
4. Develop a long-term fish monitoring/adaptive management plan prior to project construction that provides specific details relating to the length of monitoring prior to each report, triggering points, and specific monitoring details for connectivity, fish access, hydrograph, and HSI values.

Comment: 14

The shorebird adaptive management plan lacks the detail needed to establish monitoring frequency and to determine the habitat value of rice agriculture.

Basis for Comment:

The DEIS (Table 5.4) lists the parameters necessary to monitor the proposed mitigation, including vegetation present, which is applied to moist soil units but not to seasonally inundated farmland. Monitoring at shorebird mitigation sites should include tracking vegetation on seasonally inundated farmland. The farming activity to be allowed following spring shorebird migration could include plowing or other activities that would maintain low vegetation cover over time. However, if not managed or actively farmed between years, lack of soil disturbance might significantly reduce habitat quality over time.

The adaptive management section of the DEIS related to shorebirds (Section 6.4.4, p. 242) states that shorebird compensatory mitigation will be assessed at 5, 15, 25, and 50 years. Because successful establishment of mitigation areas is often most uncertain when first constructed, the Panel believes that the mitigation sites should be evaluated in the years immediately after establishment, particularly in years 1-5 when sites are first being established, as well as during the later years proposed.

The DEIS (p. 242), also raises the possibility that increased rice agriculture may be used to provide mitigation for loss of shorebird habitat resulting from the project, including the potential sale of the compensatory mitigation lands. Determining the value of increased rice agriculture to shorebirds would require development of appropriate HSI values for areas newly converted to rice agriculture. In addition, there may be considerable uncertainty in choosing the appropriate HSI values, given the variations in habitat quality that will result from different agricultural management practices, which would make measurement of the habitat value provided challenging.

Significance: High

Monitoring early results for mitigation of shorebird resources is critical to establishing successful mitigation projects, and the selection of appropriate HSI values is critical to determining the value of any additional rice agriculture.

Recommendations for Resolution:

1. Include monitoring of seasonally inundated farmland early in the project to ensure that appropriate habitat is being provided as planned.
2. Include an approach to measuring HSI values for rice agriculture that would be sensitive to variations in agricultural management practices likely to be employed in the project area, and that would determine the value of increases in rice agriculture, if they occur, to migrating shorebirds.

Comment: 15

The new shorebird habitat model, Assessment of Shorebird Habitat within the St. Johns-New Madrid Basins, Missouri, should be validated to ensure that the HSI values are correct.

Basis for Comment:

The Panel believes that the new method for assessing shorebird impacts and planning shorebird mitigation, Assessment of Shorebird Habitat Within the St. Johns-New Madrid Basins, Missouri, appears sound. The new model is a significant improvement over the initial approach presented in the Phase 2 IEPR, and the Panel commends USACE for supporting development of the new model. Because this model is new, validation work will be required, in particular to ensure that the proposed HSI values are accurate.

The validation of the model suggested in the IEPR model certification review has not yet been conducted, and is an important step in ensuring that the model is accurate and precise. The validation process, including collection of field data showing how the various HSI values compare to actual shorebird use of the various habitat types, should be completed prior to using the model to calculate needed mitigation.

The Draft Planning Model Quality Assurance Review Report for the Model Review of the Assessment of Shorebird Habitat within the St. Johns-New Madrid Basins, Missouri, (Volume 3, Part 6.4) includes the recommendation by the expert review panel that “the performance of the model needs to be tested and verified before it is applied for decision-making.” Field-based evaluations will be necessary to address the recommendation of the review, and to validate the relative HSI values assigned to the various water depths in the model (DEIS, p. 144). The proposed HSI values are likely good first approximations, but require field data for validation.

The Assessment of Digital Elevation Model (DEM) Accuracy on the St. Johns - New Madrid Shorebird Habitat Model (Appendix M, Part 4) concludes that the aggregation of low resolution estimates from the DEM is adequate for estimating the overall inundated area, but further recommends adjusting the mitigation area upward to the 95% confidence interval value to account for uncertainties resulting from the lower resolution of the DEM. Implementation of this recommendation should be applied for the calculations related to the St. Johns Basin portion of the project.

Significance: High

Validation of the Assessment of Shorebird Habitat Within the St. Johns-New Madrid Basins, Missouri must be completed before the model is applied so that any adjustments to model parameters can be applied when calculating necessary mitigation.

Recommendations for Resolution:

1. Include specific plans for field validation of the shorebird habitat model in the DEIS.
2. Apply the model review recommendation to adjust the St. Johns Basin mitigation upward by the 95% confidence interval to account for any uncertainties related to the DEM.

Comment: 16

The calculation of economic and ecological benefits does not consider the impact of global climate change and the economic opportunities for carbon sequestration and bottomland hardwood forest management.

Basis for Comment:

Emerging markets for carbon to offset the impacts of global climate change have created opportunities to finance afforestation worldwide. The DEIS states that the Lower Mississippi River Valley has seen afforestation of more than 77,000 acres of agricultural land due to carbon finance. This region also receives high attention from carbon market entrepreneurs, attracted by the scientific evidence that bottomland hardwood forests have high capacity to sequester carbon. For example, the Ohio River, located just upstream of this site, is estimated to have 35,000 MW of electrical generation capacity and a high-level need for offsetting carbon credit. Connecting the carbon need between the two locations (i.e., the project site and the power generation facilities upstream) would make economic and ecological sense. However, the assessment of the affected environment in terms of the carbon footprint in the DEIS was limited to the anticipated carbon dioxide emissions produced by the two electrical pumping stations, and did not consider the broader context of global climate change.

If the Village of Pinhook relocates to the St. Johns Basin, and other residents have already been displaced by operation of the Floodway in 2011, the Panel believes that conversion from agriculture to silviculture is a more viable option for the New Madrid Floodway. This alternative would also have ancillary economic and ecological benefits. Conversion from agriculture to silviculture in the New Madrid Floodway would have a nutrient trading benefit because taking cropland out of production reduces nutrient loads to the system by eliminating annual fertilizer applications. Afforestation would also have the added benefit of maintaining ecological connectivity with the Mississippi River. The forests, if made up of bottomland hardwood species, would tolerate seasonal flooding, would not require fertilizers, and would be able to assimilate seasonal loadings of water, sediments, and nutrients from upstream rivers. Downstream benefits would include increased flood protection and water quality improvements.

Significance: High

Further analysis is needed in order to justify the decision to eliminate any alternative from further consideration.

Recommendations for Resolution:

1. Conduct an economic analysis of the benefits of carbon sequestration and bottomland hardwood forest management from conversion of the New Madrid Floodway from agriculture to silviculture and/or forest conservation. This analysis should include capturing and storing carbon not only as timber wood, deadwood, litter, and understory, but especially permanently in the soil.
2. Conduct an economic analysis of the nutrient trading benefit of eliminating annual fertilizer applications from conversion of the New Madrid Floodway from agriculture to silviculture and/or bottomland hardwood forest conservation.

Comment: 17

The assumptions for the No-Action Alternative are not justified.

Basis for Comment:

The No-Action Alternative (Alternative 1) requires an estimate of future conditions that would prevail in the absence of the project, over the full anticipated life of the project, approximately 50 years. This necessitates a variety of assumptions regarding uncertainties in weather patterns and economic conditions throughout this period. Both may be affected by changes in climate conditions.

The observed progression from hydric vegetation to drier species in Big Oak Tree State Park would continue if no action is taken to restore hydrology to the park. However, the assumption that no effort would be made to restore hydrology to the park is problematic since past efforts have been made by the Missouri Department of Natural Resources (MDNR).

Table 4.34 indicates changes in acreage between existing conditions and Alternative 1 without providing an explanation. Additionally, based on this table, it is unclear what changes would occur in AAHU between existing conditions and Alternative 1.

Significance: Medium

The No-Action Alternative current and future conditions are used as a basis for comparison of each of the project alternatives, but these conditions are not justified.

Recommendations for Resolution:

1. Provide assumptions and justification for future weather patterns in the region and the associated impact on the No-Action Alternative.
2. State assumptions regarding future economic conditions that pertain to agricultural production (costs, profits, prices, etc.), and provide justification for these.
3. Provide assumptions related to anticipated changes in the region's population profile and justify these for the No Action Alternative.
4. Modify the assumptions regarding the restoration assumption of Big Oak State Park to indicate that it is likely that hydrology will be restored over the next 50 years.
5. Provide narrative to the changes identified in Table 4.34 and also present AAHU changes in this table.

Comment: 18

A detailed justification for eliminating project alternatives from further consideration is not provided.

Basis for Comment:

NEPA requires that all “reasonable” alternatives be considered. A project of this magnitude, i.e., one that affects a wide range of resources, should consider land and water management scenarios that would provide major economic, social, and ecological benefits. This is especially relevant given that the economic benefits of the proposed alternatives are uncertain. Specifically, the benefit-cost ratios of the proposed alternatives do not incorporate economic uncertainties that could result in ratios less than 1. Additionally, alternatives with varying locations for setback levies were included in the Consolidated NEPA Document reviewed under the Phase 1 IEPR, but are not included in the Working Draft DEIS. These different locations should be included as subsets of reasonable alternatives or justified as not meeting the purpose and need of the project.

The DEIS does not evaluate conservation or silvicultural alternatives that have high ecological benefits and potentially significant economic benefits. Specifically, major land management scenarios that would involve bottomland hardwood forests rather than corn and soybeans were not considered as a viable alternative.

Overall, the evaluation process for alternatives lacks the detail and consistency needed for the reader to understand how alternatives were identified and compared. For example, the number of criteria used to identify alternatives (three) is different than the number of criteria (four) used to compare proposed alternatives.

Significance: Medium

The process for evaluating and selecting among alternatives is unclear and incompletely presented, limiting the Panel’s understanding of the screening process that led to the selection of the recommended plan.

Recommendations for Resolution:

1. Include a clear and consistent comparison of alternatives.
2. Include an analysis of the economic efficiency of the alternatives that maximizes the present value of net benefits, not just whether the alternative has a benefit-cost ratio greater than 1.
3. Consider the alternative of converting agriculture to silviculture in the St. Johns and New Madrid, i.e., converting the local economy from fertilizer and/or nitrogen fixation-based agriculture to silviculture and/or cover crops and allowing the site to flood more frequently by backwater and overbank flooding.
4. Include the alternatives that contain the various locations for setback levies or justify their exclusion in this draft of the DEIS.

Comment: 19

The methods and model used to assess the impacts on fish and to estimate the compensatory mitigation are not clearly described.

Basis for Comment:

It is critical that model results are presented clearly to allow a full comparison among project and mitigation alternatives. As currently written, impacts are not fully disclosed and project alternatives are difficult to compare. The Panel suggests that the following specific clarifications be addressed.

- The first paragraph of Section 4.8.5.2 states that floodplain water bodies provide spawning and rearing habitat regardless of river conditions. Therefore, Average Daily Flooded Area (ADFA) was not calculated and only based on surface acres. The next paragraph states that river connectivity is needed to benefit the remainder of the fishery. However, timing of this connectivity is not defined or referenced to the section that contains these data.
- Connectivity of borrow pits used for mitigation is an important consideration, but connectivity use in mitigation is not evident unless reviewing multiple tables and text.
- The Panel agrees that all fish do not need to have access to the floodplain for reproductive success for a particular species. However, the ones that do have access would not likely have “high reproductive success” as stated. Individual reproductive success is typically low for fish due to a variety of factors that can cause high mortality of eggs and larvae. This is particularly true in floodplain habitats.
- The fish access coefficient is a reasonable measure in the quantification of available pre- and post-project habitat in the St. Johns Bayou Basin and post-project habitat in the New Madrid Floodway. However, access coefficients may vary by season and were not calculated.
- The summary of impacts in Table 4.33 does not include existing AAHUs, which reduces the ability for comparisons among project alternatives.
- It is unclear why the 2- and 5-year flood frequencies change with alternatives and if these changes are incorporated into AAHU loss estimates.
- AAHU reductions for each method are not clearly presented in Tables 4.34 to 4.39 or stated in Sections 4.8.5.5 through 4.8.5.8.
- Although the batture land is suitable to mitigate impacts based on the fish access studies, the amount of AAHU compensation in the batture land is too high and should be based on fish access restrictions.

Significance: Medium

The methods and model used to assess the impacts on fish and compensatory mitigation should be clearly described to achieve completeness and to have the reader correctly interpret the DEIS.

Recommendations for Resolution:

1. Reference and define the timing of the connectivity in Section 4.8.5.2. Tables 4.47, 4.48, 4.49, and 4.50 should include percentage of connectivity loss for alternatives.
2. Provide discussion on the impact of borrow pit connectivity reductions and how connectivity is incorporated in alternatives.
3. Provide clarification of reproductive success that focuses on population level maintenance that can be achieved and not individual reproductive success.
4. Provide clarification of why access coefficients were not calculated for each spawning/rearing season.
5. Expand Table 4.33 to include existing AAHUs for a more complete comparison of alternatives.
6. Provide clarification of why the 2- and 5-year flood frequencies change with alternatives and if/how these changes are used in AAHU estimates.
7. For comparative purposes, clarity would be improved by presenting reduced AAHUs as both lost AAHUs and as a percentage for each habitat type and total pooled habitats in Tables 4.34 to 4.39. For example, late spawning period alternative 3.1 AAHUs are 1810.8 pre- project and are estimated to be 372.3 post- project. This is a loss of 1438.5 AAHUs or 79.4% of late season spawning habitat in the New Madrid Floodway. The narrative for these tables should briefly explain the reasons for the losses. In addition, functional floodplain acres should be presented in separate tables.
8. Mitigation in batture land and floodplain lakes should be limited to no more than 27% of AAHUs based on the fish access coefficient (0.73) since this estimated access restriction cannot be compensated within the New Madrid Floodway.

Comment: 20

The description of fisheries resources is inconsistent and is not adequately explained.

Basis for Comment:

Inconsistent and incomplete descriptions of the fisheries resources are found in several locations throughout the DEIS and Appendix G. Ultimately, conflicting descriptions and conclusions of the resource and project impacts raise questions regarding mitigation necessity and implementation.

Section 3.8.5 of the DEIS states that environmental advocacy group claims are used to support the argument that the ecosystem is “destroyed or in a disastrous state” and has “no remaining value.” The two references cited are a fact sheet and a memo. While the Panel agrees that the fish communities have made adjustments to anthropogenic changes, we are unaware of any scientific publications that state the Mississippi River ecosystem is destroyed and has no remaining value either economically or biologically. This section should describe the current fisheries resources in the Mississippi River near the project area and in the St. Johns Bayou Basin and New Madrid Floodway.

Section 3.8.5 and Appendix G provide a description and comparison of fisheries resources (species richness and relative abundance) in the St. Johns Bayou Basin and New Madrid Floodway. However, this section does not describe the fisheries resources of the Mississippi River fishes and those species that use floodplain habitat.

Quantitative approaches are used throughout the DEIS to estimate existing fish spawning/rearing habitat and project impacts. For example, Alternative 3.1 projects fisheries spawning/rearing habitat loss in the St. Johns Bayou Basin to be 28.5%, 31.1%, and 31.7% for early, mid, and late seasons, respectively. It projects losses in the New Madrid Floodway to be 61.6%, 71.2%, and 79.4% for early, mid, and late seasons, respectively. However, Section 4.17, Cumulative Impacts (p. 216) contains an argument that, due to differences in the fish communities between historic conditions and current conditions, “the project would not have any significant additional impacts because it no longer provides any significant habitat.”

Section 4.17, Cumulative Impacts (Loss of Connectivity, p. 222-223), has nothing to do with cumulative impacts and qualitatively dismisses the fish resources that were quantified in the DEIS. This section also fails to recognize that batture lands have been affected by the same or similar anthropogenic changes to the Mississippi River as in the St. Johns Bayou Basin and the New Madrid Floodway.

Significance: Medium

The fisheries resources and habitat value (AAHU) has been described and quantified throughout the DEIS. However, inconsistencies with the fisheries resource and habitat values affect the completeness of the report.

Recommendations for Resolution:

1. Revise the DEIS to include a description of the current fisheries resources in the Mississippi River near the project area and in the St. Johns Bayou Basin and New Madrid Floodway and eliminate environmental advocacy group claims.
2. Correct the inconsistency between the quantitative evaluation and qualitative suggestions of no fish resource value and remove the language in the DEIS suggesting that the project area has no value or significant habitat for fish resources
3. Remove Section 4.17, Loss of Connectivity, from the DEIS.

Comment: 21

The species used to construct the Habitat Evaluation Procedure (HEP) model analysis for assessing terrestrial wildlife are not representative of the affected species.

Basis for Comment:

The Panel recognizes that the representative terrestrial animals (fox squirrel, mink, barred owl, muskrat, pileated woodpecker, black-capped chickadee, red-winged black bird, and great blue heron) were selected based on the availability of habitat suitability index models for the HEP analysis. However, the Panel believes that the life history characteristics of the animals used to represent terrestrial animals only represent birds and mammals and are not adequate to represent reptiles and amphibians.

Significance: Medium

A broader range of animals should be used to ensure adequate mitigation for terrestrial wildlife.

Recommendation for Resolution:

1. Include representatives of amphibians and reptiles in the HEP model.

Comment: 22
The positive ecological effects of the flood pulse on the landscape are not considered and the flood pulse is applied inaccurately in a social impact context.
Basis for Comment:
<p>The historical accounts of human suffering due to flood pulses are interesting and relevant, but they should not be tied to Junk’s concept of flood pulsing. The Panel believes that this is an artificial connection between an ecological concept and social effects of flooding; the link should be removed from the document.</p> <p>More importantly, the economic benefits of flood pulsing are not described in the DEIS or in the benefit-cost section. Flood pulses are natural subsidies to ecosystems such as bottomland hardwood forests and backwater swamps. Floods cause an increase in nutrient availability to wetlands in these settings, as well as increased nutrient cycling due to water level fluctuations. Historically, flood pulses supported entire civilizations (i.e., Mesopotamia, Nile Delta) where nutrient-rich waters and sediments subsidized agriculture. Artificial fertilizers and drainage control are now employed to achieve similar effects, and the flood pulses are considered nuisances and destructive.</p>
Significance: Medium
Scientific concepts such as “flood pulse,” as described well in the scientific literature, should be used properly in impact statements.
Recommendations for Resolution:
<ol style="list-style-type: none"> 1. Include a balanced discussion of both the negative impacts of flooding on human culture and the positive impact of flooding on ecological systems.

Literature cited

Junk, W.J., P.B. Bayley, and R.E. Sparks. (1989). The flood pulse concept in river-floodplain systems. In: Proceedings of the International Large River Symposium Ca. Special Issue of the Journal of Canadian Fisheries and Aquatic Sciences (D.P. Dodge, ed.) 106:110-127

Comment: 23
The cumulative impacts analysis does not consider the value of ecosystem services that have diminished over time.
Basis for Comment:
<p>The DEIS assigns little value to the ecosystem services (e.g., carbon sequestration) provided by floodplain connection to the Mississippi River, based on the argument that the system has been significantly changed over time. However, the Panel believes that the ecological value of the remaining connection to the Mississippi River is high. As described in CEQ (1997), the loss of this last remaining connection is an example where additional impacts, no matter how small, will have a disproportionate cumulative effect by exceeding the threshold where floodplain connection ecosystem functioning is eliminated. The Panel believes that closing the last connection would have a significant cumulative impact on the flood-dependent system. While it is not required that a project compensate for historical impacts, it is incumbent on the project not to contribute the incremental impact that may cause the project to exceed this overall threshold.</p> <p>The value of the flood-dependent system can be characterized in terms of ecosystem services such as carbon and nitrogen sequestration (Costanza et al. 1997). Throughout the DEIS, ecosystem services are not considered or are undervalued, while economic benefits may be inflated and based on previous socioeconomic data, particularly given the major changes in the Floodway after the 2011 floods.</p>
Significance: Medium
The analysis of cumulative impacts is incomplete without a proper consideration of the effect of closing this river connection on the diminution over time of regional ecosystem services (such as carbon and nitrogen sequestration) provided by this flood-dependent ecosystem.
Recommendations for Resolution:
<ol style="list-style-type: none"> 1. Prepare an analysis of cumulative effects that includes evaluation of the last remaining connection to the Mississippi River in terms of ecosystem services that have diminished over time. 2. Evaluate each of the alternatives (including any new alternatives) in terms of cumulative impacts on ecosystem services.

Literature cited

Council on Environmental Quality (1997). Considering Cumulative Effects Under the National Environmental Policy Act. Council on Environmental Quality, Executive Office of the President, Washington, D.C. January.

Costanza, R., R. d’Arge, R. de Groot, S. Farberk, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O’Neill, J. Paruelo, R.G. Raskin, P. Sutton, and M. van den Belt (1997). The value of the world’s ecosystem services and natural capital. *Nature* 387:253-260.

Comment: 24

The project's direct and indirect impacts on ecosystem services are not fully addressed.

Basis for Comment:

The DEIS does not contain an evaluation of the ecosystem services that will be directly or indirectly affected by the project. In addition, an economic value has not been apportioned to compensate for the loss of these services. For instance, the DEIS estimates the economic benefit to cropland when water levels are decreased (i.e., implementation of the recommended alternative); however, the report does not contain an estimate of the loss in ecosystem services to bottomland forests and other wetlands associated with that corresponding drop in water level. Furthermore, the indirect impact of the proposed project on downstream ecosystem services, such as flood mitigation or water quality improvement, is also not included in the DEIS.

Significance: Medium

Ecosystem services such as flood prevention, water quality improvement, and carbon sequestration are an important part of the true value of natural ecosystems whether they occur at the project site or downstream.

Recommendations for Resolution:

1. Implement the use of the ecosystem services paradigm in the HGM analysis and other analyses that determine impacts on ecological function.
2. Estimate the ecosystem services that wetlands caused indirectly by the project on downstream and adjacent landscapes.
3. Include the cost of protecting the existing wetlands from potential impacts from proposed project alternatives in the benefit-cost calculations.
4. Include the benefits in the project alternatives that could enhance downstream services such as silviculture or bottomland hardwood forest conservation/management.

Comment: 25

It is unlikely that the warm season grass buffers proposed for use on the project channel will be successfully established.

Basis for Comment:

Native warm season grasses and forbs require substantial disturbance such as burning every 3 to 5 years to be successfully maintained. Difficulties in maintaining the desired vegetative communities are exacerbated when the ratio of edge to total patch size is great, such as when the patch is a long narrow strip rather than a square. Because even under ideal conditions (large, >20 ha square plots) it is difficult to maintain warm season grasses, the Panel believes that it is unlikely the establishment of warm season grasses in long narrow buffers would be successful or successfully maintained. Furthermore, because grass buffers do not currently exist in the region, they would not be appropriate for mitigating lost habitat, thus the Panel recommends forested riparian buffers if these areas are to be used for mitigation.

Significance: Medium

Many habitat types can be used as buffers for restoration along riparian corridors, but native warm season grass would be difficult to maintain successfully in such an application.

Recommendation for Resolution:

1. Remove the native warm season grass buffers from use as stream bank mitigation.

Comment: 26**The description of shorebird resources includes inconsistencies and inaccuracies..****Basis for Comment:**

The DEIS contains assumptions about shorebird use of the project area that are not accurate. For example, it is stated that “Historically, the project area did not provide any suitable shorebird habitat (DEIS, p. 212).” The Panel believes it is likely, based on general geomorphologic principles, that river scour areas and other similar river features, as well as margins of open wetland areas, provided sparsely vegetated areas suitable for shorebirds before landscape conversion, even though these areas were probably not extensive in the project area.

Several places in the DEIS describe historic habitat conditions as having no value for shorebirds. While the historical conditions analysis (Heitmeyer et al 2010, Appendix D) includes an estimation of the former extent of various forested habitat types, other habitats not accounted for in the analysis were likely also present in smaller amounts. For example, river scour areas, depositional alluvial fan areas, recently formed wetlands around river channels, and other features likely to result from the actively meandering main channel could be expected to provide some sparsely vegetated habitat for shorebirds. The statement (DEIS, p. 98) that the area “previously did not attract large flocks of shorebirds” may be accurate, but the places within the DEIS which specifically mention that there was no value for shorebirds should be revised.

The DEIS is also inconsistent in its description of shorebird use of the area, and some editing would improve the document in this respect. In Section 3.8.4 (p. 98), it is correctly stated that “Away from coastal areas, most shorebird species forage in areas of sparse vegetation...” In contrast, in Section 4.8.4 (p. 152), it is stated that “By definition, shorebirds frequent coastal areas...” This is a common and understandable misconception of the term “shorebirds.” However, as correctly pointed out on p. 98 of the document, many shorebirds migrate through interior areas and use seasonally inundated and sparsely vegetated habitats as foraging areas. Consistent descriptions of the use of the project area by shorebirds would strengthen the document.

Significance: Low

The historical value of the project area for shorebirds should be accurately described so that the resource is accurately represented throughout the DEIS.

Recommendations for Resolution:

1. Remove the statements suggesting that the area did not historically provide any habitat for shorebirds.
2. Remove the statement suggesting that by definition shorebirds frequent coastal areas.

Comment: 27

The impacts/benefits to water quality are not thoroughly discussed in the DEIS, nor are they consistently treated in Section 4.11 of the DEIS and Appendix I.

Basis for Comment:

In Ashby et al. (2000), sensitivity analyses were conducted for wetland function factors, export coefficients, constituent concentrations in floodwaters, and the assumed 50 percent reduction in the available load associated with inundation. No sensitivity analyses are presented for the revised export model. The discussion of constituent export in Section 4.11 of the DEIS is confined to decreased export due to capture of winter runoff with the project in place. However, the revised export model in Appendix I calculates net total export for the entire annual cycle, thus including non-winter periods of reduced flooding and periods coinciding with fertilizer applications. These annual constituent export results provide a more complete context for the discussion of water quality impacts.

The following appear to be inconsistencies or errors:

- DEIS, p. 103 -- It is stated that the project area serves more as a nutrient source rather than a nutrient sink. Appendix I (p. ii) -- It is stated that overall the basin is expected to retain or remove materials from headwaters and floodwaters.
- DEIS, Table 4.51 -- The caption refers to Season 1 and Season 2. These seasons are defined in Appendix I, but not in Section 4.11 of the DEIS.
- Appendix (p. 5) -- It is stated that the revised export model calculates a net total export for each year. The captions for Table 1 and Figures 3-10 refer to export model results for seasons, not the entire annual cycle.
- Appendix I, Equations 1-7 —They contain plus signs instead of multiplication signs and do not show any units for volumes, concentrations, or mass loads.
- Appendix I, Equation 3 -- The first term on the right hand side appears to be mass and the second term appears to be mass per unit time.

Significance: Low

Providing results from a sensitivity analysis of the revised export model, and correcting inconsistencies and errors, will strengthen the conclusions of the water quality analysis and improve the organization and readability of the DEIS.

Recommendations for Resolution:

1. Conduct sensitivity analyses for wetland function factors, export coefficients, constituent concentrations in floodwaters, and the assumed 50 percent reduction in the available load associated with inundation.
2. Improve the discussion in Section 4.11 of the DEIS by ensuring that summarized results from each of Sections 3.2, 3.3, 3.4, and 3.5 in Appendix I are incorporated.
3. Improve the discussion in Section 3.3 of Appendix I by integrating the results from Robertson et al. (2009) (cited on p. 103 in the DEIS) on watershed yields of nitrogen and phosphorus.

4. Include a conceptual diagram of the revised export model.
5. Include a box-and-arrow diagram showing individual constituent mass flux components for each land cover (wetlands, upland, agricultural lands, and “dry land”). It should also include inundation export and trapping fluxes.

Literature cited

Ashby, S.L., C.E. Ruiz and P.N. Deliman (2000). Water Quality. St. Johns Bayou and New Madrid Floodway Consolidated NEPA Document (Phase 1), Appendix I. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

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APPENDIX B

**St. Johns Bayou Phase 3 IEPR:
Final Charge Questions and Guidance to the Peer Reviewers
as submitted to the IEPR Panel on October 14, 2011**

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**Final Charge Questions and Guidance to the Peer Reviewers
for the
Independent External Peer Review of the St. Johns Bayou and New Madrid Floodway
Project, Missouri, Phase 3 - Draft Environmental Impact Statement (DEIS)**

BACKGROUND

The St. Johns Bayou and New Madrid Floodway Project, Missouri, is an authorized project with a portion of it already constructed. Due to environmentally based litigation, the U.S. District Court for the District of Columbia halted construction and ordered constructed work restored to pre-construction conditions. In response to this litigation, a current EIS is being prepared to address the requirements of the National Environmental Policy Act (NEPA). The purpose of this IEPR is to ensure that the scope of the current EIS is complete and scientifically accurate.

The St. Johns Bayou Basin and New Madrid Floodway Project area is located in Mississippi and New Madrid counties in southeastern Missouri along the right descending bank of the Mississippi River floodplain. The project area encompasses portions of two drainage basins separated by the Mississippi River and Tributaries Project's Birds Point-New Madrid Setback Levee.

The EIS will focus on Flood Risk Management (FRM) within the St. Johns Bayou Basin and the New Madrid Floodway. Agriculture is the primary economic resource within the project area. According to recent data, the 2-year backwater flood occurrence in the New Madrid Floodway inundates 33,391 acres, of which approximately 25,000 acres are agricultural lands. At high Mississippi River stages, the St. Johns Bayou Basin control gates are closed to prevent backwater flooding. However, closing the gates prevents interior drainage and leads to impounded interior. The 2-year flood event under these circumstances inundates approximately 11,900 acres, 7,110 of which are agricultural lands.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Independent External Peer Review of the St. Johns Bayou and New Madrid Floodway Project, Missouri, Draft and Final Environmental Impact Statement (EIS) (hereinafter: St. Johns Bayou Phase 3 IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

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

The purpose of the 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 St. Johns Bayou Phase 3 documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in wetland ecology, waterfowl biology, fishery biology, shorebird ecology, water quality, hydraulic and hydrologic engineering, economics and NEPA issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

The Panel will be “charged” with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-209, 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 members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

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

Documents for Review

The following documents are to be reviewed by designated discipline:

Phase 3 Review Documents		Document Review by Panel Member Discipline							
Review Document Title	Pages	Water Quality	Fish	H&H	Econ	NEPA	Wildlife	Shorebird	Wetland
Volume I									
DEIS	250	X	X	X	X	X	X	X	X
Appendix A - Figures	20	X	X	X	X	X	X	X	X
Appendix B - Econ and Social Analysis	65	X	X	X	X	X	X	X	X
Appendix C - H&H text	20	X	X	X	X	X	X	X	X
Appendix C - H&H figures	150	X	X	X	X	X	X	X	X
Appendix D - Historic	R	X	X	X	X	X	X	X	X

Phase 3 Review Documents		Document Review by Panel Member Discipline							
Review Document Title	Pages	Water Quality	Fish	H&H	Econ	NEPA	Wildlife	Shorebird	Wetland
Appendix E - Wetlands EMAP	25	X	X	--	--	X	X	X	X
Appendix E - Wetlands HGM	45	--	--	--	--	--	X	X	X
Appendix E - Wetlands 404(b)(1)	15	X	X	--	--	X	X	X	X
Appendix F - Waterfowl	25	--	X	--	--	X	X	X	--
Appendix G - Fisheries	50	--	X	X	--	X	X	X	--
Appendix I - Water Qual text	45	X	--	X	--	X	--	--	X
Appendix I - Water Qual program code	50	X	--	X	--	--	--	--	--
Appendix J - Threatened Endangered Species	30	--	--	--	--	X	--	--	X
Appendix K - HTRW	10	X	--	--	X	X	--	--	--
Appendix K - HTRW reference	R	X	X	X	X	X	X	X	X
Appendix L - Floodway Operations	30	X	X	X	X	X	X	X	X
Appendix M - WRP*	10	--	X	--	--	X	X	X	X
Appendix M - WETSORT*	50	--	X	--	--	--	X	X	X
Appendix M - Shorebird Sensitivity*	10	--	--	--	--	--	X	X	--
Volume II									
Public Scoping ¹	R	X	X	X	X	X	X	X	X
Interagency ² Coordination	R	X	X	X	X	X	X	X	X
Volume III³	R	X	X	X	X	X	X	X	X

¹ Volume II: Public Scoping-200 pages of comment for reference (R) only.

² Volume II: Agency Coordination- 125 pages for Reference (R) only.

³ Volume III- Reference (R) only.

Documents for Reference

- 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

Note: The table below represents the IEPR schedule originally presented to the panelists and differs from the actual review schedule.

Task	Action	Days to Complete Action	Due Date
Conduct Peer Review	Battelle sends review documents to Panel	Within 1 day of Panel being under subcontract	10/12/2011
	Battelle convenes kick-off meeting with Panel	Within 1 day of Panel being under subcontract	10/12/2011
	USACE/Battelle convenes kick-off meeting with Panel	Within 1 day of Panel being under subcontract	10/12/2011
	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	At the halfway point of Panel review	10/20/2011 and 10/21/2011
	Panel members complete their individual reviews	Within 20 days of Battelle/Panel kick-off meeting	11/9/2011
Prepare Final Panel Comments and Final IEPR Report	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	Within 4 days of panel members completing their review	11/16/2011
	Battelle convenes Panel Review Teleconference	Within 7 days of panel members completing their review	11/21/2011
	Final Panel Comments finalized	Within 4 days of receipt of draft Final Panel Comments	12/2/2011
	Battelle provides Final IEPR Report to Panel for review	Within 2 days Final Panel Comments being finalized	12/5/2011
	Panel provides comments on Final IEPR Report	Within 1 day of receipt of Final IEPR Report	12/6/2011
	*Battelle submits Final IEPR Report to USACE	Within 8 days of panel members providing draft Final Panel Comments to Battelle	12/7/2011
Comment/Response Process	Battelle convenes teleconference with Panel to review the Comment Response Process (if necessary)	Within 2 days of submittal of Final IEPR Report	12/9/2011

Task	Action	Days to Complete Action	Due Date
	USACE provides draft Evaluator Responses to Battelle	Within 5 days of receipt of Final IEPR Report	12/14/2011
	Battelle provides the Panel the draft Evaluator Responses	Within 0 day of receipt of draft Evaluator Responses and from USACE PDT	12/14/2011
	Panel members provide Battelle with draft comments on draft Evaluator Responses (i.e., draft BackCheck Responses)	Within 2 days of receipt of draft Evaluator Responses from Battelle	12/16/2011
Comment/ Response Process, Continued	Battelle convenes teleconference with Panel to discuss draft BackCheck Responses	Within 1 day of receipt of draft BackCheck Responses	12/16/2011
	Battelle convenes up to 3 teleconferences with Panel and USACE to discuss Final Panel Comments and draft responses	Within 6 days of USACE providing draft Evaluator Responses	12/19/2011 - 12/22/2011
	USACE enters final Evaluator Responses into DrChecks	Within 8 days of Final Panel Teleconference	1/3/2012
	Battelle provides final Evaluator Responses to Panel	Within 0 days of final Evaluator Responses being available	1/3/2012
	Panel members provide Battelle with final BackCheck Responses	Within 2 days of receipt of final Evaluator Responses	1/5/2012
	Battelle inputs the Panel's final BackCheck Responses into DrChecks	Within 2 days of notification that USACE final Evaluator Responses are available	1/9/2012
	*Battelle submits pdf printout of DrChecks project file	Within 1 day of receipt of Panel Backcheck Reponses	1/10/2012

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the St. Johns Bayou Phase 3 documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

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

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the St. Johns Bayou Phase 3 documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-209; 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 evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
7. Please focus the review on assumptions, data, methods, and models.

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

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

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

Please submit your comments in electronic form to Lauren Baker-Hart, bakerhartl@battelle.org, no later than November 9, 2011, 10 pm ET

**Independent External Peer Review
of the
St. Johns Bayou and New Madrid Floodway Project, Missouri, Draft and Final
Environmental Impact Statement (EIS)**

Final Charge Questions and Relevant Sections As Supplied By USACE

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 analysis and conclusions based on the analysis reasonable?
6. Is the quality and quantity of the surveys, investigations, and engineering sufficient for the Draft EIS?

Glossary and Terms

7. Are there any other terms that should be defined? If yes, please describe.

Section 1 – Purpose and Need

8. Is the purpose of the project adequately defined? If not, describe why.
9. Has the project need been described clearly? If not, describe why.
10. Are the project specific objectives adequately described? If not, describe why.
11. Are the selection criteria sufficient? If not, describe why.
12. Have public concerns been identified? If not, describe why.
13. In your opinion, are there any other relevant issues, resources, or concerns that have not been identified and or addressed?

Section 2 – Alternatives including the Proposed Action

14. Was a reasonable array of possible alternatives considered? If not, describe why.
15. Are the elimination criteria adequately described?
16. Are alternatives clearly described? Specifically are there any improvements in the discussion that can be made?
17. Please comment on the assumptions regarding the No Action Alternative.

18. Please comment regarding the following statement: “It is anticipated that with time, the Floodway would return to pre-operation conditions.”
19. Does the working draft EIS adequately demonstrate that the avoidance and minimization measures will have intended result/effect? If not, describe why.
20. Are mitigation features adequately described? If not, describe why.
21. Please comment on the suitability of mitigation features to each specific resource.
22. Please comment on the applicability of establishing warm season grass buffers on project channels.

Section 3 – Affected Environment

23. Is the project area clearly described? If not, describe why.
24. Are the hydraulic and hydrologic analyses adequate? Specifically should the period of record be extended?
25. Is the source of flooding (impounded interior runoff or backwater flooding) clearly explained? If not, describe why.
26. Has Does the role the flood pulse plays on social resources been adequately described? If not, describe why.
27. Are there any remaining social resource that should be included? If yes, please describe.
28. Has the role the flood pulse plays on economic resources been adequately described? If not, describe why.
29. Are there any remaining economic resources that need discussion? If yes, please describe.
30. Has the general role the flood pulse plays on environmental resources been adequately described (note specific issues are addressed below)? If not, describe why.
31. Please comment on the role a flood pulse plays in a manipulated environment and conclusions made in the EIS regarding its limited role in agrarian landscapes.
32. Are wetland resources adequately described? If not, describe why.
33. Was the method utilized to determine jurisdictional wetlands consistent with the methodology described in USACE’s February 2011 Work Plan? If not, describe why.
34. Are terrestrial wildlife resources adequately described? If not, describe why.
35. Are waterfowl resources adequately described? If not, describe why.
36. Are shorebird resources adequately described? If not, describe why.
37. Are fishery resources adequately described? If not, describe why.
38. Are freshwater mussel resources adequately described? If not, describe why.

39. Are endangered species adequately addressed? If not, describe why.
40. Is water quality adequately addressed? If not, describe why.
41. Is carbon footprint adequately addressed? If not, describe why.
42. Are cultural resources adequately addressed? If not, describe why.

Section 4 – Environmental Consequences

43. Are future changes to land use adequately discussed? If not, describe why.
44. Are changes to H+H adequately discussed? If not, describe why.
45. Are impacts/benefits to social resources adequately discussed? If not, describe why.
46. Are impacts/benefits to economic resources adequately discussed? If not, describe why.
47. Were impacts to wetlands and compensatory mitigation quantified consistent with the methodology described in the Work Plan and the HGM model? If not, describe why.
48. Have direct impacts to wetlands been adequately described? If not, describe why.
49. Have indirect impacts (change in flood frequencies and duration) been adequately described? If not, describe why.
50. Are impacts to wetlands and compensatory mitigation adequately discussed? If not, describe why.
51. Were impacts to terrestrial wildlife and compensatory mitigation quantified consistent with the methodology described in the Work Plan and the HEP model? If not, describe why.
52. Are impacts to terrestrial wildlife and compensatory mitigation adequately discussed? If not, describe why.
53. Were impacts to waterfowl and compensatory mitigation quantified consistent with the methodology described in the Work Plan and the HEP model? If not, describe why.
54. Are impacts to waterfowl and compensatory mitigation adequately discussed? If not, describe why.
55. Were impacts to shorebirds and compensatory mitigation quantified consistent with the methodology described in the Work Plan and the HEP model? If not, describe why.
56. Are impacts to shorebirds and compensatory mitigation adequately discussed? If not, describe why.
57. Please comment on USACE's position regarding additional mitigation for shorebirds as a result of compensating for impacts to other ecological resources.
58. Were impacts to fish and compensatory mitigation quantified consistent with the methodology described in the Work Plan and the HEP model? If not, describe why.

59. Are impacts to fish and compensatory mitigation adequately discussed? If not, describe why.
60. Are impacts to freshwater mussels adequately discussed? If not, describe why.
61. Are impacts to endangered species adequately discussed? If not, describe why.
62. Are impacts/benefits to water quality adequately discussed? If not, describe why.
63. Please comment on proposed stream mitigation features.
64. Are impacts to Mississippi River stages and New Madrid Floodway operation adequately discussed? If not, describe why.
65. Are cumulative impacts adequately described and discussed? If not, describe why.
66. Has global climate change been adequately considered? If not, describe why.

Section 5 – Compensatory Mitigation

67. Has the compensatory mitigation process been adequately described? If not, describe why.

Section 6 – Project Monitoring and Adaptive Management

68. Please comment on the USACE plan to monitor the project area and adaptively manage the project.
69. Please comment on the value of adaptive management.

Section 7 – List of Agencies

No questions

Section 8 – Coordination

No questions

Section 9 – Conclusions

No questions – reserved for Phase 4 IEPR.

Appendix A

70. Please comment on the clarity and adequacy of figures.

Appendix B

71. Was the economic analysis conducted consistent with the methodology described in the Project Work Plan? If not, describe why.

Appendix C

72. Was the H+H analysis conducted consistent with the methodology described in the Project Work Plan? If not, describe why.

Appendix D

73. Are historic conditions adequately described upon which to base cumulative impacts and develop compensatory mitigation? If not, describe why.

Appendix E

74. Was the wetland analysis conducted consistent with the methodology described in the Project Work Plan and HGM model? If not, describe why.
75. Please comment on the conclusions of the EMAP process.
76. Please comment on the conclusions of the HGM model.

Appendix F

77. Was the waterfowl analysis conducted consistent with the methodology described in the Project Work Plan and the waterfowl model? If not, describe why.

Appendix G

78. Was the fisheries analysis conducted consistent with the methodology described in the Project Work Plan and EnviroFish Model? If not, describe why.

Appendix H

79. Was the shorebird analysis conducted consistent with the methodology described in the Project Work Plan and shorebird model? If not, describe why.

Appendix I

80. Was the water quality analysis conducted consistent with the methodology described in the Project Work Plan? If not, describe why.

Appendix J

No questions

Appendix K

No questions – information only

Appendix L

No questions – information only

Appendix M

No questions – information only

Appendix N

No questions

Appendix O

No questions

Appendix N

81. Please comment on proposed mitigation methods?

Volume 2

No questions – information only

Volume 3

No questions – information only