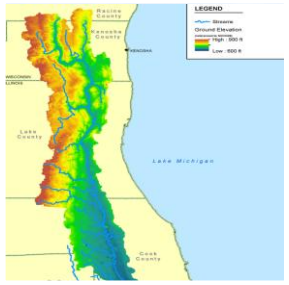
Battelle
The Business of Innovation

June 28, 2013

Final Independent External Peer Review Report Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase II Study)



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. W911NF-07-D-0001
Task Control Number: 09282
Delivery Order: 0796

This work was performed under the auspices of the U.S. Army Research Office Scientific Services Program administered by Battelle Memorial Institute, Contract No. W911NF-07-D-0001.

Final Independent External Peer Review Report Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase II Study)

by

Rachel N. Sell
Battelle
505 King Avenue
Columbus, OH 43201
(408) 728-7008, sellr@battelle.org

for

Department of the Army
U.S. Army Corps of Engineers
Flood Risk Management Planning Center of Expertise
Baltimore District
CENAB-PL-P, 10 South Howard Street
Baltimore, MD 21201
Mark Chalecki
(410) 962-4998, mark.s.chalecki@usace.army.mil

June 28, 2013

This page is intentionally left blank.

Final Independent External Peer Review Report for the

Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase II Study)

EXECUTIVE SUMMARY

Project Background and Purpose

The Upper Des Plaines River watershed originates in the agricultural landscape of Racine and Kenosha counties of southeastern Wisconsin. The watershed then slopes south into Illinois through Lake County and then Cook County, where it converges with the Salt Creek watershed near Riverside, Illinois. The Des Plaines River then flows southwest on to its confluence with the Kankakee River, where the two rivers combine to form the Illinois River.

The study area for this Phase II Study includes the entire drainage area upstream of the confluence with Salt Creek, including 12 major tributaries to the river. The Upper Des Plaines watershed covers approximately 484 square miles, an area that spans approximately 60 miles from north to south and 8 miles from east to west. The Upper Des Plaines River travels over 69 miles before its confluence with Salt Creek. Tributaries within the study area include about 330 miles of perennial and intermittent streams.

This study builds on the work completed in the Upper Des Plaines River Flood Damage Reduction Feasibility Study (Phase I Study), conducted under the Chicago – South End of Lake Michigan (C-SELM) Urban Water Damage Study Authority, contained in Section 206 of the 1958 Flood Control Act (P.L. 85-500). The Phase I Study was initiated to address severe overbank flooding along the Upper Des Plaines River. Two particularly severe events in 1986 and 1987 together caused over $100 million in damages. Federal interest in flood risk management in the Upper Des Plaines watershed was established in a Reconnaissance Report that preceded the Phase I Study and was approved in 1989. The Phase I Study investigated plans for urban flood risk management in the Upper Des Plaines River watershed and recommended six projects to reduce mainstem flooding. The Feasibility Report was approved in 1999 and the recommended projects were authorized in Section 101 of Water Resources Development Act (WRDA) 1999. Project benefits, if all projects are built, would result in a 25% reduction in flood damages. This Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (hereinafter Upper Des Plaines Phase II Study) provides an opportunity to develop a more comprehensive solution to ongoing occurrences of flooding in the Upper Des Plaines River watershed, evaluating plans to manage flood risk on both the mainstem and tributaries.

The study area for the Upper Des Plaines Phase II study encompasses the Phase I study area as well as the Des Plaines headwaters in Wisconsin and all tributaries to the mainstem. In addition, the study authorization directs the Secretary to develop plans that also address environmental restoration and protection, water quality, recreation, and related purposes.

The Upper Des Plaines Phase II Study has two primary purposes: further reduction of flooding along the mainstem and tributaries, and environmental restoration of degraded ecosystems within the basin. Secondary purposes are improving water quality and enhancing recreational opportunities throughout the basin. The study will consider sites located within tributary watersheds and along the mainstem for both Flood Risk Management (FRM) and Ecosystem Restoration (ER) potential. The effects of FRM sites within tributary watersheds on mainstem flooding will also be evaluated.

The combined plan developed for the Upper Des Plaines Phase II Study has been formulated to build on and extend the benefits achieved by the Upper Des Plaines River Flood Damage Reduction Feasibility Study (Phase I Study). The authorized plan developed through the Phase I Study addressed flood risk within the Upper Des Plaines River watershed in Illinois. This Phase II Study recommends a plan that further manages flood risk on the Des Plaines mainstem in both Illinois and Wisconsin, manages flood risk on tributaries to the mainstem, and, additionally, restores degraded ecosystems within the study area.

Separate plans were formulated to meet the flood risk management and ecosystem restoration study purposes, resulting in distinct FRM and ER plans. These plans have been combined into a multipurpose FRM/ER plan. The Full FRM and ER Plans include all the features of the Full, National Economic Development (NED), National Ecosystem Restoration (NER), and Continuing Authorities Program (CAP) Plans. The single-purpose plans can be compared to determine if any components are interdependent. Interdependent elements share the same physical location, resources, or functions and have the potential to either negatively affect one another or compete for the same resources. When interdependence occurs, the outputs from the elements that cause impacts or are in competition with each other must be traded off. If the elements are independent – there is no competition for the resources – and do not affect one another, trade-offs are not necessary. If the plans are independent, the combined plan simply includes each element identified in the single-purpose plans.

The Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment presents three tentatively recommended plans:

1. Full Plan – includes all economically justified, environmentally acceptable separable features evaluated during the course of the study
2. NED/NER Plan – includes all policy compliant, economically justified, environmentally acceptable separable features of such scope that they could not reasonably be implemented under the CAP
3. CAP Plan – includes all policy compliant, economically justified, environmentally acceptable separable features of such scope that they could reasonably be implemented under CAP.

Independent External Peer Review Process

The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the Upper Des Plaines Phase II Study. As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2010, 2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Upper Des Plaines Phase II Study. 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, 2012) and OMB (2004).

This IEPR was conducted in two parts. The first review (Component A), conducted in 2010, assessed the Upper Des Plaines Phase II Study document, which was 90% complete, with NED and NER Plans. The second review (Component B), conducted in 2013, assessed the final draft version of the Upper Des Plaines Phase II Study document (including appendices). Because the Component B decision document is the complete document following the Alternative Formulation Briefing (AFB), the results and Final Panel Comments from the Component B IEPR are the primary focus of this final report. The report also describes the IEPR process for both the Component A and B reviews, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

Based on the technical content of the Upper Des Plaines Phase II Study review documents and the overall scope of the project, Battelle identified candidates for the Panel in five key technical areas: plan formulation, hydraulic engineering, geotechnical engineering, ecology, and economics. Five panel members were selected for the IEPR. USACE was given the list of candidate panel members, but Battelle made the final selection of the original Component A Panel. Three of the Component A panel members were able to participate in the Component B review. Due to contract extensions and the protracted period of performance, it was necessary to replace and identify new hydraulic engineering and plan formulation panelists for the Component B review. USACE was given the names of these two new candidate panel members, but Battelle made the final selection of the Component B Panel.

For both the Component A and Component B reviews, the Panel received hard copy and electronic versions of their respective documents along with a charge that solicited comments on specific sections of the documents to be reviewed. Battelle developed the charge questions for the Component A review following guidance provided in USACE (2010, 2012) and OMB (2004). USACE was given the opportunity to provide comments and revisions, and subsequently approved the final charge questions. For the Component B review, USACE prepared the charge questions adhering to guidance in USACE (2010, 2012) and OMB (2004) and provided them to Battelle. These charge questions and guidance were provided to the Panel, which are included in Appendix C.

For both the Component A and B reviews, the USACE Project Delivery Team briefed the Panel and Battelle during kick-off meetings held via teleconference prior to the start of the reviews and

mid-review meetings held via teleconference near the end of the reviews to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than these teleconferences, there was no direct communication between the Panel and USACE during the peer review process. As part of the Component A review, the Panel produced more than 300 individual comments in response to the 185 charge questions. As part of the Component B review, the Panel produced approximately 300 individual comments in response to the 91 charge questions.

IEPR panel members reviewed the Upper Des Plaines Phase II Study documents individually. For both the Component A and B reviews, the panel members 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.

For the Component A review, 22 Final Panel Comments were identified and documented. Of these, six were identified as having high significance, eight had medium significance, and eight had low significance. For the Component B review, 16 Final Panel Comments were identified and documented. Of these, two were identified as having high significance, seven had medium significance, and seven had low significance.

Results of the Independent External Peer Review

Because the Component B decision document consists of the complete set of review materials following the AFB, the results and Final Panel Comments from the Component B IEPR are the primary focus of this final report. The panel members agreed among themselves on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2010, 2012; p. D-4) in the Upper Des Plaines Phase II Study review documents. Table ES-1 lists the Final Panel Comments statements by level of significance. The full text of the Component B Final Panel Comments is presented in Appendix B of this report.[1] The following summarizes the Panel's findings from the Component B review.

Based on the Panel's review, the report is well-organized and provides an excellent presentation of information through the use of maps, diagrams, and tables. It is apparent that great effort was made to identify all reasonable alternatives. While the report adequately assesses the plan formulation, economic, and environmental issues for the Upper Des Plaines Phase II Study project, the Panel identified several elements of the report that should be clarified or revised, especially with respect to engineering issues. A summary of the most important findings are presented below.

[1] Final Panel Comments from the Component A are provided in Appendix A and have been documented in DrChecks.

Plan Formulation

The Panel found that the Plan Formulation process is easy to follow and the assumptions, methodologies, and results provide a well-reasoned and systematic basis for selecting the three tentatively recommended plans for this study: a Full Plan, an NED/NER Plan, and a CAP Plan. Each plan is formulated in accordance with USACE plan formulation guidelines and considers mitigation of adverse effects.

Of some concern though is the with- and without-project conditions and the basis for estimating flood damage reduction, which assumes that the six flood risk management projects from Phase I are completed. Modification of any of these projects potentially affects benefits from the flood risk management projects proposed in the Phase II study. The Panel believes this is a consideration that should be acknowledged and described further to ensure that the proposed plans accurately represent the most likely reduction in flood damages if some of the six proposed Phase I projects are not funded and constructed as proposed. Potential relocations as a result of the six Phase I projects should also be evaluated to determine impact on costs, benefits, and benefit-to-cost ratios if relocations are delayed or not achieved.

The Panel believes that without a sensitivity analysis or discussion of how the assumptions influence the plans, the level of completeness associated with the models and analyses cannot be fully determined. This issue can be readily addressed by evaluating the available documentation for each assumption, adding that discussion to the report, and conducting a sensitivity analyses of the assumptions surrounding the variables in the models or analyses, thus identifying the critical variables and processes to be closely monitored as the chosen plan is developed.

The Panel also considers there is some chance that the combination of different flood risk management projects (e.g., levees with one or more off-channel reservoirs) could provide technically and economically feasible solutions to further reduce the risk of flooding related damage. On an individual basis, these projects may not result in a positive net benefit, or benefit-to-cost ratio greater than one, and so they may have been prematurely discarded during the screening and evaluation of sites. However, when combined, they could offer the level of flood damage reduction that would translate into a benefit that is greater than the cost of the projects combined, and thus be compliant with ER 1105-2-100 and related guidelines. It is worthwhile acknowledging that with limited space available (because the basin is densely developed where flood damages are the greatest) and little topographic relief to take advantage of (because the area is very flat), more than one additional reservoir might be needed to provide effective flood damage reduction, and this integrated approach could help further reduce to some degree the still significant residual flood damages.

The Panel suggests the useful approach of correlating (economic) benefits with the magnitude of flood damage reduction required to accomplish those benefits in advance of evaluating sites for flood risk management. In this way, some guidance on the magnitude of reduction in peak flows and/or hydrograph volumes would be available to the site evaluator to look for combining sites or types of flood risk management projects proposed to achieve technically and economically feasible flood damage reduction.

Engineering

The report provides adequate levels of detail to understand the hydrologic and hydraulic characteristics of the study area under current baseline conditions, but does not describe clearly the calibration of the hydrologic and hydraulic models in the Upper Des Plaines Phase II report. The Panel acknowledges the comprehensive effort put into calibrating the hydrologic and hydraulic models available through the 1990s, documented in the Phase I report; however, outstanding questions about the accuracy of the hydrologic and hydraulic models and reliance of oversimplified flood routing with hydrologic methods instead of hydraulic methods need to be addressed in the Phase II study. This issue can be resolved by including more details regarding the calibration of the hydrologic and hydraulic models (model versus observed values) and validating the accuracy of the hydrologic and hydraulic models against more recent historical floods for which input information can be readily available (e.g., the 2008 flood).

In addition, the report does not provide adequate levels of geotechnical detail to support reliable exploration at the project sites. Changes in site conditions and other costs associated with geotechnical conditions revealed during construction could result in construction problems, delays, and added costs not considered during design. This issue can be resolved by reviewing geologic conditions anticipated at each of the proposed flood damage mitigation elements, assessing the impact of variable soils on the proposed construction site, and obtaining supplemental geotechnical information before completing the design phase should the results of any geotechnical analyses indicate structure performance is likely to be less than required. Impacts from raising roads and constructing floodwalls on existing infrastructure, residences, and commercial facilities, notably, the main entrance of these structures from Ashley Street, have not been adequately addressed. This is an important risk that should be acknowledged and resolved through a review of existing topography and confirmation that all existing commercial and residential driveways and building access walks can be reached by normal means.

Economics

The economic analysis is concise and complies with USACE requirements outlined in ER 1105-2-100. Development of data and use of Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) and Visual Interactive System for Transportation Algorithms (VISTA) software appear to be technically sound. The Panel noted, however, that there is no discussion of how benefits for non-structural alternatives are calculated, or if they are excluded in the HEC-FDA calculations. This can be addressed by adding a discussion to detail the methodology used to calculate damage reduction for the non-structural alternatives.

Future development is also not discussed sufficiently to determine how risk and uncertainty associated with that development will affect the with-project conditions. This issue can be resolved by relating risk and uncertainty parameters to the range of future development expected as one of the proposed plan(s) is implemented and considering the impacts of varying levels of development on the relevant variables that could affect the NED/NER plan.

Environmental

Environmental documentation is thorough and comprehensive throughout the document, and provides an adequate environmental justification for the three tentatively recommended plans.

All environmental models appear to have been used in an appropriate manner and the environmental assessment appears to satisfy the requirements of the National Environmental Policy Act (NEPA). Many of the environmental final panel comments raised during the Component A review were effectively addressed and incorporated into the current report.

The Panel noticed, however, a lack of detail for the prescribed burning regimen enabling understanding and support from affected property owners. The Panel believes it is necessary to provide information on the procedures that will be followed so that the prescribed burns are conducted without a safety hazard to people or property. The Panel also believes that the objective of reducing cover of invasive plants to less than 1% or even 5% is admirable but unrealistic given the current state of the art. This can be addressed by clarifying whether the objective is a suggested target or a required success criterion and discussing how frequently reduction of invasive plant cover below levels of 5% or 1% has been attained and maintained in real-world projects. Finally, the Panel considers that better documenting site specific information on existing conditions and feasibility designs of proposed riverine restoration projects is useful to support estimated gains in habitat units that can be attributable to these projects.

Table ES-1. Overview of 16 Final Panel Comments Identified by the Upper Des Plaines Phase II Study IEPR Panel

No.	Final Panel Comment
Significance – High	
1	Assumptions used for the with- and without-project conditions for the six Phase I projects and the basis for estimating flood damage reduction may no longer be valid.
2	There is a general lack of geotechnical data to support reliable exploration at the project sites.
Significance – Medium	
3	There is insufficient detail about the prescribed burning regimen to ensure understanding and support from affected property owners.
4	The calibration of the hydrologic and hydraulic models has not been documented in the Phase II report, and the relevant information in the Phase I report shows significant discrepancies between model and observed values.
5	The impacts from raising roads and constructing floodwalls on existing infrastructure, residences, and commercial facilities have not been adequately addressed.
6	The current alignment of DPLV09 - Segment 3 is not the most efficient and effective way to mitigate the risk of flood damage in the unprotected area.
7	The assumptions associated with models and analyses lack thorough documentation and explanation, making it difficult to assess their influence on conclusions.
8	The objective of achieving restored habitats with less than 1% cover of invasive plant species seems highly unrealistic given the current state of the art.

Table ES-1. Overview of 16 Final Panel Comments Identified by the Upper Des Plaines Phase II Study IEPR Panel (continued)

No.	Final Panel Comment
9	The proposed riverine restoration projects do not include site-specific information on existing conditions and feasibility designs, which is considered necessary to support estimated gains in habitat units that can be attributable to these projects.
	Significance – Low
10	Future development is not discussed sufficiently to determine how risk and uncertainty associated with that development will affect the with-project conditions.
11	It is not clear when ditch filling will be applied instead of ditch plugging in wetland restoration.
12	Public concerns and the outreach process have not been identified nor adequately described.
13	Potential relocations as a result of the six Phase I projects have not been adequately addressed.
14	There is no discussion of how benefits for non-structural alternatives are calculated, or if they are excluded in the Hydrologic Engineering Center- Flood Damage Reduction Analysis calculations.
15	Uncertainty surrounding benefits from the Full, National Economic Development (NED)/National Ecosystem Restoration (NER), and Continuing Authorities Program (CAP) plans is not clearly analyzed or presented.
16	It is not clear whether models based on subjective expert analyses could be replicated by a different team of experts and whether they would vary significantly.

This page is intentionally left blank.

Table of Contents

List of Tables

LIST OF ACRONYMS

AFB	Alternative Formulation Briefing
ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
BCR	Benefit Cost Ratio
C-SELM	Chicago – South End of Lake Michigan
CAP	Continuing Authorities Program
CCHD	Cook County Highway Department
CE/ICA	Cost Effective/Incremental Cost Analysis
COI	Conflict of Interest
DOT	Department of Transportation
DrChecks	Design Review and Checking System
E-TEAM	Interagency Ecosystem Assessment Team
EAD	Equivalent Annual Damages
ER	Ecosystem Restoration
ERDC	Engineering Research and Development Center
FCI	Functional Capacity Index
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FQA	Floristic Quality Assessment
FRM	Flood Risk Management
GIS	Geographic Information Systems
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEP	Habitat Evaluation Procedure
HGM	Hydrogeomorphic Model
HTRW	Hazardous, Toxic, Radioactive Wastes
IBI	Index of Biotic Integrity
IDNR	Illinois Department of Natural Resources
IEPR	Independent External Peer Review
INDOT	Indiana Department of Transportation
IWR	Institute for Water Resources

LCSMS	Lake County Stormwater Management Commission
LERRD	Land, easements, rights-of-way, relocation, and disposal
NED	national economic development
NEPA	National Environmental Policy Act
NER	national ecosystem restoration
O&M	Operation and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OWR	Office of Water Resources
PDT	Project Delivery Team
QHEI	Qualitative Habitat Evaluation Index
SAME	Society of American Military Engineers
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SI	Sustainability Index
SWS	Society of Wetland Scientists
T&E	Threatened and Endangered
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VISTA	Visual Interactive System for Transportation Algorithms
WRDA	Water Resources Development Act

1. INTRODUCTION

The Upper Des Plaines River watershed originates in the agricultural landscape of Racine and Kenosha counties of southeastern Wisconsin. The watershed then slopes south into Illinois through Lake County and then Cook County, where it converges with the Salt Creek watershed near Riverside, Illinois. The Des Plaines River then flows southwest on to its confluence with the Kankakee River, where the two rivers combine to form the Illinois River.

The study area for this Phase II Study includes the entire drainage area upstream of the confluence with Salt Creek, including 12 major tributaries to the river. The Upper Des Plaines watershed covers approximately 484 square miles, an area that spans approximately 60 miles from north to south and 8 miles from east to west. The Upper Des Plaines River travels over 69 miles before its confluence with Salt Creek. Tributaries within the study area include about 330 miles of perennial and intermittent streams.

This study builds on the work completed in the Upper Des Plaines River Flood Damage Reduction Feasibility Study (Phase I Study), conducted under the Chicago – South End of Lake Michigan (C-SELM) Urban Water Damage Study Authority, contained in Section 206 of the 1958 Flood Control Act (P.L. 85-500). The Phase I Study was initiated to address severe overbank flooding along the Upper Des Plaines River. Two particularly severe events in 1986 and 1987 together caused over $100 million in damages. Federal interest in flood risk management in the Upper Des Plaines watershed was established in a Reconnaissance Report that preceded the Phase I Study and was approved in 1989. The Phase I Study investigated plans for urban flood risk management in the Upper Des Plaines River watershed and recommended six projects to reduce mainstem flooding. The Feasibility Report was approved in 1999 and the recommended projects were authorized in Section 101 of Water Resources Development Act (WRDA) 1999. Project benefits, if all projects are built, would result in a 25% reduction in flood damages. This Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (hereinafter Upper Des Plaines Phase II Study) provides an opportunity to develop a more comprehensive solution to ongoing occurrences of flooding in the Upper Des Plaines River watershed, evaluating plans to manage flood risk on both the mainstem and tributaries.

The study area for the Upper Des Plaines Phase II study encompasses the Phase I study area as well as the Des Plaines headwaters in Wisconsin and all tributaries to the mainstem. In addition, the study authorization directs the Secretary to develop plans that also address environmental restoration and protection, water quality, recreation, and related purposes.

The Upper Des Plaines Phase II Study has two primary purposes: further reduction of flooding along the mainstem and tributaries, and environmental restoration of degraded ecosystems within the basin. Secondary purposes are improving water quality and enhancing recreational opportunities throughout the basin. The study will consider sites located within tributary watersheds and along the mainstem for both Flood Risk Management (FRM) and Ecosystem Restoration (ER) potential. The effects of FRM sites within tributary watersheds on mainstem flooding will also be evaluated.

The combined plan developed for the Upper Des Plaines Phase II Study has been formulated to build on and extend the benefits achieved by the Upper Des Plaines River Flood Damage Reduction Feasibility Study (Phase I Study). The authorized plan developed through the Phase I Study addressed flood risk within the Upper Des Plaines River watershed in Illinois. This Phase II Study recommends a plan that further manages flood risk on the Des Plaines mainstem in both Illinois and Wisconsin, manages flood risk on tributaries to the mainstem, and, additionally, restores degraded ecosystems within the study area.

Separate plans were formulated to meet the flood risk management and ecosystem restoration study purposes, resulting in distinct FRM and ER plans. These plans have been combined into a multipurpose FRM/ER plan. The Full FRM and ER Plans include all the features of the Full, National Economic Development (NED), National Ecosystem Restoration (NER), and Continuing Authorities Program (CAP) Plans. The single-purpose plans can be compared to determine if any components are interdependent. Interdependent elements share the same physical location, resources, or functions and have the potential to either negatively affect one another or compete for the same resources. When interdependence occurs, the outputs from the elements that cause impacts or are in competition with each other must be traded off. If the elements are independent – there is no competition for the resources – and do not affect one another, trade-offs are not necessary. If the plans are independent, the combined plan simply includes each element identified in the single-purpose plans.

The Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment presents three tentatively recommended plans:

1. Full Plan – includes all economically justified, environmentally acceptable separable features evaluated during the course of the study
2. NED/NER Plan – includes all policy compliant, economically justified, environmentally acceptable separable features of such scope that they could not reasonably be implemented under the CAP
3. CAP Plan – includes all policy compliant, economically justified, environmentally acceptable separable features of such scope that they could reasonably be implemented under CAP.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Upper Des Plaines Phase II Study in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE) Engineer Circular (EC) *Civil Works Review Policy* EC 1165-2-209 and Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review* (OMB, 2004).[2] Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.
Because the Component B decision document consists of the complete set of review materials following the Alternative Formulation Briefing (AFB), the results and Final Panel Comments from the Component B IEPR are the primary focus of this final report. The report also details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final

[2] On December 15, 2012, USACE issued Civil Works Review (EC 1165-2-214), which supersedes EC 1165-2-209. However, the contract for this IEPR was awarded on February 1, 2010, before EC 1165-2-214 took effect. Accordingly, all tasks under this contract, including development of this IEPR report, were performed under Civil Works Review Policy EC 1165-2-209.

Panel Comments of the IEPR Panel on the existing environmental, economic, and engineering analyses contained in the Upper Des Plaines Phase II Study. The full text of the Final Panel Comments is presented in Appendix A and Appendix B.[3]

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 (2012).

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 plan formulation, 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 Upper Des Plaines Phase II Study was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-214) 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 of the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2010, 2012) and in accordance with 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 (February 1, 2010), 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, or in subsequent electronic mail communication to USACE.

As part of the first (i.e., Component A) review, Battelle developed the charge questions. USACE was given the opportunity to provide comments and revisions, and subsequently approved the 141 final charge questions, which were included in the draft and final Work Plans. As part of the second (i.e., Component B) review, USACE developed 82 charge questions. Battelle was given

[3] This IEPR was conducted in two parts. The first review (Component A) was conducted in 2010, and the second review (Component B) was conducted in 2013.

the opportunity to provide comments and revisions; however, USACE subsequently approved the final charge questions. In the middle of the review, USACE provided nine additional charge questions for the Component B panel members. This brought the total number of Component B charge questions to 91. The final charge for the review also included general guidance for the Panel on the conduct of the Component B peer review (provided in Appendix C of this final report).

Table 1 presents the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on the notice to proceed of February 1, 2010. USACE provided the review documents for Component A on September 14, 2010, and for Component B on May 20, 2013.[4] Note that the work items listed in Task 7 occur after the submission of this report. As part of the initial Component A review, Battelle entered the 22 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 could review and respond to them. As part of Component B, Battelle will enter the 16 Final Panel Comments developed by the Panel into DrChecks. For both Component A and B reviews, USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. Battelle will document all USACE and Panel responses and provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closure, as a final deliverable and record of the IEPR results.[5]

Table 1. Upper Des Plaines Phase II Study IEPR Schedule

		Due Dates	
Task	Action	Component A	Component B
1	Notice to Proceed	2/1/2010	
	USACE provides review documents	9/14/2010	
	Battelle submits draft Work Plan[a]	7/20/2010	
	USACE provides comments on draft Work Plan	7/26/2010	
	Battelle submits final Work Plan[a]	7/30/2010	
2	Battelle requests input from USACE on the COI questionnaire	4/23/2010	
	USACE provides comments on COI questionnaire	4/28/2010	
	Battelle submits list of selected panel members[a]	5/14/2010	5/17/2013
	USACE confirms the Panel has no conflicts of interest	5/19/2010	5/20/2013

[4] The Upper Des Plaines Phase II Study review documents underwent revisions that delayed the project schedule between 2010 and 2013.
[5] Task 7 will be completed under a separate contract/task order.

Table 1. Upper Des Plaines Phase II Study IEPR Schedule (continued)

		Due Dates	
Task	Action	Component A	Component B
	Battelle completes subcontracts for panel members	7/19/2010	5/23/2013
3	Battelle submits draft Charge in Work Plan for Component A review	7/20/2010	
	USACE submits draft Charge to Battelle for Component B review		5/17/2013
4	Battelle convenes kick-off meeting with USACE	5/7/2010	5/14/2013
	Battelle convenes Panel kick-off meeting	8/5/2010	5/24/2013
	Battelle convenes USACE/Panel kick-off meeting	8/5/2010	5/24/2013
	Battelle sends review documents to Panel	11/2/2010	5/20/2013
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	11/23/2010	6/5/2013
5	Panel members complete their individual reviews	12/6/2010	6/10/2013
	Battelle provides panel members with talking points for Panel Review Teleconference	12/10/2010	6/12/2013
	Battelle convenes Panel Review Teleconference	12/10/2010	6/12/2013
	Panel members provide draft Final Panel Comments to Battelle	12/20/2010	6/19/2013
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	12/20 – 1/24/2010	6/20 – 6/26/2013
	Battelle finalizes Final Panel Comments	2/18/2011	6/26/2013
6	Battelle submits Final IEPR Report to USACE[a]		6/28/2013
7	Comment/Response process[b]		TBD
CW RB	Civil Works Review Board[c]		TBD
	Project Closeout		6/30/2013

a Deliverable.

b Task 7 occurs after the submission of this report under a separate contract/task order.

c The Civil Works Review Board will be completed under a separate contract/task order.

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: plan formulation, hydraulic engineering, geotechnical engineering, ecology, and economics. These areas correspond to the technical content and overall scope of the Upper Des Plaines Phase II Study IEPR.

To identify candidate panel members for the Component A review, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential COIs. Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and

availability, and ultimately selected five experts for the final Panel. The five selected reviewers constituted the final Panel for the Component A review. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required. Three of the Component A panel members were able to serve on the Component B Panel. However, due to contract extensions and the protracted period of performance, it was necessary to replace and identify new hydraulic engineering and plan formulation panelists for the Component B review.

For both the Component A and B reviews, the candidates were screened for the following potential exclusion criteria or COIs.[6] 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[7] in the any part of the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase I or Phase II).
- Involvement by you or your firm[7] in flood risk management, ecosystem restoration, water quality improvement, or recreation in the Upper Des Plaines Watershed, Des Plaines River, Illinois River, Salt Creek, or Kankakee River.
- Current employment by USACE.
- Involvement with paid or unpaid expert testimony related to the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study.
- Current or previous employment or affiliation with members of the project study team, including the Illinois Dept. of Natural Resources, Lake County Stormwater Management Commission, Cook County (Illinois), Kenosha County (Wisconsin), Wisconsin Dept. of Natural Resources, Southeastern Wisconsin Regional Planning Commission, Chicago Metropolitan Agency for Planning, Lake County Forest Preserve District, Forest Preserve District of Cook County, Northwest Municipal Conference, Upper Des Plaines River Partnership, Cook County Highway Department, Metropolitan Water Reclamation District of Greater Chicago, and U.S. Fish and Wildlife Service (USFWS) and currently working on Upper Des Plaines River Basin-related projects (for pay or pro bono).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to Upper Des Plaines River watershed.

[6] 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."

[7] Includes any joint ventures in which a panel member's firm is involved and if the firm serves as a prime or as a subcontractor to a prime.

- Current personal involvement in other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Chicago District.
- Current firm[7] involvement in other USACE projects, specifically those projects/contracts that are with the Chicago District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by USACE as a direct employee or contractor (either as an individual or through your firm[7]) within the last 10 years, notably if those projects/contracts are with the Chicago District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood risk management, ecosystem restoration, water quality improvement, or recreation, and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[7] revenues within the last 3 years came from USACE contracts.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase I or Phase II).
- Participation in relevant prior Federal studies relevant to this project and/or Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase I or Phase II).
- Participation in prior non-Federal studies relevant to this project and/or Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase I or Phase II).
- Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project?

In selecting the final members of both Panels, Battelle chose experts who best fit the expertise areas and had no COIs. The final reviewers were affiliated with academic institutions, consulting companies, or were independent 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 selection of the Panel. Section 4 of this report provides names and biographical information on the Component B panel members.

3.3 Conduct of the IEPR

Before beginning their reviews, the members of the Panels 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. In the Component A review, the meeting took place within three days of subcontracts being finalized. In the Component B review, the meeting took place within one day of subcontracts being finalized.

Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panels received an electronic version of the final charge as well as the review documents and reference materials.

Component A consisted of the Upper Des Plaines Phase II Feasibility Study (90% complete report with the NED and NER plans). The documents and files in bold font were provided for review; the other documents were provided for reference or as supplemental information only. For Component A, USACE provided:

- **Upper Des Plaines River and Tributaries, Phase II, Illinois and Wisconsin Feasibility Study**
    - **Main Report Volumes 1-3**
    - **Appendix A: Hydrology & Hydraulics**
    - **Appendix B: NED Plan Formulation**
    - **Appendix C: NER Plan Formulation**
    - **Appendix D: Civil Design**
    - **Appendix E: Economic Analysis**
    - **Appendix F: Cost Engineering**
    - **Appendix H: Preliminary Hazardous, Toxic, Radioactive Wastes (HTRW) Screening**
- **USACE guidance Civil Works Review Policy, (EC 1165-2-209) dated January 31, 2010**
- **Office of Management and Budget's Final Information Quality Bulletin for Peer Review released December 16, 2004.**

Throughout the review period, at the request of panel members, USACE provided additional documents, which Battelle sent to the Panel. These documents were treated as additional information only and were not part of the official review. The Component A Panel requested:

- Riverine Average Annual Habitat Units
- Depth-damage curves developed by URS
- URS Final Project Report Upper Des Plaines Structure Inventory and Nonresidential Surveys
- Development of Hydrologic % Hydraulic Models by Tributary
- Cost unit bid prices, cost annualization, cost estimate work sheet.

Component B consisted of the draft final Upper Des Plaines Phase II Study (including appendices). For Component B, USACE provided:

- **Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment – Main Report, May 2013 (Draft) (284 pages)**
- **Appendix A: Hydrology & Hydraulics, Plates and Appendices (133 pages)**
- **Appendix B: NED Plan Formulation (99 pages)**
- **Appendix C: NER Plan Formulation (16 pages)**
- **Appendix D: Civil Design (148 pages)**
- **Appendix E: Economic Analysis (94 pages)**
- **Appended E: Attachment 1 (Final Project Report, Upper Des Plaines Structure Inventory and Nonresidential Surveys) (186 pages)**
- **Appendix F: Cost Engineering (79 pages)**
- **Appendix G: Geotechnical Analysis (631 pages)**
- **Appendix H: HTRW Report (266 pages)**
- **Appendix I: Real Estate (37 pages)**
- **Appendix L: Coordination (46 pages)**
- **Appendix M: Monitoring Plan (9 pages)**
- **Appendix N: Clean Air Act General Conformity Report (34 pages)**
- **Finding of No Significant Impact (FONSI) (3 pages)**
- **USACE guidance Civil Works Review, (EC 1165-2-214) dated 15 December 2012**
- **Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004**.

Throughout the Component B review period, USACE provided documents at the request of panel members; USACE provided additional documents, which Battelle sent to the Panel. These documents were treated as additional information only and were not part of the official review. The Panel requested:

- Attachment 1 of the Phase I Study, Appendix A, Hydrology & Hydraulics
- Exhibit A and Exhibit B of the Real Estate Appendix I
- Phase I model calibration information dated June, 1999
- Attachment 3 Previous Borings – addendum
- White Paper on the Hofmann, Armitage and Fairbanks Dams Removal & Potential of Asian Carp Dispersal.

About halfway through both the Component A and Component B reviews, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. During Component A, Battelle submitted 15 panel member questions to USACE before the teleconference and received

responses to all of the questions during the teleconference. During Component B, Battelle submitted 28 panel member questions to USACE before the teleconference and received responses to all of the questions during the teleconference.

3.4 Review of Individual Comments

The Panels for both Component A and Component B were instructed to address the charge questions/discussion points within a charge question response table provided by Battelle.

At the end of the review period, the Component A Panel produced 300 individual comments in response to 185 charge questions/discussion points. After reviewing the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions, Battelle summarized the 300 comments in a preliminary list of 25 overall comments and discussion points.

The Component B Panel also produced 300 individual comments in response to 91 charge questions/discussion points. After reviewing the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions, Battelle summarized the 300 comments in a preliminary list of 26 overall comments and discussion points.

During both the Component A and Component B reviews, each panel member's individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

For both the Component A and the Component B review, Battelle facilitated a 4-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member 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.

During the Component A review, there were no responses to specific charge questions where there appeared to be disagreement among panel members. At the end of these discussions, the Panel identified 25 comments and discussion points to be brought forward as Final Panel Comments.

During the Component B review, the Panel 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 18 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following both the Component A and Component B teleconferences, 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 Upper Des Plaines Phase II Study:

- 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 the other panel member 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).

In both the Component A and Component B reviews, 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.

During the Final Panel Comment development process of Component A, the Panel determined that three of the Final Panel Comments could be either dropped or merged into other Final Panel Comments; therefore, the total Final Panel Comment count was reduced to 22. At the end of this process, 22 Final Panel Comments were prepared and assembled.

During the Final Panel Comment development process of Component B, the Panel determined that two of the Final Panel Comments could be either dropped or merged into other Final Panel Comments; therefore, the total Final Panel Comment count was reduced to 16. At the end of this process, 16 Final Panel Comments were prepared and assembled.

At no time during the preparation of the Final Panel Comments was there any direct communication between the Panel and USACE. Component A Final Panel Comments are presented in Appendix A of this report; Component B Final Panel Comments are presented in Appendix B.

4. PANEL DESCRIPTION

Candidates for the Component A Panel were identified using Battelle's Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and referrals. Battelle prepared a draft list of primary and backup candidate panel members (who were screened for availability, technical background, and COIs), and provided it to USACE for feedback. Battelle made the final selection of panel members. Due to contract extensions and the protracted period of performance, it was necessary to replace and identify new hydraulic engineering and plan formulation panelists for the Component B review [8]

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

[8] Biographical information for the two panel members that had to be replaced after the Component A review have not been presented.

Table 2. Upper Des Plaines Phase II Study IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Wong	Bird	Schachtschneider	Newling	Casavant
Hydraulic Engineering					
Minimum 10 years of experience in hydrologic and hydraulic engineering with emphasis on large public works projects	X				
Familiarity with USACE application of risk and uncertainty analyses in flood risk management studies	X				
Registered professional engineer	X				
Familiarity with standard USACE hydrologic and hydraulic computer models including HEC-1	X				
Familiarity with standard USACE hydrologic and hydraulic computer models including HEC-2	X				
Familiarity with standard USACE hydrologic and hydraulic computer models including HEC-RAS	X				
Familiarity with standard USACE hydrologic and hydraulic computer models including HEC-DSS	X				
Active participant in related professional societies	X				
M.S. degree or higher in engineering	X				
Geotechnical Engineering					
Minimum 10 years of demonstrated experience in geotechnical exploration, studies, design and construction of projects involving groundwater		X			
Minimum 10 years of demonstrated experience in geotechnical exploration, studies, design and construction of projects involving seepage		X			
Minimum 10 years of demonstrated experience in geotechnical exploration, studies, design and construction of projects involving slope stability		X			
Minimum 10 years of demonstrated experience in geotechnical exploration, studies, design and construction of projects involving pile foundation analysis and design		X			
Registered Professional Engineer		X			
Familiarity with geotechnical practices and general subsurface conditions in Northeast Illinois and Southeast Wisconsin		X			
Active participation in related professional societies		X			
M.S. degree or higher in geotechnical engineering		X			

Table 2. Upper Des Plaines Phase II Study IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Wong	Bird	Schachtschneider	Newling	Casavant
Economics					
Experience in flood risk management analysis			X		
Experience in risk based economic analysis			X		
Experience with HEC-FDA			X		
M.S. degree or higher in economics			X[a]		
Ecology					
Minimum 10 years of demonstrated experience with projects in Illinois and Wisconsin				X	
Knowledge of ecological value of wetlands, wet prairies, streams, and interconnected habitat				X	
Familiarity with USFWS Habitat Evaluation Procedure (HEP)				X	
Familiarity with USACE-ERDC Hydrogeomorphic Model (HGM)				X	
Familiarity with Index of Biotic Integrity (IBI)				X	
Familiarity with Floristic Quality Assessment (FQA)				X	
Plan Formulation					
Minimum 10 years of experience in publics work planning					X
Experience in flood risk management					X
Experience in ecosystem restoration					X
Experience in multipurpose planning					X
Familiarity with USACE plan formulation standards and procedures for flood risk management					X
Familiarity with USACE plan formulation standards and procedures for ecosystem restoration					X

[a] *Waiver statement presented as part of Task 2 deliverable and approved by USACE*

Miguel Wong, Ph.D., P.E. (Component B Panelist)

Role: Hydraulic engineering review
Affiliation: Barr Engineering Co.

Dr. Wong is a senior water resources engineer with Barr Engineering, Inc. He earned his Ph.D. in civil engineering from the University of Minnesota in 2006 and is a registered professional engineer in Minnesota. He has 15 years of combined experience in basic and applied research and engineering consulting with emphasis on hydrologic modeling, hydraulic design, and river mechanics analysis, sediment transport modeling, environmental evaluations, water balance and water quality modeling using a probabilistic framework, and management of interdisciplinary teams working on large complex projects.

Dr. Wong's experience in hydraulic engineering with emphasis on large public works projects includes his leadership role in the two of the largest proposed diversion projects in the Upper Midwest: Project Manager and Technical Lead of the feasibility design for the Fargo-Moorhead Area Diversion project at $1.7 billion (30 miles of diversion channel, eight major hydraulic structures, and over 15 miles of levees); and Quality Management Representative and Erosion & Sedimentation expert for the Mouse River enhanced flood protection project at $0.8 billion (21.6 miles of levees, 2.8 miles of floodwalls, and 30 transportation closure structures).

His familiarity with USACE application of risk and uncertainty analysis in flood risk management studies includes his engineering on the Fargo-Moorhead Area Diversion project. This project involved dam and levee safety evaluations to consider how dam and levee safety criteria being considered for these features would affect design, real estate, long-term maintenance implications, and cost.

Dr. Wong is familiar with standard USACE hydrologic and hydraulic computer modeling including HEC-1, HEC-2, HEC-RAS, and HEC-DSS. His Ph.D. work led to proposed modification of the Meyer-Peter and Muller bedload transport relationship, which has been cited in more than 100 professional publications; the new relationship has been adopted in the sediment transport module of HEC-RAS.

Dr. Wong is a member of the American Geophysical Union, the International Association for Hydro-Environment Engineering and Research, and the Society of American Military Engineers. His work has appeared in scientific journals including Water Resources Research, Journal of Geophysical Research—Earth Surface, and Journal of Hydraulic Engineering. In addition, he has conducted technical peer reviews of manuscripts submitted to refereed journals including the Water Resources Research and Journal of Hydraulic Engineering, and presents regularly at technical conferences.

David Bird, P.E. (Component A and B Panelist)

Role: Geotechnical engineering review
Affiliation: Independent Consultant

Mr. David Bird is a geotechnical engineer and independent consultant. He earned his M.S. in civil engineering from the University of Illinois, specializing in soil mechanics and foundation

engineering. He has over 39 years of geotechnical and geo-structural experience, is a registered professional engineer in six states including Illinois and Wisconsin, and has practiced in the subject area since 1974. Mr. Bird's areas of expertise include geotechnical explorations, analysis and design and geo-structural engineering and design.

Most recently he has specialized in the review of geotechnical related design and construction projects, and geotechnical consulting in the area of high capacity foundations and earth retention system design and construction. Mr. Bird has consulted on numerous projects related to groundwater issues, control and dewatering for both permanent and temporary conditions. He has performed multiple under-seepage analyses for flood control levees, as well as slope stability analyses for embankments, excavations, and design and remediation of failed slopes throughout the Midwest. Mr. Bird has been involved in numerous pile foundation analyses including Driven, LPile, SPile, and WEAP for the development of pile foundation design capacity and pile installation recommendations. In addition, he has observed, reduced data, and evaluated numerous pile load tests on friction and end bearing piles.

Mr. Bird is author of publications and has given technical talks on such topics as the use of drainage for slope stabilization and practical considerations in earth retaining structure design. Most recently he spoke about "Stabilization of a Cellular Cofferdam in the Ohio River" at the 7th ASCE Case History Symposium honoring Ralph Peck and Clyde Baker. He is an active member of the American Society of Civil Engineers.

James Schachtschneider (Component A and B Panelist)

Role: Economics review
Affiliation: Independent Consultant

Mr. Schachtschneider is an economist and independent consultant. He earned his B.A. in business from the University of Texas at Austin and has over 30 years of professional experience in economics, financials, and real estate valuations. He is also a Certified General Real Estate Appraiser in Texas.

Mr. Schachtschneider has served as a senior economist and senior real estate appraiser on many economic studies and has extensive knowledge of the USACE planning policies and National Economic Development (NED) procedures for conducting flood damage reduction studies. He has been involved in economic flood risk management for numerous flood risk management programs and as economics project manager for USACE Brays Bayou General Reevaluation Report, White Oaks General Reevaluation Report and Buffalo Bayou and Lower White Oak General Reevaluation Report Federal Flood Damage and Ecosystem Restoration Studies.
In addition to the flood risk management, all of these projects required risk-based economic analysis detailed further in ER1105-2-101 and EM1110-2-1619. He has extensive experience with risk-based stage damage functions, risk-based hydraulic studies, and conveyance roughness and cross section geometry for hydraulic studies.

Mr. Schachtschneider's work has included HEC-FDA modeling and FEMA benefit-cost studies to support Federally sponsored water resources projects, and he has run HEC-FDA economic damage estimates in numerous studies including the Buffalo Bayou and Lower White Oak GRR

Federal Flood Reduction Study. His expertise also includes using commercial and propriety computer models such as M&S Commercial Cost Estimator and Argus Discounted Cash Flow Analysis to estimate values and forecast trends. In addition, he has experience performing market demand, economic feasibility and Highest and Best Use studies.

Charles Newling (Component A and B Panelist)

Role: Ecological review
Affiliation: Wetland Science Applications, Inc.

Mr. Newling is the senior vice-president of Wetland Science Applications Inc. and the Wetland Training Institute, Inc. He earned his M.S. in zoology, specializing in wildlife ecology, from Southern Illinois University Carbondale. He holds certifications as a Professional Wetland Scientist, Certified Wildlife Biologist, Wetland Delineator, and is a qualified wetland specialist. He has over 38 years of experience in wetland delineation, construction and restoration, evaluation techniques and Federal regulation and has conducted professional level training courses in those subjects since 1981.

As a senior wetland regulatory scientist, he has served as a consultant through Wetland Science Applications to both private industry and state and Federal government. Mr. Newling has worked professionally in 48 states including Wisconsin and Illinois. He has over 13 years direct experience with projects in Illinois and Wisconsin, including the Walkerwin Wetland Mitigation Bank, a wetland and prairie restoration project, in Columbia County, Wisconsin. He has a strong knowledge of the ecology of wetlands, wet prairies, streams, and interconnected habitat, having conducted functional analyses of these environs since 1975. In addition, he has conducted research on the long-term monitoring of wetland and upland habitat development on dredged material and on the ecology of greentree reservoirs during his time at the USACE Waterways Experiment Station 1978 -89. He has provided rapid response assistance to USACE District offices nationwide on technical matters of wetland delineation and restoration including, when necessary, provision of expert testimony.

Mr. Newling is familiar with various assessment models including Hydrogeomorphic Model (HGM), WET, Habitat Evaluation Procedure (HEP), WAFAM, and others. He was trained in HEP from its inception, has worked with the team that developed some of the Habitat Suitability Indices, and is familiar with the concepts and application of Index of Biotic Integrity (IBI) and Floristic Quality Assessment (FQA).

He is author of more than 20 publications and a contributor to several state and Federal publications. He is a member of The Wildlife Society, Association of State Wetland Managers, Society of Ecological Restoration, Wisconsin Wetland Association, and has served on the Board of Directors for the Society of Wetland Scientists (SWS) as Liaison to the SWS Professional Certification Program.

Kenneth Casavant (Component B Panelist)

Role: Plan formulation review
Affiliation: Washington State University

Dr. Casavant is an independent consultant and an agricultural economist at Washington State University School of Economic Sciences. He has also served as an adjunct professor at the North Dakota State Upper Great Plains Transportation Institute since 2002. He earned his Ph.D. in economics from Washington State University and has 45 years of experience as an economist, with expertise in transportation economics and planning.

Dr. Casavant has more than 10 years of experience in plan formulation, evaluation and comparison of alternative plans for numerous ecosystem restoration projects, flood risk management projects, navigation studies, and feasibility studies for more than 60 different projects. His Civil Works planning experience includes technical reviews and participation in studies such as the Lower Columbia River Channel Deepening Project, the Upper Mississippi and Illinois Navigation Study, the Barataria Basin Barrier Shoreline Restoration Study, and the Mississippi River Gulf Outlet Ecosystem Restoration Plan. Many of these included the assessment and sensitivity analyses of ecosystem restoration and flood risk management. He is familiar with USACE plan formulation standards and procedures and the Institute for Water Resources-Planning Suite methodologies, with a focus on ecological output per dollar of relevant expenditure for alternative project formulations. He has experience evaluating the usage and output of HEC-FDA models; risk analysis and risk models are critical to many of his projects, including ecosystem restoration projects that included a methodological review of flood risk management. His dam construction and public works development and evaluation projects have included benefit/cost analysis where a major benefit has been flood risk reduction.

He is a member of numerous professional associations including the Transportation Research Board - National Research Council, the International Agricultural Economics Association, and the Logistics and Physical Distribution Association.

5. SUMMARY OF FINAL PANEL COMMENTS

The panel members agreed among themselves on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2010, 2012; p. D-4) in the Upper Des Plaines Phase II Study review documents. Table 3 lists the Final Panel Comments statements by level of significance. The full text of the Component B Final Panel Comments is presented in Appendix B of this report.[9] The following summarizes the Panel's findings from the Component B review.

[9] Final Panel Comments from the Component A are provided in Appendix A and have been documented in DrChecks.

Based on the Panel's review, the report is well-organized and provides an excellent presentation of information through the use of maps, diagrams, and tables. It is apparent that great effort was made to identify all reasonable alternatives. While the report adequately assesses the plan formulation, economic, and environmental issues for the Upper Des Plaines Phase II Study project, the Panel identified several elements of the report that should be clarified or revised, especially with respect to engineering issues. A summary of the most important findings are presented below.

Plan Formulation

The Panel found that the Plan Formulation process is easy to follow and the assumptions, methodologies, and results provide a well-reasoned and systematic basis for selecting the three tentatively recommended plans for this study: a Full Plan, an NED/NER Plan, and a CAP Plan. Each plan is formulated in accordance with USACE plan formulation guidelines and considers mitigation of adverse effects.

Of some concern though is the with- and without-project conditions and the basis for estimating flood damage reduction, which assumes that the six flood risk management projects from Phase I are completed. Modification of any of these projects potentially affects benefits from the flood risk management projects proposed in the Phase II study. The Panel believes this is a consideration that should be acknowledged and described further to ensure that the proposed plans accurately represent the most likely reduction in flood damages if some of the six proposed Phase I projects are not funded and constructed as proposed. Potential relocations as a result of the six Phase I projects should also be evaluated to determine impact on costs, benefits, and benefit-to-cost ratios if relocations are delayed or not achieved.

The Panel believes that without a sensitivity analysis or discussion of how the assumptions influence the plans, the level of completeness associated with the models and analyses cannot be fully determined. This issue can be readily addressed by evaluating the available documentation for each assumption, adding that discussion to the report, and conducting a sensitivity analyses of the assumptions surrounding the variables in the models or analyses, thus identifying the critical variables and processes to be closely monitored as the chosen plan is developed.

The Panel also considers there is some chance that the combination of different flood risk management projects (e.g., levees with one or more off-channel reservoirs) could provide technically and economically feasible solutions to further reduce the risk of flooding related damage. On an individual basis, these projects may not result in a positive net benefit, or benefit-to-cost ratio greater than one, and so they may have been prematurely discarded during the screening and evaluation of sites. However, when combined, they could offer the level of flood damage reduction that would translate into a benefit that is greater than the cost of the projects combined, and thus be compliant with ER 1105-2-100 and related guidelines. It is worthwhile acknowledging that with limited space available (because the basin is densely developed where flood damages are the greatest) and little topographic relief to take advantage of (because the area is very flat), more than one additional reservoir might be needed to provide effective flood damage reduction, and this integrated approach could help further reduce to some degree the still significant residual flood damages.

The Panel suggests the useful approach of correlating (economic) benefits with the magnitude of flood damage reduction required to accomplish those benefits in advance of evaluating sites for flood risk management. In this way, some guidance on the magnitude of reduction in peak flows and/or hydrograph volumes would be available to the site evaluator to look for combining sites or types of flood risk management projects proposed to achieve technically and economically feasible flood damage reduction.

Engineering

The report provides adequate levels of detail to understand the hydrologic and hydraulic characteristics of the study area under current baseline conditions, but does not describe clearly the calibration of the hydrologic and hydraulic models in the Upper Des Plaines Phase II report. The Panel acknowledges the comprehensive effort put into calibrating the hydrologic and hydraulic models available through the 1990s, documented in the Phase I report; however, outstanding questions about the accuracy of the hydrologic and hydraulic models and reliance of oversimplified flood routing with hydrologic methods instead of hydraulic methods need to be addressed in the Phase II study. This issue can be resolved by including more details regarding the calibration of the hydrologic and hydraulic models (model versus observed values) and validating the accuracy of the hydrologic and hydraulic models against more recent historical floods for which input information can be readily available (e.g., the 2008 flood).

In addition, the report does not provide adequate levels of geotechnical detail to support reliable exploration at the project sites. Changes in site conditions and other costs associated with geotechnical conditions revealed during construction could result in construction problems, delays, and added costs not considered during design. This issue can be resolved by reviewing geologic conditions anticipated at each of the proposed flood damage mitigation elements, assessing the impact of variable soils on the proposed construction site, and obtaining supplemental geotechnical information before completing the design phase should the results of any geotechnical analyses indicate structure performance is likely to be less than required.

Impacts from raising roads and constructing floodwalls on existing infrastructure, residences, and commercial facilities, notably, the main entrance of these structures from Ashley Street, have not been adequately addressed. This is an important risk that should be acknowledged and resolved through a review of existing topography and confirmation that all existing commercial and residential driveways and building access walks can be reached by normal means.

Economics

The economic analysis is concise and complies with USACE requirements outlined in ER 1105-2-100. Development of data and use of Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) and Visual Interactive System for Transportation Algorithms (VISTA) software appear to be technically sound. The Panel noted, however, that there is no discussion of how benefits for non-structural alternatives are calculated, or if they are excluded in the HEC-FDA calculations. This can be addressed by adding a discussion to detail the methodology used to calculate damage reduction for the non-structural alternatives.

Future development is also not discussed sufficiently to determine how risk and uncertainty associated with that development will affect the with-project conditions. This issue can be

resolved by relating risk and uncertainty parameters to the range of future development expected as one of the proposed plan(s) is implemented and considering the impacts of varying levels of development on the relevant variables that could affect the NED/NER plan.

Environmental

Environmental documentation is thorough and comprehensive throughout the document, and provides an adequate environmental justification for the three tentatively recommended plans. All environmental models appear to have been used in an appropriate manner and the environmental assessment appears to satisfy the requirements of the National Environmental Policy Act (NEPA). Many of the environmental final panel comments raised during the Component A review were effectively addressed and incorporated into the current report.

The Panel noticed, however, a lack of detail for the prescribed burning regimen enabling understanding and support from affected property owners. The Panel believes it is necessary to provide information on the procedures that will be followed so that the prescribed burns are conducted without a safety hazard to people or property. The Panel also believes that the objective of reducing cover of invasive plants to less than 1% or even 5% is admirable but unrealistic given the current state of the art. This can be addressed by clarifying whether the objective is a suggested target or a required success criterion and discussing how frequently reduction of invasive plant cover below levels of 5% or 1% has been attained and maintained in real-world projects. Finally, the Panel considers that better documenting site specific information on existing conditions and feasibility designs of proposed riverine restoration projects is useful to support estimated gains in habitat units that can be attributable to these projects.

Table 3. Overview of 16 Final Panel Comments Identified by the Upper Des Plaines Phase II Study IEPR Panel

No.	Final Panel Comment
Significance – High	
1	Assumptions used for the with- and without-project conditions for the six Phase I projects and the basis for estimating flood damage reduction may no longer be valid.
2	There is a general lack of geotechnical data to support reliable exploration at the project sites.
Significance – Medium	
3	There is insufficient detail about the prescribed burning regimen to ensure understanding and support from affected property owners.
4	The calibration of the hydrologic and hydraulic models has not been documented in the Phase II report, and the relevant information in the Phase I report shows significant discrepancies between model and observed values.
5	The impacts from raising roads and constructing floodwalls on existing infrastructure, residences, and commercial facilities have not been adequately addressed.

Table 3. Overview of 16 Final Panel Comments Identified by the Upper Des Plaines Phase II Study IEPR Panel (continued)

No.	Final Panel Comment
6	The current alignment of DPLV09 - Segment 3 is not the most efficient and effective way to mitigate the risk of flood damage in the unprotected area.
7	The assumptions associated with models and analyses lack thorough documentation and explanation, making it difficult to assess their influence on conclusions.
8	The objective of achieving restored habitats with less than 1% cover of invasive plant species seems highly unrealistic given the current state of the art.
9	The proposed riverine restoration projects do not include site-specific information on existing conditions and feasibility designs, which is considered necessary to support estimated gains in habitat units that can be attributable to these projects.
	Significance – Low
10	Future development is not discussed sufficiently to determine how risk and uncertainty associated with that development will affect the with-project conditions.
11	It is not clear when ditch filling will be applied instead of ditch plugging in wetland restoration.
12	Public concerns and the outreach process have not been identified nor adequately described.
13	Potential relocations as a result of the six Phase I projects have not been adequately addressed.
14	There is no discussion of how benefits for non-structural alternatives are calculated, or if they are excluded in the Hydrologic Engineering Center- Flood Damage Reduction Analysis calculations.
15	Uncertainty surrounding benefits from the Full, National Economic Development (NED)/National Ecosystem Restoration (NER), and Continuing Authorities Program (CAP) plans is not clearly analyzed or presented.
16	It is not clear whether models based on subjective expert analyses could be replicated by a different team of experts and whether they would vary significantly.

6. REFERENCES

IDNR (1998). Upper Des Plaines Area Assessment, Volume 2: Water Resources. Illinois Department of Natural Resources, Office of Scientific Research and Analysis, Champaign, Illinois.

INDOT (2010). Geotechnical Manual (revised). Indiana Department of Transportation, Office of Geotechnical Engineering. [www.google.com/search?q=indot+geotechnical+manual&oq=indot+geotechnical+manual&aqs=chrome.0.57.15225j0&sourceid=chrome&ie=UTF-8]

INDOT (2012). Geotechnical Engineering Report: Segment 2 – I-69 Mainline Roadway, Taylor Ridge to Plummer Creek. Indiana Department of Transportation, Office of Geotechnical Engineering. [https://netservices.indot.in.gov/ViewDocs2.0/View.aspx?Did=1597309]

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

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

USACE (1996). Engineering and Design - Risk-Based Analysis for Flood Damage Reduction Studies. Engineer Manual 1110-2-1619. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 1 August.

USACE (2000). Planning - Planning Guidance Notebook**.** Engineer Regulation 1105-2-100. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 22 April.

USACE (2008). HED-FDA User's Manual, Version 1.2.4. U.S. Army Corps of Engineers, Institute for Water Resources, Hydrologic Engineering Center, Davis, CA. November.

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

USACE (2012). Water Resources Policies and Authorities: Civil Works Review. Department of the Army, US Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-214. December 15.

This page is intentionally left blank.

APPENDIX A

Final Panel Comments

on the

Upper Des Plaines Phase II Study
Component A Review

This page is intentionally left blank.

Final Panel Comment 1

Greater clarification is needed for the decision to use the urban/rural and county stratified approach for the National Ecosystem Restoration (NER) Plan.

Basis for Comment

The Panel finds that the decisions made for the NER Plan (Volume 3), especially the decision to stratify the analysis by urban vs. rural and by county, need greater justification. Since the goal is to determine the most cost-effective restoration alternatives for the entire study area, the Panel believes that all screened alternatives should be analyzed by Cost Effective/Incremental Cost Analysis (CE/ICA), regardless of location (urban vs. rural, by county).

Section 3.4 does not explain why the alternatives analysis was stratified by urban vs. rural, nor does it explain why the construction costs were broken out by urban vs. rural and then by county. If certain alternatives simply cost more, then that should become evident in the overall Institute for Water Resources (IWR) analysis.

The Panel realizes that land costs in the lower watershed are higher; however, by conducting the analysis according to this stratification, the likelihood of justifying projects in higher land cost areas increase.

Significance – High

Clarification of the NER Plan needs to be justified as it could affect the selection of the recommended plan.

Recommendations for Resolution

1. Conduct the CE/ICA on all screened NER alternatives without stratification to determine the cost-effective frontier and the best buys for all screened alternatives.

Final Panel Comment 2

The future response of the river channels to the various plan features has not been fully investigated.

Basis for Comment

The document sections identify the importance of not impacting geomorphic features and indicate that the rivers have been characterized. The existing channel morphology (bank erosion, and bed sediment erosion, transport, and deposition) has been characterized; however, the potential for adverse channel responses to plan measures has not been evaluated. These include responses, such as aggradation and degradation, to altered basin hydrology, channel hydraulics, and sediment transport.

- Volume 1– Study Overview, Section 3.2.3 (Constraints) identifies minimizing and avoiding effects on natural geomorphic features as constraints related to flood risk management, and recreation and cultural resources. Although not mentioned, ecosystem restoration activities, such as dam removal, that provide habitat benefits in one area may adversely impact habitat upstream and downstream.
- Volume 1 – Study Overview, Section 4.1.1.6 (Fluvial Geomorphology and Topography) introduces the topic of sediment transport and bank erosion as important geomorphic processes. However, this section does not indicate whether or how these processes will be evaluated.
- Volume 2 – NED Plan Formulation, Section 2.5.2 (NED Opportunities and Constraints) indicates that a constraint is to minimize adverse effects to natural geomorphic features, but this topic is not addressed elsewhere in Volume 2.
- Volume 3 – NER Plan Formulation, Section 2.3.1 (Habitat Assessment Methodology) discusses characterization of channel morphology, riparian zone, and bank erosion that has been performed for this study, but does not discuss how these features will be affected by the various features of the NER plan over the life of the project.
- Volume 3 – NER Plan Formulation, Section 3.1 (Measure Identification) identifies several beneficial measures including riffle structures, dam removal, and sinuosity reestablishment, but does not discuss potential adverse impacts of these measures.
- Volume 3 – NER Plan Formulation, Section 3.7.2 (Significance of Ecosystem Habitat Units) indicates that the riverine system has been altered through the construction of dams, channelization, and the river's restricted use of the floodplain. Because the system has been altered, it may still be responding to previous construction activities and sensitive to future plan construction. The potential for adverse river response has not been addressed.

Significance – High

Potential adverse impacts of plan activities on channel form and function may significantly affect the selection of the recommended plan.

Recommendations for Resolution

1. Evaluate potential channel response to NED and NER plan measures to avoid

significant adverse impacts on geomorphic processes.

Final Panel Comment 3

The frequency analysis for the Riverside Gage on the Des Plaines River should be reviewed for accuracy.

Basis for Comment

Table 3 of the NED plan (Volume 2) indicates that the Des Plaines River at Riverside, Illinois (USGS gage 05532500) has experienced 300-, 200-, 20-, 10-, and four 5-year events in 23 years (water years 1986 – 2008).

- Although this sequence of moderate and extreme floods is statistically possible, it is highly improbable and suggests that the flood frequency relationship for this location may be affected by the urbanization discussed as a flood risk concern elsewhere in the report.
- This result indicates that it is very likely that the flood frequency relationship is not valid for current watershed conditions or there is great uncertainty in this flood frequency relationship.

Significance – High

Because the flood frequency relationship for the Riverside Gage is the basis for flood damage estimates, the uncertainty at this location may impact project benefit calculations and plan selection.

Recommendations for Resolution

1. Examine the weather conditions for the 1987 and 2008 floods to determine whether rainfall amounts and intensities have similar extreme recurrence intervals and justify the actual occurrence of 200- and 300-year flood discharge events. If these flood events are justified, provide expanded discussion in the flood frequency analysis section of Appendix A, Hydrology and Hydraulics and in Section 2.3 (Inventory of Historic Flooding) of the NED Plan (Volume 2).
2. If the floods are determined to be caused by much less extreme rainfall conditions, adjust the flood frequency relationships accordingly and revise the benefit cost analysis as needed.
3. Alternatively, increase the uncertainty related to flood discharge frequency in the HEC-FDA risk analysis and revise the benefit/cost analysis as needed.

Final Panel Comment 4

There are discrepancies in damage estimates for the same conditions presented in Figures 1, 2, and 4 of the NED Plan (Volume 2).

Basis for Comment

Figures 1, 2, and 4 in Volume 2 of the NED Plan include damage estimates (structure and transportation) along the mainstem Des Plaines River, but contain differences that are not expected based on the information that has been provided.

- Figures 1 and 2 show damages along the mainstem Des Plaines River and include damages with Phase I project implemented for baseline (1995) and future (2010) conditions. In general, the relative damages shown for individual river miles are consistent between these figures. However, Figure 2 shows significantly reduced damages at approximately river mile 47 that are inconsistent with those shown in Figure 1.
- Figure 4 also shows damages along the mainstem Des Plaines River. The Panel assumes that the Figure 4 "Without Project Condition" also includes Phase I project implemented. The distribution of damages along the river are significantly different in Figure 4 from what is shown in Figures 1 and 2. In addition, the damages shown in Figure 4 do not include the significant non-transportation related damages that are prevalent in Figure 2. For example, nearly $1.5 million in average annual damages occur in the combined COM, APT, and RES categories at river mile 70.7 in Figure 2, but only transportation (traffic) related damages occur at this location in Figure 4.

Significance – High

The information for the "without project condition" damages may not be correct, potentially impacting project benefit calculations and plan selection.

Recommendations for Resolution

1. Clarify the discussion of Figures 1, 2, and 4 to explain the apparent inconsistencies among the three figures.
2. Should significant damages be identified that were not included in the "without project condition," evaluate and revise the benefit cost analysis as needed.

Final Panel Comment 5

The rationale and assumptions regarding the remedial/removal approaches for hydrologic restoration methods are not justified, and the restoration costs may be underestimated.

Basis for Comment

The approaches for hydrologic restoration are adequately defined. However, no justification or support is given for the methods that were selected, so they may not result in the desired results. For example, based on experience, the Panel disagrees with the assertion made in Section H1, Tile Disablement (pp. 31-32) that valves and/or plugs appear to be equally effective in tile removal. As long as the tiles remain in the ground, they provide an impediment to lateral groundwater flow and subsequent restoration to pre-existing natural conditions. The Panel also does not agree that it is necessarily true that "site disturbance is severe" with excavation and removal of tiles. Severe disturbance, along with subsequent disruption of natural lateral flow patterns in the soil, happens when excavation is poorly planned and executed. Proper execution to minimize disturbance and restore natural ground water flow involves carefully segregating the removed soil and replacing it, after tile removal, in the order that matches pre-exiting, adjacent soil horizons.

The Panel also disagrees with using ditch plugging instead of ditch filling, as described in Section H2, Ditch Filling/Plugging (p. 32). Even though it may be plugged, an open ditch is an unnatural feature on the landscape. It intercepts lateral flow and serves as a reservoir or sink, capturing and retaining water that under natural (truly restored) conditions would wet a disproportionately large area of the surrounding soil.

If a viable native wetland seed bank is present, tile disablement and ditch plugging typically provides just enough hydrology to activate the dormant propagules, but not enough to maintain the wetland plant community. Several wetland restoration projects conducted by the Wisconsin Waterfowl Association (unpublished data), mostly undertaken in Southern Wisconsin since 1990, has shown this outcome. Retrofitting such a site to correct the hydrology (e.g., by subsequently filling the ditch), succeeds in more completely restoring the hydrology of the site, but the now exhausted seed bank cannot respond a second time. Thus, the restorationist incurs the additional costs of planting as well as loss of the genetic stock native to that location.

There is a considerable difference in costs between "disabling drain tile" versus removing drain tile and restoring soil horizons. Likewise, there is a considerable difference in costs between "ditch plugging" and ditch filling done correctly to attain optimal restoration conditions because ditch filling requires more time and care to replicate adjacent soil horizons.

The Panel finds that restoration cost estimates were low, yet yields were assumed to be high. It is not clear if adequate mobilization/demobilization or long-term monitoring and

maintenance were factored into the costs.

Significance – High

If the restoration is implemented using less effective methods, restoration benefits will not accrue to the level expected. Furthermore, if restoration costs are estimated at an unrealistically low level, the benefit cost ratios will not be accurate.

Recommendations for Resolution

1. Replace disabling drain tile with removal of drain tile and restoration of soil horizons.
2. Replace ditch plugging with ditch filling including the matching of adjacent soil horizons.
3. Provide more detail on the approach for estimating the costs of restoration, including the approaches that will be used and mobilization/demobilization, long-term monitoring, and maintenance costs.
4. If necessary, recalculate benefit/costs for the restorations.

Final Panel Comment 6

There are errors and inconsistencies in some of the flood profiles in Appendix A (Hydraulics and Hydrology).

Basis for Comment

Incorrect flood elevation values cause erroneous flood damage estimates.

- Plate A-26 (Bull Creek without project profiles) shows the 500-year flood profile below the 100-, 50-, and 25- year flood profiles for main channel distances less than 1500 feet.
- Plate A-26 also shows the 100-year flood profile above the 500-year flood profile for main channel distances greater than 4500 feet.
- Plate A-38b (Willow Creek future profiles) shows coincident flood profiles for the 10-, 25-, 50-, and 100-year floods as if a structural modification has taken place, but no structural modification is indicated.

Significance – High

Errors and inconsistencies in some of the flood profiles may have resulted in incorrect damage estimates, which could affect project benefit calculations and plan selection.

Recommendations for Resolution

1. Examine the hydraulic models and correct any errors in the Bull Creek model.
2. Provide an explanation for the apparent inconsistencies in the Willow Creek model or correct errors as needed.
3. Determine whether the results significantly affect damage estimates.
4. Evaluate and revise the benefit/cost analysis as needed.

Final Panel Comment 7

The ranking and application procedure for proposed reservoir sites was limited in not considering factors other than soil grain size and organic content.

Basis for Comment

Material grain size and organic content are two of the elements that can affect the way soils will perform, but they are not the only elements of concern.

Fine-grained soils behave substantively differently than coarse-grained soils. Furthermore, not all fine-grained soils (silty clay) behave similarly, nor do all coarse-grained soils (fine to coarse sand) or mixtures of fine- and coarse-grained (silty and clayey fine to coarse sand and gravel) behave similarly. The plasticity of the soil or of the fine-grained soil components has a significant impact on the geotechnical properties of the soil. The soil strength, either undrained in cohesive soils or drained in granular soils, has much to do with the soil stability and shear strength. Natural soil moisture content in cohesive soils is a good indicator of the potential the soil has for volume change under increased load; the higher the natural moisture content, the more potential for volume change.

A typical geotechnical investigation will include soil sampling for the purposes of determining the soil classification as well as the geotechnical properties related to strength, compressibility, plasticity, and grain size. These are all important properties or qualities that are necessary for the appropriate determination of the geotechnical design parameter.

Significance – Medium

The determination of the appropriate geotechnical properties for the soils at the various project sites is a necessary and important part of the civil engineering design aspects of each of these projects and for the selection of appropriate construction sites.

Recommendations for Resolution

1. Develop a proper understanding of how soil will perform under various design loads by determining:
    a. the geologic origin of the material (glacial vs. residual)
    b. the past stress history (overconsolidated vs. lightly or normally consolidated)
    c. the soil strength (loose vs. dense in granular soil; weak or soft vs. hard in cohesive soil)
    d. compressibility (highly compressible organic soil vs. relatively incompressible low plasticity hard silty clay).
2. Perform a properly scoped geotechnical exploration and take all of these issues as well as others into consideration to include performance of:
    a. appropriate field sampling
    b. laboratory testing of representative materials.

3. Use data from all analyses performed to evaluate the soil conditions, and consider all factors for the selection of construction sites and to make appropriate design and construction recommendations.

Final Panel Comment 8

The geotechnical aspects of the project, which will have civil engineering design and construction implications for the proposed construction, have not been investigated.

Basis for Comment

Geotechnical engineering is an important aspect of any of the recommended flood risk management projects considered in this investigation. The project documents indicated geotechnical issues were not going to be considered during this phase of the work. Therefore, geotechnical analyses have been specifically omitted from the scope of the investigation on this project.

However, without appropriate geotechnical exploration and analyses, it is not possible to properly design the civil engineering aspects of the proposed flood risk management projects. This is likely to result in changed site condition claims during construction and potentially result in failures of some of the proposed measures due to improper characterization of the geotechnical conditions.

The standard practice of the industry is to investigate all anticipated potential geotechnical problems for each of the subject sites. Even though not all issues are expected to be problematic at each location, sufficient investigation and analyses are generally performed to show that these issues will not be problematic, unless it is obvious by examination once the full measure of the proposed project is known and some geotechnical information has been collected.

Significance – Medium

Without the information provided by the geotechnical analysis, the completion of the project design, bidding, and construction is likely to encounter constructability related problems, changed condition claims, and redesign of proposed measures during construction, resulting in greater construction costs.

Recommendations for Resolution

1. Conduct a geotechnical investigation at all the subject sites. Refer to the attached spreadsheet for examples and suggestions with regard to potential geotechnically related design issues.
2. Based on the geotechnical characterizations, as well as USACE's geotechnical insights, develop a site-specific geotechnical exploration plan for each of the proposed measures, including appropriate field sampling (borings, in-situ shear strength testing, water elevation monitoring wells, in-situ permeability testing, etc.), laboratory investigation and testing (plasticity, grain size, moisture content, shear strength, etc.), and geotechnical engineering analyses.
3. Define the site geotechnical conditions through appropriate laboratory classification, geotechnical property laboratory testing, and preparation of representative soil boring logs.

4. Analyze the pertinent geotechnical engineering aspects of each project (geologic history and setting, excessive settlement, slope stability considerations, flood water underseepage, subgrade instability, borror material characteristics, flood wall overturing stability, etc.) through appropriate geotechnical analyses.
5. Determine what modifications to “standard” measure designs are required to increase the likelihood the proposed measures will be constructible at reasonable cost and will perform acceptably under the design loads, forces, and constraints once construction is completed.
6. Modify the proposed measures as needed to achieve an acceptable geotechnical performance outcome based on item 4 above.
7. Include all geotechnically relevant information (boring logs, laboratory test results, geotechnical strength and material profiles, geotechnically related analyses, etc.) in the appropriate Appendix of the Feasibility Report/Environmental Assessment.
8. Include a written exploration report which should consist of at least the following sections:
    a. Explanation of exploration process,
    b. Characterization of the design constraints,
    c. Understanding of the geologic history and conditions at the site,
    d. Summary of the geotechnical conditions at the site,
    e. Implications of the geologic and geotechnical conditions on the design, construction, and operation of the proposed measures,
    f. Analyses that were performed for the study
    g. Results of the analyses performed and the changes to the initially proposed design as a function of those analyses
    h. Soil and groundwater constructability problems associated with or anticipated for the proposed construction.

Final Panel Comment 9

The assumptions and approach used to make the flood damage estimates for the Wisconsin properties needs additional explanation.

Basis for Comment

Damage estimates for the Illinois properties were calculated using HEC-FDA (Volume 2, Section 2.4.3). A different methodology was used to calculate damages for properties located in Wisconsin (Volume 1) due to the information available, but the methodology was not fully explained. There was no discussion of without project damages for the Wisconsin properties.

Significance – Medium

It is not possible to evaluate or understand the approach used to estimate flood damages for properties in Wisconsin because the description of the methods is incomplete.

Recommendations for Resolution

1. In Volume 2, Section 2.4.3, the discussion of flood damage estimates for the Wisconsin properties should explain:
   a. Why the damages were calculated outside HEC-FDA. (Explain which information was not available that was needed in HEC-FDA.)
   b. How the damages were calculated. (Since HEC-FDA was not used, explain what the methodology was for calculating the damages for the Wisconsin properties.)
   c. In what way the results may or may not differ between the two methodologies. (Explain whether the damages calculated using this alternative methodology will be less accurate. Explain how this effects the with project benefits.)

Final Panel Comment 10

The assumptions and approach used to screen potential floodwater storage sites need clarification.

Basis for Comment

The Panel assumes that potential floodwater storage sites were selected based on an identification process followed by a screening process. Table 7 (Volume 2) appears to be part of a screening process, but is presented in the site identifications section (Volume 2, Section 3.2.1). As such, this section appears to be mixing identification and screening. The Panel assumes that 200 sites were first identified and then screened down to 70. Table 7 indicates that 130 sites were eliminated, but does not give the reasons for elimination.

The Panel thinks that the 250-foot length for conveyance to a storage site is a little too short and may have prematurely eliminated important sites. The 10-acre criterion seems reasonable, but the 250-foot distance screening requirement needs further justification. The volume of storage that could be achieved in combination with costs and specifics of the connector could possibly be more important than just distance. That is, if it would provide enough storage, the cost of a longer length of conveyance could be justified.

The assumption that potential floodwater storage capacity is 4.41 times the surface area is not clearly explained. It seems that eligible sites could have other ratios as well. The Panel has concerns about prematurely eliminating reservoirs whose potential volumes exceed the value of 4.41 times the area. For example, DPRS23 has a ratio of volume-to-surface area of 8.0. The Panel is also concerned that the resultant water table could affect the storage potential.

For screening and conceptual level construction costs, average tax assessed market land values are often used and are acceptable. The Panel notes, however, that the differences in market values from one area to another should be considered. For example, land values near the city center will be considerably different from the suburbs and surrounding rural land.

Significance – Medium

Flood storage sites need to be identified based on a well-defined screening process; all assumptions and approaches must be fully explained.

Recommendations for Resolution

1. Move the screening language and Table 7 from Section 3.2.1 to Section 3.3.1.
2. Add a footnote to Table 7 explaining the elimination of each site.
3. Justify the 250-foot length limit of conveyance to a storage site and address whether certain sites could have still been justified with such a limit.
4. Explain the assumption that flood storage volume is 4.41 times the surface area to determine the potential volume of flood storage sites; provide evidence that this

conversion is adequate over all sites and did not prematurely eliminate potentially beneficial sites from further consideration.

5. Discuss how groundwater levels could affect the calculation for flood storage capacity.
6. Clarify the use of average tax assessed market land values as it relates to different areas.

Final Panel Comment 11

The assumptions and screening approach used in determining the benefit cost ratios (BCR) to select road raises, bridge modifications, floodwater storage sites, floodwater protection sites, modifications to existing structures, and non-structural sites need more explanation and justification.

Basis for Comment

The Panel assumes that a BCR of 1.0 was used, mainly since no BCRs were listed lower than 1.1 in Tables 18-21 in Volume 2, for screening road raises, bridge modifications, floodwater storage sites, and non-structural sites, although the report states "positive net benefits." The Panel is concerned that some sites may be screened out too early using this less detailed level of analysis. With the higher uncertainty associated with this level of analysis, the screening ratio could be lowered (e.g., to 0.9 or 0.8), then, when more detailed data are collected, the next screening could use a higher ratio. The Panel assumes that a BCR of 3.0 or higher was then used for further screening. Other projects have used initial screening BCRs of less than 1.0 due to uncertainty of costs and benefits in initial phases of study.

The Panel also questions the correctness of some of the BCRs in Table 15, Volume 2. For example, DPBM10 shows a Max BCR of 3,118; however, on p. E-78 of the economic appendix where the NED plan is presented, the BCR for DPBM10 is 13.8. Since many intangible costs, such as social costs, are not included in the economic analysis, use of a 3+ BCR is reasonable. However, it seems odd that BCRs of 307 to 3,118 (Table 15) would turn out to be less than 6.7 upon further analysis (Table 20). The Panel is concerned that the BCR values greater than 300 may be in error and are not representative of the true BCRs.

The Panel noted that site WHRS06 initially had a BCR >30 and subsequently ended up with a BCR <1.0. This brings into question the reasonableness of using the BCRs for the flood storage areas, if a BCR could change so greatly.

Volume 2, Section 3.3.5 (p. 29), states, "within most clusters not all structures were retained for further evaluation." There is no clarification or explanation of this issue.

The Panel is also concerned about only providing a 10-year level of protection (SCLV03 and DPLV15) and whether future construction at these sites would increase flood risk. The measures being used at these sites may provide the residents with a false sense of security regarding the protection of their property from less frequent recurrence interval events.

Significance – Medium

Clarifying the assumptions and screening approach will add to the completeness and understanding of the report and will better support the recommended plan.

Recommendations for Resolution

1. Provide more detail to support the statement “within most clusters not all structures were retained for further evaluation” (Volume 2, Section 3.3.5).
2. Clarify how a BCR of >30 ends with a BCR of <1.0 and address whether the analysis for the earlier screening was adequate to eliminate sites.
3. Consider using a lower BCR for initial screening, such as 0.8 or 0.9, to allow for alternatives that could be justified under further analysis, or provide the rationale for the BCR of 1.0 on the first screening.
4. In Table 15 of Volume 2, explain how the BCRs shown in this table relate to the BCRs for the same components in the NED (p. E-78 of the economic appendix).
5. Clarify how future construction would not increase risk when only a 10-year level of protection would be provided by SCLV03 and DPLV15. Explain what controls would be in place to prevent increased risk due to future construction.
6. Consider increasing the level of protection to reduce the risk of frequent flood damage despite the addition of improvements.

Final Panel Comment 12

More detail is needed to explain how vegetation restoration will be accomplished.

Basis for Comment

The description of vegetation restoration needs more explanation regarding some of the aspects of the approach that are critical to the success of the project.

It is unclear whether the long-term Operations and Maintenance costs have been included in the P1 (Invasive Woody Vegetation Removal) and P2 (Invasive Herbaceous Vegetation Removal) phases of construction and whether other features should be included in these two measures such as planting of native species.

The Panel believes that removal of invasive exotics is critical, but to establish native plants will take other restorative measures such as hydrologic restoration and planting of native species. Invasive plants may have to be controlled over a long period in the Operations and Maintenance Phase. In addition, future plantings of native vegetation may be required until the native plants are able to be restored and prevent the invasive species from returning. These costs could be substantial.

Significance – Medium

A more detailed description of vegetation restoration measures is critical to estimated costs associated with this feature as it could affect the selection of the recommended plan.

Recommendations for Resolution

1. Include planting and long-term operation and maintenance (O&M) as a part of measures for both P1 and P2.
2. Include appropriate descriptions and costs.
3. Provide additional information on the assumptions and methods for calculating the average annual cost per habitat unit.

Final Panel Comment 13

The effects of construction on residents, such as driveway and property accessibility, does not appear to have been considered at all proposed construction locations.

Basis for Comment

The proposed flood risk reduction measures include the raising of roads and construction of floodwalls. For some of the sites, these proposed measures will prevent residents from gaining access to their driveways with vehicles. Plates D-9 and D-12 (Sites DPLV09 and DPLV08, respectively) in Appendix D show floodwalls passing at the edge of the right of way (ROW) and obstructing access to commercial and residential driveways as well as public sidewalks and private residence access walks. This could present accessibility problems for the handicapped.

Similarly, the grades shown on the plates presenting the road raise options, (D-20, D-21, D-22, D-26, and D-27; Sites DPBM10, DPBM08, DPRR05, DPRR03, DPRR09, and DPRR08) result in the roadway being too high above the existing driveway grades to permit an acceptably sloped transition from the driveway to the road.

Significance – Medium

Based on the current understanding gained from the documented plans, the Panel believes it will not be acceptable to the public to obstruct commercial and residential driveways, public and private sidewalks with flood walls, or the raising of road grades.

Recommendations for Resolution

1. Review the grades at sites DPBM10, DPBM08, DPRR05, DPRR03, DPRR09, and DPRR08 and confirm that all existing commercial and residential driveways and building access walks can be accessed by normal means.
2. For all driveways and walks noted to be inaccessible by normal means, modify the proposed flood risk reduction measure to permit normal access.
3. Review the projects at sites DPBM10, DPBM08, DPRR05, DPRR03, DPRR09, and DPRR08 and confirm that all the proposed measures do not render inaccessible a structure or location previously accessible to the handicapped.
4. For all locations found to be inaccessible to the handicapped, modify the proposed flood risk reduction measures to permit access to the handicapped.

Final Panel Comment 14

There is no discussion of the possibility that removal of the dams might facilitate Asian carp invasion.

Basis for Comment

The Panel found no discussion of the possibility that removal of the dams might facilitate Asian carp invasion of the watershed. Because of the concerns and issues associated with Asian carp invasions downstream in the Illinois River, the analyses for the Upper Des Plaines River Project is not complete without some analysis of whether dam removal might facilitate Asian carp invasions further upstream.

Significance – Medium

The potential for Asian carp invasion is an important consideration for the project and needs to be addressed in the report.

Recommendations for Resolution

1. Briefly describe the problems with invasive Asian Carp downstream on the Illinois River
2. Analyze and describe whether dam removal would have any effect on potential invasion into the Des Plaines River system.

Final Panel Comment 15

The description of the current ecological resource conditions in the watershed is incomplete and inconsistent.

Basis for Comment

Examples of federal and state listed threatened and endangered (T&E) plant species and invasive or opportunistic plants are provided for each community type described within the watershed. However, the dominant plant species in each community type is not described (see Volume 3 – NER Plan Formulation, Section 2.2.2 (Ecological Resources), pp. 11-22). This information is needed to fully describe the plant communities.

Also, characteristic animals are listed for all community types except for the prairie types; no explanation is given for the omission.

Furthermore, with regard to the listing of threatened bird species, the reason for their listing is unclear (e.g., there is a listing based on status as a 'breeding bird'). A suitable explanation would state that some of the species listed are not rare during migration, but may be very rare as breeders in the project area.

Significance – Low

Consistency in community type descriptions and the amount of detail provided would make resources present and goals of the project easier to understand.

Recommendations for Resolution

1. When describing communities, include a description of the characteristic plant species that dominate the community within the given categories, e.g. prairie, savannah, woodland, wetland, etc.
2. List animals characteristic of the habitats described in a consistent manner for all communities.
3. For highly mobile animals, like birds, list the reason they are considered threatened or endangered in the project area.

Final Panel Comment 16

Assumptions regarding future development are not clearly stated.

Basis for Comment

It is not clear what assumptions were made with regard to land use restrictions and redevelopment of previously developed land when determining how much agricultural land will be developed. An explanation of how the reallocation of agricultural land to residential, commercial, industrial, public and infrastructure uses were estimated is needed.

The selection of population data and conclusions regarding land use changes are important in order to project future conditions. The percentage of land available for future development is critical to projecting future development. In Volume 1, Sections 4.1.2.5, Table 10 gives the population projections that were used to project land use changes in Table 11 (Section 4.2.1). On p. 5 it is stated that the land use projections (Table 11) were computed using the population projections (Table 10). The relationship between the projections in these two tables should be explained in more detail. For example, the projected population change from 2005 to 2020 for Lake County is a 10.22% increase, and the projected change in agricultural land use from 2001 to 2020 is a 26% decrease. This is probably reasonable, but the relationship is not apparent from the tables.

Additionally, addressing future development in the report would clarify that the benefits of the recommended plan are not reduced by future development. Development controls are put in place to limit the impact of future development. Procurement and restoration of land removes land from future development and the impact of development. When evaluating future with-project conditions, it is important to clearly describe the assumptions regarding development controls specific to reducing future development and impacts to the flood stages (up or downstream).

Significance – Low

Future development is a key consideration in plan formulation, and clarification of the assumptions is important for a complete understanding of the performance of the various alternatives.

Recommendations for Resolution

1. Volume 1, Sections 4.1.2.5 and 4.2.1, Tables 10 and 11 illustrate population and land use trends. Clarify the assumptions and relationships used to project the land use changes from the population projections, particularly for understanding projected changes in agricultural land use.
2. In Volume 1, Section 4.2.2, clarify how future development impacts future condition projections, including flood stages up and downstream, and explain what development controls are in place at the present time.
3. In Volume 3, clarify how the continued development of the watershed could affect the benefits of the restoration (positively or negatively) and whether the ecological

models have taken this into account.

Final Panel Comment 17

The alternative screening summary tables are inconsistent in providing benefit, cost, and benefit cost ratio data.

Basis for Comment

The BCR is a key factor in evaluating and screening the alternative components and should be consistently presented in all of the tables in Volume 2. Since the BCR is a function of the benefits and costs, it is easier for the reader to understand the process when the benefits and costs are presented along with the BCR.

The information presented in the tables in Volume 2 are generally clear and easy to understand. However, five of the tables are inconsistent in the types of information they present:

- Tables 17 and 25 do not include BCRs.
- Table 11 includes BCRs, but not net benefits.
- Table 13 includes net benefits, but not benefits, costs, or BCRs.
- Table 15 includes BCRs and net benefits, but not benefits or costs.

Significance – Low

Inclusion of the BCR and providing consistent information across tables for the alternatives analysis will allow easier comparison with other tables in the section and allow the reader to better follow the evaluation process.

Recommendations for Resolution

1. Provide consistent information for each of the summary tables in Volume 2. Tables 13, 17, and 25 should include the BCRs. Table 15 should show the benefits and costs. Table 11 should show the net benefits.

Final Panel Comment 18

The Equivalent Annual Damages (EAD) presented in Figure 3 (Section 2.3.4 of NED Volume 2) needs clarification.

Basis for Comment

Figure 3 (Volume 2, p. 14), illustrates the calculation of EAD and Average Annual Damages. There is no explanation of why EAD increases from 2010 to 2020 and then levels off. There is also no explanation of how the EAD in Figure 3 relates to damages presented below it in Table 6 (Volume 2, p.14). The EAD in Figure 3 does not appear to match damages presented in Table 6.

Significance – Low

The EAD cannot be understood without clarification of the calculation of damages in Figure 3.

Recommendations for Resolution

1. Explain why, in Figure 3, EAD increases between 2010 and 2020 and why EAD remain flat after that time.
2. Explain how EAD in Figure 3 relates to Table 6.

Final Panel Comment 19

Some sections of the report rely too heavily on the appendices to explain the steps in data acquisition, analysis, and conclusions.

Basis for Comment

While the report is well written and easy to understand, it is the opinion of the Panel that the main report should provide substantial detail on the study approach and analysis so that the reader does not have to refer to the appendices in order to understand what was done and how conclusions were drawn. The report should be able to serve as a standalone document, with appendices in supporting role providing more detailed information.

Significance – Low

Synthesis of the approach and analysis, as well as full support of the conclusions in the main report, without heavy reliance on the appendices, is important to the completeness and understanding of the report.

Recommendations for Resolution

1. Summarize and integrate into the report the supporting information detailed in the appendices. For example, in Volume 3, Section 1.2, include a map or a plate to show the reader the plant types or plant community change; this could also possibly serve as an orientation map for the reader.
2. Include Table 3 from Appendix C (p. 330) in Volume 3, Section 2.1.1, Fishes, Index of Biological Integrity.
3. Add Table 23 from Appendix B (p. B-33) to Volume 2 to more clearly describe the criteria used to identify the construction sites, or refer to where this is covered in another part of the report.
4. Include Table 29 from Appendix B (p. B-38) in Volume 2, and clarify if there were any individual properties that were identified as candidates for non-structural flood reduction measures but not geographically located in one of the clusters. If there were such properties, explain how these were evaluated or included.
5. Explain the rationale for averaging the cost calculations derived from two different methods.

Final Panel Comment 20

In several places in the report, statements or calculations have not been supported by adequate explanations.

Basis for Comment

The methods for screening sites for non-structural measures, calculating the cost of elevating structures, and screening flood risk reduction sites are not fully described.

- In Appendix B, Table 29 (p. B-38) clearly identifies clusters of properties as potential non-structural candidates. It appears that all of the structures were located in these clusters. There is no discussion indicating if there were structures identified geographically outside of these clusters or how they were evaluated.

- In Appendix B (p. B-67), two methods were presented for calculating the cost of elevating structures. It was indicated that the results of each method were averaged. However, it appears that the two methods yield substantially different results.

- In Volume 2, Section 3.3 Flood Risk Reduction Site Screening (p. 26) it was indicated that tax assessor estimates were used to estimate site values. It is not clear whether differences in market land values from one area to another are considered in the cost estimates for the flood risk reduction site screening.

Significance – Low

The limited description of the methods for screening sites for non-structural measures, calculating the cost of elevating structures, and screening flood risk reduction sites affects the understanding of the approaches used.

Recommendations for Resolution

1. Provide additional discussion to clarify whether any structures were identified outside of the cluster areas selected for non-structural measures and how these were eliminated or included.
2. Provide justification for averaging the results of the two methods used for calculating the costs of elevating structures instead of relying on one or the other.
3. Explain whether differences in market land values between urban and developed areas were considered for cost estimates used for the screening of flood risk reduction sites.

Final Panel Comment 21

The habitat assessment method for quantifying the quality of habitat cover types is highly subjective and needs to be explained more thoroughly.

Basis for Comment

The protocol and decision process used by the E-Team, based on expert judgment, to "gradually modify some of the [Suitability Index (SI) or Functional Capacity Index (FCI)] curves to better reflect reality as they perceived it “in the field” (p. 25) reveals the subjectivity of analyses such as HEP, HGM, Floristic Quality Index, etc. Without a full description of the approach used to modify SI and FCI curves, the results may not be repeatable or even comparable if a different group of experts were to conduct the same analyses independently. The Panel recognizes, however, that the ecological assessment approaches described here are consistent with the current state of the art. The Panel notes that objectively applying a subjectively based metric like “index of conservatism” may make the result repeatable, but it does not make the conclusion derived any less subjective.

In addition, the Panel did not find a rationale in Volume 3 for excluding certain habitats from evaluation (e.g., anthropogenic habitat and glacial lakes). All of these habitats have at least some ecological value, even though it may be low, especially in the case of the anthropogenic habitats.

Significance – Low

Evidence that expert opinions and conclusions were based on measureable, repeatable, objective facts is important to reducing subjectivity in the various ecological analyses and strengthening the conclusions. Similarly, a rationale for excluding certain habitats is important to understanding the evaluation process.

Recommendations for Resolution

1. Acknowledge which portions of the ecological analyses depend on subjective assertions or "best professional judgment" and explain what was done to maximize measurability and objectivity to make the results more repeatable in the future.
2. Provide a rationale for why certain habitats were not evaluated.

Final Panel Comment 22

Information on stakeholder and public involvement is very limited to one reference.

Basis for Comment

This is such a large project that the Panel assumes that some level of public coordination was conducted in order to meet NEPA requirements. Additionally, for such an extensive project, an outreach and comment process would have been most prudent to garner public acceptance. Watershed studies of this magnitude are normally driven by stakeholder needs and usually have extensive public coordination efforts. However, Volume 1, Section 2.5 is the only reference to a major stakeholder list, but the list is not presented. The Panel could not find any other public coordination efforts documented in the rest of Volumes 1-3.

Significance – Low

Public and stakeholder coordination is critical to the acceptance and ultimate success of the project. The inclusion of information on stakeholder involvement also adds to the completeness of the report.

Recommendation for Resolution

1. Provide a summary of public and stakeholder involvement throughout the study.

This page is intentionally left blank.

APPENDIX B

Final Panel Comments

on the

Upper Des Plaines Phase II Study
Component B Review

This page is intentionally left blank.

Final Panel Comment 1

Assumptions used for the with- and without-project conditions for the six Phase I projects and the basis for estimating flood damage reduction may no longer be valid.

Basis for Comment

The Upper Des Plaines River, Illinois Feasibility (Phase I Study) was approved in 1999 and the recommended six projects were authorized in Section 101 of the Water Resources Development Act (WRDA) 1999. Project benefits, if all projects are built, would provide an estimated 25% reduction in flood damages. The without-project conditions for the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment (Phase II Study) (hereinafter Main Report) assume that the six projects recommended in Phase I are completed (Main Report, p. 62).

However, during a mid-review teleconference facilitated by Battelle on June 5, 2013 to provide the Panel an opportunity to ask clarifying questions about the review documents and the project, the Project Delivery Team clarified that one or more of these projects may not be funded, completed, or may be modified. The Panel found a corroborating statement in the Main Report (p. 69): “At the site identified by the Phase I Study for the North Fork Mill Creek Dam Modification, Lake County has pursued partial removal of the dam. With the dam notching, this site can no longer be used for the authorized storage expansion.”

In fact, only one of the six projects has been constructed and another one is currently under construction. It is not clear if the remaining four projects will be constructed at some time in the future, and if not, how much of a reduction in flood damage would result from the Phase I projects that are already implemented (i.e., how much less than the 25% reduction of the six projects combined). This is partially discussed in the Main Report, Section 4.4, p. 68:

> “Incorporation of these reduced flood stages in the without project conditions for this study prevents allocation of benefits that have already been used to justify federally authorized projects to evaluations conducted in this study. This approach ensures that the recommended plan will be justified with or without construction of the Phase 1 storage; and, until those projects are constructed, the benefits of each flood risk management project recommended by this study will actually be greater than those presented here.”

More structures (residential, commercial, roads, etc.) would be affected by more frequent flood events if some of the Phase I flood risk management projects (i.e., the reservoirs proposed) are not constructed. In other words, the absolute benefit (or flood damage reduction) provided by the combination of Phase I and Phase II projects is

greater than that provided by the Phase II projects alone. Furthermore, it is not clear if the implementation of a given Phase I project would affect the damages benefits estimated for the flood risk management projects proposed in Phase II. The lack of clarity is because of the lack of detail about the geographical areas that would benefit from implementation of a given Phase I project, especially the reservoir sites.

Without-project conditions are the benchmark used by Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) and Visual Interactive System for Transportation Algorithms (VISTA) to estimate flood damage reduction resulting from proposed with-project conditions. If the without-project conditions are established on the assumption that the six Phase I projects are completed, the with-project benefits may be overstated (or understated).

Significance – High

The without-project conditions are the benchmark used to compare with-project conditions. Since the with-project conditions include damage reduction from Phase I, elimination of any of the Phase I projects could result in an under or overstatement of benefits resulting from the preliminary proposed Phase II projects.

Recommendations for Resolution

1. Describe the current status of the six Phase I projects.
2. Describe what steps were taken to ensure that the proposed plans accurately represent the most likely reduction in flood damages if some of the six proposed Phase I projects are not funded and constructed as proposed.
3. Re-run the without-project conditions in both HEC-FDA and VISTA with the most likely combination of Phase I projects and then rerun the with-project damages.

Final Panel Comment 2

There is a general lack of geotechnical data to support reliable exploration at the project sites.

Basis for Comment

Many, if not most, construction claims emanate from issues related to soil or rock – changed conditions, unexpected rock, ground conditions that do not perform as anticipated in the investigation, to name but a few.

At the time the USACE contractor undertook the geotechnical exploration work, the flood damage risk mitigation components of the study included the elements shown in the summary table below (extracted from Appendix G and the Main Report plates). Although some of the elements were later removed from the plan(s), they formed the basis for the geotechnical exploration performed by the USACE contractor when the borings were drilled in the fall of 2011. The table gives the approximate length of reservoir perimeter dikes, flood walls, reservoir fill/drain pipelines, the length of road raises, and number or bridge substructure elements to be re-aligned.

Proposed Flood Damage Mitigation Element	Dike/Flood Wall/Levee/Road Raise Length (ft)	Boring Spacing (ft)	No. of Borings	Pipeline Length (ft)	No. of Borings*
Lake Mary Anne Pump Station (FPCI01)		250		620	2
Bull Creek Reservoir (BCRS02)	7,300	500	15	18,500	19
Aptakisic Creek Reservoir (ACRS08)	5,700	500	11	11,700	12
Campground Road Reservoir (DPRS15)	4,600	500	9	500	2
DPLV09 Levee/Floodwall	11,600	500	23		
Groveland Avenue Levee (DPLV01)	1,600	500	3		
Adler Park Levee (DPLV15)	2,900	500	6		
First Avenue Bridge (DPBM04) Road Raise	4,200	500	8		
BNSF Railroad Bridge (DPBM01) Pier Re-Alignment	4 span	2/Pier	10		
Totals	38,520		75	31,320	35

**denotes spacing at 1,000 ft or 2/element, minimum.*

The number of soil borings performed at any of these sites should be based at minimum upon the anticipated conditions, element alignment, element importance factor, and other pertinent structure and geologic conditions. The table provides an estimate of the minimal number of soil borings likely to be required to provide a reasonable amount of geotechnical data for use in design and construction. The table gives 110 borings. In comparison, a recent geotechnical investigation for a segment of the I-69 project under construction in Indiana (Segment 2 - I-69 Mainline Roadway) included over 150 borings for roadway embankments, road cuts, and drainage structures (not including bridges) for

a 20,000 foot length of new roadway construction (INDOT 2012). Although the I-69 project faces admittedly challenging soil conditions, the soils are not likely to be as poor as those encountered at the Bull Creek reservoir site.

The USACE contractor's investigation had a total of 12 soil borings, or less than 11% of what is anticipated to be needed as a minimum. Only eight of these soil borings are associated with elements remaining in the project. These numbers would be judged insufficient in a typical state Department of Transportation roadway (DOT) design and construction project, or in conventional geotechnical engineering for preliminary design or feasibility studies for land development (shopping centers, residential developments, etc.). Although state DOTs do not provide guidance on the frequency of soil borings for levees and floodwalls, a typical INDOT retaining wall would have borings every 90 feet for walls less than 20 feet high and every 50 feet for walls over that height. The typical geotechnical exploration for a roadway would require borings at the centerline and right and left construction extent at spacing between 450 and 600 feet. It would be reasonable to presume a flood wall or levee type structure has at least as much infrastructure importance as roadway pavement, especially when considering the ability to evaluate the pavement subgrade performance during construction by proof-rolling, an option not available or appropriate for these flood damage risk mitigation structures.

The geotechnical literature does not address the number or frequency of borings that should be performed for the preliminary engineering design stages of a project. Presuming the project moves forward, all of the borings are useful for the later stages of the design, thus, the sooner the borings are performed, the more useful the data are in providing a meaningful design basis.

From the perspective of typical state DOT roadway design and construction, the frequency of soil boring performance (a dike, floodwall or levee construction cross section of 3 borings every 1,000 lf) would be judged insufficient (INDOT 2010). From the perspective of conventional geotechnical engineering for preliminary design or feasibility studies for land development (shopping centers, residential developments, etc.) the number of borings performed for this study by the USACE contractor would also be judged to fall below the normal standard of care in the industry.

Significance – High

The project should not proceed to final design and construction without more and better geotechnical information and analysis because changed condition claims and other costs associated with geotechnical conditions revealed during construction can result in construction problems, delays, and added costs not considered during design.

Recommendations for Resolution

1. Review the geologic conditions anticipated at each of the proposed flood damage mitigation elements.
2. Assess the likely impact of variable soils (type, strength, workability and compressibility) on the proposed construction site by site.
3. Develop a soil boring plan that addresses the potential risks presented by each site

and structure.
4. Revise the plan based upon the data obtained in the field while the investigation is ongoing.
5. Obtain supplemental geotechnical information before completion of the design phase should the results of any geotechnical analyses indicate structure performance is likely to be less than required.

Literature Cited:

INDOT (2010). Geotechnical Manual (revised). Indiana Department of Transportation, Office of Geotechnical Engineering. [www.google.com/search?q=indot+geotechnical+manual&oq=indot+geotechnical+manual&aqs=chrome.0.57.15225j0&sourceid=chrome&ie=UTF-8]

INDOT (2012). Geotechnical Engineering Report: Segment 2 – I-69 Mainline Roadway, Taylor Ridge to Plummer Creek. Indiana Department of Transportation, Office of Geotechnical Engineering. [https://netservices.indot.in.gov/ViewDocs2.0/View.aspx?Did=1597309]

Final Panel Comment 3

There is insufficient detail about the prescribed burning regimen to ensure understanding and support from affected property owners.

Basis for Comment

Prairie restoration is a major component of the Upper Des Plaines River project. Prairies cannot be maintained without a regular regimen of fire maintenance. This is particularly true when the prairie is surrounded by forest, scrub-shrub, or residential development providing a continual source of seed from woody species that will invade the prairie. The Upper Des Plaines River and Tributaries Illinois & Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report) briefly alludes to prescribed burns currently being undertaken more frequently at the onset of the of the prairie restorations and then repeating at about three-year intervals on existing prairie habitats in the project area (Main Report, Section 5.4.1.3, p. 120 and Section 5.4.3, p. 125). This appears to be a realistic approximation.

However, the Panel believes there is insufficient detail for the affected property owners to have a reasonable understanding of what is involved in these periodic prescribed burns. Without such understanding, the burns frequently encounter public resistance, usually based on fears about potential fire damage to nearby properties and complaints about air quality. Often, burning permits become very difficult to obtain, especially if there is significant public opposition to the prescribed burns.

To fully inform the public, the Panel believes the issue of burning management should be addressed directly and in more detail in the Main Report, with an explanation of the need for the prescribed burns and how they are accomplished in a safe manner. In some cases, public involvement in the actual burns has reversed opposition and garnered support for the process.

Significance – Medium

Providing information on the procedures that will be followed to ensure that the prescribed burns are conducted without a safety hazard to people or property is important to fully understanding the management practices that will be employed in the prairie restoration portions of the project.

Recommendations for Resolution

1. In Section 5.4.1.3 in the Main Report, under P2, provide the public with a specific statement of anticipated frequency, time of year, and extent of fire management on prairies associated with this project.
2. In Section 5.4.1.3 in the Main Report under P2, provide an example of the safety ground rules for deciding under what circumstances on a given day a prescribed burn will or will not be undertaken.

3. In section 5.4.1.3. in the Main Report under P2, provide an example of the typical safety rules and precautions that will be taken to ensure that a prescribed burn will remain controlled and will not become a hazard.

Final Panel Comment 4

The calibration of the hydrologic and hydraulic models has not been documented in the Phase II report, and the relevant information in the Phase I report shows significant discrepancies between model and observed values.

Basis for Comment

The without-project and with-project conditions have been determined using hydrologic and hydraulic models that are assumed to be accurate and representative. This assumption relies on a good calibration of these models against observed values. The Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report) (p. 28) indicates that "Both mainstem models have undergone extensive calibration and review by both the Illinois Department of Natural Resources (IDNR) and the Federal Emergency Management Agency (FEMA) during the Phase I study; design of Phase I projects, and a full remapping of the floodplain that was completed along the mainstem Des Plaines River." However, neither the Main Report nor Appendix A, Hydrology and Hydraulics, presents any details on the results of the model calibration. The discussion in Appendix A (pp. 6 and 11) briefly describes the approach, but provides no comparison of model versus observed values.

Details about the calibration of the hydrologic and hydraulic models can be found in the Phase I report, Appendix A, Hydrology and Hydraulics, including Attachment 1, which documents hydrologic and hydraulic modeling by the Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR). The comparison of model and observed values for the 1986 and 1987 historical floods shows significant discrepancies not only in the peak flows (which may affect the estimates of flood damages as well as the design of levees and reservoirs), but also in the flood hydrograph volumes (which may affect the estimates of flood damages, in particular on transportation, and the design of reservoirs).

For instance, the plots of the HEC-1 hydrographs in Figures A-61, A-63 and A-65 of Attachment 1 show discrepancies of model versus observed peak flows as large as approximately 1,400 cfs at the Gurnee gage, 3,800 cfs at the Des Plaines gage, and 6,500 cfs at the Riverside gage during the 1986 historical flood. A better match of "model" to observed values is shown in Plates A-23 through A-28 of Appendix A, but these results are somewhat biased by the fact that the "model" values include observed values for part of the modeled watershed, and yet the better match still shows discrepancies in peak flows as large as 2,000 cfs. This issue was supposedly resolved in a final calibration of design hydrographs (from the 0.2% chance to the 50% chance events) to adjusted statistical records (Appendix A, Table A-8), but no further attempt to improve the model calibration against historical events is provided. On the other hand, iterative model runs of the hydrologic model (in HEC-1) and the hydraulic model (in HEC-2) resulted in a good calibration of the 1986 historical flood, with model values within plus/minus 1 foot of observed values (Appendix A, Page A-40 and Table A-14). It

would have been prudent to test the results of this iteration applied to the 1987 historical flood. Furthermore, it is unclear if this work translated into an improved hydrologic model (in HEC-1) to determine baseline conditions, which in turn are used to estimate flood damages.

The Panel considers there was a huge and valuable effort put into calibrating the hydrologic and hydraulic models with information and model capabilities available through the 1990s, and that effort is documented in the Phase I report. At the same time, the Panel finds there are some outstanding questions about the accuracy of the hydrologic and hydraulic models that needed to be addressed in the Phase II study, which may have led to a review of the appropriateness of relying on over-simplified flood routing with hydrologic methods instead of hydraulic methods. In addition, the Panel does not agree with the technical analysis approach used to determine that it is applicable to use the Phase I mainstem H&H models as the basis for computation of mainstem damages and benefits for the Phase II study (Appendix A, Attachment A-1). It is an indirect way of evaluating the representativeness of the models, which relies on finding out that the revised estimates fall within the 90% confidence limits of the Phase I models; these confidence limits are so wide that they can accommodate most significant deviations. It would have been more straightforward and defensible to verify/validate the Phase I H&H models against flood events that happened after 1999 (2002, 2004, 2007, 2008, or 2010).

Significance – Medium

More objective tests of the model calibration (e.g., using statistics like the deviation of volume runoff, or the coefficient of efficiency) than just indicating the match of model versus observed in qualitative or very general terms are necessary, otherwise the flood damage estimates as well as the effectiveness of the proposed flood risk management projects cannot be supported by current information.

Recommendations for Resolution

1. Include details of the calibration of the hydrologic and hydraulic models (plots or tables of model versus observed values) in Appendix A of the Phase II report.
2. Validate the accuracy of the hydrologic and hydraulic models against more recent historical floods for which input information can be readily available (e.g., the 2008 flood).
3. If recommendation 2 above shows significant discrepancies between model and observed values, both for peak flows and for flood hydrograph volumes, discuss and quantify impacts on flood damages and benefits estimates.

Final Panel Comment 5

The impacts from raising roads and constructing flood walls on existing infrastructure, residences, and commercial facilities have not been adequately addressed.

Basis for Comment

The proposed flood damage risk reduction measures include the raising of roads and construction of flood walls. The flood wall proposed for Ashley Street (DPLV09 - Segment 1) will be located on the south side of the street. It extends approximately 850 feet to the west of River Road. There is a commercial building, a series of apartment buildings, and one private residence located on the south side of the street, all with walk access to the main entrance of each structure from Ashley Street and one with a driveway access as well.

The current flood wall configuration does not address the need for access, handicapped or otherwise, to the main entrance of these structures from Ashley Street once the flood wall has been constructed.

Significance – Medium

The proper design of a flood damage risk reduction measure should not prevent access to existing commercial and residential driveways and public and private sidewalks from existing streets with flood walls or the raising of road grades.

Recommendations for Resolution

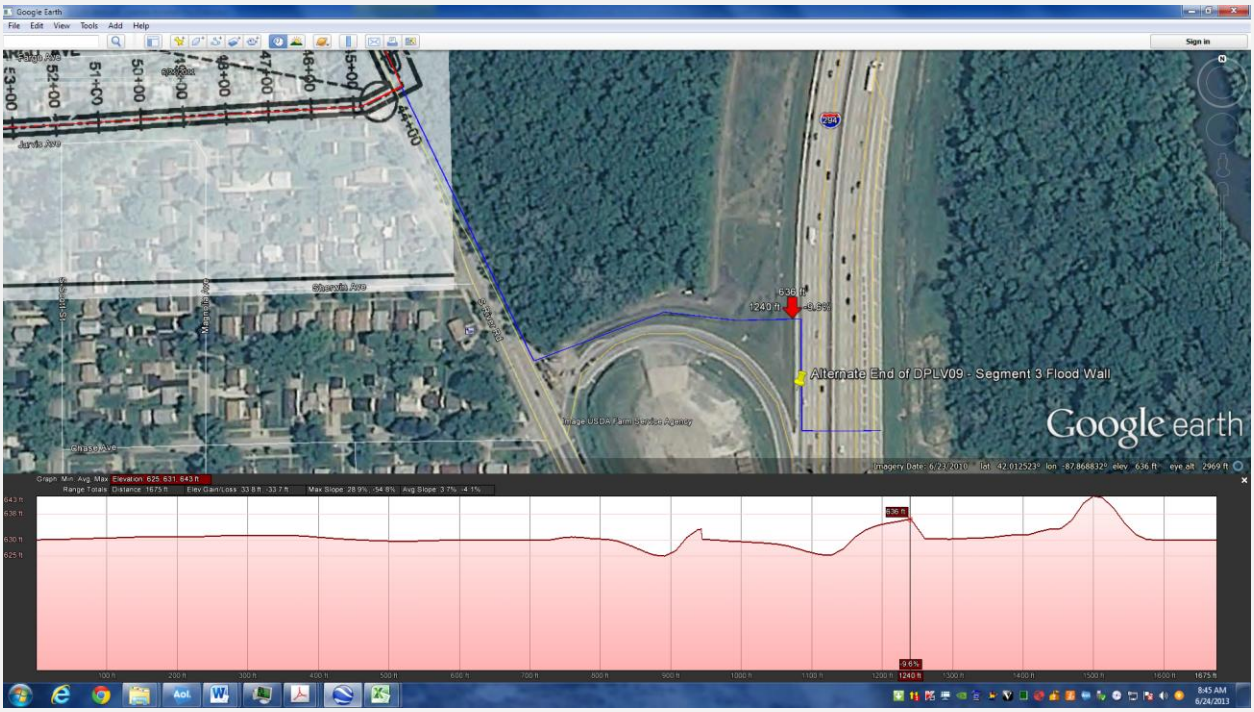
1. Review the grades along Ashley Street for DPLV09 – Segment 1 flood wall and confirm that all existing commercial and residential driveways and building access walks can be accessed by normal means.
2. Modify the proposed flood damage risk reduction measure at all driveways, sidewalk, and private access walks noted to be inaccessible by normal means to permit normal access.
3. Modify the proposed flood damage risk reduction measures to permit handicapped access at all locations found to be inaccessible to the handicapped

Final Panel Comment 6

The current alignment of DPLV09 - Segment 3 is not the most efficient and effective way to mitigate the risk of flood damage in the unprotected area.

Basis for Comment

A review of the potential alternative alignments for the termination of DPLV09 – Segment 3 using Google Earth imagery and elevation data (see image below) suggests that an alternative alignment would be shorter, all on roadway right-of-way, and would protect a larger area.



The top of the Segment 3 floodwall per Plate 19C (file: dp_ii_plates_dec_2012.pdf) is at 633.4; however, the Google Earth imagery indicates a ground level at El. 636 to 637 at the tie-in locations. The Panel recognizes that there are some inconsistencies in the Google earth elevation data, but taken in total, they support the premise that a floodwall could tie into the Tristate Tollway embankment at or above El. 636, but could be as low as 633.5.

Significance – Medium

Relocation of the termination of Segment 3 of this floodwall will increase the protected area by approximately 44 acres with a wall whose length is slightly shorter than the current configuration, would be on existing roadway right-of-way, and would not require the taking of existing residences to complete.

Recommendations for Resolution

1. Review the existing topography along the suggested alternative alignment. If the elevation of the Tristate Tollway proximate to the site is at or above El. 636, then realign the termination of Segment 3 as nominally indicated on the included imagery.

Final Panel Comment 7

The assumptions associated with models and analyses lack thorough documentation and explanation, making it difficult to assess their influence on conclusions.

Basis for Comment

Some of the assumptions in the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report) have undergone little sensitivity analyses, which is used to identify critical variables in each plan under consideration. Performing such analyses would produce a more robust set of documentation and enhance the Main Report.

Some sections of the Main Report are overly dense and difficult for the Panel to follow, especially when many assumptions are being presented. Throughout the Main Report, assumptions need to be supported with more information and explanation in the text. Often the logic and justifications are buried in an appendix or simply do not exist.

Overall, the assumptions seem logical and reasonable. The Panel found it difficult to determine whether they are completely warranted because the sources of, and documentation for, the assumptions are sparse. For example:

- There is no support for choosing the 250-foot buffer versus a larger one. It is not clear whether Geographic Information Systems (GIS) was used.
- Road repairs and transportation delays due to road repairs have been eliminated because of “several transportation agencies,” but neither the agencies nor their comments are presented.
- It was stated or assumed that National Economic Development (NED) and National Ecosystem Restoration (NER) plans are not interdependent. No information is given on how this conclusion was reached.
- There are significant changes in the estimate of benefits for some of the proposed reservoirs when moving along from screening to evaluation of sites. The reasons offered for these changes are very generic. For instance, reservoir site WHRS06 had an initial benefit-to-cost ratio (BCR) of 34.1 (which is high), but it was later eliminated as a feasible option because the BCR went down to less than one “due to detailed analysis of H&H profile” (Appendix B, Table 67, p. B-66). It is not clear what caused the change in the H&H profile and whether the change was due to changes on the H&H models following verification runs against more recent historical flood events.

Significance – Medium

Without a sensitivity analysis or discussion of how the assumptions influence the plans, the level of completeness associated with the models and analyses cannot be fully understood.

Recommendations for Resolution

1. Inventory the assumptions in the Main Report and the supporting appendices.
2. Evaluate the available and potential support or documentation for each assumption, adding that discussion to the Main Report.
3. Conduct sensitivity analyses of the assumptions surrounding the variables in the models or analyses, thus identifying the critical variables and processes to be closely monitored as the chosen plan is developed.
4. Add the sensitivity results to the plan being evaluated in the relevant areas of discussion in the Main Report.

Final Panel Comment 8

The objective of achieving restored habitats with less than 1% cover of invasive plant species seems highly unrealistic given the current state of the art.

Basis for Comment

The Panel believes that the objective of reducing cover of invasive plants to less than 1% or even 5% (Main Report, Section 2.4.1, p. 18) is admirable but unrealistic given the current state of the art. The wording of the objective implies keeping invasive plant species cover at either 1% or, at a minimum, 5%, both of which present a degree of technical capability that will be a significant effort to achieve and particularly to maintain. Useful and highly improved habitat may be restored and maintained even if it meets a somewhat lesser standard.

USACE and both the Illinois and Wisconsin Department of Natural Resources permits with mitigation requirement conditions sometimes cite a performance standard of no more than 5% cover of invasive species. Based on the Panel's experience, this objective is rarely achieved and, if so, only temporarily without long-term maintenance involving weeding and substantial, repeated application of herbicides. Given these challenges to maintaining 5% cover of invasive species, the Panel believes that less than 1% cover is unrealistic. Currently, the literature does not report long-term success maintaining less than 1% cover of invasive plant species.

Even if the more conservative percentage is used, and less than 5% invasive plant species is a required measure of success, the Panel believes the objective is highly unlikely to be achievable and maintained under the current state of the art. The Panel believes that "Plans should, at a minimum, keep invasive plant species cover at less than 5%" (Main Report, Section 2.4.1, p. 18) should be clarified as a suggested objective but not a required success criterion.

Significance – Medium

An objective of less than 5% cover by invasive plant species is a desirable target but the ability to achieve and maintain that objective is unlikely at the present time and as a success criterion, it should not be a requirement.

Recommendations for Resolution

1. Clarify whether the objective of "keeping invasive plant species cover to less than 1% of the site" with plans to keep invasive plant species cover, at a minimum, to less than 5% is a suggested target or a required success criterion.
2. Address the intensity, frequency, and kind of effort required to achieve and maintain invasive plant species cover to such levels.
3. Discuss how frequently levels such as less than 5% or less than 1% invasive plant species have been attained and maintained over time in real-world projects.

Final Panel Comment 9

The proposed riverine restoration projects do not include site specific information on existing conditions and feasibility designs, which is considered necessary to support estimated gains in habitat units that can be attributable to these projects.

Basis for Comment

The analysis and proposals related to riverine restoration are very generic, and do not provide the specifics of the riverine systems within the project area. Examples of this in the Upper Des Plaines River and Tributaries, Illinois and Wisconsin, Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report) include:

- Section 3.1.1.6, Fluvial Geomorphology & Topography and Plate 8 (which primarily shows topographic relief, but not much about geomorphology) do not describe the relevant geomorphologic characteristics of the mainstem and tributaries that could offer guidance on the scope and magnitude of stream restoration efforts needed. A summary of previous studies could have been helpful. For instance, summarizing the information on erosion and sedimentation in the report Upper Des Plaines Area Assessment (IDNR 1998) could have served as an initial platform to characterize the gradation of bed and bank sediment material, dominant mode of sediment transport (as bedload, suspended, or washload), typical cross sections and planforms (sinuosity, meander wavelength and amplitude), and historical changes (channel bed aggradation or degradation, and channel migration rates).
- Section 3.2.1.5 of the Phase II report indicates that "The Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio Environmental Protection Agency was utilized to assess riverine habitat quality. The average QHEI score of 44 classifies the Upper Des Plaines River system as a 'moderate aquatic resource' in terms of riverine habitat" (Main Report, p. 41). However, the actual assessment is not provided.
- Section 5.4.1.2 offers some general design guidelines but no detail for dam removal, sinuosity reestablishment, and cobble riffles riverine restoration projects. Hence, it is not clear what the bases are for the specific riverine restoration proposals presented in Section 5.5. The Phase II report itself acknowledges this gap in Section 5.5, where one of the additional studies listed is: "Hydrologic and hydraulic modeling for stream restoration and dam removal features. This would provide information for proper placement and sizing of in-stream structures to remeander streams" (Main Report, p.156).

Gains in habitat units and the associated costs to produce these gains are the metrics used to evaluate ecosystem restoration projects. Appendix C provides some relevant information. Section 2.2 of this appendix (P. C-9) indicates that the proposed riverine restoration projects have been evaluated using the Net Average Annual Habitat Unit spreadsheet developed by the Chicago District Planning Section. However, no specific

information is provided about the nature and size of the riverine restoration projects being proposed, which would allow gaging the need and benefits of these projects.

Significance – Medium

Site-specific background information, analysis, and feasibility design of the proposed riverine restoration projects could prove the estimated gains in habitat units or the associated cost estimates are not accurate, which in turn could affect which projects to include in the NED/NER plan.

Recommendations for Resolution

1. Include the results of the QHEI in the Main Report.
2. Include the results of the Net Average Annual Habitat Unit spreadsheet used to evaluate riverine restoration projects in Appendix C.
3. If no additional analysis and design can be completed in the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase II Study), provide examples of similar riverine restoration projects in the study area that can serve as a reference for the estimated gains in habitat units that can be attributable to the riverine restoration projects proposed in Phase II.

Literature Cited:

IDNR (1998). Upper Des Plaines Area Assessment, Volume 2: Water Resources. Illinois Department of Natural Resources, Office of Scientific Research and Analysis, Champaign, Illinois.

Final Panel Comment 10

Future development is not discussed sufficiently to determine how risk and uncertainty associated with that development will affect the with-project conditions.

Basis for Comment

There is a discussion in the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report) (pp. 50-51) of ongoing and increasing risk caused by future development. However, the discussion in Appendix E, Economic Analysis, does not address how the risk and uncertainty specifically related to new development will affect the with-project conditions.

New development is expected to be minimal and mostly related to redevelopment of previously developed land. Yet Table 3.11 (p. 51) shows there will be new development of agricultural land in the study area. The impact of denser development and increased run-off on these open agricultural lands is not discussed.

The Panel finds that the risk is only qualitatively evaluated throughout the real estate plan in Exhibit G of Appendix E, which is not enough to answer issues about the future development. It is important to determine which variables dealing with future development are critical, either before or after sensitivity analyses are run. Such analyses would provide good information for planning during the implementation phase.

Land, easements, rights-of-way, relocation, and disposal (LERRD) costs of expected and future development are uncertain, while being a significant portion of Total Project Costs (land values alone are 45% of the total National Economic Development/National Ecosystem Restoration [NED/NER] plan): as such they need major treatment and resolution as risk contributors.

Significance – Low

Future development is an important variable for projects that will be executed a significant period after the base analyses. The risks and uncertainties associated with such development should be considered during initial planning.

Recommendations for Resolution

1. Revise the risk and uncertainty discussions in the Main Report specifically related to future development.
2. Relate the risk and uncertainty parameters to the range of future development expected as one of the proposed plan(s) is implemented.
3. Discuss and consider impacts of varying levels of development on the relevant variables that could affect the NED/NER plan.
4. Evaluate the impact of denser development and increased run-off on the agricultural

lands.

5. Expand on the conclusion that new development will be minimal and how that conclusion was reached and supported.

Final Panel Comment 11

It is not clear when ditch filling will be applied instead of ditch plugging in wetland restoration.

Basis for Comment

Filling a ditch rather than simply plugging it has proven to be much more successful in restoring natural hydrology to areas undergoing wetland restoration efforts. Ditch plugging can be partially successful but is not preferable; while it stops drainage, the open ditch remains as a reservoir holding water that would otherwise be distributed to adjacent soil. In some cases, ditch filling may not be possible and ditch plugging is the only alternative. Both options are planned for this project (Main Report, Section 5.4.1.1, pp. 116-117; Section 5.4.4.1, p. 126; Section 10.1.1, p. 214; Section 10.1.2, p. 221). The Panel is unclear as to what the underlying guidance is for selecting ditch plugging instead of filling.

Significance – Low

Since both filling and plugging of ditches are proposed as wetland restoration methods, knowing when and why either method would be used would help in understanding the selection process.

Recommendations for Resolution

1. State when and why ditch plugging would supersede ditch filling in the wetland restorations.

Final Panel Comment 12

Public concerns and the outreach process have not been identified nor adequately described.

Basis for Comment

Public concerns do not seem to have been considered in the Upper Des Plaines River and Tributaries Illinois & Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report). Background on public concerns and outreach, available in Appendix L, Coordination, dates back to 2002, 11 years ago. These 2002 comments by the public suggest their lack of understanding of how much is going to be achieved by this initial set of six projects proposed in Phase I.

There is also little information about an overall communication (or outreach) plan in either the Main Report or the appendices. State and local agencies were contacted, but that does not replace the need for outreach to the public. The support from the public for an overall plan that focuses heavily on ecosystem restoration projects, with significant residual flood damage still existing, has not been assessed after 2002.

Significance – Low

A solid outreach process, properly implemented, can increase acceptability (an evaluation criterion for screening alternative plans) of the elements of the overall plan chosen for implementation.

Recommendations for Resolution

1. Add a paragraph in the Main Report describing the steps taken to involve the public.
2. Conduct a public release of the plan, accompanied by public meetings, as the first step in the outreach process. Such a release could include the results of running the H&H models for the recent large floods (2008 and 2013) to give the public a base for comparison.
3. Responses to public concerns/comments should be openly published.

Final Panel Comment 13

Potential relocations as a result of the six Phase I projects have not been adequately addressed.

Basis for Comment

It is not clear to the Panel what or who would be relocated and to where. The Panel understands that a detailed relocation Real Estate Plan will be developed during the final feasibility phase (Appendix I, p. 34) and, as such, was not available for review. Appendix I, p.35, affirms that the comments and views of local residents and the public will be gathered from the public and affected landowners to assess the support for the project" as part of this feasibility study. The Panel could not determine whether such efforts have been started; if so, the results are not in the report or appendices.

It is risky to not fully understand landowners' needs, as indicated by the lack of progress on the six Phase I projects where landowners' needs seem to be the source of barriers to implementation.

Significance – Low

Reluctant, delayed, or non-achieved relocations could potentially create changes in the plans, in the costs, and in acceptability (one of the four evaluation criteria for screening alternative plans), but will not significantly affect the overall benefit/cost ratios.

Recommendations for Resolution

1. Evaluate plan components and measures for all three plans, determining which measures may entail relocations.
2. Develop a list of properties that would require relocations and a planning level cost for relocations.
3. Conduct sensitivity analyses to determine impact on costs, benefits, and benefit/cost ratios if relocations are delayed or not achieved.

Final Panel Comment 14

There is no discussion of how benefits for non-structural alternatives are calculated, or if they are excluded in the Hydrologic Engineering Center- Flood Damage Reduction Analysis calculations.

Basis for Comment

Typically damage reductions are calculated outside of Hydrologic Engineering Center - Flood Damage Reduction Analysis (HEC-FDA) or manually adjusted in the model. The Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report), Appendix E and Appendix B, discusses the non-structural alternatives. Damage reduction from non-structural alternatives accounts for a significant portion of benefits. However, since there is no discussion of how damage reduction estimates were made, there is no basis to understand if the assumptions and methodology are well considered and appropriate. The Panel is unable to determine how the calculations were performed or whether the assumptions and methodology were reasonable.

Significance – Low

Providing more detail on how the calculations were performed and whether the methodology is reasonable would improve the quality of information presented in the Economic Appendix.

Recommendations for Resolution

1. Add a discussion in Appendix E, Economic Analysis, to detail the methodology used to calculate damage reduction for the non-structural alternatives.

Final Panel Comment 15

Uncertainty surrounding benefits from the Full, National Economic Development (NED)/National Ecosystem Restoration (NER), and Continuing Authorities Program (CAP) plans is not clearly analyzed or presented.

Basis for Comment

Risk and uncertainty associated with alternatives considered are addressed throughout the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment (hereinafter Main Report). There is a sufficient discussion of the factors that contribute to risk and uncertainty in Appendix E, Section 2.3. However, in presenting the Full, NED/NER, and CAP plans and expected flood damage reduction, there is no discussion of uncertainty and the probability that the desired reductions will be achieved for any of the three plans that are tentatively recommended by this Study.

A discussion of the probability that the tentatively recommended plans will achieve the expected benefits would be useful and could be included at the end of Appendix E. Engineer Regulation (ER) 1105-2-100 states, “Planners shall identify areas of risk and uncertainty in their analysis and describe them clearly, so that decisions can be made with knowledge of the degree of reliability of the estimated benefits and costs and of the effectiveness of alternative plans” (USACE 2000). A similar source of risk and uncertainty analysis can be found in Engineer Manual (EM) 1110-2-1619 (USACE 1996).

Significance – Low

Without a meaningful discussion of uncertainty, it is not possible to understand the likelihood that the proposed plan(s) will achieve the stated goal of flood damage reduction.

Recommendations for Resolution

1. Include a discussion of uncertainty and the probability that the tentatively recommended plan will achieve the expected benefits at the end of Appendix E. Since each plan has uncertainty associated with variables, state what the likelihood/probability that the proposed plan(s) will achieve the indicated damage reduction. A table similar to Figure 15.3 of the HEC-FDA User’s Manual, V1.2.4 (p. 15-3) (USACE 2008) may serve as a useful model.

Literature Cited:

USACE (2008). HED-FDA User’s Manual, Version 1.2.4. U.S. Army Corps of Engineers, Institute for Water Resources, Hydrologic Engineering Center, Davis, CA. November.

USACE (2000). Planning - Planning Guidance Notebook**.** Engineer Regulation 1105-2-100. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 22 April.

USACE (1996). Engineering and Design - Risk-Based Analysis for Flood Damage Reduction Studies. Engineer Manual 1110-2-1619. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 1 August.

Final Panel Comment 16

It is not clear whether models based on subjective expert analyses could be replicated by a different team of experts and whether they would vary significantly.

Basis for Comment

The environmental models and the analyses derived from them are acceptable. Quality Indices such as Habitat Evaluation Procedure (HEP), Hydrogeomorphic (HGM) assessment, and Floristic Quality Index that depend on values derived from the subjective opinions of experts (e.g., "Coefficients of Conservatism" used in the Floristic Quality Index) leave the Panel with concern regarding validity and repeatability. For example, the protocol implemented during the HEP/HGM process allows the Interagency Ecosystem Assessment Team (E-Team) to provide its expert judgment in order "to refine the curves to better reflect reality as they perceived it in-the-field" (Section 5.3.1, p.110). Confidence in the Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (Phase II Study) conclusions would be bolstered with additional explanation of why these values should be considered dependable and not likely to change if a future panel of different experts were engaged as quality control to independently replicate the subjectively derived values. To the extent that USACE can show their conclusions are based on measureable, repeatable, objective facts rather than subjective opinions (even if expert), those conclusions will be strengthened.

Several of the models used in the analysis are admittedly "under review" (Table 2.1, p. 14). This includes the Index of Biological Integrity (IBI); the HEP Community Models for the Upper Des Plaines River Watershed, Illinois and Wisconsin; the Regional Guide for Applying the HGM Approach to Assessing Wetland Functions of Depressional Wetlands in the Upper Des Plaines River Basin; and the Visual Interactive System for Transportation Algorithms (VISTA). The Panel believes there should be some reassurance that the results garnered from these methods will not differ significantly once the methods pass final review.

Significance – Low

Clarification regarding the accuracy and precision (repeatability) of the expert-based evaluation methods used would improve confidence in the results reported and environmental benefits anticipated.

Recommendations for Resolution

1. Explain how the conclusions drawn from the methods used were based on measureable, repeatable, objective facts rather than subjective opinions (even if expert).
2. Provide some reassurance that the results garnered from the methods "under review" will not differ significantly once the methods pass final review.

Appendix C

Final Charge to the Independent External Peer Review

on the

Upper Des Plaines Phase II Study
Component B Review

Charge Questions and Guidance to the Peer Reviewers for the Component B Independent External Peer Review of the Upper Des Plaines Phase II Study

BACKGROUND

The study area of the upper Des Plaines River watershed originates in an agricultural landscape in Racine and Kenosha counties of southeastern Wisconsin. The watershed then slopes south to where it meets with the confluence of the Salt Creek watershed near Riverside, Illinois. The Des Plaines River then flows southwest on to its confluence with the Kankakee River, which together combine to form the Illinois River. The study area for this Phase II Study includes the entire drainage area upstream of the confluence with Salt Creek, including 12 major tributaries to the river. The Upper Des Plaines watershed covers approximately 484 square miles, an area that spans approximately 60 miles from north to south and 8 miles from east to west. The Upper Des Plaines River travels over 69 miles before its confluence with Salt Creek. Tributaries within the study area include about 330 miles of perennial and intermittent streams.

The Upper Des Plaines River and Tributaries, Illinois and Wisconsin Feasibility Study (hereinafter Upper Des Plaines Phase II study) is a continuation of the Upper Des Plaines River Flood Damage Reduction Feasibility Study (Phase I Study), conducted under the Chicago – South End of Lake Michigan (C-SELM) Urban Water Damage Study Authority, contained in Section 206 of the 1958 Flood Control Act (P.L. 85-500). Federal interest in flood risk management in the Upper Des Plaines watershed was established in a Reconnaissance Report that preceded the Phase I Study and was approved in 1989. The Phase I Study, approved in 1999, focused primarily on flooding problems along the main stem of the upper Des Plaines River (upstream of its confluence with Salt Creek), and recommended implementation of six projects to reduce main stem flooding. Study recommendations were authorized in the Water Resources Development Act of 1999 (P.L. 106-53).

The Upper Des Plaines Phase II study was authorized by Section 419 of the Water Resources Development Act of 1999, and identified as the Upper Des Plaines River and Tributaries, Illinois and Wisconsin. The authority provides the following:

> Sec. 419. Upper Des Plaines River and Tributaries, Illinois and Wisconsin
> a) In General. –The Secretary shall conduct a study of the upper Des Plaines River and tributaries, Illinois and Wisconsin, upstream of the confluence with Salt Creek at Riverside, Illinois, to determine the feasibility of improvements in the interests of flood damage reduction, environmental restoration and protection, water quality, recreation, and related purposes.
> b) Special Rule. –In conducting the study, the Secretary may not exclude from consideration and evaluation flood damage reduction measures based on restrictive policies regarding the frequency of flooding, the drainage area, and the amount of runoff.
> c) Consultation and Use of Existing Data. –In carrying out this section, the Secretary shall–
> (1) consult with appropriate Federal and State agencies; and

(2) make maximum use of data in existence on the date of enactment of this Act and ongoing programs and efforts of Federal agencies and States.

A Coalition of State and local agencies are acting as non-Federal sponsors with USACE for this project. The partnering agencies are the Illinois Department of Natural Resources (IDNR), Cook County Highway Department (CCHD), Lake County Stormwater Management Commission (LCSMC), and Southeastern Wisconsin Regional Planning Commission (SEWRPC). A Feasibility Cost Sharing Agreement was signed between the sponsors and USACE in 2002.

The Upper Des Plaines Phase II study has two primary purposes: flood risk management (mainstem and tributary damages) and ecosystem restoration within the watershed. Secondary purposes include water quality improvement, recreation, and related purposes as noted in the authority. The study will consider sites located within tributary watersheds and along the main stem for both Flood Risk Management (FRM) and Ecosystem Restoration (ER) potential. The affects of FRM sites located within tributary watersheds on mainstem flooding will also be evaluated.

The Upper Des Plaines Phase II study is taking a systems approach to planning by building upon the Phase I analyses and integrating analyses aimed at multi-purpose solutions to problems across the entire watershed. A major outcome of the Phase II study will be a watershed management plan that identifies a combination of recommended actions to be undertaken by USACE as well as additional actions to be undertaken by various partners, stakeholders, and other agencies. The watershed management plan will identify multi-purpose actions for flood risk management, ecosystem restoration, watershed management ordinances, floodplain management, and water quality improvements through the implementation of best management practices within the study area.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Upper Des Plaines Phase II Study in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review Policy* Engineer Circular (EC) 1165-2-209, January 31, 2010), *Civil Works Review* EC 1165-2-214 (15 December 2012), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

This purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-209; p. D-4) for the Upper Des Plaines Phase II Feasibility Study. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in engineering, economics, plan formulation, and environmental issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

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

DOCUMENTS PROVIDED

The documents for review are presented in the table below. Note the review assignments per panel member vary slightly according to discipline. Panel members are not precluded from reviewing all of the documents; however, this table is meant to serve as a guide to best focus their review.

Report Title	Approx. No. of Pages
Upper Des Plaines River and Tributaries, Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment – Main Report, *May 2013 (Draft)*	**284**
Appendix A – Hydrology & Hydraulics, Plates an Appendices	**133**
Appendix B – NED Plan Formulation	**99**
Appendix C – NER Plan Formulation	**16**
Appendix D – Civil Design	**148**
Appendix E – Economic Analysis	**94**
Appended E – Attachment 1 (Final Project Report, Upper Des Plaines Structure Inventory and Nonresidential Surveys)	**186**
Appendix F – Cost Engineering	**79**
Appendix G – Geotechnical Analysis	**631**
Appendix H – HTRW Report	**266**
Appendix I – Real Estate	**37**
Appendix L – Coordination	**46**
Appendix M – Monitoring Plan	**9**
Appendix N – Clean Air Act General Conformity Report	**34**
Finding of No Significant Impact (FONSI)	**3**
Total Page Count	**2,069**

DOCUMENTS FOR REFERENCE

- USACE guidance Civil Works Review, (EC 1165-2-214, 15 December 2012)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

SCHEDULE

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	5/24/2013
	Battelle convenes kick-off meeting with panel members	5/24/2013
	Battelle convenes kick-off meeting with USACE and panel members	5/24/2013
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	6/3/2013
	Panel members complete their individual reviews	6/10/2013
Prepare Final Panel Comments and Final IEPR Report	Battelle provides panel members with talking points for Panel Review Teleconference	6/12/2013
	Battelle convenes Panel Review Teleconference	6/13/2013
	Battelle provides Final Panel Comment templates and instructions to panel members	6/14/2013
	Panel members provide draft Final Panel Comments to Battelle	6/19/2013
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	6/20 – 6/24/2013
	Battelle finalizes Final Panel Comments	6/25/2013
	Battelle provides Final IEPR Report to panel members for review	6/26/2013
	Panel members provide comments on Final IEPR Report	6/27/2013
	*Battelle submits Final IEPR Report to USACE	6/28/2013

Deliverables are noted with an asterisk (*)

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Upper Des Plaines Phase II Study 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 Upper Des Plaines Phase II Study. Please focus on your areas of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-209; Appendix D).

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

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Independent Technical Review.
2. Please contact the Battelle project manager (Rachel Sell, sellr@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 project manager immediately.

4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Rachel Sell, sellr@battelle.org, no later than June 10, 2013, 10 pm EST.

Independent External Peer Review of the

Upper Des Plaines River and Tributaries Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment

Component B 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?
2. Are the assumptions that underlie the engineering and environmental analyses sound?
3. Are the engineering and environmental methods, models, and analyses used adequate and acceptable?
4. Were all models used in the analyses used in an appropriate manner with assumptions appropriately documented and explained?
5. Were risk and uncertainty sufficiently considered?
6. Was the process used to select the recommended alternative rational, and was the process implemented in a reasonable manner given the project constraints?
7. Does the environmental assessment satisfy the requirements of the National Environmental Policy Act (NEPA)? Were adequate considerations given to significant resources by the project?
8. In general terms, are the planning methods sound?
9. Are the interpretations of the analysis and conclusions based on the analysis reasonable?
10. Assess the recommended alternative from the perspective of systems. Does the alternatives analysis consider systemic aspects from a temporal perspective, including the potential effects of climate change?
11. What sections of the report are well written and do not require further revision?

Safety Assurance Review Questions

12. Were the methods used to evaluate the condition of the structure adequate and appropriate given the circumstances?

13. Have the appropriate alternatives been considered and adequately described for this project, and do they appear reasonable?

14. Do the project features adequately address redundancy, resiliency, or robustness with an emphasis on interfaces between structures, materials, members, and project phases?

15. Are the quality and quantity of the surveys, investigations, and engineering sufficient to assess expected risk reduction?

16. Have the hazards that affect the structures been adequately documented and described?

17. Are the models used to assess hazards appropriate?

18. Are the assumptions made for the impacts appropriately documented and explained?

19. Is sufficient information presented to identify, explain, and comment on the assumptions that underlie the engineering analyses?

20. Are any additional analyses or information available or readily obtainable that would affect decisions regarding the structures?

21. Do the physical data and observed data provide adequate information to characterize the structures and their performance?

22. Have all characteristics, conditions, and scenarios leading to potential failure, along with the potential impacts and consequences, been clearly identified and described? Have all pertinent factors, including but not necessarily limited to the population at risk, been considered?

23. Does the analysis adequately address the uncertainty given the consequences associated with the potential loss of life for this type of project?

24. From a public safety perspective, is the proposed alternative reasonably appropriate, or are there other alternatives that should be considered?

25. Has anything significant been overlooked in developing the assessment of the project or the alternatives?

26. Do the alternatives and their associated costs appear reasonable? Do the benefits and consequences appear reasonable?

Specific Charge Questions for the Component B IEPR for the Upper Des Plaines River and Tributaries Illinois and Wisconsin Integrated Feasibility Report and Environmental Assessment

Objectives

27. To what extent does the present study achieve its stated primary objectives to (1) further reduce mainstem flooding, (2) reduce tributary flooding, and (3) restore degraded ecosystems?

28. To what extent does the present study achieve its stated secondary objectives to (1) improve water quality and (2) enhance recreational opportunities?

29. Has the project need been clearly described?

30. Have the public concerns been identified and adequately described?

31. Are the specific objectives adequately described?

32. In your opinion, are there any other issues, resources, or concerns that have not been identified and/or addressed?

33. Comment on whether the stated objectives and constraints embrace all of the key elements that need to be taken into account in the project. If not, what should be added?

Alternatives

34. Have the criteria to eliminate plans from further study been clearly described?

35. Is each of the different alternative plans clearly described?

36. For each alternative, were the assumptions made to develop the future with-project conditions reasonable? Were adequate scenarios considered? Were the assumptions reasonably consistent across the range of alternatives? Where assumptions were different across the alternatives, were they adequately justified?

37. Are the changes between the without- and with-project conditions adequately described for each alternative?

38. Have comparative impacts been clearly and adequately described?

39. Are future operation, maintenance, repair, replacement, and rehabilitation efforts adequately described, and are the estimated costs of those efforts reasonable for each alternative?

40. Are all unmitigated environmental impacts identified? If not, could project designs be impacted?

41. Please comment on the likelihood that the recommended alternative will achieve the expected outcomes.

42. Are residual risks adequately described, and is there a sufficient plan for communicating residual risks to affected populations?

43. Have the impacts to the existing infrastructure, including the existing flood risk management project, utilities, and transportation infrastructure, been adequately addressed?

Affected Environment

44. Is the description of physical resources complete and accurate?

45. Comment on the accuracy of the description of ecological resources in the study area.

46. Comment on the assessment that the riverine fish communities in the Des Plaines watershed are moderately to highly degraded.

47. Is the description of the climate in the study area sufficiently detailed and accurate? If not, please explain.

48. Is the description of wetland resources in the project area complete and accurate? If not, please explain.

49. Is the description of aquatic resources in the project area complete and accurate? If not, please explain.

50. Is the description of threatened and endangered species resources in the study area complete and accurate? If not, please explain.

51. Is the description of the historical and existing recreational resources in the study area complete and accurate? If not, please explain.

52. Is the description of archaeological and historical sites in the Des Plaines watershed complete and accurate? If not, please explain.

53. Is the description of the socioeconomic setting in the Des Plaines watershed complete and accurate? If not, please explain.

Environmental Consequences

54. Have impacts to significant resources been adequately and clearly described?

55. To what extent have the potential impacts of the alternatives on significant resources been addressed and supported?

56. Are the scope and detail of the potential adverse effects resulting from project implementation sufficiently described and supported?

Cumulative Impacts

57. Are cumulative impacts adequately described and discussed? If not, please explain.

Mitigation

58. Are mitigation measures adequately described and discussed? If not, please explain.

Traffic

59. Were mitigation measures proposed during construction adequately described and discussed? If not, please explain.

Hydrology and Hydraulics

60. Was the hydrology discussion sufficient to (1) characterize current baseline conditions and (2) allow for evaluation of how forecasted conditions (with and without proposed actions) are likely to affect hydrologic conditions?

61. Comment on whether the discussion of land acquisition within the floodplain is adequate, focusing on the report's finding that preventing development on this land might prevent future flood conditions from worsening, given the assumption that urbanization in the remainder of the watershed will increase.

Geotechnical Engineering

62. Is the description of the geomorphic and physiographic setting of the proposed project area accurate and comprehensive?

63. Were the geotechnical analyses in the report documentation adequate and appropriate for the current level of design?

Design

64. Have the design and engineering considerations been clearly outlined and will they achieve the project objectives?

65. Are any additional design assumptions necessary to validate the preliminary design of the primary project components?

66. Are the assumptions used to determine the cost of operations and maintenance for the proposed project adequately documented and explained?

Real Estate Plan

67. Comment on the extent to which (1) assumptions and data sources used in the economics analyses are clearly identified and (2) the assumptions are justified and reasonable.

68. Does the Real Estate Plan adequately address all real estate interests (public and private)?

Relocations

69. Have potential relocations as a result of the project been adequately addressed?

Hazardous, Toxic, and Radioactive Waste

70. Comment on the extent to which potential impacts of the alternatives regarding hazardous, toxic, and radioactive waste issues have been addressed.

Cost Estimates and Economics

71. Were the benefit categories used in the economic analysis adequate to calculate a benefit-to-cost ratio for each project alternative?

72. Was the methodology used to determine the characteristics and corresponding value of the structure inventory for the study area adequate?

73. Were the methods used to develop the content-to-structure value ratios appropriate, and were the generated results applicable to the study area?

74. Were the methods to develop the depth-damage relationships appropriate, and were the generated results applicable to the study area?

75. Has the economic analysis addressed the issue of repetitive flood damages and the subsequent extent of rebuild/repair by property owners as a result of flooding and how that cost impacts the annual damage estimation?

76. Were risk and uncertainty sufficiently considered in relation to the future development process?

77. To what extent have significant project construction costs been adequately identified and described?

78. Are the costs adequately justified?

79. Comment on the extent to which the approach used to determine costs is clearly and completely explained.

Public Involvement and Correspondence

80. Based on your experience with similar projects, has adequate public, stakeholder, and agency involvement occurred to determine all issues of interest and to ensure that the issues have been adequately addressed to the satisfaction of those interested parties? Should additional public outreach and coordination activities be conducted?

FINAL OVERVIEW QUESTIONS

81. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

82. Please provide positive feedback on the project and/or review documents, especially with respect to how the review documents changed, incorporated your comments from the first phase of review.

SUPPLEMENTAL CHARGE QUESTIONS

1. Are there any gaps or weaknesses in the overall system, presented as the recommended plan, that could affect the expected protection of life safety and/or property?

2. Are the quality and quantity of the subsurface investigations and testing sufficient to support the geotechnical analyses and recommendations for this level of design?

3. Is the level of design adequate for the alternatives and recommended plan to support the cost comparison and project costs presented?

4. Are the flood damage reductions proposed appropriate for a highly urbanized watershed with limited available land? Are there other possible alternatives that could/should have been considered?

5. Are the hydrology and hydraulic models used to evaluation these alternatives appropriate for the proposed measures

6. Were the methods used to develop the traffic damage estimate appropriate, and were the generated results applicable to the study area?

7. Were the methods used to develop the direct depth-delay damage value appropriate, and were the generated results applicable to the study area?

8. Were the methods used to develop the non-structural damage estimate appropriate, and were the generated results applicable to the study area?

9. Were the methods used to develop the recreation unit day values appropriate, and were the generated results applicable to the study area?