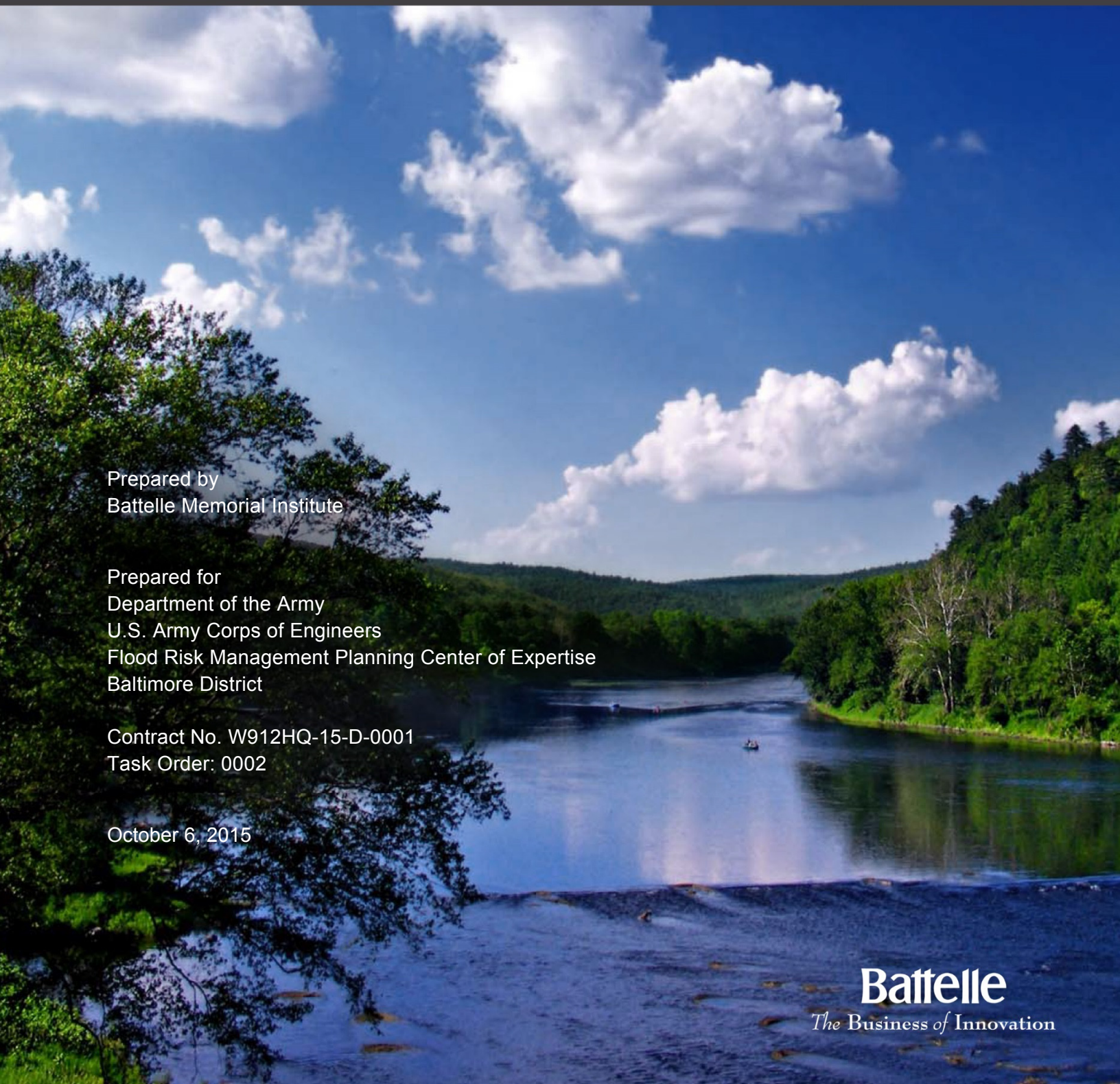
Final Independent External Peer Review Report Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey



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-15-D-0001
Task Order: 0002

October 6, 2015

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Final Independent External Peer Review Report Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey

Executive Summary

PROJECT BACKGROUND AND PURPOSE

The study area for the Delaware River Basin Comprehensive Interim Feasibility Study is located in the mid-Atlantic region of the United States and generally lies between Philadelphia, Pennsylvania, and New York, New York. The study area as a whole has an estimated 2010 population of 204,231. The major population center within the study area is the City of Trenton, New Jersey, with a 2010 population of 85,403. Most of the study area has a rural/suburban character, with some areas experiencing a small amount of population increase. The Delaware River had a major role in the area dating back to when the land was occupied by indigenous tribes. The majority of the floodplain areas are now extensively developed, particularly in older communities such as Gibbstown, Phillipsburg, Lambertville, Stockton, and Trenton. In the majority of the study area communities, the floodplain is primarily occupied by residential development. In some communities, commercial uses are intermixed with the residential development.

Structural flood risk management measures such as levees, floodwalls, and associated interior drainage have been considered. In addition, nonstructural measures such as structure elevation, wet and dry flood-proofing, ringwalls, relocating, and acquisition have been considered. Prior to Public Law 113-2 (Disaster Relief Appropriations Act), signed January 29, 2013, in the aftermath of Hurricane Sandy, ecosystem restoration opportunities that could be pursued in conjunction with flood risk management measures were also identified. Such opportunities were limited, due to the relatively small scale and limited regional or national significance of the potential restoration outputs. The most likely significant restoration opportunity was associated with a line of protection in Greenwich and Logan Townships.

The plan formulation process screened out most measures and municipalities, resulting in a Tentatively Selected Plan (TSP) with plans for the Gibbstown area of Greenwich Township and the Alexauken Creek area of the City of Lambertville. The primary features of the plans are a system of levees and floodwalls with gravity drainage outlets. In both locations, the levees and floodwalls provide greater than a 90% reliability against overtopping during a 1% annual chance exceedance (ACE) flood.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey (hereinafter: Del Comp NJ IEPR). 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 Del Comp NJ project. The IEPR was external to the agency and was conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the Del Comp NJ review documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: Civil Works planner/economics, biological resources and environmental law compliance, hydrology and hydraulic engineer, geotechnical engineer, and structural/civil engineer. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of final candidates to confirm that they had no COIs, but Battelle made the final selection of the five-person Panel.

The Panel received electronic versions of the Del Comp NJ IEPR review documents (990 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012) and OMB (2004), USACE prepared the charge questions, 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 Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the Del Comp NJ documents individually. The panel members then met via teleconference with Battelle to review key technical comments 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/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, 13 Final Panel Comments were identified and documented. Of these, one was identified as having medium/high significance, seven had a medium significance, four had medium/low significance, and one had low significance.

Battelle received public comments from USACE on the Del Comp NJ (approximately 16 written comments totaling 28 total pages) and provided them to the IEPR panel members. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Del Comp NJ review documents. After completing its review, the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments; however, the Panel noted that some of the issues raised in the public comments augmented the IEPR Final Panel Comments, particularly the concept that the potential development of the Gibbstown brownfield area could change the TSP.

Results of the Independent External Peer Review

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Del Comp NJ review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

Based on the Panel's review of the 10% conceptual design as contained in the Del Comp NJ review documents, the project seems to be well thought-out and focused on the priority issues. The review documents are well written and provided the proper data, applied appropriate modeling tools, and presented project information in a manner that is easy to follow. Given the large project area, for a 10% conceptual design, the data and level of information are comprehensive. The Panel did identify elements of the project that require further consideration and verification and found sections of the Del Comp NJ review documents that should be clarified or discussed in greater detail.

Environmental: The Panel found that the environmental aspects regarding the flood risk management improvements of this project are straightforward and reasonable. However, several concerns were identified that should be reviewed and clarified. The Panel's most significant finding was the potential for the project to disperse contaminated materials from petrochemical facilities and other Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) sites, potentially causing both short-term and long-term impacts. Given the project's proposed vicinity to known CERCLA and RCRA sites in Gibbstown, the Panel is concerned that erecting levees and floodwalls in these areas may create wave conditions and increase local velocities that could erode and suspend pollutants. Furthermore, flood remediation wells could force groundwater contaminants to migrate. Providing additional information on contaminated soils, the potential for disturbance of existing contaminants, and life safety risks associated with their potential movement would help identify the risks inherent with this issue. The Panel also noted that the use of the Habitat Evaluation Procedures (HEP) method is appropriate for evaluating habitat quality. However, this project is not targeting habitat quality or any particular species; therefore, the basis of this method is not ideally suited for this application. Other methods (for example, the Highway Methodology Workbook [USACE New England District]) consider other variables such as sediment retention, which may be more applicable to the flood risk reduction goals of this project and may capture benefits not defined, given the specific site conditions (hazardous, toxic, and radioactive waste [HTRW]). The Panel believes that using a more comprehensive wetland evaluation method will result in a higher wetland mitigation ratio. It was unclear if the ecosystem restoration analysis considered indirect benefits of flood reduction and if inclusion of these benefits would affect the determination for inclusion in the TSP. It is also unclear whether the TSP provides adequate mitigation for impacts on biological resources from a loss of watershed connectivity and stream connectivity in the two smaller streams, and potential removal of habitat for newly listed species. To help address these issues, the IFS/IEA should clarify (1) how proposed mitigation practices would mitigate for a loss of connectivity in the watershed, (2) why "fish friendly" passage structures are only being used on two of the four streams that will be impacted by the TSP, and (3) how habitat for the Northern long-eared bat (NLEB) will be protected and potentially mitigated.

Engineering: The Panel agreed that for a 10% conceptual design, the information provided was complete and detailed enough to allow the Panel to understand the engineering intent at this stage of design. A significant amount of detail was provided in support of flood risk reduction analyses, and the hydrologic and hydraulic analyses are thorough and may be sufficient to support the project development

up to final design. However, the Panel noted that the suitability of the short sheet pile cantilevered I-wall proposed for the Lambertville floodwalls is not substantiated by the analysis considering the weak soils identified in the area and the relative height-to-embedment ratio. The performance and practicality of the TSP's preliminary design should be verified using estimated soil properties. In addition, the Panel noted that the project performance analysis does not address the possibility that the levee or floodwall features might fail at less than the design elevation, nor does it explain the risks to project performance due to ice jams, wave overtopping, or potential increased incidence of severe storms. The Panel suggests that a description of the effects of a levee/floodwall failure prior to overtopping (breach) be added to the discussion of residual risk.

Plan Formulation/Economics: The Panel noted that the National Economic Development (NED) benefits attributed to the structural measures may not fully account for potential emergency costs, infrastructure damages, and damages to private property. Without accounting for those potential benefits, the Panel was unable to determine whether other municipalities would have qualified by having a benefit-cost ratio (BCR) over 1. USACE can address this issue by defining the limitations of the benefits estimated to date and potential benefits not yet included in the screening analysis, and reanalyzing to determine if any additional alternative may result in a qualifying BCR and, if so, determine their eligibility for project inclusion.

Table ES-1. Overview of 13 Final Panel Comments Identified by the Del Comp NJ IEPR Panel

No.	Final Panel Comment
Significance – Medium/High	
1	The potential for the project to disperse contaminated materials from petrochemical facilities and other CERCLA and RCRA sites and the impacts of this dispersal have not been fully addressed.
Significance – Medium	
2	The use of the HEP model to determine wetland mitigation ratios is not appropriate for a flood risk management project in which habitat quality is not the target.
3	It is unclear whether the TSP mitigates impacts on biological resources from loss of watershed connectivity, loss of connectivity in the two smaller streams, and potential removal of habitat for newly listed species.
4	The project performance analysis does not address the possibility that the levee or floodwall features might fail at less than the design elevation, nor does it explain the risks to project performance due to ice jams, wave overtopping, or potential increased incidence of severe storms.
5	Project operations, impacts, and risks associated with a high rate of relative sea level rise (RSLR) are not discussed in sufficient detail to evaluate the resilience of project design and performance.
6	It is unclear whether the interior drainage systems would perform adequately under increased storm intensity conditions, and what consequences would occur if certain components were to fail.
7	The suitability of the short sheet pile cantilevered I-wall proposed for the Lambertville floodwalls has not been substantiated by analysis.
8	The NED benefits attributed to the structural measures may not fully account for potential emergency costs, infrastructure damages, damages to private property, and impacts to brownfield redevelopment opportunities.
Significance – Medium/Low	
9	The residual risks of possible loss of life are not presented in sufficient detail to document how the proposed alternative is appropriate and adequate in terms of life safety.
10	Ecosystem restoration opportunities with potential benefit to flood reduction objectives may not have been fully analyzed and, therefore, were not considered in the formulation of the TSP.

Table ES-1. Overview of 13 Final Panel Comments Identified by the Del Comp NJ IEPR Panel (continued)

No.	Final Panel Comment
11	The cumulative impacts from other past, present, or future projects that may affect wetlands in the area, change drainage features, reduce habitat connectivity, or affect species of concern are not documented.
12	Uncertainty concerning climate change and basin development impacts on the Delaware River design flows is not adequately addressed.
Significance – Low	
13	It is unclear what analysis was used to justify inclusion of ringwalls for three commercial structures as part of the three Gibbstown alternatives.

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LIST OF ACRONYMS

A/E	Architect/Engineer
ACE	Annual Chance Exceedance
ADM	Agency Decision Milestone
ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
BCR	Benefit-Cost Ratio
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFM	Certified Floodplain Manager
COI	Conflict of Interest
CWRB	Civil Works Review Board
D.WRE	Diplomate, Water Resources Engineer
DrChecks	Design Review and Checking System
EAD	Expected Annual Damage
EC	Engineer Circular
EM	Engineer Manual
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
EWRI	Environmental and Water Resources Institute
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
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
HEP	Habitat Evaluation Procedures
HQ USACE	USACE-Headquarters
HSI	Habitat Suitability Index
HTRW	Hazardous, Toxic, and Radioactive Waste
HU	Habitat Unit
IEA	Integrated Environmental Assessment

IEPR	Independent External Peer Review
IFS	Interim Feasibility Study
IPR	In-Progress Review
IWR	Institute for Water Resources
L&D	Locks and Dams
MSD	Metropolitan Sewerage District
NED	National Economic Development
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NJDEP	New Jersey Department of Environmental Protection
NLEB	Northern Long-eared Bat
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
O&M	Operation and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
P.E.	Professional Engineer
PDT	Project Delivery Team
PED	Pre-construction engineering design
RCRA	Resource Conservation and Recovery Act
RSLR	Relative Sea Level Rise
SAME	Society of American Military Engineers
SAR	Safety Assurance Review
SMART	Specific, Measurable, Attainable, Risk Informed, Timely
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Services

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1. INTRODUCTION

The study area for the Delaware River Basin Comprehensive Interim Feasibility Study is located in the mid-Atlantic region of the United States and generally lies between Philadelphia, Pennsylvania, and New York, New York. The study area as a whole has an estimated 2010 population of 204,231. The major population center within the study area is the City of Trenton, New Jersey, with a 2010 population of 85,403. Most of the study area has a rural/suburban character, with some areas experiencing a small amount of population increase. The Delaware River had a major role in the area dating back to when the land was occupied by indigenous tribes. The majority of the floodplain areas are now extensively developed, particularly in older communities such as Gibbstown, Phillipsburg, Lambertville, Stockton, and Trenton. In the majority of the study area communities, the floodplain is primarily occupied by residential development. In some communities, commercial uses are intermixed with the residential development.

Structural flood risk management measures such as levees, floodwalls, and associated interior drainage have been considered. In addition, nonstructural measures such as structure elevation, wet and dry flood-proofing, ringwalls, relocating, and acquisition have been considered. Prior to Public Law 113-2 (Disaster Relief Appropriations Act), signed January 29, 2013, in the aftermath of Hurricane Sandy, ecosystem restoration opportunities that could be pursued in conjunction with flood risk management measures were also identified. Such opportunities were limited, due to the relatively small scale and limited regional or national significance of the potential restoration outputs. The most likely significant restoration opportunity was associated with a line of protection in Greenwich and Logan Townships.

The plan formulation process screened out most measures and municipalities, resulting in a Tentatively Selected Plan (TSP) with plans for the Gibbstown area of Greenwich Township and the Alexauken Creek area of the City of Lambertville. The primary features of the plans are a system of levees and floodwalls with gravity drainage outlets. In both locations, the levees and floodwalls provide greater than a 90% reliability against overtopping during a 1% annual chance exceedance (ACE) flood.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey (hereinafter: Del Comp NJ IEPR) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE), Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE, 2012) and the Office of Management and Budget (OMB), *Final Information Quality Bulletin for Peer Review* (OMB, 2004). 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).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the Del Comp NJ IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE on August 17, 2015. Appendix D presents the organizational conflict of interest form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the Del Comp NJ IEPR.

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 engineering, economic, environmental, and plan formulation analyses 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 Del Comp NJ was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-214). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. Table 1 presents the major milestones and deliverables of the Del Comp NJ IEPR. Due dates for milestones and deliverables are based on the award/effective date of July 14, 2015. Note that the work items listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on December 14, 2015. The actual date for contract end will depend on the date that all activities for this IEPR, including Civil Works Review Board (CWRB) preparation and participation, are conducted.

Table 1. Major Milestones and Deliverables of the Del Comp NJ IEPR

Task	Action	Due Date
1	Award/Effective Date	7/14/2015
	Review documents available	7/15/2015
2	Battelle submits revised list of selected panel members	8/13/2015
	USACE confirms the panel members have no COI	8/17/2015
3	Battelle convenes kick-off meeting with USACE	7/24/2015
	Battelle convenes kick-off meeting with USACE and panel members	8/19/2015
4	Panel members complete their individual reviews	9/2/2015
	Panel members provide draft Final Panel Comments to Battelle	9/16/2015
	Public comments received to date provided by USACE	9/22/2015
	Battelle sends public comments to panel members for review	9/22/2015

Table 1. Major Milestones and Deliverables of the Del Comp NJ IEPR (continued)

Task	Action	Due Date
	Panel confirms no additional Final Panel Comment is necessary with regard to the public comments	9/24/2015
5	Battelle submits Final IEPR Report to USACE	10/6/2015
6[a]	Battelle convenes Comment-Response Teleconference with panel members and USACE	11/17/2015
	Battelle submits pdf printout of DrChecks project file to USACE	12/14/2015
3	Agency Decision Meeting (ADM)[b]	To Be Determined
	CWRB Meeting (Estimated Date)[b]	
	Contract End/Delivery Date	5/31/2016

[a] Task 6 occurs after the submission of this report.

[b.] The ADM and CWRB meetings were listed in the Performance Work Statement under Task 3 but were relocated in this schedule to reflect the chronological order of activities.

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: Civil Works planner/economics, biological resources and environmental law compliance, hydrology and hydraulic engineer, geotechnical engineer, and structural/civil engineer. The Panel reviewed the Del Comp NJ document and produced 13 Final Panel Comments in response to 20 charge questions provided by USACE for the review. Two summary charge questions and one charge question regarding the public comment review were added by Battelle. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-214, Appendix D), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed 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 Del Comp NJ IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review of the 10% conceptual design as contained in the Del Comp NJ review documents, the project seems to be well thought-out and focused on the priority issues. The review documents are well written and provided the proper data, applied appropriate modeling tools, and presented project information in a manner that is easy to follow. Given the large project area, for a 10% conceptual design, the data and level of information are comprehensive. The Panel did identify elements of the project that require further consideration and verification and found sections of the Del Comp NJ review documents that should be clarified or discussed in greater detail.

Environmental: The Panel found that the environmental aspects regarding the flood risk management improvements of this project are straightforward and reasonable. However, several concerns were identified that should be reviewed and clarified. The Panel's most significant finding was the potential for the project to disperse contaminated materials from petrochemical facilities and other Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) sites, potentially causing both short-term and long-term impacts. Given the project's proposed vicinity to known CERCLA and RCRA sites in Gibbstown, the Panel is concerned that erecting levees and floodwalls in these areas may create wave conditions and increase local velocities that could erode and suspend pollutants. Furthermore, flood remediation wells could force groundwater contaminants to migrate. Providing additional information on contaminated soils, the potential for disturbance of existing contaminants, and life safety risks associated with their potential movement would help identify the risks inherent with this issue. The Panel also noted that the use of the Habitat Evaluation Procedures (HEP) method is appropriate for evaluating habitat quality. However, this project is not targeting habitat quality or any particular species; therefore, the basis of this method is not ideally suited for this application. Other methods (for example, the Highway Methodology Workbook [USACE New England District]) consider other variables such as sediment retention, which may be more applicable to the flood risk reduction goals of this project and may capture benefits not defined, given the specific site conditions (hazardous, toxic, and radioactive waste [HTRW]). The Panel believes that using a more comprehensive wetland evaluation method will result in a higher wetland mitigation ratio. It was unclear if the ecosystem restoration analysis considered indirect benefits of flood reduction and if inclusion of these benefits would affect the determination for inclusion in the TSP. It is also unclear whether the TSP provides adequate mitigation for impacts on biological resources from a loss of watershed connectivity and stream connectivity in the two smaller streams, and potential removal of habitat for newly listed species. To help address these issues, the IFS/IEA should clarify (1) how proposed mitigation practices would mitigate for a loss of connectivity in the watershed, (2) why "fish friendly" passage structures are only being used on two of the four streams that will be impacted by the TSP, and (3) how habitat for the Northern long-eared bat (NLEB) will be protected and potentially mitigated.

Engineering: The Panel agreed that for a 10% conceptual design, the information provided was complete and detailed enough to allow the Panel to understand the engineering intent at this stage of design. A significant amount of detail was provided in support of flood risk reduction analyses, and the hydrologic and hydraulic analyses are thorough and may be sufficient to support the project development up to final design. However, the Panel noted that the suitability of the short sheet pile cantilevered I-wall proposed for the Lambertville floodwalls is not substantiated by the analysis considering the weak soils

identified in the area and the relative height-to-embedment ratio. The performance and practicality of the TSP's preliminary design should be verified using estimated soil properties. In addition, the Panel noted that the project performance analysis does not address the possibility that the levee or floodwall features might fail at less than the design elevation, nor does it explain the risks to project performance due to ice jams, wave overtopping, or potential increased incidence of severe storms. The Panel suggests that a description of the effects of a levee/floodwall failure prior to overtopping (breach) be added to the discussion of residual risk.

Plan Formulation/Economics: The Panel noted that the National Economic Development (NED) benefits attributed to the structural measures may not fully account for potential emergency costs, infrastructure damages, and damages to private property. Without accounting for those potential benefits, the Panel was unable to determine whether other municipalities would have qualified by having a benefit-cost ratio (BCR) over 1. USACE can address this issue by defining the limitations of the benefits estimated to date and potential benefits not yet included in the screening analysis, and reanalyzing to determine if any additional alternative may result in a qualifying BCR and, if so, determine their eligibility for project inclusion.

4.2 Final Panel Comments

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

The potential for the project to disperse contaminated materials from petrochemical facilities and other CERCLA and RCRA sites and the impacts of this dispersal have not been fully addressed.

Basis for Comment

According to the Interim Feasibility Study and Integrated Environmental Assessment (IFS/IEA), Gibbstown borders petrochemical facilities containing areas that are classified as CERCLA and RCRA sites. The proximity of lands with known contamination has been clearly established. Hundreds of spills have been reported at a refinery and at a DuPont site. However, Appendix D (pp. D-5, D-6, and D-40) indicates that little information is available about the contamination that could be caused by project construction or local flooding. Contamination remediation/mitigation introduces risk and uncertainty that need to be addressed comprehensively. The erection of levees and floodwalls may create wave conditions and increased local velocities that could erode contaminated soil, thereby suspending and transporting pollutants, and flood remediation wells could spread contaminated groundwater. HTRW sites may have containment caps that could potentially become compromised during a flood event with increased wave velocity, creating the potential for the contained contamination to be released into the flood waters (Delaware River Partners LLC, public comment letter). These risks are not addressed in the report.

Section 6.2.10, Cumulative Impacts (IFS/IEA, p. 6-21) states:

> "Providing Gibbstown and Lambertville with flood risk management projects would contribute to the protection of life… Significant flooding often results in contamination of drinking water supplies, dispersion of HTRW, and dispersion of large quantities of solid waste that require clean-up and disposal. Experience has shown that vast quantities of debris (e.g., homes, vehicles, mobile homes, etc.) and sediment must be collected and hauled away after a flooding event."

There is no discussion of life safety risk from potential exposure to hazardous materials, or of potential impacts on residential areas from the mobilization and deposition of hazardous materials from nearby HTRW sites. The cleanup efforts presented do not include the preferential handling of hazardous materials after storm events. There may be undefined life safety risks under the without-project condition, as well as potential exposure issues during construction. With-project conditions may reduce some of this risk, as the HTRW primary sites are beyond the line of protection. However, increased flow rates on HTRW lands resulting from this project may mobilize these materials, potentially adversely affecting water quality downstream in the Delaware River.

Because of the lack of information in the IFS/IEA on contaminated soils near the project area, it is difficult to assess the situation. For an area to be classified as CERCLA or RCRA, significant investigations are generally required, and detailed examination and documentation exist between culpable parties and government agencies. Information is normally available on specific contaminants, their locations, and current concentrations.

Final Panel Comment 1

Significance – Medium/High

Based on the analyses available, if the potential for contamination issue is not addressed, project activities could disturb CERCLA and RCRA sites and result in potential offsite impacts.

Recommendations for Resolution

1. Identify whether contaminant information can be obtained through Federal or state agencies; if so, include the information in the IFS/IEA.
2. Determine whether obtaining this information could potentially delay the study.
3. Determine whether the project could directly or indirectly disturb the existing contaminants.
4. Obtain specifications regarding contaminant caps at HTRW sites, and conduct geotechnical analyses to determine if increased wave velocities may compromise the integrity of the cap.
5. Discuss potential life safety risks associated with the exposure of humans and essential natural resources to HTRW. Include the uncertainty and risk associated with the potential movement of contaminated sediments from HTRW sites during flood events, and present any data from previous contamination of drinking water supplies and known dispersion of HTRW into residential areas.
6. Indicate whether the PDT has coordinated this issue with the state and with the U.S. Environmental Protection Agency.

Final Panel Comment 2

The use of the HEP model to determine wetland mitigation ratios is not appropriate for a flood risk management project in which habitat quality is not the target.

Basis for Comment

The assumptions and methods used to evaluate wetland resources and potential impacts of the alternative plans are reasonable; however, the technique used for mitigation analysis may not be the best method for this study. The mitigation analysis is based on HEP methodology, as presented in detail in Appendix D (p. D-9). The HEP is a good method to use when evaluating wetlands for habitat quality in projects where habitat restoration is a primary focus. However, this project is not targeting habitat quality or any particular species; therefore, the basis of this method is not ideally suited for this application. There are many functions and values of wetland beyond habitat, and they should be considered for this flood reduction project. The potential functions and values of these wetlands that are not captured in the HEP, but are important to this project, include retention of sediments and toxicants, groundwater recharge/discharge, flood flow alteration, sediment/ toxicant/pathogen retention, nutrient removal/retention/transformation, and sediment stabilization.

A variety of assessment methods use a comprehensive approach for evaluating individual wetlands that considers wetland functions to be the physical, chemical, and biological characteristics of a wetland. It assigns wetland values to the characteristics that are valuable to society. For example, the Highway Methodology Workbook (USACE 1999a) and the Wetland Evaluation Technique (USACE 1987) consider these other variables, which may be more applicable to the flood risk reduction goals of this project and which consider the specific-site conditions (HTRW onsite). The Highway Method was designed by USACE to capture other benefits that are not captured in the HEP.

The result of the analysis using the HEP appears to provide an estimate that is not conservative for the wetland impacts resulting from this project. In the HEP analysis, the required mitigation ratio was based on 11.5 acres of potentially impacted wetland of diverse wetland types, resulting in required mitigation of 7.0 acres replacement. Using a wetland assessment model better suited for this project would likely result in a higher value for the existing emergent wetlands (and for the mitigation required) and would better capture the potential impacts resulting from this project.

For this study, the wetland mitigation ratio is determined as follows (IFS/IEA, p. 6-2):

> "Approximately 11.5 acres of wetlands will be impacted by the levee/floodwall system and ringwalls identified as the TSP. This impact can be broken down to approximately, 2.8 acres of forested, 3.5 acres of scrub/shrub, 1.7 acres of emergent, and 3.5 acres of Phragmites-dominated wetlands (see Figures 6.2). … Three options meeting the mitigation objectives were considered and mitigation Option #1 was determined to be the recommended mitigation option. This option will replace 8.8 habitat units with approximately 12.5 acres. The HEP analysis concluded that 7.0 acres of habitat would be sufficient to replace the habitat impacted by the TSP (11.5 acres); however, since forested wetlands will be impacted by the proposed project and science has demonstrated that forested wetlands take approximately 25-50 years to replace loss function and structure, this supports the need to add mitigation acreage above the HEP

Final Panel Comment 2

computed value of 7.0 acres. After taking this into account, the proposed mitigation acreage for the TSP is 12.5 acres."

Although the mitigation ratio is increased because of the forested wetland recovery time, the discussion regarding the method of analysis and determination of the additional compensation is inadequate.

The selection of the specific species used for the HEP analysis is also not clearly justified. For example, the red spotted newt was chosen to represent the emergent wetlands. Since no species are targeted for habitat enhancement, it is unclear why the newt is the basis for the wetland impact assessment. The primary issue of concern is that the HEP method evaluates the value of the wetlands in this project based solely on habitat value. The specific calculation for habitat suitability index (HSI) equals the product of three variables: HSI Red-spotted newt = V1 x V2 x V3

The phragmites-dominated emergent wetland was assigned a habitat unit (HU) equal to zero for version 2 of the HEP, based on the absence of adequate aquatic vegetation cover in the littoral zone for the red spotted newt. Therefore, the HSI value was 0. Perhaps there is no habitat value for the red spotted newt in this wetland, but recent studies show that even phragmites-dominated systems have some habitat value, such that the HU for the degraded wetland should not be zero. For the purposes of comparing alternatives and comparing with-project and without-project conditions, the results of the HEP analysis may be adequate. However, for wetland mitigation, the HEP results may have been applied in too narrow a manner in terms of assessing overall wetland value.

Significance – Medium

The model application, specified indicator species, and inadequate acknowledgment of the full range of wetlands functions have resulted in an undersized mitigation area, which may not adequately compensate for the planned impacts to public resources.

Recommendations for Resolution

1. Reanalyze the wetland impacts using a more comprehensive method, such as the Highway Methodology Workbook (New England USACE District).
2. If HEP is retained as the selected model, justify its application and explain the rationale for the species selection.
3. Describe the method for determining wetland mitigation and the process that increased the mitigation to account for forested wetland recovery time.

Literature Cited:

USACE (1999a). The Highway Methodology Workbook. U.S. Army Corps of Engineers, New England District. NAEEP-360-1-30a.
http://www.nae.usace.army.mil/Portals/74/docs/regulatory/Forms/HighwaySupplement6Apr2015.pdf
USACE (1987). Wetland Evaluation Technique (WET). U.S. Army Corps of Engineers, Waterways Experiment Station. Washington DC.

Final Panel Comment 3

It is unclear whether the TSP mitigates impacts on biological resources from loss of watershed connectivity, loss of connectivity in the two smaller streams, and potential removal of habitat for newly listed species.

Basis for Comment

The proposed levee/floodwall for the Gibbstown area will have direct impacts on fisheries in the Repaupo Creek watershed, as well as on terrestrial species from loss of habitat connectivity, and may result in permanently disconnecting some species from their foraging habitat or affect their habitat needs during reproduction. These impacts are described in the IFS/IEA (p. 6-5). However, these impacts to biological resources are listed as temporary and not significant (Table 5.16 of the IFS/IEA). This determination is not clearly justified; as stated in the IFS/IEA (p. 6-6):

> "There will be some loss of connectivity for land species moving through the watershed."
>
> and
>
> "In addition, the levee/floodwall system will result in the loss of connectivity and impact movement of wildlife that use the riparian corridor around all four of the streams…"

The National Environmental Policy Act (NEPA) requires mitigation for significant impacts on biological resources. These impacts include both direct impacts (due to the construction of the TSP with four stream crossings) and indirect impacts (such as increased sediment and pollutants entering habitats):

> "In addition, floodgate structures will have to be installed in and adjacent to the four creeks. This will have a direct impact on the creeks." (IFS/IEA, p. 6-5).

The plan proposes mitigation in the form of "fish friendly" floodgates at the two largest creeks (Repaupo and White Sluice). Despite these impacts on aquatic species, no justification is presented explaining why the only mitigation proposed for the project is the fish friendly passages on two of the four impacted streams. No rationale is given for why the mitigation effort does not consider fish passage opportunities on the other creeks or why other impacts on small land animals are not addressed. Furthermore, there is no discussion of wildlife corridors or any proposed mitigation for these biological impacts.

The Northern long-eared bat (NLEB) is now listed as a threatened species. Section 6.2.3.2.4 of the IFS/IEA states:

> "Through continued informal consultation with the [U.S. Fish and Wildlife Service], surveys to determine the presence or absence of roosting trees will be performed in the next phase of the study. In addition, if trees for roosting bats are found in the project area, seasonal restrictions on tree removal activities will be instituted during construction to minimize any impacts on federally listed bats." IFS/IEA (p. 6-7).

Although U.S. Fish and Wildlife Service consultation has begun, potential impacts to NLEB habitat are possible; however, the TSP does not define proposed mitigation efforts if there will be a permanent removal of roosting trees. Such measures should also address potential impacts during the reproductive season when bats establish sites for nurseries. If habitat is removed during construction, mitigation will be necessary.

Final Panel Comment 3

Significance – Medium

Without addressing mitigation for impacts on biological resources for the permanent loss of connectivity in the watershed and obstruction of two unmitigated stream crossings, the NEPA analysis is incomplete.

Recommendations for Resolution

1. Define the proposed mitigation for the loss of connectivity in the watershed.
2. Justify why only two of the four impacted streams will have “fish friendly” passage structures to mitigate for impacts on aquatic resources in the four streams that will be impacted by the TSP.
3. Define potential mitigation for impacts on bat habitat resulting from this project if roosting habitat to the newly listed NLEB will be removed as part of the TSP.

Final Panel Comment 4

The project performance analysis does not address the possibility that the levee or floodwall features might fail at less than the design elevation, nor does it explain the risks to project performance due to ice jams, wave overtopping, or potential increased incidence of severe storms.

Basis for Comment

Table 6.3 of the IFS/IEA presents a project performance analysis, but the only mode of performance risk considered is overtopping. While this may be the most probable mode of nonperformance, levee failure prior to overtopping is a well-documented occurrence throughout the country and elsewhere. Construction of levee or floodwall features introduces risk associated with breach events that is qualitatively different from inundation flooding. Existing overbank flooding in the project area would likely occur after several hours or more of advance warning, and such flooding would consist of increasing depths of low-velocity water. A breach, should it occur, introduces the potential for locally high velocities with little or no warning time. The high velocities pose a significant risk of damage and loss of life to those in the immediate vicinity, and the lack of warning time reduces the potential to evacuate. The risk of breach would arise as a direct result of project construction because without a floodwall or levee, no breach would occur. The probability of such an event can be described as very low but not zero, with significant potential consequences. This risk can be minimized by design, construction, operations, and maintenance measures.

The level of performance provided by flood risk management can be reduced by increased water levels associated with ice jams, wave action, and increased incidence of severe storms. Ice jams and wave action are phenomena that are known to occur along portions of the Delaware River and at nearby coastal areas. The risks posed by both phenomena are specifically required to be considered in the evaluation of National Flood Insurance Program (NFIP) levee systems, per EC 1110-2-6067 (USACE, 2010). Neither of these is analyzed or described in the IFS/IEA or in the engineering appendices, and it is not clear whether the concept-level costs include consideration of scour countermeasures to address these risks, if necessary. Section 5.3.2 of the IFS/IEA describes the method for estimating the future stage frequency analysis as superimposing the current tidal conditions atop an assumed rate of relative sea level rise (RSLR). However, climate variability projections suggest the potential for changes to the occurrence and intensity of severe storms in the future, which would change the occurrence of storm surge experienced in the Gibbstown project area. Recognizing that there is a considerable amount of uncertainty regarding the magnitude and characteristics of such changes, if they occur, storm frequency and intensity still represents an element of risk to the project in that the incidence of high water against the levee and floodwall elements could increase relative to the plan assumptions.

Significance – Medium

Without addressing the potential risk of failure and the risks to performance due to ice jams, wave overtopping, and potential changes to storm frequency, the documentation of risks associated with the project is incomplete.

Final Panel Comment 4

Recommendations for Resolution

1. Describe the effects of a levee/floodwall failure prior to overtopping (breach) in the discussion of residual risk.
2. Qualitatively discuss the potential for ice jams, wave overtopping, and changes in severe storm occurrence to increase the frequency of high water levels along the levees and floodwalls.
3. During pre-construction engineering design (PED), conduct quantitative analyses, including review of Federal Emergency Management Agency (FEMA) storm surge modeling for Delaware Bay and Estuary, and incorporate these factors into design water surface profiles and/or additional protective measures, if appropriate.

Literature Cited:

USACE (2010). Engineering and Design -- USACE Process for the NFIP Levee System Evaluation. Engineer Circular (EC) 1110-2-6067. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 31 August.

Final Panel Comment 5

Project operations, impacts, and risks associated with a high rate of relative sea level rise (RSLR) are not discussed in sufficient detail to evaluate the resilience of project design and performance.

Basis for Comment

The plan formulation and conceptual design are based on the assumption that sea level rise will continue at the existing rate of increase. This assumption affects both component design and damage estimates at Gibbstown. However, a low estimate of the future rate of increase is used that assumes no acceleration over time and implicitly assumes that deceleration is as likely as acceleration. The current scientific consensus seems to be that in the near term, sea level rise is more likely to accelerate than decelerate. This makes the assumption of no acceleration “non-conservative” and makes it probable that the risks associated with sea level rise will exceed those assumed for the project analysis.

The IFS/IEA and its appendices do present predicted river levels at Gibbstown based on higher rates of RSLR, but data regarding the effects of these higher rates are limited. Table 6.3 presents an overtopping rate analysis under the various rates of RSLR, and Section 6.6.1.2 lists the calculated expected annual damage (EAD) values for each scenario, though the values and percentages have not been updated for the 2014 damage estimates. However, rates of RSLR would also affect such aspects of the TSP as damages prevented, maintenance requirements, interior drainage performance, and possibly others. For example, the Repaupo Creek interior drainage analysis indicates that the assumed rate of rise would increase interior stage levels by 1 foot, and that a high rate of rise would increase stages by an additional 1.2 feet (Appendix A2, Table A.7.7). The impacts of the additional 1.2 feet, if any, are not discussed in the IFS/IEA or the appendices. In addition, Table 6.5 presents predicted changes in future land use and the effects of moderate RSLR on its distribution. However, changes in future land use do not appear to have been considered in any of the estimates of future damages and damages prevented.

Significance – Medium

Because sea level rise is a major source of uncertainty to this project, further analysis of the resilience of the TSP within the likely range of rise would improve the assessment of risk associated with the project.

Recommendations for Resolution

1. Calculate and compare TSP benefits at Gibbstown under the accelerated sea level rise scenarios to those for the assumed sea level rise scenario. Use 2014 base year estimates and account for the predicted changes in land use.
2. Discuss the impacts of the high rate of sea level rise on the performance or extent of flooding within the Repaupo Creek interior drainage system and evaluate their significance.

Final Panel Comment 6

It is unclear whether the interior drainage systems would perform adequately under increased storm intensity conditions, and what consequences would occur if certain components were to fail.

Basis for Comment

The interior drainage facilities are designed to prevent increases in post-project stormwater flooding relative to existing conditions. However, there is no estimate of the uncertainty associated with the flows used to evaluate the interior drainage conditions. Precipitation for each design storm is taken as a single value from National Oceanic and Atmospheric Administration (NOAA) Atlas 14, and design hydrographs are deterministic output from the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) model runs. Changes in watershed conditions are modeled for the Gibbstown system, but not the Lambertville system, and future-condition models for both systems assume no change in precipitation frequency. Uncertainty in future flows and future watershed response is not quantified.

Evaluation of uncertainty in these analyses is relevant because it provides an opportunity to appraise the resilience of the project under the reasonably foreseeable range of conditions. Uncertainty in watershed model responses is very difficult to quantify without a full Monte Carlo analysis, which may not be justified in this case. However, uncertainty in the precipitation estimates can be analyzed using data such as the National Weather Service (NWS) precipitation station confidence limits described in Atlas 14. With regard to future conditions, there may be a lack of a solid consensus as to trends in extreme precipitation events to the year 2065, but that lack of consensus means that there is a high level of uncertainty regarding future storm intensities. By assuming “no change,” the model results may be indicative of a median condition, but they do not provide clarity regarding whether the system would be resilient under the more extreme limits of foreseeable change. Therefore, it is difficult to judge whether it would be prudent to make design adjustments that might increase cost slightly, but provide better performance should more intense storms become more common.

Appendix B describes the hydrologic model of the with-project Lambertville interior drainage system. This model includes two diversion pipes and one sluice gate, all of which shunt water from the main drainage system and out of the model domain. Presumably, without this transfer of water out of the drainage system, the with-project interior drainage would function differently, potentially with additional ponding levels downstream. The nature and magnitude of the change in hydrologic and hydraulic function should the diversions and sluice gates fail to operate are unclear, and the analyses do not consider whether this would motivate changes in the proposed design of the interior drainage system.

Significance – Medium

Reduced performance of the interior drainage systems could lead to unanticipated levels of induced flooding.

Recommendations for Resolution

1. Coordinate with NOAA and the NWS to analyze and present the uncertainty in the precipitation frequency estimates developed from Atlas 14.

Final Panel Comment 6
2. During the PED phase, analyze the vulnerability of the interior drainage systems to (1) potential increases in rainfall intensity associated with climate changes, and (2) the failure of non-project drainage system elements. Consider vulnerability analysis results in the final design of these systems.

Final Panel Comment 7

The suitability of the short sheet pile cantilevered I-wall proposed for the Lambertville floodwalls has not been substantiated by analysis.

Basis for Comment

Appendix A Sections 4.6 and 5.4 describe the Lambertville floodwall as a steel sheet pile cantilevered concrete I-wall up to 7 feet high and driven about 13 feet to shallow bedrock. While it is understood that this design is based on general guidance and that calculations have not yet been performed at this early stage in the study, the ability of such construction to provide flood protection is questionable. Considering the weak soils identified in boreholes LAM-03 and -04, the relative height-to-embedment ratio may be impracticable.

An I-wall system has been proposed because of the relatively low height and the limited area available for construction. Hence, were analyses to show that a different system is required (such as a pile-supported T-wall or I-wall with socketed king piles), the cost could change dramatically.

Per EC1110-2-6066 (USACE [2011], expired, but still the interim guideline per ECB 2014-18, USACE, 2014), one performance requirement for I-walls is that the structure and foundation be resilient and tough to preclude catastrophic failure under extreme loading. Sheet piles driven to bedrock effectively cut off seepage and result in full headwater pressure on the water side of the sheet piles. This effect is similar to the increase in driving force experienced during Katrina, when a gap developed on the water side at some I-walls and contributed to their failure. Generally, deeper pile penetration is typically required to provide stability under such conditions.

Significance – Medium

Based on the information provided and the potential sensitivity of cost associated with the limited area available for construction for the Lambertville floodwall, the proposed I-wall may be unsuitable and the appropriate solution could significantly affect the project cost.

Recommendations for Resolution

1. Perform a preliminary design based on estimated soil properties to verify whether the proposed TSP is practicable.
2. Develop an alternative system, if necessary, and re-evaluate project costs accordingly.

Literature Cited:

USACE (2014). Design and Evaluation of I-Walls Including Sheet Pile Walls. Engineering and Construction Bulletin (ECB) 2014-18. U.S. Army Corps of Engineers, CECW-CE. 9 September.

USACE (2011). Engineering and Design -- Design of I-Walls. EC1110-2-6066. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 1 April. Expired.

Final Panel Comment 8

The NED benefits attributed to the structural measures may not fully account for potential emergency costs, infrastructure damages, damages to private property, and impacts to brownfield redevelopment opportunities.

Basis for Comment

The screening benefits analysis appears to take into account only structure and content and not categories involving other physical damages or losses (for example, infrastructure, vehicles, income losses, and emergency costs). NED project benefits include damages prevented to these categories as well. Without accounting for those potential benefits, the Panel is unable to determine whether other municipalities would have qualified by having a BCR over 1. Development of the brownfield area between the TSP and the Delaware River as cited in public comments (the Ashland and Delaware River Partners letters) could affect the economic analysis of the Gibbstown area and change the TSP for the area.

Significance – Medium

Based on the information provided, some alternatives that could otherwise qualify when provided a fuller range of benefit categories may have been prematurely dismissed from consideration.

Recommendations for Resolution

1. Define the limitations of the benefits estimated to date, as well as potential benefits not yet presented in the screening analysis.
2. Discuss whether other potential flood damage reductions would or could be sufficient to increase the number of areas within the study area that could qualify as economically justified candidates for flood risk management.
3. Reanalyze, if necessary, the municipality alternatives to determine if other municipalities may result in a qualifying BCR, and determine their eligibility for project inclusion.
4. Discuss the likelihood of the Ashland and Delaware River Partners' letters claims for development and how that might affect the TSP.

Final Panel Comment 9

The residual risks of possible loss of life are not presented in sufficient detail to document how the proposed alternative is appropriate and adequate in terms of life safety.

Basis for Comment

The life safety aspects of the project are not well-documented in the IFS/IEA. There is no discussion of past life lost due to flood events in the project area, and there is no quantitative discussion of life safety under the with-project conditions.

Life safety risks for Gibbstown are briefly discussed in Tables 5.16 and 5.21. No justification is provided for the statement that there is significant life safety risk due to the perceived protection offered by the existing landform. Therefore, the statement that the alternatives reduce the residual life safety risk is not supported by the data provided.

Life safety risks for Lambertville are briefly discussed in Tables 5.19 and 5.21. Life safety has a rating of “N/A” for the no action alternative, and a statement is made that there is improved life safety protection with the project.

The design of the TSP protects interior areas against flooding for up to the 1% annual exceedance event. Several levee safety groups, including the Interagency Levee Policy Review Committee in “The National Levee Challenge: Levees and the FEMA Map Modernization Initiative,” have questioned whether this standard is adequate to serve as a life safety standard in urbanized areas.

Significance –Medium/Low

Without a comprehensive evaluation of life safety risk, the evaluation of project alternatives is incomplete.

Recommendations for Resolution

1. Add a discussion to Chapter 3 detailing past life lost due to flood events in the project area.
2. Update Table 5.16 in Section 5.9 with existing and expected residual life safety risk under the without- and with-project conditions for Gibbstown. If data are currently unavailable to quantify the residual life safety risk, then the discussion should be qualitative in nature.
3. Update Section 5.9.2 with existing and expected residual life safety risks under the without- and with-project conditions for Lambertville. If data are currently unavailable to quantify the residual life safety risk, then the discussion should be qualitative in nature.
4. Provide a quantitative discussion of life safety during plan optimization.
5. Discuss life safety with respect to overtopping and structural failure.
6. Explain why the selected 1% annual exceedance level of protection is considered adequate to address life safety concerns.

Final Panel Comment 10

Ecosystem restoration opportunities with potential benefit to flood reduction objectives may not have been fully analyzed and, therefore, were not considered in the formulation of the TSP.

Basis for Comment

The stated goals of the project (IFS/IEA, p. 3) include reducing flood risk to life, safety, and infrastructure associated with the Delaware River … and providing associated ecosystem restoration. The IFS/IEA states (p. 5-24):

> "For this study, ecosystem restoration measures must contribute to the primary goal of flood risk management."

It is unclear whether a comprehensive analysis of the indirect flood risk reduction benefits of ecosystem restoration was conducted for this project. The IFS/IEA discussion was limited to defining potential direct benefits that result from slowing the speed of floodwaters (p. 5-24); however, indirect benefits to flood risk management that may result from restoring the floodplain were not discussed. If these additional project benefits were considered, there may be sufficient justification to include ecosystem restoration in the TSP. Potential indirect benefits associated with flood risk management that should be discussed include:

- Groundwater recharge
- Groundwater discharge
- Flood flow alteration
- Sediment stabilization
- Sediment/toxicant retention
- Nutrient removal/transformation
- Production export
- Wildlife diversity/abundance
- Aquatic diversity/abundance

Considering the high concentrations of contaminated soils from the HTRW surrounding the project area, benefits from the retention of the sediments, potential pathogen transformations, and water quality improvements, as well as other indirect benefits of restoring the floodplain in the project area, should be considered in the cost-benefit analysis. Implementation would add to the project cost and require a different non-Federal sponsor for the cost-share percentage for this component. However, long-term benefits not currently included in the TSP could be realized.

The TSP involves the buyouts of 16 residential structures and one currently vacant commercial structure located outside the proposed levee system (17 structures). The IFS/IEA states (p. 5-24):

> "Floodplain reclamation can be achieved through removal of buildings and flood control structures to allow floodwaters to return. Wetland restoration can expand upon the ecosystem services of existing wetlands by improving hydrology to increase flows and expand flood storage capacity."

Based on Figure 5.13, the removal of these structures from the northern area of the project site would provide an excellent opportunity to restore the historic floodplain in the entire northern/northwestern

portion of the site. The plan for post-buyout is not presented in the document. At a minimum, removal of all impervious areas would have a positive impact on flood storage.

The IFS/IEA (p. 5-36) states that:

> "The most significant restoration opportunity for Corps involvement is restoration of historic tidal inundation and invasive species control in conjunction with a line of protection at Greenwich and Logan Townships."

Appendix H states (p. 2-37):

> "The Greenwich and Logan Townships site appears to meet policy and budget guidance on opportunities for offsetting trends of loss of tidal wetlands and for increasing the connectivity of habitats."

Considering that these identified benefits address the specific biological impacts that may result from the TSP, and which may not have been fully mitigated, the opportunity exists to meet additional project goals (ecosystem restoration), add small flood management benefit, and mitigate impacts on biological resources.

It appears that ecosystem restoration opportunities may have been dismissed without sufficient analysis, which would preclude identifying the National Ecosystem Restoration plan. Appendix H, Table 2.7, suggests that ecosystem restoration was not comprehensively analyzed, stating that:

> "…effective designs are available and have been implemented in other nearby locations…" (p. H-2-37)

However, the table also states:

> "Neither the ecological impact of the restoration nor the economic impact of flood risk management measures have been assessed in detail" (pg. H-2-37)

The IFS/IEA ultimately concludes (Section 5.8.3, p. 5-36) that:

> "The potential for Corps participation in ecosystem restoration alternatives appears to be limited due to the relatively small scale and limited regional or national significance of the potential restoration outputs. However, restoration of the marsh would not contribute significantly to flood risk management. Consequently and consistent with Public Law 113-2 (Hurricane Sandy response), restoration will need to be considered separately from this study under other project authorization."

It is unclear if the funds planned for use in this project from the Hurricane Sandy legislation can include indirect flood risk reduction benefits not yet defined in this analysis, or if these funds are earmarked only for direct flood risk reduction; therefore, this distinction is fundamentally a policy/authorization issue.

The IFS/IEA also states (p. 6-27):

> "Without restoration work on the wetlands, it is likely that the current invasive species in the project area (e.g., common reed) will continue to expand and further degrade the system. If this happens, the functionality and value of the wetlands in the project area will continue to decline."

The long-term benefits of restoring these wetlands have not been considered in comparison with the possibility of without-project continued degradation and a likely decrease in the flood attenuation capability. Sedimentation has resulted in a decrease in stream storage capacity ranging from 50% to 80% in the last 35 years, according to the public comment submitted by Mayor George Shivery of Greenwich Township. Data showing sedimentation rates in the streams and floodplain are not presented in the IFS/IEA. Inclusion of these data in the analyses may strengthen potential benefits in the BCR.

If ecosystem restoration is not considered, it seems prudent to ensure that future opportunities can include ecosystem restoration as a possible use of the land included in the buyouts. The IFS/IEA states (p. 5-3):

> "A number of flood prone properties within the study area have been purchased recently (outside of this project) and are now designated as open space. Because of this designation, the land is not available for construction of flood risk management measures."

Significance – Medium/Low

The opportunity for restoring historic tidal inundation and wetland restoration may have additional indirect ecosystem benefits that contribute to flood risk reduction and flood storage, potentially changing the BCR for this component.

Recommendations for Resolution

1. Reanalyze the potential restoration of the historic tidal inundation area to include additional benefits to the ecosystem that may not be currently captured in the analysis, especially considering the presence of highly contaminated soils.
2. Present data on sedimentation rates in streams and floodplain in recent years in the existing site conditions description.
3. Clarify the authorization of Public Law 113-2 to specify whether indirect flood reduction risks are included or whether this funding excludes ecosystem restoration opportunities.
4. Add language to the document explaining the plan for post-buyout, and include removal of all impervious areas to optimize flood storage benefits from this component of the TSP.
5. Define land use options for the lands involved in the buyouts to enable future beneficial uses of the land if ecosystem restoration is not included in this project.
6. Consider recommendations for ecosystem restoration opportunities presented in the conclusion of Appendix D, GEA study, in terms of long-term regional activities in association with this project.

Final Panel Comment 11

The cumulative impacts from other past, present, or future projects that may affect wetlands in the area, change drainage features, reduce habitat connectivity, or affect species of concern are not documented.

Basis for Comment

The NEPA analysis of cumulative impacts is brief and does not discuss other flood risk management measures in the region. NEPA requires the cumulative assessment of even small impacts to comprehensively assess what changes will likely result from the proposed project. Although not addressed in Section 6.2.10, Cumulative Impacts, of the IFS/IEA, the project may alter drainage patterns, degrade wetlands, and affect biological resources. Cumulative impacts on limited resources may be significant. For this project, impacts on wetlands are proposed to be mitigated at a mitigation and replacement ratio of just over 1:1. A discussion of other past, present, and future regional wetland impacts would help justify a mitigation ratio roughly equal to the estimated area of impact.
The public comment letters also describe short-term development plans on the DuPont and Hercules lands. These plans for revitalization of the floodplain should be included in the cumulative impacts section of the IFS/IEA.

Significance – Medium/Low

Potential cumulative impacts may not been identified; therefore, the proposed mitigation may not be adequate.

Recommendations for Resolution

1. Analyze the cumulative past, present, and future impacts on wetlands and streams in the region.
2. Analyze the cumulative past, present, and future impacts on drainage patterns and biological species in the region.
3. Revise Section 6.2.10, Cumulative Impacts, of the IFS/IEA to reflect the additional analyses and add any other relevant information.
4. Add information pertaining to the redevelopment plans associated with the DuPont and Hercules sites to Section 6.2.10, Cumulative Impacts, of the IFS/IEA.
5. Consider the existing mitigation plan in terms of overall regional impacts and assess its adequacy.

Final Panel Comment 12

Uncertainty concerning climate change and basin development impacts on the Delaware River design flows is not adequately addressed.

Basis for Comment

The IFS/IEA does not assess the uncertainty associated with future Delaware River flows. Appendix A2 does describe the uncertainty attributed to existing flow conditions based on an analysis of gage data, but not potential additional sources of uncertainty in future flows, including the actual degree of development occurring and changes in precipitation regime due to climate change.

Future Delaware River flows are estimated by applying a 10% increase to current modeled flows. The basis for this increase appears to be professional judgment, but it is not clear whether this approach is intended to be a representative/average estimate or a conservative estimate of potential flow increases. Section 5.3.1 (p. 5-8) states that the U.S. Geological Survey identified “no long-term trends in the annual peak streamflow data over the course of the past 100 years.” The estimated 10% increase would represent a significant deviation from the past trend.

Modeling data summarized in Section A.5.6 of Appendix A2 indicate that the peak flow from three selected large storm events would be expected to increase by 1% to 3% at Trenton under the projected development increases. This finding would suggest that the majority of the estimated future 10% increase would likely be attributable to changes in the frequency of large precipitation events. The discussion presented in Section A.1.4 of Appendix A2 suggests there is a high degree of uncertainty with regard to climate variability impacts, but there is also general consensus with regard to changes affecting both total precipitation amounts and seasonality of runoff processes. However, the IFS/IEA does not present data on how current climate projections compare to the assumed peak flow increases and the uncertainty regarding those projections. At the current state of design, identifying the uncertainty associated with future flows is primarily a matter of completely defining risks to the project.

Significance – Medium/Low

Consideration of uncertainty with regard to future Delaware River flows would strengthen the analyses for project design.

Recommendations for Resolution

1. Clarify whether the estimates of future flows used in the plan are intended to represent a conservative/”high end” estimate or a representative/average estimate of future conditions.
2. Use the uncertainties in the population projections to estimate uncertainty in peak flow increases due to increases in impervious areas.
3. Describe the general magnitude of expected Delaware River peak flow increases given the current understanding of the magnitude/frequency of future large storm events, and the uncertainty in peak flow increases given the uncertainty in climate projections. Present a range of reasonably foreseeable increases. Discuss how these projected flow increases compare to the increases assumed for the plan.

Final Panel Comment 13

It is unclear what analysis was used to justify inclusion of ringwalls for three commercial structures as part of the three Gibbstown alternatives.

Basis for Comment

The purpose of the levee/floodwall barrier proposed in the TSP is to lower risk to much of Gibbstown. However, little information is provided on three ringwalls also proposed in the TSP. Aerial photographs indicate that these gated rings will surround commercial facilities that are not included in the line of defense from the levee/floodwall barrier. The ringwall structures appear to be separable elements (Engineer Regulation [ER] 1105-2-100, paragraph E-3.c.(2) [USACE, 2000] and EP 1165-2-1 30 Jul 99, paragraph 6.2.b [USACE, 1999b]). No economic analysis is presented to allow the Panel to judge their separable economic feasibility.

Significance – Low

Without a physical description of the proposed ringwalls and clear economic data to allow their economic feasibility to be evaluated, the understanding, justification, and perhaps the accuracy and costs of the project cannot be determined.

Recommendations for Resolution

1. Describe the estimated costs and benefits for the separable elements and for the Gibbstown levee/floodwall excluding the ringwalls, to enable analysis by component.
2. Describe the assets that the ringwalls would encompass and justify the inclusion of those assets.

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APPENDIX A

IEPR Process for the Del Comp NJ Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the schedule followed in executing the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey Independent External Peer Review (hereinafter: Del Comp NJ IEPR). Due dates for milestones and deliverables are based on the award/effective date of July 14, 2015. The review documents were provided by U.S. Army Corps of Engineers (USACE) on July 15, 2015. Note that the work items listed under Task 6 occur after the submission of this report.

Battelle will enter the 13 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 a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

Table A-1. Del Comp NJ Complete IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	7/14/2015
	Review documents available	7/15/2015
	Public Comments Available	9/11/2015
	Battelle submits draft Work Plan[a]	7/24/2015
	USACE provides comments on draft Work Plan	7/28/2015
	Battelle submits final Work Plan[a]	8/17/2015
2	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	7/17/2015
	USACE provides comments on COI questionnaire	7/17/2015
	Battelle submits list of selected panel members[a]	7/24/2015
	Battelle submits revised list of selected panel members[a]	8/13/2015
	USACE confirms the panel members have no COI	8/17/2015
	Battelle completes subcontracts for panel members	8/19/2015
3	Battelle convenes kick-off meeting with USACE	7/24/2015
	Battelle sends review documents to panel members	8/19/2015
	Battelle convenes kick-off meeting with panel members	8/19/2015
	Battelle convenes kick-off meeting with USACE and panel members	8/19/2015
	Battelle convenes Mid-Review Teleconference for panel members to ask clarifying questions of USACE	8/31/2015

Table A-1. Del Comp NJ Complete IEPR Schedule (continued)

Task	Action	Due Date
4	Panel members complete their individual reviews	9/2/2015
	Battelle provides panel members with talking points for Panel Review Teleconference	9/4/2015
	Battelle convenes Panel Review Teleconference	9/8/2015
	Battelle provides Final Panel Comment templates and instructions to panel members	9/8/2015
	Panel members provide draft Final Panel Comments to Battelle	9/16/2015
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	9/17 - 9/24/2015
	Panel finalizes Final Panel Comments	9/25/2015
	Battelle receives public comments received to date from USACE	9/22/2015
	Battelle sends public comments to Panel	9/22/2015
	Panel completes their review of public comments	9/24/2015
	Battelle and Panel review Panel's responses to public comments	9/25/2015
	Panel confirms no additional Final Panel Comment is necessary with regard to the public comments	9/24/2015
5	Battelle provides Final IEPR Report to panel members for review	9/30/2015
	Panel members provide comments on Final IEPR Report	10/2/2015
	Battelle submits Final IEPR Report to USACE[a]	10/6/2015
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	10/14/2015
6[b]	Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE	10/16/2015
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	10/16/2015
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	10/16/2015
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to USACE PCX for review	10/30/2015
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	11/5/2015
	USACE PCX provides draft PDT Evaluator Responses to Battelle	11/6/2015
	Battelle provides the panel members the draft PDT Evaluator Responses	11/10/2015

Table A-1. Del Comp NJ Complete IEPR Schedule (continued)

Task	Action	Due Date
	Panel members provide Battelle with draft BackCheck Responses	11/16/2015
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	11/17/2015
	Battelle convenes Comment-Response Teleconference with panel members and USACE	11/18/2015
	USACE inputs final PDT Evaluator Responses to DrChecks	11/25/2015
	Battelle provides final PDT Evaluator Responses to panel members	12/1/2015
	Panel members provide Battelle with final BackCheck Responses	12/4/2015
	Battelle inputs the Panel's final BackCheck Responses in DrChecks	12/11/2015
	Battelle submits pdf printout of DrChecks project file[a]	12/14/2015
	CWRB Meeting (Estimated Date)[c]	TBD
	Agency Decision Milestone (ADM) Meeting[c]	
	Contract End/Delivery Date	5/31/2016

[a] Deliverable.
[b] Task 6 occurs after the submission of this report
[c] The ADM and CWRB meetings were listed in the Performance Work Statement under Task 3 but were relocated in this schedule to reflect the chronological order of activities.

At the beginning of the Period of Performance for the Del Comp NJ IEPR, 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. The final charge consisted of 20 charge questions provided by USACE, two summary charge questions and one charge question regarding the public comment review were added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and within one day of their subcontracts being finalized, all the 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 Del Comp NJ 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.

- **Draft Feasibility Report and Integrated EA (168 pages)**
- **Appendix A: Engineering Technical Appendix (70 pages)**
- **Appendix A: Engineering Technical Appendix – Section 2 H&H (120 pages)**

- **Appendix B: Interior Drainage Analysis (55 pages)**
- **Appendix C: Economic Analysis (85 pages)**
- **Appendix C: Economic Analysis, Exhibit C-D (USACE State Frequency Table) (2 pages)**
- **Appendix C: Economic Analysis, Exhibit C-E (Individual Municipality and Damage Research Structure Damage Computations and Maps) (141 pages)**
- **Appendix D: Environmental (59 pages)**
- **Appendix F: Real Estate Plan (24 pages)**
- **Appendix H: Plan Formulation (216 pages)**
- **Public Comments (28 pages)**
- Appendix C - Economic Analysis, Exhibit C-A (Effective Age Methodology Memorandum)
- Appendix C - Economic Analysis, Exhibit C-B (Generic Depth Damage Relationships for Residential Structures)
- Appendix C - Economic Analysis, Exhibit C-C (Analysis of Non-Residential Content Value and Depth Damage Data for Flood Reduction Studies)
- Appendix C - Economic Analysis, Exhibit C-F (National Flood Insurance Program (NFIP) Closed Claims Data)
- Appendix D - Environmental, Draft 2(b) Report
- Appendix D - Environmental, Planning Aid Letter #1 (Gloucester County)
- Appendix D - Environmental, Planning Aid Letter #2 (Mercer County)
- Appendix D - Environmental, Planning Aid Letter #3 (Hunterdon County)
- Appendix D - Environmental, Planning Aid Letter #4 (Warren County)
- Appendix D - Relevant Correspondence (NEPA)
- Appendix D - Environmental, Gibbstown Ecological Assessment
- Appendix E - Cultural Resources - Phase 1a
- Appendix E - Cultural Resources - Phase 1b
- Appendix G - Public Outreach Phase 1 (elected & appointed officials)
- Appendix G - Public Outreach Phase 2 (public)
- Appendix G - Fact Sheets
- Risk Register
- Decision Log
- USACE guidance, *Civil Works Review* (EC 1165-2-214), December 15, 2012
- Office of Management and Budget *Final Information Quality Bulletin for Peer Review,* December 16, 2004
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)

- SMART – Planning Overview
- Planning Modernization Fact Sheet.

About three-quarters of the way through the review of the Del Comp NJ IEPR documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 27 panel member questions to USACE. USACE provided written responses to all the questions just prior to the teleconference, answered subsequent questions, and provided clarifications during the teleconference. One additional question was asked during the call and answered by USACE in writing after the teleconference.

A.2 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. At the end of the review, Battelle summarized the individual comments in a preliminary list of 14 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

A.3 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 should 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 significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

At the end of these discussions, the Panel identified 13 comments and discussion points that should be brought forward as Final Panel Comments.

A.4 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 Del Comp NJ 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 member as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:

  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium/high, medium, medium/low, and 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 issue with the project that affects the current recommendation or justification of the project, and which will affect its future success, if the project moves forward without the issue being addressed. Comments rated as high indicate that the Panel determined that the current methods, models, and/or analyses contain a "showstopper" issue.
  2. **Medium/High:** Describes a potential fundamental issue with the project, which has not been evaluated at a level appropriate to this stage in the SMART Planning process. Comments rated as medium/high indicate that the Panel analyzed or assessed the methods, models, and/or analyses available at this stage in the SMART Planning process and has determined that if the issue is not addressed, it could lead to a "showstopper" issue.
  3. **Medium:** Describes an issue with the project, which does not align with the currently assessed level of risk assigned at this stage in the SMART Planning process. Comments rated as medium indicate that, based on the information provided, the Panel identified an issue that would raise the risk level if the issue is not appropriately addressed.
  4. **Medium/Low:** Affects the completeness of the report at this time in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium/low indicate that the Panel does not currently have sufficient information to analyze or assess the methods, models, or analyses.
  5. **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 that was mislabeled or incorrect or that certain data or report section(s) were not clearly described or presented.

- Guidelines 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).

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, 13 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 the main report.

A.5 Conduct of the Public Comment Review

Battelle received a several files containing 28 pages of public comments on the Del Comp NJ (approximately 16 written comments) from USACE on September 22, 2015. Battelle sent the public comments to the panel members on September 22, 2015, in addition to the following charge question:

1. **Does information or do concerns raised in the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**

The Panel produced individual comments in response to the charge question. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. Upon review, Battelle determined, and the Panel confirmed, that no new issues or concerns were identified other than those already covered in the Final Panel Comments.

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APPENDIX B

Identification and Selection of IEPR Panel Members for the Del Comp NJ Project

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B.1 Panel Identification

The candidates for the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey (hereinafter: Del Comp NJ IEPR) Panel were evaluated based on their technical expertise in the following key areas: Civil Works planner/economics, biological resources and environmental law compliance, hydrology and hydraulic engineer, geotechnical engineer, and structural/civil engineer. These areas correspond to the technical content of the Del Comp NJ IEPR review documents and overall scope of the Del Comp NJ 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 conflicts of interest (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 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 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 Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey.
- Previous and/or current involvement by you or your firm[2] in flood risk management studies in the Delaware River Basin region located in the mid-Atlantic region of the United States between Philadelphia, Pennsylvania, Trenton, New Jersey, and New York, New York.
- Previous and/or current involvement by you or your firm[2] in the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey related projects.
- Previous and/or current involvement by you or your firm[2] in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey related projects.

[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.

- Current employment by the U.S. Army Corps of Engineers (USACE).
- Previous and/or current involvement with paid or unpaid expert testimony related to Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey.
- Previous and/or current employment or affiliation with members of the cooperating agencies, local sponsors, stakeholders, or any cooperating Federal, state, county, local, and regional agencies, environmental organizations, and interested groups (for pay or pro bono), including the New Jersey Department of Environmental Protection (NJDEP).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, children or relations associated with the Delaware River Basin region located in the mid-Atlantic region of the United States, between Philadelphia, Pennsylvania, Trenton, New Jersey, and New York, New York.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Mobile District.
- Previous or current involvement with the development or testing of models that will be used for, or in support of, the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey.
- Current firm[2] involvement with other USACE projects, specifically those projects/contracts that are with the Philadelphia 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 Mobile District. Please explain.
- Any previous employment by USACE as a direct employee, notably if employment was with the Philadelphia District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by 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 Philadelphia District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning water supply/water rights-related studies and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years came 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 any non-federal sponsors or members of the Delaware River Basin region stakeholders.

- Any publicly documented statement (including, for example, advocating for or discouraging against) related to Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey.
- Participation in relevant prior and/or current Federal studies relevant to the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey.
- Previous and/or current participation in prior non-Federal studies relevant to this project, this area of the country, and/or Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey.
- 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.

Other considerations:

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

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Four of the five final reviewers are affiliated with consulting companies; the other is an independent consultant. 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 selected the final Panel.

Table B-1 presents an overview of the credentials of the final five members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information regarding each panel member and his or her area of technical expertise is given in Section B.3.

Table B-1. Del Comp NJ IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Bastian	Rein	Schwar	Lambert	Powell
Civil Works Planning/Economics					
Minimum 10 years of experience in public works planning and economics	X				
Familiarity with USACE plan formulation process, procedures, and standards as they relate to flood risk management	X				
Familiarity with evaluation of alternative plans for flood risk management	X				
Minimum of five years of experience directly dealing with the USACE six-step planning process, which is governed by ER 1105-2-100, Planning Guidance Notebook	X				
Experience related to evaluating traditional National Economic Development plan benefits associated with flood risk management projects	X				
Experience in Corps methodologies and use of HEC-FDA	X				
Active participation in related professional societies	X				
Biological Resources and Environmental Law Compliance					
At least 15 years of experience directly related to water resource environmental evaluation or review and National Environmental Policy Act (NEPA) compliance		X			
Familiarity with the habitat, fish and wildlife species that may be affected by the project alternatives in this study area		X			
Familiarity with the tribal cultures and archeology that may be affected by the project alternatives in this study area		X			
Expert in compliance with environmental laws, policies, and regulations		X			
Expert in Fish and Wildlife Coordination Act		X			
Expert in Clean Water Act		X			
Expert in Endangered Species Act		X			
Familiarity with United States Fish and Wildlife Service Habitat Evaluation Procedure (HEP) (USFWS, 1980)		X			
Minimum MS degree or higher in a related field		X			
Hydrology and Hydraulic Engineer					
Registered professional engineer with a minimum of 15 years of experience in hydrologic and hydraulic engineering			X		
Experienced with all aspects of hydrology and hydraulic engineering including:					
northeast hydrology			X		
urban hydrology			X		
interior drainage systems			X		
riverine/tidal hydraulics			X		
open channel systems			X		

Table B-1. Del Comp NJ IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Bastian	Rein	Schwar	Lambert	Powell
Hydrology and Hydraulic Engineer					
effects of management practices and low impact development on hydrology			X		
design of earthen levees and floodwalls			X		
use of non-structural systems as they apply to flood proofing, warning systems, and evacuation			X		
Familiarity with USACE policy in regards to evaluation of projects with respect to sea-level change including impacts, responses and adaptations of projects to sea-level change			X		
Familiarity with Hydraulic Engineering Center (HEC) modeling computer software including:					
HEC River Analysis System (RAS)			X		
HEC Flood Damage Reduction Analysis (FDA)			X		
HEC Hydrologic Modeling System (HMS)			X		
Capable of addressing the USACE Safety Assurance Review (SAR) aspects of all projects			X		
Geotechnical Engineering					
A registered professional engineer with a minimum of 15 years of experience in geotechnical engineering				X	
Demonstrated experience in performing geotechnical evaluation and geo-civil design for all phases of flood risk management projects				X	
Experience in urban levees along large river systems				X	
Experience in floodwalls along large river systems				X	
Experience in channel structures along large river systems				X	
Knowledge in earthen levee and floodwall design including both pre- and post-construction evaluation and rehabilitation				X	
Demonstrated experience related to USACE geotechnical practices associated with flood management channels, construction, and soil engineering				X	
Experience in geotechnical risk and fragility analysis				X	
Ability to address the USACE Safety Assurance Review (SAR) aspects of all projects				X	
Minimum M.S. degree or higher in engineering				X	
Structural/Civil Engineering					
A registered professional engineer having a minimum of 15 years of experience in engineering					X
Experience in large public works projects					X
Have a thorough understanding of design of flood protection closure structures					X
Familiarity with levee design					X
Familiarity with dam structures for flood risk management					X
Familiarity with flood proofing relocations					X
Familiarity with floodwalls [both I- & T-]					X
Familiarity with rolling gates, swing gates, stoplogs, trolley gates, etc.					X

Ability to address the USACE Safety Assurance Review (SAR) aspects of all projects					X

B.3 Panel Member Qualifications

David F. Bastian, P.E.

Role: Civil Works planner / economic expert
Affiliation: Independent Consultant

Mr. Bastian is an independent consultant for David Bastian Consulting in Annapolis, Maryland, with more than 35 years of experience in USACE compliance and policy review, plan formulation and incremental cost analysis, flood risk reduction, and hydraulic and river engineering. He earned his B.S. in Civil Engineering from the Georgia Institute of Technology in 1968 and a M.S. in River Engineering from Delft University, The Netherlands, in 1972. During his career, he has developed economic input databases for deep-draft navigation studies at the Institute for Water Resources (IWR) (1980-1987); evaluated deep-draft economic feasibility for enlarging the Panama Canal (1987-1993); reviewed feasibility studies for economic justification (1993-1998) at USACE-Headquarters (HQ USACE); and reviewed and/or authored planning and economic analyses for various USACE projects (2001-present), including hurricane and storm damage risk reduction analyses for the New Orleans District, its architect/engineer (A/E) firms, and non-Federal sponsors (2006-2011).

Since 1993, Mr. Bastian has reviewed USACE studies with a focus on evaluating and comparing alternative plans for compliance with plan formulation processes, procedures, and standards. Since 2001, he has participated in the preparation of the Kansas City, Turkey Creek, Texas City, and Boardman flood risk management and post-Hurricane Katrina and Texas City hurricane and storm damage risk reduction studies; he also has reviewed the Blanchard environmental restoration study and various dam safety studies with regard to plan formulation compliance and economic justification.

Mr. Bastian's experience at HQ USACE and as a contractor/consultant on USACE projects includes applying ER 1105-2-100 (Principles and Guidelines) to projects subject to Civil Works project evaluations, all of which involved the six-step planning process. During his career, he has reviewed and collaborated on more than 100 USACE reports evaluating and comparing alternative plans. He also has had direct experience with other USACE engineer regulations, manuals, and pamphlets and was the co-author of the USACE Planner's Workshop Manual.

Mr. Bastian has evaluated and conducted National Economic Development (NED) analysis procedures as they relate to flood risk management and to hurricane and coastal storm damage risk reduction. Specifically, for the Kansas City, Turkey Creek, Texas City, and Boardman studies, he evaluated traditional NED plan benefits associated with flood risk management and evaluated application of the USACE Hydrologic Engineering Center Flood Damage Reduction Analysis (HEC-FDA) software.

Mr. Bastian is a certified professional engineer (P.E.) in Mississippi. His participation in professional societies includes the American Society of Civil Engineers (ASCE), the American Association of Port Authorities, the Permanent International Association of Navigation Congresses, and the Western Dredging Association.

Felicia Orah Rein, Ph.D.

Role: Biological resources and environmental law compliance expert
Affiliation: Florida Atlantic University / Watershed Solutions

Dr. Rein has 26 years of professional environmental management experience implementing large-scale multidisciplinary research and evaluation projects. Currently a researcher and Affiliate Professor of geosciences for Florida Atlantic University, she earned her Ph.D. in Ecosystem Science and Water Resource Management from the University of California, Santa Cruz, in 2000 and her B.S. in Biology, Environmental Science, and English from Tufts University in 1988. Dr. Rein's areas of expertise include water quality, wetland science, watershed management, ecological monitoring, impact assessment, and ecological restoration, with a focus on ecological and biological sciences and National Environmental Policy Act (NEPA) assessment. Additional strengths include technical science, communication, and project management.

Dr. Rein's experience relates directly to water resource environmental evaluation, including doctoral research. Her primary expertise is in ecosystem science, but her interdisciplinary graduate program targeted environmental policy and economics. She has prepared and reviewed NEPA documents for two environmental planning firms and has served on past IEPR panels as biology and environmental compliance analyst. She has experience with flood risk assessment and flood management projects (Pine Creek Dam, Oklahoma, Dam Safety Modification Report; Delta Islands & Levees Feasibility Study, Sacramento, California; and the Carmel River in Carmel, California).

Dr. Rein is familiar with the specific habitat and wildlife species potentially affected under the project alternatives in the study area, with direct experience on Northeast Coast projects. She has expertise in riparian ecosystems, and a background in hazardous waste relevant to the study area. She has worked for the Port Authority of New York and New Jersey, assessing impacts to both habitat and similar species potentially resulting from dredging activities, and has also managed a project on the Carmel River in California assessing potential impacts to habitat and similar fish and wildlife species.

During her career, Dr. Rein has written or reviewed NEPA documents that have analyzed existing archeology and potential impacts and also has specific experience with tribal culture. At the Site One Impoundment project in Florida, human remains potentially from a tribe member were found, and a protocol to communicate with the tribe regarding the remains was initiated. Under the terms of the protocol, the area was protected and kept dewatered to ensure that no impacts occurred. In addition, as project manager of a mine reclamation study for the Pala band of Mission Indians on tribal lands in northern San Diego County, she developed a familiarity with the area's tribal culture.

Dr. Rein's expertise includes compliance with environmental laws, policies, and regulations. As a consultant, she has been awarded many projects dealing with environmental compliance monitoring, and she is responsible for all aspects of conducting monitoring and maintaining compliance with permits, regulations, and laws. As a reviewer, she has extensive experience evaluating documents for NEPA compliance.

Dr. Rein has had specific experience with the U.S. Fish and Wildlife Service (USFWS) on interagency coordination for several projects in compliance with the Fish and Wildlife Coordination Act. She also has managed projects that required expert knowledge of the Clean Water Act; these projects focused on

wetland restoration or protection, wastewater discharge, and water quality protection. Her doctoral research investigated grass buffer strips as a best management practice (BMP) to reduce agricultural non-point-source pollution and protect water quality. In addition, she has managed projects involving compliance with the Endangered Species Act, both in field monitoring and report preparation and review. For example, the project in Carmel, California, required an assessment of two species with conflicting habitat needs (the threatened red-legged frog and the endangered steelhead salmon) for compliance with the Endangered Species Act. Dr. Rein is also familiar with the USFWS Habitat Evaluation Procedure (HEP), having served on other IEPR panels and having reviewed other projects requiring habitat evaluation expertise.

Michael Schwar, Ph.D., P.E.

Role: Hydrology and hydraulic engineering expert
Affiliation: Stony Point Hydrology, LLC

Dr. Schwar, Principal Water Resources Engineer with Stony Point Hydrology LLC in Mukwonago, Wisconsin, has more than 25 years of professional and academic experience focusing on the hydrology and hydraulics of surface water systems, with special emphasis on the restoration of streams, rivers, lakes, and wetlands. He earned an M.S. in Environmental Engineering and Sciences from the University of Washington in 1991 and a Ph.D. in Civil and Environmental Engineering from the University of Wisconsin – Madison in 2002. He has worked on more than 140 surface water projects in 19 states, Canada, and Puerto Rico, including more than 40 with significant ecosystem restoration components. He is a registered P.E. in six states, including Washington, Wisconsin, and Illinois; is a Certified Floodplain Manager (CFM); and has been recognized as a Diplomate, Water Resources Engineer (D.WRE) by the American Academy of Water Resources Engineers.

Throughout his career, Dr. Schwar has incorporated hydrologic design in flood risk reduction, ecosystem restoration, and stormwater management projects, particularly in the northern United States. His experience includes evaluating the effects of hurricane-level events on flood risk management projects, specifically structures within the Inner Harbor Navigation Canal in New Orleans. He has analyzed urban hydrology for more than 50 projects, using models such as the HEC Hydrologic Modeling System (HEC-HMS), Storm Water Management Model, Hydrological Simulation Program—Fortran, and FLO-2D; he also has evaluated potential flooding and water quality risks and developed mitigation practices. He is familiar with the design of interior drainage systems and has evaluated system functionality for flood risk reduction projects along the Mississippi, Illinois, and Trinity Rivers.

Dr. Schwar has extensive experience in riverine hydraulics, specifically including the modeling of flood hydraulics and flow routing. He has led or conducted river modeling in support of USACE projects in five states and Puerto Rico and has supported other projects in another four states. He is familiar with tidal and storm surge hydraulic issues, a major consideration in the evaluation of the Inner Harbor Navigation Canal structures that Dr. Schwar conducted for the USACE New Orleans District.

Dr. Schwar is trained in the advanced analysis and design of open-channel systems. He has analyzed and designed channel modifications for flood risk reduction, stabilization, sediment transport, and ecosystem restoration. Projects include Boneyard Creek Restoration (Urbana, Illinois), Blue River Grade Control (USACE Kansas City), Menomonee River - Western Milwaukee (Milwaukee Metropolitan

Sewerage District [MSD], Wisconsin), Tres Rios Phase 3A (USACE Los Angeles) and Ebner Coulee Creek (La Crosse, Wisconsin).

Dr. Schwar is familiar with the implementation of interior drainage system BMPs and specifically low-impact development on the flow and pollution export conditions in urban areas. He is currently working with the Village of Mukwonago and the City of La Crosse to evaluate the potential stormwater and flood reduction benefits from implementing low-impact development and the related green infrastructure practices. The La Crosse project involves the use of a 2-D surface model combined with a 1-D model of the drainage system to evaluate potential system performance benefits. Previously, he led an analysis of water quality benefits from such practices in Bismarck, North Dakota.

Dr. Schwar has led two major efforts involving earthen levees and floodwalls: the design of a system along the Menomonee River in Wisconsin, and the evaluation of designs for 14 USACE flood risk reduction systems along the Mississippi and Illinois Rivers in Iowa, Illinois, and Missouri. He also has conducted hydrologic and hydraulic analysis for the condition evaluation and recommendations for improvement of the Trinity Levees in Dallas, Texas.

As a CFM, Dr. Schwar has demonstrated a comprehensive understanding of floodplain management and risk reduction techniques, specifically including non-structural approaches such as flood-proofing, warning systems, and evacuation planning. He has incorporated these strategies into projects such as the Western Milwaukee Flood Management Project (Milwaukee MSD) and has developed emergency action plans for the Milwaukee County Grounds (Milwaukee MSD) and Lockport Dam (USACE) projects.

Dr. Schwar is familiar with ER 1100-2-8162 (Incorporating Sea Level Change in Civil Works Programs), including considering the sensitivity of alternate plans to different rates of local sea level change, the explicit consideration of uncertainty in the plan selection, and the requirement of an explicit adaptation strategy as conditions change. He also evaluated potential climate change impacts on a local utility for the Milwaukee MSD Climate Change Vulnerability Analysis and developed adaptation strategies to reduce risk in the face of uncertainty.

Dr. Schwar has received advanced training in several HEC software packages and has applied that training to various projects for more than 15 years. The training includes the HEC River Analysis System (HEC-RAS) and specific subjects from both USACE and ASCE courses. He has applied HEC-RAS to develop more than 25 project designs incorporating aspects such as floodplain management, dam break analysis, unsteady flow routing, levee design, and sediment transport analysis. He is also familiar with the application of the HEC-FDA software to conduct economic analysis of flood risk reduction projects and has applied HEC-HMS to generate design hydrographs for flood risk reduction, bank stabilization, and ecosystem restoration projects in Illinois, Wisconsin, and Ohio. He has used both event-based and continuous (soil moisture accounting) applications as appropriate.

Dr. Schwar has extensive experience in the development of data and modeling required to support the design of flood risk reduction projects. He has led the evaluation and design of numerous medium- to large-sized municipal flood risk reduction projects and has evaluated USACE designs in Dallas, Kansas City, New Orleans, and areas along the Mississippi, Illinois, and Blue Rivers. Specifically, he has evaluated data and modeling requirements and developed protocols for conducting levee safety analyses for the Modeling Mapping and Consequences Center at the USACE Vicksburg District. He also is familiar with the application of risk and uncertainty concepts to the evaluation of project designs.

Dr. Schwar's professional affiliations include the ASCE, the Environmental and Water Resources Institute (EWRI) River Restoration Task Committee (past chair), the Association of State Floodplain Managers, and the Society of American Military Engineers (SAME).

Michael Lambert, P.E.

Role: Geotechnical engineering expert
Affiliation: Shannon & Wilson, Inc.
Mr. Lambert is a geotechnical engineer with Shannon & Wilson, Inc. overseeing site investigations, developing geotechnical-related design and construction recommendations, developing and reviewing project plans and specifications, and monitoring compliance with project plans and specifications. He earned his M.E. in Civil Engineering from the University of Louisville in 1988, has more than 28 years direct geotechnical and soil engineering experience, and is a registered P.E. in Missouri, Arkansas, Oregon, Tennessee, and California.

Mr. Lambert has been involved with pre-construction flood risk management projects such as Howard Bend Levee, Missouri; Yakima River Levee, Washington; and the Missouri Bottom Levee System, Missouri. Post-construction flood risk management projects include St. Louis City Flood Wall Evaluation; Stockton, California Levee Evaluation/Design for Department of Water Resources; Lewiston, Idaho Levee; and Chesterfield Levee, Missouri. For each of these projects, design activities were conducted in accordance with USACE methods and criteria. In addition, risk and fragility analysis concepts were considered as part of each project.

Mr. Lambert is experienced with the geotechnical aspects of urban levees, floodwalls, earthen levees, and channel structures along large river systems, including the Mississippi River, Ohio River, and Missouri River. Relevant urban levee projects have included support for the Howard Bend Levee System in Maryland Heights, Missouri, and the City of St. Louis Floodwall along the Mississippi River. He has also performed inspections for more than 408 miles of USACE levees and over 56 miles of U.S. Bureau of Reclamation irrigation canals. His experience with floodwall design and construction is demonstrated by the Howard Bend Levee System in Maryland Heights. As senior geotechnical engineer and project manager, he was responsible for reconstruction and upgrading to provide protection from a 500-year flood event. The flood protection system included earthen levee floodwalls, closure structures, and a pump station. Engineering and design evaluations of channel structures conducted by Mr. Lambert include several locks and dams (L&D) along the Mississippi River (L&D 25 and Mel Price), and Ohio River (Olmsted, L&D 52, L&D 53, Canelton Lock, and Markland Lock).

All of these projects, including the non-USACE projects, were completed in accordance with USACE guidance, including USACE's safety assurance policy and guidance, and applicable risk assessment methodology. All of the levee and dam projects included either explicit or implicit consideration of risk analysis determining a likely range of values and the impact of different values in each project. For example, the Center Hill IEPR included a detailed review of the risk analyses performed for both the main and saddle dams. Additionally, Mr. Lambert has served on the Type I IEPR for the Phase II Post-Authorization Decision Documents for the Sacramento River Bank Protection Project, California and multiple Type II IEPR teams for levee projects, including two projects for the Chesterfield-Monarch Levee, three projects for the Wood River Levee System, and one project for the mainline Mississippi River Levee in Tunica, Mississippi.

Rex C. Powell, P.E.

Role: Structural / civil engineering expert
Affiliation: Bergmann Associates

Mr. Powell is a Senior Discipline Specialist (Waterway Structures) and Project Manager for Bergmann Associates, Buffalo, New York. A registered P.E. in New York State, he has 34 years of experience in civil/structural engineering, with an emphasis on design and analysis of structures as well as mechanical, geotechnical, and hydraulics design. He earned his A.S. in Engineering Science from SUNY Delhi in 1979 and his B.S. from Rensselaer Polytechnic Institute in 1981. He has been responsible for the design of all structural aspects of hydropower plants and dams, and structural designs for industrial plants and transportation projects. He is experienced in the design of concrete gravity dams and structures, including prestressed and post-tensioned elements, structural steel, timber, and masonry design. He has been the independent consultant on several Federal Energy Regulatory Commission (FERC) Part 12 dam safety inspections. Some of Mr. Powell's most recent work has included repair and rehabilitation of existing locks and dams and other concrete and steel hydraulic structures.

Mr. Powell has worked on a number of large public works projects requiring design, analysis, and construction expertise for various local, state, and Federal agencies, including the New York State Canal Corporation (post-Irene improvements, Erie Canal), St. Lawrence Seaway Management Corporation (Welland Canal installation and reconstruction projects, St. Catharines, Ontario, Canada), St. Lawrence Seaway Development Corporation (U.S. Department of Transportation, Massena, New York) and USACE. He has designed, analyzed, and constructed hydraulic steel structures, including spillway, power, and closure gates, using USACE guidelines. He is familiar with the requirements of USACE Engineer Manual (EM) 1110-2-1913 and has reviewed stability of levees.

For more than 30 years, Mr. Powell has been involved in dam designs for flood risk management. As Technical Design Manager for the Devils Lake (North Dakota) City Embankments project, he was responsible for reinforced concrete and steel design of a four-unit and an eight-unit pump station and ancillary equipment; an inverted T-wall inlet headwall; outlet works; abandonment / closure of existing outlet works; and cantilever sheet pile walls for embankment toe excavation. He is familiar with the concept of relocation for flood protection. He also has designed a number of T- and L-walls and is familiar with I-wall design and construction. In addition, Mr. Powell has designed or rehabilitated a variety of closure structures such as rolling gates, stoplogs, miter gates, flap gates, and slide gates.

Mr. Powell is familiar with USACE policies and design standards. He has participated in several safety assurance reviews (SARs) for USACE projects, including the Herbert Hoover Dike improvements (Lake Okeechobee, Florida) SAR and the Canton Dam (Canton, Oklahoma) SAR. He also has performed engineering peer reviews of large dam projects for USACE, evaluating structural aspects to correct dam safety issues and to satisfy dam safety requirements.

Mr. Powell’s professional affiliations include the SAME, the Association of State Dam Safety Officials, and the American Institute of Steel Construction.

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APPENDIX C

Final Charge to the IEPR Submitted to USACE on August 17, 2015 for the Del Comp NJ Project

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CHARGE QUESTIONS AND GUIDANCE TO THE PANEL MEMBERS FOR THE IEPR OF THE DELAWARE RIVER BASIN COMPREHENSIVE FLOOD RISK MANAGEMENT INTERIM FEASIBILITY STUDY AND INTEGRATED ENVIRONMENTAL ASSESSMENT FOR NEW JERSEY

BACKGROUND

The study area for the Delaware River Basin Comprehensive Interim Feasibility Study is located in the mid-Atlantic region of the United States and generally lies between Philadelphia, Pennsylvania, and New York, New York. The study area as a whole has an estimated 2010 population of 204,231. The major population center within the study area is the City of Trenton, New Jersey, with a 2010 population of 85,403. Most of the study area has a rural/suburban character, with some areas experiencing a small amount of population increase. The Delaware River had a major role in the area dating back to when the land was occupied by indigenous tribes. The majority of the floodplain areas are now extensively developed, particularly in older communities such as Gibbstown, Phillipsburg, Lambertville, Stockton, and Trenton. In the majority of the study area communities, the floodplain is primarily occupied by residential development. In some communities, commercial uses are intermixed with the residential development.

Structural flood risk management measures such as levees, floodwalls, and associated interior drainage have been considered. In addition, nonstructural measures such as structure elevation, wet and dry flood-proofing, ringwalls, relocating, and acquisition have been considered. Prior to Public Law 113-2 (Disaster Relief Appropriations Act), signed January 29, 2013, in the aftermath of Hurricane Sandy, ecosystem restoration opportunities that could be pursued in conjunction with flood risk management measures were also identified. Such opportunities were limited, due to the relatively small scale and limited regional or national significance of the potential restoration outputs. The most likely significant restoration opportunity was associated with a line of protection in Greenwich and Logan Townships.

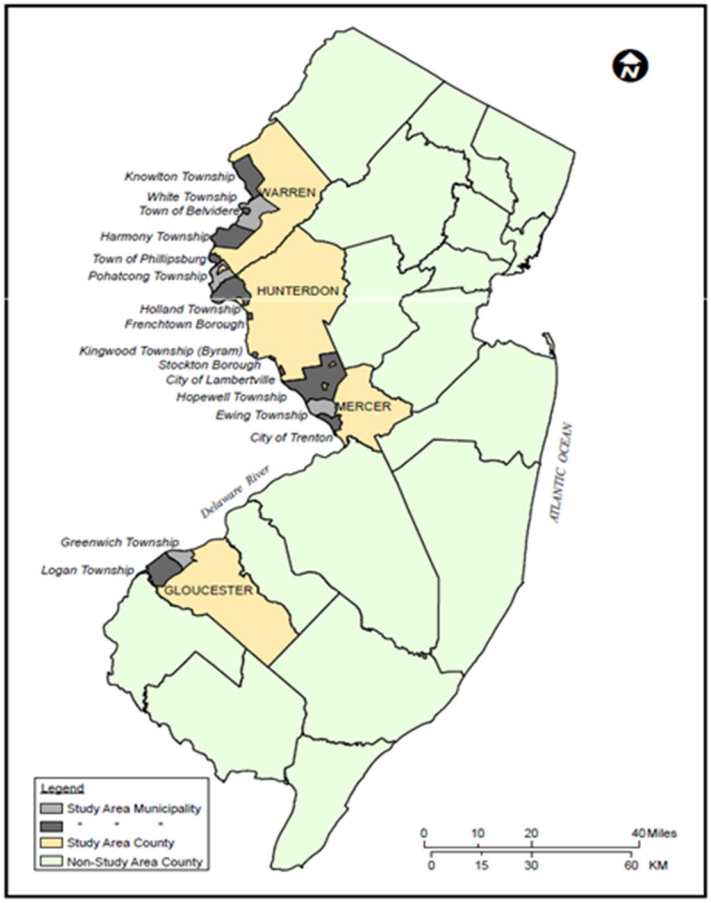
The plan formulation process screened out most measures and municipalities, resulting in a Tentatively Selected Plan (TSP) with plans for the Gibbstown area of Greenwich Township and the Alexauken Creek area of the City of Lambertville. The primary features of the plans are a system of levees and floodwalls with gravity drainage outlets. In both locations, the levees and floodwall provide greater than a 90% reliability against overtopping during a 1% annual chance exceedance (ACE) flood. The Decision Document has been developed to meet the U.S. Army Corps of Engineers (USACE) modernized Specific, Measurable, Attainable, Risk Informed, Timely (SMART) planning initiative, which is to complete investigations leading to a decision in less time by utilizing a risk-informed assessment with less detailed information for each alternative evaluated. Although this new process has altered the milestones and evaluation procedures in a feasibility study, the manner in which alternatives are developed from problems, opportunities, measures, and constraints remains the same.

Instead of following the traditional USACE planning milestones, the study has been divided into phases, each with key milestones and associated Vertical Team In-Progress Reviews (IPRs). IEPR will occur during concurrent review of the Decision Document, between the TSP Milestone (2) and the Agency Decision Milestone (ADM) meeting (3). A risk register and other risk management documentation will accompany the feasibility study decision document. Although one of the objectives of IEPR is to evaluate

whether sufficient information was available or technical analyses were completed, the IEPR must be completed within the context of the risk-informed decision-making process. Figure 1 depicts the new planning initiative; Figure 2 shows the area under study.

Figure 1: SMART Feasibility Study Process

Figure 2: Location Map



OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey (hereinafter: Delaware River IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, dated December 15, 2012), and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (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 Delaware River IEPR 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 Civil Works planning/economics, biological resources and environmental law compliance, hydrology and

hydraulic engineering, geotechnical engineering, and structural/civil 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, supporting information, and reference materials that will be provided for the review.

Documents for Review

The following documents are to be reviewed by designated discipline:

Title	Actual No. of Pages	Required Disciplines
Draft Feasibility Report and Integrated EA	168	All Disciplines
Appendix A: Engineering Technical Appendix	70	Geotechnical Engineering; H&H Engineering; Structural/Civil Engineering
Appendix A: Engineering Technical Appendix – Section 2 H&H	120	H&H Engineering
Appendix B: Interior Drainage Analysis	55	Geotechnical Engineering; H&H Engineering
Appendix C: Economic Analysis	85	Civil Works Planner/Economist
Appendix C: Economic Analysis, Exhibit C-D (USACE State Frequency Table)	2	Civil Works Planner/Economist
Appendix C: Economic Analysis, Exhibit C-E (Individual Municipality and Damage Research Structure Damage Computations and Maps)	141	Civil Works Planner/Economist
Appendix D: Environmental	59	Biological Resources and Environmental Law Compliance; Civil Works Planner/Economist
Appendix F: Real Estate Plan	24	Civil Works Planner/Economist
Appendix H: Plan Formulation	216	Civil Works Planner/Economist
Public Comments (Available in September 2015)	50 pages estimated	All Disciplines
Total Page Count	**990**	

Supporting Information

- Appendix C - Economic Analysis, Exhibit C-A (Effective Age Methodology Memorandum)
- Appendix C - Economic Analysis, Exhibit C-B (Generic Depth Damage Relationships for Residential Structures)
- Appendix C - Economic Analysis, Exhibit C-C (Analysis of Non-Residential Content Value and Depth Damage Data for Flood Reduction Studies)
- Appendix C - Economic Analysis, Exhibit C-F (National Flood Insurance Program (NFIP) Closed Claims Data)
- Appendix D - Environmental, Draft 2(b) Report
- Appendix D - Environmental, Planning Aid Letter #1 (Gloucester County)
- Appendix D - Environmental, Planning Aid Letter #2 (Mercer County)
- Appendix D - Environmental, Planning Aid Letter #3 (Hunterdon County)
- Appendix D - Environmental, Planning Aid Letter #4 (Warren County)
- Appendix D - Relevant Correspondence (NEPA)
- Appendix D - Environmental, Gibbstown Ecological Assessment
- Appendix E - Cultural Resources - Phase 1a
- Appendix E - Cultural Resources - Phase 1b
- Appendix G - Public Outreach Phase 1 (elected & appointed officials)
- Appendix G - Public Outreach Phase 2 (public)
- Appendix G - Fact Sheets
- Risk Register
- Decision Log

Documents for Reference

- USACE guidance *Civil Works Review,* (EC 1165-2-214, December 15, 2012)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004)
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)
- SMART – Planning Overview
- Planning Modernization Fact Sheet.

SCHEDULE

This schedule is based on the July 15, 2015, receipt of the final review documents. Note that dates presented in the schedule below could change due to panel member and USACE availability.

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	8/19/2015
	Battelle convenes kick-off meeting with panel members	8/19/2015
	Battelle convenes kick-off meeting with USACE and panel members	8/19/2015
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	8/26/2015
	Panel members complete their individual reviews	9/2/2015
Prepare Final Panel Comments and Final IEPR Report	Battelle provides talking points for Panel Review Teleconference to panel members	9/8/2015
	Battelle convenes Panel Review Teleconference	9/9/2015
	Battelle provides Final Panel Comment templates and instructions to panel members	9/10/2015
	Panel members provide draft Final Panel Comments to Battelle	9/16/2015
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	9/17 - 9/24/2015
	Battelle finalizes Final Panel Comments	9/25/2015
	Battelle receives public comments from USACE	9/18/2015
	Battelle sends public comments to Panel	9/21/2015
	Panel completes their review of the public comments	9/24/2015
	Battelle and Panel review Panel's responses to public comments	9/25/2015
	Panel drafts Final Panel Comment regarding public comments, if necessary	9/28/2015
	Panel finalizes Final Panel Comment regarding public comments	9/29/2015
	Battelle provides Final IEPR Report to panel members for review	9/30/2015
	Panel members provide comments on Final IEPR Report	10/2/2015
	*Battelle submits Final IEPR Report to USACE	10/6/2015
Comment/ Response Process	Battelle inputs Final Panel Comments into DrChecks and provides Final Panel Comment response template to USACE	10/16/2015
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	10/16/2015
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to USACE Planning Center of Expertise (PCX) for Review	10/16/2015
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	10/30/2015
	USACE PCX provides draft PDT Evaluator Responses to Battelle	11/5/2015
	Battelle provides draft PDT Evaluator Responses to panel members	11/6/2015

	Panel members provide draft BackCheck Responses to Battelle	11/10/2015
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	11/16/2015
	Battelle convenes Comment-Response Teleconference with panel members and USACE	11/17/2015
	USACE inputs final PDT Evaluator Responses into DrChecks	11/18/2015
	Battelle provides PDT Evaluator Responses to panel members	11/25/2015
	Panel members provide final BackCheck Responses to Battelle	12/1/2015
	Battelle inputs the panel members' final BackCheck Responses into DrChecks	12/4/2015
	*Battelle submits pdf printout of DrChecks project file	12/11/2015
Civil Works Review Board (CWRB)	Panel prepares and/or reviews slides for CWRB	TBD
	Civil Works Review Board	TBD

* Deliverables

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Delaware River documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and 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 Delaware River 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 Program Manager (Karen Johnson-Young (johnson-youngk@battelle.org) for requests or additional information.

3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnson-youngk@battelle.org) immediately.

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

Please submit your comments in electronic form to Lynn McLeod, **mcleod@battelle.org**, no later than September 2, 2015, 10 pm ET.

Independent External Peer Review

of the

Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey

Charge Questions and Relevant Sections as Supplied by USACE

The following Charge to Reviewers outlines the objective of the Independent External Peer Review (IEPR) for the subject study and the specific advice sought from the IEPR Panel. The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the charge. The Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the charge.

The IEPR is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances, the Panel may have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review. Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, explaining why it is important, describing any potential consequences of failure to address the comment, and suggesting how to address the comment.

Broad Evaluation Charge Questions

1. Are the need for and intent of the decision document clearly described?

2. Does the decision document adequately address the stated need and intent?

3. Given the need for and intent of the decision document, assess the adequacy and acceptability of the project evaluation data used in the study analyses.

4. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, and engineering assumptions that underlie the study analyses.

5. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, and engineering methodologies, analyses, and projections.

6. Given the need for and intent of the decision document, assess the adequacy and acceptability of the models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives.

7. Given the need for and intent of the decision document, assess the adequacy and acceptability of the methods for integrating risk and uncertainty.

8. Given the need for and intent of the decision document, assess the adequacy and acceptability of the formulation of alternative plans and the range of alternative plans considered.

9. Given the need for and intent of the decision document, assess the adequacy and acceptability of the quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans.

10. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.

11. For the tentatively selected plan, assess whether the models used to assess life safety hazards are appropriate.

12. For the tentatively selected plan, assess whether the assumptions made for the life safety hazards are appropriate.

13. For the tentatively selected plan, assess whether the quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards.

14. For the tentatively selected plan, assess whether the analyses adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.

15. For the tentatively selected plan, assess whether, from a public safety perspective, the proposed alternative is reasonably appropriate or whether there are other alternatives that should be considered.

Specific Technical and Scientific Charge Questions

16. Evaluate whether the interpretations of the hydraulic analysis and the conclusions based on the analysis are reasonable. Evaluate whether the uncertainties associated with the hydraulic analysis were adequately considered and addressed to provide a reasonable basis for comparison of alternatives and selection of a recommended plan.
17. Assess the adequacy and acceptability of the data, assumptions, and methods used in the geotechnical analysis. Evaluate whether the interpretations of the geotechnical analysis and the conclusions based on the analysis are reasonable. Evaluate whether the uncertainties associated with the geotechnical analysis were adequately considered and addressed to provide a reasonable basis for comparison of alternatives and selection of a recommended plan.
18. Assess the adequacy and acceptability of the data, assumptions, and methods used in the evaluation of wetland and endangered species resources and of potential alternative plan impacts. Evaluate whether the interpretations of the analyses and the conclusions based on the analysis are reasonable. Evaluate whether the uncertainties associated with the analysis were adequately considered and addressed to provide a reasonable basis for comparison of alternatives and selection of a recommended plan.

19. Evaluate the data, assumptions, and methodologies used to evaluate residential and commercial structure inventories, including sampling methods where used. Evaluate whether the interpretations of the economic analyses and the conclusions based on the analysis are reasonable. Evaluate whether the uncertainties associated with the economic analysis were adequately considered and addressed to provide a reasonable basis for comparison of alternatives and selection of a recommended plan.
20. Assess the adequacy and acceptability of the data, assumptions, and methods used in the Hazardous, Toxic and Radioactive Waste (HTRW) analysis. Evaluate whether the interpretations of the HTRW analysis and the conclusions based on the analysis are reasonable. Evaluate whether the uncertainties associated with the HTRW analysis were adequately considered and addressed to provide a reasonable basis for comparison of alternatives and selection of a recommended plan.

Battelle Summary Charge Questions to the Panel Members[3]

Summary Questions

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

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

Public Comment Questions

23. Does information or do concerns raised by the public raise any additional discipline-specific technical concerns with regard to the overall report?

[3] Questions 21 through 23 are Battelle supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the Final Work Plan submitted on August 17, 2015.

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APPENDIX D

Conflict of Interest Form

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Conflicts of Interest Questionnaire

[Independent External Peer Review]

[Delaware River IEPR]

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute**
REPRESENTATIVE'S NAME: **LaDonna F. James**
TELEPHONE: **614-424-5543**
ADDRESS: **505 King Avenue, Columbus, OH 43210**
EMAIL ADDRESS: **jamesl@battelle.org**

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) No

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? No

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? Yes

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? No

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

LaDonna F. James Digitally signed by LaDonna F. James DN: cn=LaDonna F. James, o=Government Contracts, ou=SAS, email=jamesl@battelle.org, c=US Date: 2015.09.09 18:02:24 -04'00'

September 9, 2015

YOUR SIGNATURE DATE

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