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August 6, 2013

Final Independent External Peer Review Report Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties, Kansas, Draft Feasibility Study Report and Environmental Assessment

Prepared by
Battelle Memorial Institute

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

Contract No. W912HQ-10-D-0002
Task Order: 0031

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Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties, Kansas, Draft Feasibility Study Report and Environmental Assessment

by

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505 King Avenue
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EXECUTIVE SUMMARY

Project Background and Purpose

The U.S. Army Corps of Engineers (USACE), Kansas City District along with the non-federal sponsor, the City of Merriam, Kansas, prepared a Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) of the Upper Turkey Creek watershed to determine the federal interest in constructing a flood risk management project in the City of Merriam in Johnson County, Kansas, along Turkey Creek. The study was authorized by Resolution of the Committee on Transportation and Infrastructure of the House of Representatives dated February 16, 2000, for flood damage reduction.

The focus of the Draft FS/EA study was established as the Upper Turkey Creek watershed, located in a heavily urbanized area of approximately 20 square miles where Turkey Creek and its tributaries are prone to damaging floods. The primary project sites considered for flood risk management plan formulation were: a) in the City of Merriam, Kansas; b) in the Unified Government of Wyandotte County and Kansas City, Kansas, at an industrial park called Roe Lane, and c) on a flood-prone segment of highway, Interstate 35 in Johnson County running generally between Merriam and downstream into the Unified Government area. Only the City of Merriam project site has an alternative plan carried forward for recommendation. Alternatives considered include channel widening, levees or floodwalls, and a combination of these. A non-structural buyout plan was also carried forward in plan formulation, in addition to the No Action plan.

Under the USACE concept of collaborative planning, while developing the existing conditions in the watershed, the planning team evaluated environmental degradation early in the study. This effort was intended to consider the possibility of a multipurpose formulation that included ecosystem restoration. Valuable information and data were gathered, and some preliminary candidate sites for restoration were developed; however, because there was no cost sharing sponsor interested in ecosystem restoration in this heavily urbanized watershed, it was not carried forward into plan formulation.

Independent External Peer Review Process

USACE is conducting an Independent External Peer Review (IEPR) of the Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties, Kansas, Draft Feasibility Study Report and Environmental Assessment (hereinafter Draft FS/EA). 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 (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Draft FS/EA. 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 (2012) and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

Based on the technical content of the Draft FS/EA review documents and the overall scope of the project, Battelle identified candidates for the Panel in the following key technical areas: economics/Civil Works planning, biologist/ecologist, hydrology and hydraulics (H&H) engineering, civil/cost engineering, and geotechnical engineering. 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 Panel.

The Panel received an electronic version of the 846-page Draft FS/EA, along with a charge that solicited comments on specific sections of the documents to be reviewed. USACE prepared the charge questions following guidance provided in USACE (2012) and OMB (2004), which were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than this teleconference, there was no direct communication between the Panel and USACE during the peer review process. The Panel produced individual comments in response to 73 charge questions.

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

Results of the Independent External Peer Review

The panel members agreed between each other on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Draft FS/EA. Table ES-1 lists the Final Panel Comments statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the documents include all the components of a thorough report associated with a feasibility level of study. The Panel agreed that the appropriate methods and models were used in the analysis and that they provided adequate detail in describing the processes followed throughout the project. While the Panel deemed the report to be comprehensive, it identified areas of redundancy and inconsistencies attributed to recent updates to the report. The Panel suggests that the report would benefit from consolidation of the redundancies and clarification of the inconsistencies.

Plan Formulation – The project's plan formulation process was well detailed and documented in the report. The report described the local history, urban environment, and project need very well. It identified the problems and opportunities along with the criteria used for selecting the National Economic Development (NED) plan thoroughly. For the alternatives presented, the report was complete in its description of the methods and models used in assessing the performances of the alternatives. However, the Panel suggests that in the interest of completeness, the array of alternatives considered could have included a "floodwall only" alternative in the plan formulation because it appears it may be less costly than the selected alternative. This issue can be resolved by including a floodwall only alternative and describing why it was not fully considered.

Engineering – The Panel determined that the H&H analysis was thorough, but it suggests that a recently published technical update in hydrology records should have been implemented to update the analysis. The Panel agreed that the geotechnical analysis and site investigation was adequate for a feasibility study report but anticipates the need for further refinement with additional data in the design phase as the project progresses.

Economics – The data provided are comprehensive and support the NED plan, but the information is duplicative, and in some places the figures and tables are contradictory. The figures for residual damages of the NED plan are not consistent throughout the report and appendices, which casts doubt on the report's conclusions. The Panel agreed that one of the most incomplete components of the report was presentation of the operation and maintenance (O&M) costs associated with the project. A deconstruction of the average annual O&M costs would provide an illustration of how the costs were derived.

Environmental – The description of the processes and outcomes is comprehensive and well written. However, there was no consideration of a long-term survival and plan for tree mitigation by means of tree planting. This issue can be resolved by adding a maintenance component to the mitigation plan.

Table ES-1. Overview of 16 Final Panel Comments Identified by the Upper Turkey Creek IEPR Panel

No.	Final Panel Comment
Significance – High	
1	Rainfall values are based on an outdated publication; therefore, the hydrology and hydraulics (H&H) analysis underestimates the volume of runoff and flood elevations associated with the flood risk management project and could impact conclusions related to the National Economic Development (NED) alternative.
Significance – Medium	
2	A plan to communicate to the public the residual risks concerning possible loss of life associated with the design of the levee and floodwall system has not been presented.
3	Tree planting and maintenance, which are key components of the mitigation, have not been described in sufficient detail to ensure that the mitigation plan will be successful.
4	Significant pressure flow conditions may occur as a result of the proposed headwalls at roadway crossings increasing scour conditions and leading to potential failure of these crossings or adjacent levees and floodwalls.
5	The magnitude of the increase in the contingency from the alternative analysis to the National Economic Development (NED) plan Cost and Schedule Risk Analysis (CSRA) is not supported, and the connection between this increase and the lack of detailed site investigation or geotechnical investigation is not addressed.
6	Some of the planning objectives do not satisfy the requirements of Engineer Regulation (ER) 1105-2-100, and the use of the objectives for guiding the planning process is not clearly documented.
7	The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) does not present information demonstrating how the planning criteria described in Section 4.2 were used in the plan formulation process to screen potential alternatives.
8	It is not clear if the potential sources of uncertainty and the implications of the risk and uncertainty statistics provided with regard to Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) modeling were considered.
Significance – Low	
9	It appears that the undrained shear strength of 2,000 pounds per square foot (psf) assigned to Stratum 2 is relatively high, especially if it is based solely on the descriptions given on the boring logs.
10	The assumption of no increased runoff is unclear because of conflicting statements regarding the potential for the hydrology of the basin upstream of the study area to change.
11	An alternative utilizing only floodwalls, which could be less expensive, was not considered.
12	The sources of depth-damage functions have not been adequately documented, leading to concerns regarding the validity of these functions.

Table ES-1. Overview of 16 Final Panel Comments Identified by the Upper Turkey Creek IEPR Panel (continued)

No.	Final Panel Comment
13	The significance of project impacts on the wildlife currently using the area, including birds, and the level of displacement of wildlife habitat cannot be determined based on the description provided.
14	Information regarding the quantities, materials, and equipment used to calculate the cost estimates for the selected alternative is not included in Appendix L, Cost Estimate and Cost and Schedule Risk Analysis (CSRA).
15	The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) does not describe how the operations and maintenance (O&M) cost estimate was derived and how the average annual O&M costs were developed.
16	The performance goal for the project is not well defined; therefore, it is not possible to fully understand how well the recommended National Economic Development (NED) plan performs and how it compares with other alternatives.

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LIST OF ACRONYMS

ATR	Agency Technical Review
BMP	Best Management Practice
CCCA	Certified Construction Contract Administrator
CCS	Certified Construction Specifier
CE/ICA	Cost Estimate/Independent Cost Analysis
CENWK	USACE, Kansas City District
COI	Conflict of Interest
CSRA	Cost and Schedule Risk Analysis
DOC	U.S. Department of Commerce
DrChecks	Design Review and Checking System
EC	Engineer Circular
ER	Engineer Regulation
ERDC	Engineer Research Development Center
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FS/EA	Feasibility Study/ Environmental Assessment
H&H	Hydrology and Hydraulics
HEC	Hydrologic Engineering Center
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center-River Analysis System
IEPR	Independent External Peer Review
IGE	Independent Government Estimate
IWR	Institute for Water Resources
MCACES	Micro Computer Aided Cost Estimating Software
NED	National Economic Development
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget

PDT	Project Delivery Team
POP	Period of Performance
psf	pounds per square foot
SAR	Safety Assurance Review
SWS	Society of Wetland Scientists
USACE	United States Army Corps of Engineers

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1. INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Kansas City District along with the non-Federal sponsor, the City of Merriam, Kansas, prepared a Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) of the Upper Turkey Creek watershed to determine the federal interest in constructing a flood risk management project in the City of Merriam in Johnson County, Kansas, along Turkey Creek. The study was authorized by Resolution of the Committee on Transportation and Infrastructure of the House of Representatives dated February 16, 2000, for flood damage reduction.

The focus of the Draft FS/EA study was established as the Upper Turkey Creek watershed, located in a heavily urbanized area of approximately 20 square miles where Turkey Creek and its tributaries and are prone to damaging floods. The primary project sites considered for flood risk management plan formulation were: a) in the City of Merriam, Kansas; b) in the Unified Government of Wyandotte County and Kansas City, Kansas, at an industrial park called Roe Lane, and c) on a flood-prone segment of highway, Interstate 35 in Johnson County running generally between Merriam and downstream into the Unified Government area. Only the City of Merriam project site has an alternative plan carried forward for recommendation. Alternatives considered include channel widening, levees or floodwalls, and a combination of these. A non-structural buyout plan was also carried forward in plan formulation, in addition to the No Action plan.

Under the USACE concept of collaborative planning, while developing the existing conditions in the watershed, the planning team evaluated environmental degradation early in the study. This effort was intended to consider the possibility of a multipurpose formulation that included ecosystem restoration. Valuable information and data were gathered, and some preliminary candidate sites for restoration were developed; however, because there was no cost sharing sponsor interested in ecosystem restoration in this heavily urbanized watershed, it was not carried forward into plan formulation.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties, Kansas, Feasibility Study Report and Environmental Assessment (hereinafter: Draft FS/EA) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE, 2012) and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the existing environmental, economic, and engineering analyses contained in the Draft FS/EA. The full text of the Final Panel Comments is presented in Appendix A.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (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 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 Draft FS/EA was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC No. 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 for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (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

At the beginning of the Period of Performance (POP), Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. In addition, 73 charge questions were provided by USACE and included in the draft and final Work Plans. The final charge also included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Table 1 presents the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on the award/effective date of September 24, 2012, re-initiation of the project on April 10, 2013, and the final schedule based on the receipt of final documents on June 20, 2013. Note that the work items listed in Task 6 occur after the submission of this report.

Table 1. Upper Turkey Creek IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	09/24/2012
	Review documents available	04/18/2013
	Battelle submits draft Work Plan[a]	04/12/2013
	USACE provides comments on draft Work Plan	04/22/2013
	Battelle submits final Work Plan[a]	06/28/2013[b]
2	Battelle requests input from USACE on the COI questionnaire	09/28/2012
	USACE provides comments on the COI questionnaire	04/15/2013
	Battelle submits list of selected panel members[a]	04/18/2013
	USACE confirms that the Panel has no COIs	04/22/2013
	Battelle completes subcontracts for panel members	04/23/2013
3	Battelle convenes kick-off meeting with USACE	NA
	Battelle sends review documents to Panel	04/23/2013
	Battelle convenes Panel kick-off meeting	04/23/2013
	Battelle convenes USACE/Panel kick-off meeting	04/23/2013
	Civil Works Review Board Attendance	12/17/2013
4	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	NA
	Panel members complete their individual reviews	07/01/2013
	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	07/03/2013
	Battelle convenes Panel Review Teleconference	07/08/2013
	Panel members provide draft Final Panel Comments to Battelle	07/25/2013
5	Battelle finalizes Final Panel Comments and Final IEPR Report	08/01/2013
	Panel reviews Final IEPR Report and provides comments to Battelle	08/02/2013
	Battelle submits Final IEPR Report to USACE[a]	08/06/2013
6[c]	Battelle inputs Final Panel Comments into DrChecks	08/07/2013
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	08/08/2013
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	08/08/2013
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to Battelle	08/09/2013

Table 1. Upper Turkey Creek IEPR Schedule (continued)

6[c]	Battelle convenes teleconference with Panel to discuss draft Evaluator Responses and draft BackChecks	08/15/2013
	Battelle convenes teleconference with Panel and USACE to discuss Final Panel Comments and draft responses	08/16/2013
	USACE inputs Final PDT Evaluator Responses in DrChecks	08/20/2013
	Panel provides final BackCheck Responses	08/23/2013
	Battelle inputs the Panel's BackCheck Responses in DrChecks	08/26/2013
	Battelle submits pdf printout of DrChecks project file[a]	08/27/2013
	Project Closeout	09/24/2013[d]

[a] Deliverable
[b] Final work plan was held until all documents were supplied and the actual schedule for the IEPR was finalized after discussions with USACE.
[c] Task 6 occurs after the submission of this report.
[d] Battelle will submit a request to extend the POP to cover closeout activities.

Battelle will enter the 16 Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel with a pdf printout of all DrChecks entries, through comment closure, as a final deliverable and record of the IEPR results.

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: economics/Civil Works planning, biologist/ecologist, hydrology and hydraulics (H&H) engineering, civil/cost engineering, and geotechnical engineering. These areas correspond to the technical content of the Draft FS/EA and overall scope of the Upper Turkey Creek project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle 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. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

The candidates were screened for the following potential exclusion criteria or COIs.[1] 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.

- Previous and/or current involvement by you or your firm[2] in the Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties Kansas, Draft FS/EA and/or technical appendices.
- Previous and/or current involvement by you or your firm[2] in flood risk management projects in the greater Kansas City, Kansas, or Kansas City, Missouri, regions.
- Previous and/or current involvement (conceptual or actual design, construction, or operation and maintenance [O&M]) by you or your firm[2] in projects related to the Draft FS/EA.
- Current employment by the USACE.
- Previous and/or current involvement with paid or unpaid expert testimony related to the Draft FS/EA.
- Previous and/or current employment or affiliation with members of the cooperating agencies or local sponsors: the City of Merriam, Kansas; Johnson County, Kansas; Wyandotte County, Kansas; Mid-American Regional Council; Kansas City Chapter of American Public Works Administration; Merriam Drainage District; Johnson County Public Works, Kansas Department of Health and Environment; Federal Emergency Management Agency, U.S. Department of Agriculture's Urban Forestry Initiative; U.S. Geological Survey; and/or U.S. Environmental Protection Agency (for pay or pro bono).
- Past, current or future interests or involvements (financial or otherwise) by you, your spouse or children related to the greater Kansas City, Kansas, or Kansas City, Missouri, area.
- Current personal involvement with other USACE projects, including authorship of any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please

[1] 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."

[2] 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.

highlight and discuss in greater detail any projects that are specifically with the Kansas City District.

- Previous or current involvement with the development or testing of models that will be used for or in support of the Draft FS/EA, including but not limited to the Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS), HEC-River Analysis System (HEC-RAS), and HEC-Flood Damage Reduction Analysis (HEC-FDA).
- Current firm[2] involvement with other USACE projects, specifically those projects/contracts that are with the Kansas City District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Kansas City District. Please explain.
- Any previous employment by the USACE as a direct employee, notably if employment was with the Kansas City District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by the USACE as a contractor (either as an individual or through your firm[2]) within the last 10 years, notably if those projects/contracts are with the Kansas City District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood management studies, and include the client/agency and duration of review (approximate dates).
- Pending, current or future financial interests in the Draft FS/EA-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from contracts with the non-federal sponsor (the City of Merriam, Kansas).
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Upper Turkey Creek project.
- Participation in prior Federal studies relevant to the Upper Turkey Creek project and/or the Draft FS/EA.
- Previous and/or current participation in prior non-Federal studies relevant to the Upper Turkey Creek project and/or the Draft FS/EA.
- Is there any past, present or future activity, relationship or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. The five final reviewers are affiliated with consulting companies. 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 panel members.

3.3 Conduct of the IEPR

Prior to beginning their review and within 1 day of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. 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 Panel received an electronic version of the final charge as well as the Upper Turkey Creek review documents and reference materials listed below. The documents and files in bold font were provided for review; the other documents were provided for reference or supplemental information only.

- **Upper Turkey Creek Flood Risk Management Feasibility Study, City of Merriam, Johnson and Wyandotte Counties, Kansas, Feasibility Study Report and Environmental Assessment (193 pages)**
- **Appendix A Plan Formulation and Evaluation (2 pages)**
- **Appendix B Chapter 1 Civil Engineering Appendix (15 pages)**
- **Appendix B Chapter 2 Structural Appendix (15 pages)**
- **Appendix B Chapter 3 Hydrology and Hydraulics Appendix (69 pages)**
- **Appendix B Chapter 4 Cost Estimates Appendix (27 pages)**
- **Appendix B Chapter 5 Geotechnical Engineering Appendix (116 pages)**
- **Appendix C Public Outreach & Involvement Appendix (107 pages)**
- **Appendix D Clean Water Act Section 404 (b)(1) Evaluation (19 pages)**
- **Appendix F Socioeconomic Appendix (42 pages)**
- **Appendix G Real Estate Appendix (32 pages)**
- **Appendix I Self Certification of Financial Capability (3 pages)**
- **Appendix J Environmental (hazardous, toxic, and radioactive waste, existing conditions, stream assessments) Appendix (105 pages)**
- **Appendix K Cultural Resources Appendix (14 pages)**
- **Appendix L Cost Estimate and Cost and Schedule Risk Analysis (70 pages)**
- **Appendix M CE/ICA for Mitigation Appendix (13 pages)**
- **Appendix N FONSI (4 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.

3.4 Review of Individual Comments

The Panel was 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 Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. As a result of the review, Battelle summarized the comments into a preliminary list of 19 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

Battelle facilitated a 3-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

The Panel also discussed responses to a charge question 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. The comments were incorporated into a Final Panel Comment.

At the end of these discussions, the Panel identified 15 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Draft FS/EA IEPR:

- Lead Responsibility: For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a sig-

nificant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.

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

At the beginning of this process, 15 Final Panel Comments were prepared and assembled. During the Final Panel Comment development process, the Panel determined that one of the Final Panel Comments no longer met the criteria for a high, medium, or low level significance. Additionally, during the Final Panel Comment development process, the Panel identified two new Final Panel Comments that met the criteria for a high, medium, or low level significance; therefore, the total Final Panel Comment count was increased to 16. 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. At the end of this process, 16 Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

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

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

Table 2. Upper Turkey Creek IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Burke	Newling	Hegre	Schall	Chepkoit
Economics/Civil Works Planning					
Minimum 10 years of experience in public works planning	X				
Direct experience working for or with USACE	X				
Familiar with USACE plan formulation process, procedures, and standards as it relates to flood risk management and multipurpose feasibility studies	X				
Minimum of 5 years of experience directly dealing with the USACE six-step planning process governed by Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook	X				
Familiar with the USACE flood risk management analysis and economic benefit calculations, including use of standard USACE computer programs including HEC-FDA	X				
Experience with the National Economic Development (NED) analysis procedures, particularly as they relate to flood risk management	X				
Familiar with cost effective/incremental cost analysis and trade-off analysis associated with multipurpose plan formulation	X				

Table 2. Upper Turkey Creek IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Burke	Newling	Hegre	Schall	Chepkoit
Biology/Ecology					
Minimum 15 years of demonstrated experience in evaluating and conducting National Environmental Policy Act (NEPA) impact assessments (including cumulative effects analyses) for complex multi-objective public works projects with competing trade-offs		X			
Extensive background experience in and working knowledge of the implementation of the NEPA compliance process		X			
Extensive background experience in and working knowledge of Endangered Species Act requirements		X			
Experience related to best management practices (BMPs) and stream corridor ecosystem restoration practices within urban watersheds, specifically associated with ecologies located in the Midwestern United States		X			
Minimum M.S. degree in appropriate field of study		X			
Civil/Cost Engineering					
Minimum 15 years of experience in civil or construction engineering			X		
Registered professional engineer			X		
Demonstrated experience in performing cost engineering/construction management for all phases of flood risk management-related projects			X		
Demonstrated experience related to levee and floodwall design and construction			X		
Demonstrated experience related to drainage structures			X		
Familiar with and have demonstrated experience in utility relocations			X		
Experience in associated contracting procedures, total cost growth analysis, and related cost/risk analysis			X		
Familiar with the construction industry			X		
Capable of addressing the USACE Safety Assurance Review (SAR) aspects of all projects			X		
Active participation in related professional engineering and scientific societies			X		

Table 2. Upper Turkey Creek IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Burke	Newling	Hegre	Schall	Chepkoit
Hydrologic and Hydraulic Engineering					
Minimum of 15 years of experience in H&H engineering				X	
Registered professional engineer				X	
Experience modeling multipurpose alternatives associated with ecosystem restoration and non-structural solutions including:				X	
flood warning systems				X	
buyouts				X	
flood proofing				X	
Extensive experience modeling water surface profiles for flood risk management projects, including with-project conditions, associated structural flood risk management features, and levees/floodwalls in urban settings				X	
Thorough understanding of the dynamics of both open-channel flow systems and enclosed/confined systems				X	
Experience related to the application of detention basins and the effects BMPs and low-impact development have on hydrology				X	
Familiar with standard USACE H&H computer models, including:				X	
HEC-HMS				X	
HEC-RAS				X	
Certified floodplain manager (encouraged but not required)					
Active participation in related professional engineering and scientific societies				X	
Minimum M.S. degree or higher in engineering				X	
Geotechnical Engineering					
Minimum 15 years of demonstrated experience in geotechnical engineering					X
Registered professional engineer					X
Demonstrated experience in performing construction management for all phases of flood risk management projects					X

Table 2. Upper Turkey Creek IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Burke	Newling	Hegre	Schall	Chepkoit
Demonstrated experience related to structural and geotechnical practices associated with:					X
levee and floodwall design					X
culvert design					X
building stabilization					X
wall design					X
bridge design					X
construction of channels					X
Capable of addressing the USACE SAR aspects of all projects					X
Active participation in related professional engineering and scientific societies					X

Roger Burke

Role: Economics/Civil Works planning experience and expertise.
Affiliation: Tetra Tech, Inc.

Mr. Roger Burke is currently a senior project manager at Tetra Tech, Inc. He has over 45 years of experience in water resources planning, and conducting and managing feasibility studies and associated economic analyses. He earned his M.B.A. from the University of South Alabama in 1984 and his B.S. in business statistics from the University of Alabama. His professional experience includes economic evaluation, report preparation and presentation, and communication of technical information to planners, engineers, economists, and scientists.

Mr. Burke has served as project economist on numerous navigation, flood damage reduction, and stream bank protection projects. He has also served as a study manager for a flood risk management study. Mr. Burke is well-acquainted with the plan formulation process, procedures, and policies applicable to flood risk management studies, having worked for USACE for 39 years as Plan Formulation Branch Chief, plan formulator, economist, and operations research analyst. In his role as Plan Formulation Branch Chief, he was responsible for the guidance and direction of a multi-disciplinary staff of managers, economists, and interdisciplinary teams (i.e., H&H geotechnical, economics, and environmental disciplines) in the preparation of feasibility reports for water resource issues and needs. These issues included ecosystem restoration (e.g., estuarine and stream restoration), flood control, shallow-draft and deep-draft navigation, beach erosion control, water supply, and hydroelectric power. Mr. Burke supervised numerous flood risk management and flood damage reduction studies (which included the review of HEC-FDA results) and is familiar with flood risk management analysis and benefit calculations. He is fully

knowledgeable of the analyses and concepts embodied within HEC-FDA and has experience computing (by hand) flood damages prevented, developing stage-damage curves, and combining that with stage-frequency data to derive the damage-frequency curve and then computing expected annual damages. He provided guidance to planners and economists regarding USACE planning policy and procedures, which required an in-depth knowledge of Engineer Regulation (ER) 1105-2-100 and other ERs, engineer circulars, and engineer pamphlets pertaining to Civil Works planning. Mr. Burke was a member of the internal technical review team for the Ohio River Mainstem Study, an investigation of the capital investment needs of the navigation system on the Ohio River, and the Louisiana Coastal Areas Study of the capital investment needs for restoring the marshes of south Louisiana. He has experience with cost-effectiveness/incremental cost analysis and trade-off analysis associated with multi-project plan formulation and has hands-on experience with Institute for Water Resources (IWR)-Plan. Mr. Burke is a member of the Society of American Military Engineers.

Charles Newling

Role: Biology/ecology experience and expertise.
Affiliation: Wetland Science Applications, Inc.

Mr. Charles Newling is the Senior Wetland Regulatory Scientist and Senior Vice-President of Wetlands Science Applications, Inc. and the Wetland Training Institute, Inc. He earned his M.S. in zoology with a focus in wildlife ecology from Southern Illinois University Carbondale in 1975. He holds certifications as a Professional Wetland Scientist, Certified Wildlife Biologist, Certified Wetland Delineator, and a Qualified Wetland Specialist. He has over 37 years of experience in wetland ecology, specifically the identification and delineation of jurisdictional wetlands, wetland function and values assessment, mitigation monitoring, and wetland mitigation banking. Mr. Newling has spent the majority of his professional career working with water resources, primarily wetlands, and associated permitting issues, both in the public and private sector.

Mr. Newling has over 13 years of experience working with USACE, having worked for both the USACE New England Division Regulatory Branch and the USACE Waterways Experiment Station Environmental Laboratory. He participated in the preparation of an environmental impact statement for the St. Louis District and has implemented various aspects of the NEPA compliance process, both as a biologist working for USACE (with the New England Division [1975-1978] and the USACE Waterways Experiment Station [1978-1989]) and subsequently as a private sector consultant. His NEPA experience involved projects with competing trade-offs and the analysis of cumulative effects. In addition, the majority of the projects he has been involved with required compliance with Endangered Species Act requirements. He participated in the development of the USACE Wetland Delineation Manual and assisted in efforts to develop and standardize the monitoring and evaluation of wetlands and related habitat. He has a strong knowledge of the ecology of wetlands, prairies, streams, and interconnected habitat, having conducted functional analyses of these environs since 1975. Mr. Newling's consulting work has focused on matters of wetland delineation, wetland construction and restoration, the assessment of wetland functions and values, mitigation monitoring, and wetland mitigation banking. The projects, while in the private and public sector, have required work in the wetlands of 43 states, many of which were located within the stream corridors in urban or suburban setting in the

Midwestern United States. Mr. Newling is a partner in and the senior ecologist responsible for baseline and long-term monitoring of the Walkerwin Wetland Restoration Project, a highly successful wetland and prairie restoration project and the first approved and functioning entrepreneurial mitigation bank in the state of Wisconsin.

Mr. Newling has written over 20 publications and has contributed to several state and federal publications. He is a member of the Society of Wetland Scientists (SWS), The Wildlife Society, Association of State Wetland Managers, Society of Ecological Restoration, Washington Society of Professional Soil Scientists, and Wisconsin Wetland Association. He organized and petitioned for a charter for the SWS South Central Chapter. He served as the chapter's first president, was the original chair of the SWS Professional Certification Committee, and served on the SWS international Board of Directors as Liaison to the SWS Professional Certification Program.

Paul Hegre, P.E., CCS, CCCA

Role: Civil/cost engineering experience and expertise.
Affiliation: Short Elliott Hendrickson, Inc.

Mr. Paul Hegre is a senior professional engineer with Short Elliott Hendrickson, Inc. and has 15 years of experience with environmental projects, including flood control and flood risk management. He earned his B.S. in civil engineering from the University of Minnesota in 1997 and is a registered professional engineer in Minnesota and Wisconsin. He is a certified construction specifier (CCS) and a certified construction contract administrator (CCCA).
Mr. Hegre provides project design engineering, construction documents, and cost estimating for budgets and construction. He is formally trained in cost estimating software tools that include Micro Computer Aided Cost Estimating Software (MCACES) and Crystal Ball.

Mr. Hegre's cost engineering experience includes his work on the Underwood Creek Rehabilitation and Flood Management project for USACE (Detroit District). For this project, he produced the cost estimate for the Detailed Project Report using MCACES second generation (MII), Version 4.1 and participated in the Cost and Schedule Risk Analysis (CSRA). Elements of this project include demolition of a concrete channel and storm sewer, excavation of a channel thalweg and side slopes, construction of retaining walls and drop structures, and re-establishment of native floodplain vegetation. He was also the project specifier and cost estimator for the Heartsville Coulee Diversion for USACE (St. Paul District), a project that involved earthen levees, diversion channels, a new highway bridge, gravity outlets, and road raises. He coordinated and produced construction specifications using SPECSINTACT software for all disciplines involved in the project. He also coordinated and assisted in preparation of the construction quantities for use in the independent government estimate (IGE) and in the production of the IGE using MCACES cost estimating software. Mr. Hegre's experience with the Safety Assurance Review (SAR) for projects includes his work as the project engineer for the Orwell Dam Safety Stage 2 project for USACE (St. Paul District). He assisted with project inspection/documentation, contract modification processing, daily reports, daily piezometer monitoring, daily construction observation, weekly coordination meetings, weekly safety meetings, and monthly pay request processing.

Mr. Hegre has also served as the lead design and construction engineer on the Crookston Flood Risk Management and Bank Stabilization project in Crookston, Minnesota. The project consists of concrete floodwall, earthen levee, modular block retaining wall, pump stations, utility relocation, and street reconstruction. He coordinated all engineering disciplines involved in the project, which included structural, mechanical, and electrical, and he produced the preliminary funding, engineer's cost estimates, and the construction documents. He also served as the lead civil design engineer for the Berens Monaldi Pump Station in Dyer, Indiana. Mr. Hegre's responsibilities included production of construction drawings, cost estimates, and project manuals. He also coordinated the design effort between all engineering disciplines, including civil, mechanical, and electrical.

James Schall, P.E., Ph.D.

Role: Hydrologic and hydraulic engineering experience and expertise.
Affiliation: Ayres Associates, Inc.

Dr. James Schall is the vice president at Ayres Associates, Inc. and has 32 years of experience in water resource engineering, with specific expertise in river engineering and fluvial systems analysis and design. He earned his M.S. and Ph.D in civil engineering from Colorado State University in 1979 and 1983, respectively, and he is a registered professional engineer in Colorado, California, and Nevada. He has designed a wide range of traditional open channel and storm drain systems, as well as a number of complicated hydraulic structures involving innovative design concepts based on state-of-the-art physical and mathematical modeling. He has authored a number of widely used design manuals for the Federal Highway Administration, including Culvert Design, Hydraulic Design Series 5; Urban Drainage Design, Hydrologic Engineering Center (HEC) Circular 22; Stream Stability at Highway Structures, HEC Circular 20; and Bridge Scour and Stream Stability Countermeasures, HEC Circular 23.

Dr. Schall has extensive experience on the Sacramento River levee system, designing environmentally sensitive bank protection projects with both on-site and off-site mitigation. He has conducted research for the National Cooperative Highway Research Program on scour early warning systems to protect highway infrastructure during flood events. He has also designed a setback levee on the Sacramento River that required property buyouts, and he was the principal-in-charge for flood proofing investigations for two large Midwestern universities after extensive riverine flood events. These latter projects involved relocations, landscaping changes, floodwalls, building renovations, and pump stations. Dr. Schall has experience modeling water surface profiles for flood risk management projects through his work with USACE (Sacramento District) on the Sacramento River, which involved levee repair work, hydrographic surveys, site reconnaissance to identify erosion sites, and incorporating environmentally sensitive measures with traditional levee repair. He also has experience working with HEC-RAS, HEC-HMS, and HEC-UNET for USACE's Omaha and Tulsa Districts, for which he conducted channel capacity studies, flood routing, hydrological analysis, preparation of reservoir operation manuals, and conceptual and final design of channel stability features.

Dr. Schall is a frequent instructor for short courses on culvert design, urban drainage, highway drainage, scour, and sediment transport throughout the country. He has a complete understanding of open and enclosed channel flow systems, being the author and lead instructor for the National

Highway Institute's "Urban Drainage Design" and "Intro to Highway Hydraulics" courses, which discuss analysis and design of open channel and closed conduit systems, detention ponds, and best management practices. Dr. Schall is a fellow of the American Society of Civil Engineers and a diplomate of the American Academy of Water Resource Engineers. He is also an active member of the Association of State Floodplain Managers and the Colorado Association of Stormwater and Floodplain Managers.

Kipkoeth Chepkoit, P.E., Ph.D.

Role: Geotechnical engineering experience and expertise.
Affiliation: Hanson Professional Services, Inc.

Dr. Kipkoeth Chepkoit is the chief geotechnical engineer at Hanson Professional Services, Inc. He has 22 years of experience in geotechnical subsurface explorations and computation, analysis, and design of soil-structure interaction. He earned his Ph.D. in civil engineering (geotechnical) from the University of Maryland in 1999 and is a registered professional engineer in Missouri, Louisiana, Illinois, Arkansas, Tennessee, Iowa, Mississippi, Indiana, and Ohio. His specific geotechnical expertise is in deep and shallow foundations design; geotechnical seismic evaluation and design; retaining structures; settlement of structures and embankments; slope stability and stabilization; soil shrink/swell/collapse and remediation; shoring and retention systems; non-destructive testing of foundations; site grading and compaction; and soil improvements and stabilization using deep dynamic compaction and chemical stabilization.

Dr. Chepkoit has experience performing engineering during construction services during his work on the Devils Lake City Embankments for USACE (St. Paul District). His responsibilities included designing a 6-foot raise to the existing embankment, designing a new pump station compatible with the raise, documenting the design analysis, preparing construction plans and specifications, preparing the construction cost estimate, and responding to questions and preparing amendments during the solicitation period. He served as the geotechnical engineer for several dams and levees in North Dakota, St. Louis, New Orleans, and the Mississippi Valley and designed several drainage structures (including culverts and channels) under levees, roadways, and railroads. He has experience with building stabilization, including work stabilizing existing and proposed service buildings against major landslides for a Mississippi casino company and he has acted as the geotechnical engineer for several bridge and wall structures for a variety of State Departments of Transportation and railroads. Dr. Chepkoit is capable of addressing the SAR of projects, having participated as an IEPR panel member for the Lake Pontchartrain Vicinity 145 (Chalmette Loop, Bayou Bienvenue to Bayou Dupre) for which he reviewed the geotechnical report, the Design Documentation Report, and construction plans and specifications. He is an active member of the American Society of Civil Engineers (St. Louis chapter), Society of American Military Engineers (St. Louis post), and National Council of Examiners for Engineering and Surveying.

5. SUMMARY OF FINAL PANEL COMMENTS

The panel members agreed between each other on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Draft FS/EA. Table 3 lists the Final Panel Comments

statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the documents include all the components of a thorough report associated with a feasibility level of study. The Panel agreed that the appropriate methods and models were used in the analysis and that they provided adequate detail in describing the processes followed throughout the project. While the Panel deemed the report to be comprehensive, it identified areas of redundancy and inconsistencies attributed to recent updates to the report. The Panel suggests that the report would benefit from consolidation of the redundancies and clarification of the inconsistencies.

Plan Formulation – The project's plan formulation process was well detailed and documented in the report. The report described the local history, urban environment, and project need very well. It identified the problems and opportunities along with the criteria used for selecting the National Economic Development (NED) plan thoroughly. For the alternatives presented, the report was complete in its description of the methods and models used in assessing the performances of the alternatives. However, the Panel suggests that in the interest of completeness, the array of alternatives considered could have included a "floodwall only" alternative in the plan formulation because it appears it may be less costly than the selected alternative. This issue can be resolved by including a floodwall only alternative and describing why it was not fully considered.

Engineering – The Panel determined that the H&H analysis was thorough, but it suggests that a recently published technical update in hydrology records should have been implemented to update the analysis. The Panel agreed that the geotechnical analysis and site investigation was adequate for a feasibility study report but anticipates the need for further refinement with additional data in the design phase as the project progresses.

Economics – The data provided are comprehensive and support the NED plan, but the information is duplicative, and in some places the figures and tables are contradictory. The figures for residual damages of the NED plan are not consistent throughout the report and appendices, which casts doubt on the report's conclusions. The Panel agreed that one of the most incomplete components of the report was presentation of the O&M costs associated with the project. A deconstruction of the average annual O&M costs would provide an illustration of how the costs were derived.

Environmental – The description of the processes and outcomes is comprehensive and well written. However, there was no consideration of a long-term survival and plan for tree mitigation by means of tree planting. This issue can be resolved by adding a maintenance component to the mitigation plan.

Table 3. Overview of 16 Final Panel Comments Identified by the Upper Turkey Creek IEPR Panel

No.	Final Panel Comment
	Significance – High
1	Rainfall values are based on an outdated publication; therefore, the hydrology and hydraulics (H&H) analysis underestimates the volume of runoff and flood elevations associated with the flood risk management project and could impact conclusions related to the National Economic Development (NED) alternative.
	Significance – Medium
2	A plan to communicate to the public the residual risks concerning possible loss of life associated with the design of the levee and floodwall system has not been presented.
3	Tree planting and maintenance, which are key components of the mitigation, have not been described in sufficient detail to ensure that the mitigation plan will be successful.
4	Significant pressure flow conditions may occur as a result of the proposed headwalls at roadway crossings increasing scour conditions and leading to potential failure of these crossings or adjacent levees and floodwalls.
5	The magnitude of the increase in the contingency from the alternative analysis to the National Economic Development (NED) plan Cost and Schedule Risk Analysis (CSRA) is not supported, and the connection between this increase and the lack of detailed site investigation or geotechnical investigation is not addressed.
6	Some of the planning objectives do not satisfy the requirements of Engineer Regulation (ER) 1105-2-100, and the use of the objectives for guiding the planning process is not clearly documented.
7	The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) does not present information demonstrating how the planning criteria described in Section 4.2 were used in the plan formulation process to screen potential alternatives.
8	It is not clear if the potential sources of uncertainty and the implications of the risk and uncertainty statistics provided with regard to Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) modeling were considered.
	Significance – Low
9	It appears that the undrained shear strength of 2,000 pounds per square foot (psf) assigned to Stratum 2 is relatively high, especially if it is based solely on the descriptions given on the boring logs.
10	The assumption of no increased runoff is unclear because of conflicting statements regarding the potential for the hydrology of the basin upstream of the study area to change.
11	An alternative utilizing only floodwalls, which could be less expensive, was not considered.
12	The sources of depth-damage functions have not been adequately documented, leading to concerns regarding the validity of these functions.

Table 3. Overview of 16 Final Panel Comments Identified by the Upper Turkey Creek IEPR Panel (continued)

No.	Final Panel Comment
13	The significance of project impacts on the wildlife currently using the area, including birds, and the level of displacement of wildlife habitat cannot be determined based on the description provided.
14	Information regarding the quantities, materials, and equipment used to calculate the cost estimates for the selected alternative is not included in Appendix L, Cost Estimate and Cost and Schedule Risk Analysis (CSRA).
15	The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) does not describe how the operations and maintenance (O&M) cost estimate was derived and how the average annual O&M costs were developed.
16	The performance goal for the project is not well defined; therefore, it is not possible to fully understand how well the recommended National Economic Development (NED) plan performs and how it compares with other alternatives.

6. REFERENCES

DOC (1961). Rainfall Frequency Atlas of the United States. Technical Paper No. 40. U.S Department of Commerce, Washington, D.C., May. Available at http://www.nws.noaa.gov/oh/hdsc/PF_documents/TechnicalPaper_No40.pdf.

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APPENDIX A

Final Panel Comments

on the

Upper Turkey Creek Draft FS/EA

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Final Panel Comment 1

Rainfall values are based on an outdated publication; therefore, the hydrology and hydraulics (H&H) analysis underestimates the volume of runoff and flood elevations associated with the flood risk management project and could impact conclusions related to the National Economic Development (NED) alternative.

Basis for Comment

The rainfall values used in the hydrologic modeling presented in the Upper Turkey Creek Draft Feasibility Report/Environmental Assessment are from a 50+ year-old rainfall frequency study prepared for the U.S. Department of Commerce (DOC, 1961). A new design standard from the National Oceanic and Atmospheric Administration (NOAA) called Atlas 14 became available in April 2013. Kansas was part of the pooled fund effort to produce Volume 8 of this new atlas. Based on the Atlas 14 Precipitation Frequency Data Server, design rainfall values have increased from the values used in the Upper Turkey Creek report. For example, the 1-percent annual exceedance probability event rainfall amount used in the Upper Turkey Creek analysis was 7.8 inches (Appendix B, Chapter 3,Table 2-3, page B3-7), while the new value is closer to 8.8 inches, an increase of over 10 percent. Using values from the new publication will increase the discharge and the resulting flood elevations computed in the H&H analysis and could reduce the estimated assurance of the NED alternative. The increase in precipitation could also change the benefit-cost analysis. Under existing conditions higher precipitation might result in greater damages, and therefore, an increase in benefits with the project in place, and/or it might also require an increase in levee and flood wall height under project conditions that could increase cost. Without re-analysis it is not possible to predict how the benefit-cost ratio might change.

Significance – High

Higher flood elevations could increase required floodwalls and levee heights, impacting the benefit/cost analysis and the risk associated with the NED plan.

Recommendations for Resolution

1. Revise the H&H analysis for the NED alternative using the 2013 rainfall data.
2. Increase floodwall and levee heights as needed, and evaluate the change in the benefit/cost ratio and the resulting estimated assurance level.
3. Since the increase in precipitation would impact all alternatives in a similar manner, explain why it was not considered necessary to reanalyze all of the alternatives, and justify the results of the screening analysis and basic formulation of the NED plan.
4. Alternatively, to avoid possible concern with the results of the study and the recommended NED plan, consider revising all H&H analyses based on the new design rainfall data.

Literature Cited:

DOC (1961). Rainfall Frequency Atlas of the United States. Technical Paper No. 40. U.S Department of Commerce, Washington, D.C., May. Available at http://www.nws.noaa.gov/oh/hdsc/PF_documents/TechnicalPaper_No40.pdf.

NOAA (2013). National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server Atlas 14. National Oceanic and Atmospheric Administration website. Available at http://hdsc.nws.noaa.gov/hdsc/pfds/.

Final Panel Comment 2

A plan to communicate to the public the residual risks concerning possible loss of life associated with the design of the levee and floodwall system has not been presented.

Basis for Comment

The impacts of exceeding the design event are briefly discussed in the Draft Feasibility Report/Environmental Assessment (Section 7.4.2) and in Appendix F of the report (Section 7.3). These sections discuss how overtopping the levees or floodwalls could result in “significant” or “catastrophic” damages within the project area; however, there is little emphasis on public safety, including the potential loss of life, and the importance of an emergency action plan given that risk. As used, these terms are ambiguous because they could be construed to mean only great physical loss of property and damage to structures, without loss of life.

The project area does not include much residential use but is an important commercial area that includes the Merriam Farmers’ Market, described in the report (Section 2.3.1) as a community event pavilion that houses many special events and programs. Because the project area is susceptible to flash flooding, the advance warning time and the time for citizens to evacuate the Farmers’ Market area during a flash flood will be extremely short, creating serious potential for loss of life. With the new levee and floodwall system on one side, and I-35 along the other, the protected area in the future essentially will become a reservoir with limited overflow routes. An emergency action plan would be an effective way to communicate public safety risk, including potential loss of life.

Significance – Medium

The residual risks must be communicated to the public to prevent, as much as possible, the potential loss of life if an overtopping event occurred.

Recommendations for Resolution

1. Describe the concern for potential loss of life in the discussions of residual risk.
2. Include a clear statement about the need for, and importance of, an emergency action plan prepared and implemented by the local sponsor that communicates the nature of the risk involved and the appropriate actions to take. Emphasize that the local sponsor is responsible for ensuring that effective emergency measures (early warning systems, sirens, reverse 911 calls, evacuation routes, etc.) are in place should an overtopping event occur.

Final Panel Comment 3

Tree planting and maintenance, which are key components of the mitigation, have not been described in sufficient detail to ensure that the mitigation plan will be successful.

Basis for Comment

The success of the mitigation plan hinges on guaranteeing that the trees are planted in suitable locations and that they survive over the long term. In addition, the safe application of approved chemicals where needed for long-term brush and tree control on riprap areas is fundamental for protecting water quality.

Tree Planting: The mitigation plan centers around tree planting, which appears to be a reasonable approach. However, no specific, approved locations for the planting are confirmed. This omission could have serious implications if mitigation activities are required to take place before or during construction activities. Also, there is no discussion of monitoring to ensure the long-term survival of the trees after they are planted.

Brush Spraying: Another long-term maintenance issue arises with regard to "Spraying and removing woody brush and trees in riprap areas," listed in Section 7.6 as a "typical maintenance requirement." The report does not specify what chemicals and procedures will be used and does not state whether the chemicals will be approved and determined to be safe for near-water application.

Significance – Medium

The mitigation plan is incomplete without specific details regarding tree planting and maintenance.

Recommendations for Resolution

1. Identify the specific location(s) where trees would be planted to mitigate project impacts. If locations are not yet confirmed, describe how a suitable location will be selected.
2. Identify when the mitigation will occur (before, during, or after project construction activities).
3. Describe how the planted trees will be monitored to promote their long-term survival.
4. Describe how trees that do not survive will be replaced. State the agency or organization responsible for tree replacement and the source of funding.
5. Specify what chemicals and procedures will be used to control brush and trees in riprap areas, and describe how the chemicals will be approved and deemed safe for near-water application.

Final Panel Comment 4

Significant pressure flow conditions may occur as a result of the proposed headwalls at roadway crossings increasing scour conditions and leading to potential failure of these crossings or adjacent levees and floodwalls.

Basis for Comment

Adding headwalls at roadway crossings (a 4-foot headwall at Merriam Drive and a 2-foot headwall at Shawnee Mission Parkway) to prevent overtopping will allow more water to pond upstream of the bridge or culvert structure, creating significant pressure flow conditions. Scour under pressure flow is more severe (FHWA [2012], Section 6.10) and could quickly lead to catastrophic failure of the foundations of these roadway crossings during the design event. This could allow flood water into the project area, and/or cause failure of adjacent levees and floodwalls. Countermeasures for scour are available (FHWA 2009) and should be considered, as necessary, during final design.

Significance – Medium

The potential for scour at roadway crossings should be acknowledged and the plan to address it in the final design should be stated.

Recommendations for Resolution

1. In Section 7.1.3, Bridge Modifications, describe the concerns related to pressure flow conditions created by the proposed headwalls at Merriam Drive and Shawnee Mission Parkway.
2. Add a statement recommending a detailed evaluation of the pressure flow conditions according to FHWA (2012) and the inclusion of appropriate bridge scour countermeasures in the final design based on FHWA (2009).

Literature Cited:

FHWA (2009). Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance, Federal Highway Administration, Washington, D.C. Hydraulic Engineering Circular No. 23, Publication FHWA-NHI-09-112. September.

FHWA (2012). Evaluating Scour at Bridges. U.S. Department of Transportation, Federal Highway Administration, Washington D.C. Hydraulic Engineering Circular No. 18, Publication No. FHWA-HIF-12-003. April.

Final Panel Comment 5

The magnitude of the increase in the contingency from the alternative analysis to the National Economic Development (NED) plan Cost and Schedule Risk Analysis (CSRA) is not supported, and the connection between this increase and the lack of detailed site investigation or geotechnical investigation is not addressed.

Basis for Comment

Page B4-5 of APPENDICES – AFB DOCUMENT in Chapter 4 (Cost Estimation), Section 9 separates cost contingency for the alternative analysis into two separate components: a general contingency and a varying contingency for risk. The total of these two components for any of the alternatives is at most 24 percent. The subsequent CSRA produced a contingency of 33 percent for Work Breakdown Structure item number 11 – Levees and Floodwalls for the NED plan. Assuming item 11 includes generally the same components of construction considered in the alternative analysis process, a 9- to 10-percent increase in magnitude from alternative analysis to the NED plan CSRA seems inordinate given that contingencies generally diminish as a project progresses. Section 9, page B4-5, states that the general contingency is for "undetermined items not yet accounted for" during the feasibility study phase.

Likewise, in APPENDIX L – Cost Estimate and CSRA items CC-2, CC-4, and CC-5 on page 3 of the CSRA are listed as concerns for lack of detailed site investigation or geotechnical investigation. These concerns are rated by the Project Delivery Team as "Likely" with an impact of "Significant," leading to a risk level of 4. These are the highest risk levels produced within the CSRA and most likely have the largest impact on the 33 percent contingency. It follows that the general contingency for the alternative analysis and items CC-2, CC-4, and CC-5 of the CSRA have a connection and should be commensurate. The current increase in contingency from the alternative analysis to the CSRA, combined with the relative magnitude of the increase, casts doubt on the contingencies applied to the alternative analysis and/or the risk level applied to items CC-2, CC-4, and CC-5 in the CSRA.

Significance – Medium

Without an explanation for the increase, there is not a logical transition from the alternative analysis contingency to the CSRA contingency.

Recommendations for Resolution

Provide <u>one</u> of the following items along with additional narrative.

1. Increase the general contingency applied to the alternative analysis cost estimates.
2. Reduce, through reconsideration/customization, the risk level of CSRA items CC-2, CC-4, and CC-5.
3. Provide additional detail to the narrative for the alternative analysis general contingency and a narrative for the CSRA Report that clarifies the difference in contingencies.

Final Panel Comment 6

Some of the planning objectives do not satisfy the requirements of Engineer Regulation (ER) 1105-2-100, and the use of the objectives for guiding the planning process is not clearly documented.

Basis for Comment

U.S. Army Corps of Engineers (USACE) ER 1105-2-100 (USACE, 2000) (Section 2-3a(4), page 2-3) states the following:

> "Planning objectives are statements that describe the desired results of the planning process by solving the problems and taking advantage of the opportunities identified. The **planning objectives must be directly related to the problems and opportunities identified for the study** and will be used for the formulation and evaluation of plans. Objectives must be clearly defined and provide information on the effect desired (quantified, if possible), the subject of the objective (what will be changed by accomplishing the objective), the location where the expected result will occur, the timing of the effect (when would the effect occur) and the duration of the effect." (Bold inserted for emphasis)

In the Draft FS/EA, planning objective 2 (regarding assisting the public and stakeholders) and planning objective 3 (regarding partnering with other entities/agencies) (page 2-9, Section 2.4.1 - Planning Objectives) do not comply with the ER guidance in that they do not relate to the problems and opportunities identified for the study. Further, in Section 2.4.2 regarding the systems approach, the report states that:

> "The planners have integrated these updates into analysis tools as one of the project's objectives."

Likewise, this objective does not comply with the ER guidance. The report refers several times (page 4-9, first paragraph; page 4-13, Section 4.6; page 5-25, last paragraph; page 5-34, second complete paragraph) to consideration of meeting the planning objectives as a basis for some decision; however, the degree or manner in which planning objectives are to be met is not documented.

Significance – Medium

A clear statement of planning objectives and how they were used in the planning process is important for understanding what the study is intended to achieve and how the tentatively selected plan was selected.

Recommendations for Resolution

1. Add to or revise the report to identify planning objectives that comply with the guidance of ER 1105-2-100.
2. Add to or revise the report to clarify how the planning objectives guided the planning process.

Literature Cited:

USACE (2000). Planning Guidance Notebook. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) No.1105-2-100. April 22.

Final Panel Comment 7

The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) does not present information demonstrating how the planning criteria described in Section 4.2 were used in the plan formulation process to screen potential alternatives.

Basis for Comment

The Draft FS/EA (page 4-2, Section 4.2 – Planning Criteria) states that the planning criteria were used to "assess the overall characteristics of each alternative measure to identify those most likely to meet the project purpose and objectives." There are statements elsewhere in the report indicating that the planning criteria guided the screening of alternatives to focus on the most important alternatives (e.g., page 4-14, Section 4.6.3, first sentence; page 5-16, Section 5.2, second paragraph). The report does not, however, demonstrate or document the application of these criteria in the screening process.

Significance – Medium

Documenting the use of the planning criteria in the screening of alternatives would improve the report by explaining the rationale for eliminating certain alternatives from further consideration.

Recommendations for Resolution

1. Add to or revise the report to demonstrate the use of the planning criteria to screen alternatives.

Final Panel Comment 8

It is not clear if the potential sources of uncertainty and the implications of the risk and uncertainty statistics provided with regard to Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) modeling were considered.

Basis for Comment

The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) (page 4-18) discusses the use of the HEC-FDA software to evaluate risk. As described, HEC-FDA uses discharge-exceedance probability, stage-discharge, and damage-stage functions and applies Monte Carlo simulation to compute expected damage and to account for uncertainty. The report does not explain whether the HEC-FDA model accounts for other sources of hydraulic and geotechnical uncertainties such as overtopping. Overtopping will undermine the resilience of the structure by scouring, ultimately leading to failure in stability. It is common practice to account for such uncertainty by increasing the design height of the levee or floodwall to include freeboard and overbuild due to anticipated settlement.

Significance – Medium

The final heights of the levees and floodwalls, taking into account all uncertainties, will impact geotechnical analyses (slope stability and settlement) and should be described.

Recommendations for Resolution

1. Include in HEC-FDA modeling a more detailed discussion on how the software takes into account the full range of hydraulic and geotechnical uncertainties.

Final Panel Comment 9

It appears that the undrained shear strength of 2,000 pounds per square foot (psf) assigned to Stratum 2 is relatively high, especially if it is based solely on the descriptions given on the boring logs.

Basis for Comment

The undrained shear strength will affect the slope stability results significantly. The source and method used to derive soil parameters defines the level of risk and uncertainty. In Appendix B (Engineering Design and Modeling), Chapter 5 (Geotechnical), pages B5-2 through B5-4 discuss site-specific subsurface conditions. The hand-written field logs present the standard penetration test blow counts for Stratum 2 to be between 4 and 11. The laboratory tests performed are for soil index properties, not strength test. Soil strength parameters for conceptual preliminary design (given in Table 5-2) are reasonable with the exception of the value for Stratum 2. A value of 2,000 psf for undrained shear strength is too high for Stratum 2 given that there are no undrained shear strength data (pocket penetrometer or torvane) on the field logs and/or laboratory test results to support it.

Significance – Low

The value of undrained shear strength will impact the slope stability of the levee and/or floodwall.

Recommendations for Resolution

1. Explain how the undrained shear strength of 2,000 psf for Stratum 2 was derived.
2. Add a recommendation that future geotechnical exploration should determine strength parameters.

Final Panel Comment 10

The assumption of no increased runoff is unclear because of conflicting statements regarding the potential for the hydrology of the basin upstream of the study area to change.

Basis for Comment

Various sections of the Draft FS/EA indicate that the hydrology of the basin upstream of the study area is not likely to change under either the without-project or with-project conditions. For example, the report states (Chapter 3, page 3-1) that the watershed is fully developed and urbanized. Based on statements made about land use in the basin (pages 3-5 and 3-6, Section 3.2.3), it appears unlikely that changes in hydrology will occur. Section 3.2.3 states:

> "Because of a recent period of rapid urban expansion, Turkey Creek stormwater flows have increased."

On page 2-6, the report states:

> "Within the Upper Turkey Creek watershed, communities must work to preserve routing characteristics so that the USACE flow assumption for runoff (not to increase) remains true."

These statements indicate that there is a possibility that runoff from the Upper Turkey Creek watershed could increase. Because of these inconsistencies, the Panel is uncertain what the future hydrologic conditions in the watershed will be.

Significance – Low

Definitive statements to support the contention that hydrology in the project area is not expected to change in the future would improve the report by eliminating any uncertainty.

Recommendations for Resolution

1. Add to or revise the report to clarify that no changes that would affect hydrology are expected to occur upstream of the proposed project.
2. Add a brief discussion to the report clarifying that the proposed project will not increase flood levels on the recently constructed Lower Turkey Creek Project.

Final Panel Comment 11

An alternative utilizing only floodwalls, which could be less expensive, was not considered.

Basis for Comment

The report considers a broad array of flood risk management measures and adequately evaluates the measures chosen for consideration. However, the report does not consider an alternative that utilizes only floodwalls (without levees) to provide the equivalent level of protection. Admittedly, a simple comparison of costs per foot for floodwalls compared to levees indicates that levees are less expensive. Such a simple comparison, however, may not consider all relevant costs and may overlook efficiencies that may be gained because multiple types of construction equipment would not need to be used under a “floodwalls only” alternative.

Significance – Low

Adding this alternative to the report will make it more complete by documenting that the alternative analysis considered all possible alternatives in selecting the recommended plan.

Recommendations for Resolution

1. Add a discussion in the report describing and documenting the costs of a “flood-wall only” alternative.

Final Panel Comment 12

The sources of depth-damage functions have not been adequately documented, leading to concerns regarding the validity of these functions.

Basis for Comment

The report states (page F-10 of Appendix F, Socioeconomics) that depth-damage functions were obtained from the following three sources:

- businesses and property owners in the study area;
- depth-damage relationships contained in recently approved studies in the U.S. Army Corps of Engineers , Kansas City District; and
- Institute for Water Resources (IWR) Report 96-R-12, *Analysis of Non-Residential Content Value and Depth-Damage Data for Flood Damage Reduction Studies*, (IWR 1996).

Appendix F further states:

> "When survey data were not available, the USACE, New Orleans District, depth-damage functions were typically applied." (Appendix F, page F-10)

The report does not display these functions, does not explain how they were derived by Kansas City District, New Orleans District or IWR, and does not support why it is appropriate to use these functions for the Turkey Creek analysis. Without this information, the Panel cannot determine the validity of these functions.

Significance – Low

A better description of the sources of the depth-damage functions used in the report would demonstrate the validity and reliability of the functions.

Recommendations for Resolution

1. Provide better descriptions of the sources of the depth-damage functions used in the report.

Literature Cited:

IWR (1996). Analysis of Non-Residential Content Value and Depth-Damage Data for Flood Damage Reduction Studies. Institute for Water Resources Report 96-R-12. May.

Final Panel Comment 13

The significance of project impacts on the wildlife currently using the area, including birds, and the level of displacement of wildlife habitat cannot be determined based on the description provided.

Basis for Comment

While many of the likely environmental impacts appear to have been adequately described, more detail on wildlife (albeit urban) using the project area would be helpful to more fully understand whether impacts to those species are likely. Fox squirrel was used appropriately for modeling. However, it seems probable that at least some birds nest in the trees and brushy habitats that currently exist in the project area. Listing them, or stating they were considered but found to be absent, would make it easier to understand the significance of likely impacts and their analyses.

Significance – Low

A more thorough listing of wildlife species observed using the project area would confirm the adequacy of the proposed mitigation.

Recommendations for Resolution

1. Add a more detailed listing of the wildlife species that have been observed using the project area, particularly the nesting birds.

Final Panel Comment 14

Information regarding the quantities, materials, and equipment used to calculate the cost estimates for the selected alternative is not included in Appendix L, Cost Estimate and Cost and Schedule Risk Analysis (CSRA).

Basis for Comment

Appendix L, Cost Estimate and CSRA, does not indicate what information has been carried over from the alternatives analysis and what has been refined in the Micro Computer Aided Cost Estimate System (MCACES) estimate. There is cost information in Appendix L – Cost Estimate and Cost and Schedule Risk Analysis; APPENDICES – AFB DOCUMENT, Chapter 4 (Cost Estimation); and Chapter 7 (The Recommended Plan) of the main report. This information should be summarized within the MCACES estimate "notes" page as per U.S. Army Corps of Engineers (USACE) (2008a), Engineer Regulation (ER) 1110-2-1302, paragraph 8, and USACE (2008b), Engineer Technical Letter 1110-2-573, paragraph 2.4.7.

Consolidating pertinent cost information into Appendix L will improve the discussion of quantities, materials, and equipment used to calculate the cost estimates for the chosen alternative.

Significance – Low

Summarizing the assumptions used during the beginning stages of the Baseline Cost Estimate and including the narrative within the MCACES estimate "notes" page will benefit the Cost Engineer.

Recommendations for Resolution

1. Consolidate the pertinent cost information provided in Tab 2 - Appendix B – Engineering and Modeling, Chapter 4, of the document titled APPENDICES – AFB DOCUMENT, with the updated information provided in Chapter 7 of the main report. Insert and summarize the consolidated information in Appendix L – Cost Estimate and CSRA.

Literature Cited:

USACE (2008a). Civil Works Cost Engineering. Department of the Army, U.S Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) No. 1110-2-1302. September 15.

USACE (2008b). Construction Cost Estimating Guide for Civil Works. Department of the Army, U.S Army Corps of Engineers, Washington, D.C. Engineer Technical Letter No. 1110-2-573. September 30.

Final Panel Comment 15

The Draft Feasibility Study Report/Environmental Assessment (Draft FS/EA) does not describe how the operations and maintenance (O&M) cost estimate was derived and how the average annual O&M costs were developed.

Basis for Comment

The tasks included in the O&M of the proposed project are well described in Section 7.6, but the descriptions are limited to percentages with no additional backup information on how the percentages were developed. Derivation of the O&M costs for each alternative is not described in detail.

Significance – Low

Additional description of the effort, frequency, and costs associated with O&M of the proposed project would establish the validity of the O&M costs.

Recommendations for Resolution

1. Describe the level of effort involved in various O&M activities, substantiate the associated costs, and explain how the average annual O&M costs were derived.

Final Panel Comment 16

The performance goal for the project is not well defined; therefore, it is not possible to fully understand how well the recommended National Economic Development (NED) plan performs and how it compares with other alternatives.

Basis for Comment

There is no clear statement within the report on the performance goal that the project must meet. The only information on this topic was found in Appendix B, page B3-21, where the U.S. Army Corps of Engineers (USACE) requested that an alternative be modified "…to achieve a reliable factor of at least 90 percent." In a risk-based analysis, the level of assurance or reliability factor is a statement of the probability of non-exceedance. Based on the limited discussion in Appendix B, it appears that the project was designed for a minimum probability of non-exceedance of 90 percent, or conversely, a maximum probability of exceedance of 10 percent. The NED alternative resulted in a probability of non-exceedance of 95.7 percent (Chapter 7, page 7.1), meaning a probability of exceedance of only 4.3 percent. If the goal was 90 percent non-exceedance, the NED plan would seem to perform quite well.

Significance – Low

A clear statement describing the desired performance goal, and an explanation of why it was selected (including whether it is a USACE standard or a standard related to an NED plan) will increase the understanding of the NED plan's performance.

Recommendations for Resolution

1. Describe the performance goal for the project in the main report and explain why it was selected.

APPENDIX B

Final Charge to the Independent External Peer Review Panel as Submitted to USACE on June 28, 2013

on the

Upper Turkey Creek Draft FS/EA

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Charge Questions and Guidance to the Peer Reviewers for the Independent External Peer Review of the Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties, Kansas, Feasibility Study Report and Environmental Assessment

BACKGROUND

The Turkey Creek watershed lies in the southwestern portion of the Kansas City metropolitan area. The study area covers about 20 square miles in portions of Wyandotte and Johnson Counties, Kansas, from the headwaters downstream to the upstream limits of the USACE Turkey Creek flood risk management project in the lower portion of the watershed. The Turkey Creek channel through the upper segment is about 15 miles in length. The watershed consists predominantly of high-density developed urban areas.

Severe flash flooding has occurred in the Turkey Creek watershed in 1977, 1993 and 1998. The October 4, 1998 flood caused over $12 million in flood damages in the City of Merriam, overtopped Interstate 35 and threatened lives in several areas of Johnson and Wyandotte Counties. The Turkey Creek watershed has a history of U.S. Army Corps of Engineers (USACE) involvement. Currently, lower Turkey Creek has an active flood risk management construction project. One component is to repair an aging tunnel that conveys all flow from the Turkey Creek watershed through a bluff to the Kansas River. Channel widening has also been constructed.

USACE, Kansas City District (CENWK) along with the non-Federal sponsor, the City of Merriam, Kansas, are conducting a feasibility study of the Upper Turkey Creek watershed to examine measures for flood risk management. The study was authorized by Resolution of the Committee on Transportation and Infrastructure of the House of Representatives dated February 16, 2000 for Flood Damage Reduction. CENWK completed a reconnaissance study in October 2001.

The recommended plan was formulated using a systems approach, a watershed perspective (per Engineer Regulation (ER) 1105-2-100), and collaborative planning to ensure a complete plan formulation process. The PDT formulated flood risk management alternatives, including channel widening, levees and floodwalls, and buyouts, with the main purpose being to examine the full range of structural and nonstructural measures that address the flood risk management authorization. The watershed planning approach provides an opportunity to promote interagency cooperation, multipurpose project planning, and the protection of existing federal flood protection investment. Ecosystem restoration and recreation measures were formulated, but there was no local interest in cost sharing, so these were considered secondary mission areas compatible with local initiatives for addressing urban streambank erosion and stormwater best management practices (BMPs). These measures were not carried past the preliminary screening phase.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties Kansas, Feasibility Study Report and Environmental Assessment (hereinafter: Upper Turkey Creek IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review* (EC 1165-2-214) dated December 15, 2012, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

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

The purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the Upper Turkey Creek documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in economics/Civil Works planning, biology/ecology, hydrologic and hydraulic engineering, civil/cost engineering, and geotechnical engineering issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-214, Appendix D, review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

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

Documents for Review[3]

The following documents are to be reviewed by designated discipline:

Title	Approximate Number of Pages	Required Disciplines
Upper Turkey Creek Flood Risk Management Feasibility Study, City of Merriam, Johnson and Wyandotte Counties, Kansas, Feasibility Study Report and Environmental Assessment	159	All Disciplines
Civil Engineering Appendix	15	Civil/Cost Engineering
Geotechnical Engineering Appendix	95	Geotechnical Engineering
Cost Estimates Appendix	27	Civil/Cost Engineering
Hydrology and Hydraulics Appendix	69	Hydrologic and Hydraulic Engineering
Structural Appendix	15	Hydrologic and Hydraulic Engineering; Civil/Cost Engineering; Geotechnical Engineering
Environmental (hazardous, toxic, and radioactive waste, existing conditions, stream assessments) Appendix	105	Biologist/Ecologist
Real Estate Appendix	18	Economics/Civil Works Planning; Civil/Cost Engineering
Cultural Resources Appendix	14	Biologist/Ecologist
Socioeconomic Appendix	48	Economics/Civil Works Planner; Civil/Cost Engineering
CE/ICA for Mitigation Appendix	13	Civil/Cost Engineering
Public Outreach & Involvement Appendix	107	Civil Works Planner
Plan Formulation & Evaluation	2	All
Total	687	

Documents for Reference

- USACE guidance *Civil Works Review,* (EC 1165-2-214) dated December 15, 2012
- USACE ER 1110-1-8159, Engineering and Design, DrChecks, May 10, 2001
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review released December 16, 2004.

[3] This reflects the actual charge supplied, updates on documents supplied via emails to the Panel.

SCHEDULE[4]

This draft schedule is based on the April 18, 2013 receipt of the final review documents. The schedule will be revised upon receipt of final review documents.

Task	Action	Due Date
1	Award/Effective Date	09/24/2012
	Review documents available	04/18/2013
	Battelle submits draft Work Plan[a]	04/12/2013
	USACE provides comments on draft Work Plan	04/22/2013
	Battelle submits final Work Plan[a]	04/23/2013
2	Battelle requests input from USACE on the COI questionnaire	09/28/2012
	USACE provides comments on COI questionnaire	04/15/2013
	Battelle submits list of selected panel members[a]	04/18/2013
	USACE confirms the Panel has no COIs	04/22/2013
	Battelle completes subcontracts for panel members	04/23/2013
3	Battelle convenes kick-off meeting with USACE	TBD
	Battelle sends review documents to Panel	04/23/2013
	Battelle convenes Panel kick-off meeting	04/23/2013
	Battelle convenes USACE/Panel kick-off meeting	04/23/2013
4	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	04/29/2013
	Panel members complete their individual reviews	05/02/2013
	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	05/06/2013
	Battelle convenes Panel Review Teleconference	05/06/2013
	Panel members provide draft Final Panel Comments to Battelle	05/13/2013
5	Battelle finalizes Final Panel Comments and Final Report	05/20/2013
	Panel reviews Final IEPR Report and provides comments to Battelle	05/21/2013
	Battelle submits Final IEPR Report to USACE[a]	05/23/2013
6[b]	Battelle inputs Final Panel Comments into DrChecks	05/24/2013
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	05/24/2013
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	05/24/2013

[4] The schedule presented here reflects the original schedule provided in the charge, a revised schedule based on the schedule in Table 1 of this work plan was supplied via email to the panel.

Task	Action	Due Date
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to Battelle	05/29/2013
	Battelle convenes teleconference with Panel to discuss draft Evaluator Responses and draft BackChecks	06/04/2013
	Battelle convenes teleconference with Panel and USACE to discuss Final Panel Comments and draft responses	06/05/2013
	USACE inputs Final PDT Evaluator Responses in the Design Review and Checking System (DrChecks)	06/11/2013
	Panel provides final BackCheck Responses	06/13/2013
	Battelle inputs the Panel's BackCheck Responses in DrChecks	06/14/2013
	Battelle submits pdf printout of DrChecks project file[a]	06/17/2013
3	Civil Works Review Board Attendance	07/30/2013
	Project Closeout	09/24/2013

CHARGE FOR PEER REVIEW

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

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

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the Upper Turkey Creek documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-214; Appendix D).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.

3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
7. Please focus the review on assumptions, data, methods, and models.

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

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

Please submit your comments in electronic form to Lynn McLeod, mcleod@battelle.org, no later than May 1, 2013, 10 pm ET.

Independent External Peer Review
of the
Upper Turkey Creek Flood Risk Management Feasibility Study, the City of Merriam, Johnson and Wyandotte Counties Kansas, Feasibility Study Report and Environmental Assessment

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 NEPA? Were adequate considerations given to significant resources by the project?

8. Assess the recommended alternatives from the perspective of systems. It should also include systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

Safety Assurance Review Questions

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

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

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

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

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

14. Are the models used to assess hazards appropriate?

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

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

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

18. Does the physical data and observed data provide adequate information to characterize the structures and their performance?

19. 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 population-at-risk been considered?

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

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

22. Has anything significant been overlooked in the development of the assessment of the project or the alternatives?

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

Specific Charge Questions for the Upper Turkey Creek Johnson County and Wyandotte County, Kansas, Flood Risk Management Project Feasibility Study Report with Integrated Environmental Assessment and Accompanying Appendices

Objectives

24. Is the purpose of the project adequately defined? If not, why?

25. Has the project need been clearly described?

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

27. Are the specific objectives adequately described?

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

Alternatives

29. Has the criteria to eliminate plans from further study been clearly described?

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

31. Were the assumptions made for use in developing the future with-project conditions for each alternative reasonable? Were adequate scenarios considered? Were the assumptions reasonably consistent across the range of alternatives and/or adequately justified where different?

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

33. Have comparative impacts been clearly and adequately described?

34. Are future Operation, Maintenance, Repair, Replacement, and Rehabilitation efforts adequately described and are the estimated cost of those efforts reasonable for each alternative?

35. Are there any unmitigated environmental impacts not identified and if so could they impact project designs?

36. Please comment on the likelihood of the recommended alternative will achieve the expected outputs.

37. Are residual risks adequately described and is there a sufficient plan for communicating the residual risk to affected populations?

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

Affected Environment

39. Is the description of the climate in the study area sufficiently detailed and accurate?

40. Is the description of wetland resources in the project area complete and accurate?

41. Is the description of aquatic resources in the project area complete and accurate?

42. Is the description of threatened and endangered species resources in the study area complete and accurate?

43. Is the description of the historical and existing recreational resources in the study area complete and accurate?

44. Is the description of the cultural resources in the study area complete and accurate?

45. Is the description of the historical and existing socioeconomic resources in the study area complete and accurate? Were specific socioeconomic issues not addressed?

Environmental Consequences

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

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

48. Are the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and supported?

49. Have impacts from borrow areas been adequately and clearly described?

Cumulative Impacts

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

Mitigation

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

Hydrology and Hydraulics

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

Geotechnical Engineering

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

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

Design

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

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

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

Real Estate Plan

58. Comment on the extent to which assumptions and data sources used in the economics analyses are clearly identified and the assumptions are justified and reasonable.

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

Relocations

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

Hazardous, Toxic, and Radioactive Waste

61. Comment on the extent to which impacts of the alternatives may have on hazardous, toxic, and radioactive waste issues?

Cost Estimates and Economics

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

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

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

65. Were the methods to develop the depth-damage relationships appropriate ad were the generated results applicable to the study area?

66. Has the economic analyses addressed the issue of repetitive flood damages and the subsequent extent of rebuild/repair by property owners as it relates to annual damage estimation?

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

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

69. Are the costs adequately justified?

Public Involvement and Correspondence

70. 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

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

72. Please identify the most critical concerns (up to 5) you have with the project and/or review documents.

73. Please provide positive feedback on the project and/or review documents.