DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1399

REPLY TO
ATTENTION OF

CESPD-PDP (FRM-PCX)

12 August 2015

MEMORANDUM FOR Commander, Headquarters, U.S. Army Corps of Engineers (CECW-NAD-RIT/Raymond Wimbrough)

SUBJECT: Transmittal of Final Independent External Peer Review (IEPR) Report for Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY Flood Risk Management General Reevaluation Study

1. Reference: EC 1165-2-214, Civil Works Review, 15 December 2012.

2. Enclosed please find the subject Final IEPR Report, dated 6 August 2015. Pursuant to Reference 1, the enclosed report is available for posting on the HQUSACE public website.

3. The IEPR was managed by Battelle Memorial Institute. The review panel consisted of five panel members with expertise in economics/civil works planning, biological resources and environmental law compliance, civil/structural engineering, hydrology and hydraulic engineering, and geotechnical engineering. The review resulted in 26 final panel comments – 2 comments were rated as having high significance, 5 were rated as medium/high, 10 were rated medium, and 9 were rated medium/low. See the enclosed Final IEPR Report Executive Summary for a synopsis of the final panel comments and the main body of the report for details about the IEPR execution and individual final panel comments.

4. For further information, please contact Mr. Eric Thaut, Deputy Director FRM-PCX, at (415) 503-6852, or Ms. Anastasiya Hernandez, the FRM-PCX IEPR Lead for this effort, at 410-962-2558.

Encl

JOSEPHINE R. AXT, Ph.D.
Director, Flood Risk Management
Planning Center of Expertise

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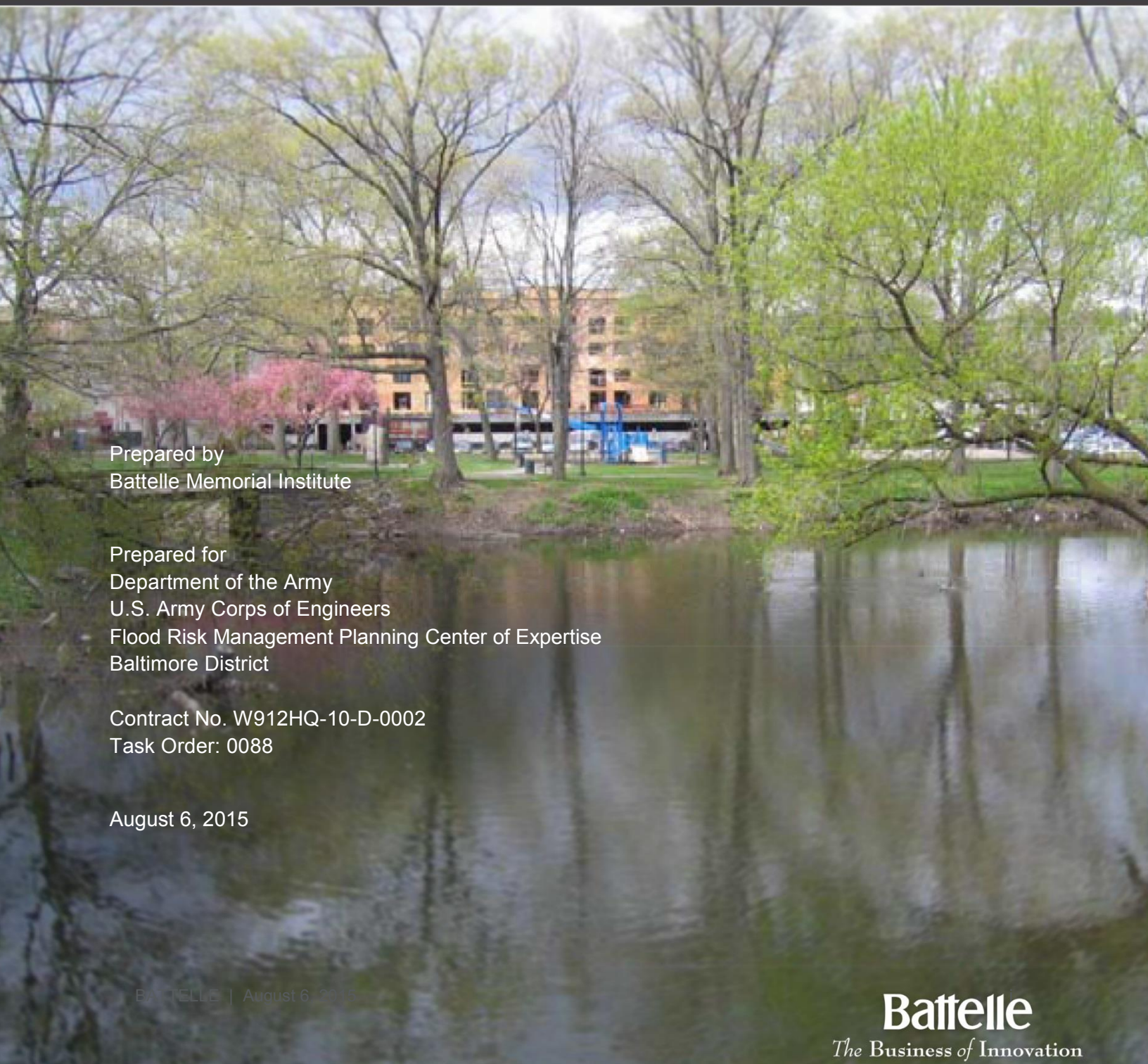
CENAB-PL-P (Anastasiya Hernandez)
CENAN-PL-F (Karen Ashton)
CENAN-PL (Frank Santomauro)
CENAN-PD-P (Joseph Vietri)
CEIWR-RMC (John Clarkson)
CECW-CP (Stuart McLean)

Final Independent External Peer Review Report
Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY Flood Risk Management General Reevaluation Report



Prepared by
Battelle Memorial Institute

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

Contract No. W912HQ-10-D-0002
Task Order: 0088

August 6, 2015

Battelle
The Business of Innovation

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CONTRACT NO. W912HQ-10-D-0002
Task Order: 0088

Final Independent External Peer Review Report

Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY Flood Risk Management General Reevaluation Report

Prepared by

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505 King Avenue
Columbus, Ohio 43201

for

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

August 6, 2015

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Final Independent External Peer Review Report
Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY Flood Risk Management General Reevaluation Report

Executive Summary

Project Background and Purpose

The Mamaroneck and Sheldrake Rivers Basin has a 23-square-mile drainage area and is located along the northern coast of Long Island Sound within the New York City metropolitan area. The Mamaroneck and Sheldrake Rivers Basin lies entirely within Westchester County, New York and contains portions of the Village and Town of Mamaroneck, the Cities of New Rochelle and White Plains, the Towns of Harrison and North Castle, and the Village of Scarsdale. Both the Mamaroneck and Sheldrake Rivers travel through heavily urbanized areas and have inadequate capacity to control flood flows. The Village of Mamaroneck is located at the bottom of the drainage basin. Twice in the spring of 2007, the Village of Mamaroneck was inundated by flooding from both rivers.

The study is a single-purpose flood risk management study. The types of measures/alternatives to be considered in the study are channel improvements, diversions (reevaluation of the authorized tunnel plan), detention, as well as non-structural (flood proofing, acquisition, etc.) and combinations of structural and non-structural solutions. The estimated range of costs for a potentially recommended plan is between $50M and $100M. The non-Federal sponsor is the New York State Department of Environmental Conservation, which has Westchester County as a local sponsor. The original project was authorized by Section 101(a) of the Water Resources Development Act (WRDA) of 1986. The purpose of this study is to identify and evaluate Flood Risk Management (FRM) options for the Mamaroneck and Sheldrake Rivers Basin authorized project, specifically within the Village of Mamaroneck, Westchester County, New York. The decision document will present planning, environmental, and engineering details for the alternative analysis, as well as the National Economic Development Plan (NED Plan) for review and approval. The effort is a General Investigations-funded study undertaken to evaluate structural and non-structural flood risk management measures, including but not limited to, a diversion tunnel and channel modifications. The General Reevaluation of this study is cost-shared 75/25 with the project sponsor, the New York State Department of Environmental Conservation. Approval of the General Reevaluation Report (GRR) will be by Headquarters, U. S. Army Corps of Engineers (HQUSACE) and will require new Congressional authorization, as the tentatively selected plan is not the previously authorized plan. An Environmental Impact Statement (EIS) will be prepared to support the National Environmental Policy Act (NEPA) requirements for this study.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY, Flood Risk Management General Reevaluation Report (hereinafter: Mamaroneck-Sheldrake IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE

(2012). Battelle, experienced in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the Mamaroneck-Sheldrake project. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report 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 Mamaroneck-Sheldrake IEPR review documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: economics/Civil Works planning, biological resources and environmental law compliance, civil/structural engineering, hydrology and hydraulic engineering, and geotechnical engineering. 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 an electronic version of the 1,201 pages of Mamaroneck-Sheldrake IEPR review documents, along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012) and OMB (2014), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team 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 Mamaroneck-Sheldrake IEPR 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, 26 Final Panel Comments were identified and documented. Of these, two were identified as having high significance, five had medium/high significance, 10 had a medium significance, and nine had medium/low significance.

Battelle is scheduled to receive public comments from USACE on October 5, 2015. Battelle will then provide the public comments to the IEPR Panel for review. The panel members will be charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Mamaroneck-Sheldrake IEPR review documents. After completing its review, the Panel will determine if any new issues or concerns were identified that should be brought forward as Final Panel Comments. Battelle will submit a revised Final IEPR Report to document results of the public comment review by the IEPR Panel.

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 Mamaroneck-Sheldrake IEPR 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, the review documents are well-written and well-organized, and provide an excellent presentation and support of information through the use of graphics to illustrate important project concepts. The need and intent for the FRM project is clearly defined in the Mamaroneck-Sheldrake GRR and its appendices. The Panel, however, did identify elements of the project that require further analysis and evaluation, and sections of the GRR and appendices that should be clarified or revised.

Hydrologic and Hydraulic (H&H) Engineering: The Panel's most significant finding was that stream flows are not systematically recorded and some are estimated using various correlation techniques, which may affect the flow frequency and associated confidence limit curves used in the hydrologic analysis. If significant changes in the flow frequency curves are required, the future of the project could be affected since the benefit-cost ratio is relatively low. To address this, USACE can include gage data from 2011 to the current year, perform a detailed analysis of historic development and imperviousness in the watershed to support any "updating function" used to modify historic stream gage data, provide more detailed description as to why certain correlation methodologies were used for specific years of the missing gage data, provide more information on initial loss and infiltration parameters used for the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) estimated gage flows, and consider using a shorter gage record for the confidence limits analysis.

The Panel also identified several important issues with the HEC-HMS hydrologic modeling performed, which may affect the precision and accuracy of the hydrologic analyses, thus increasing the uncertainty of water surface elevations and flood damage calculations. Adjustments to the model may also result in significant changes to peak flow estimates that would impact peak flood elevations and corresponding flood damage cost estimates. To address this, USACE can analyze watershed soils to determine if the constant loss rates used in the analysis are consistent with potential infiltration rates, consider using consistent constant loss rates for the design storm flow frequency curve development, document the development of Clark Unit Hydrograph parameters used in the analysis, updating the outdated NOAA TP-40 rainfall data used in the analyses, and revise the project benefits and costs, as needed, to reflect the resulting modifications to the hydrographic considerations listed above.

Civil/Structural Engineering: A primary concern of the Panel was that quantities cited for excavation, length of channel work, and retaining walls are inconsistent and raise uncertainty regarding the accuracy of cost estimates, including the optimization of alternative #1. Cost estimates based on incorrect and inconsistent quantities can erroneously affect the optimization of alternative #1 and identification of the tentatively selected plan (TSP). USACE can address this by confirming that wall and excavation quantities are based on reviewed engineering analyses (versus estimates), correcting text and tables in the review documents to reflect the correct and consistent quantities, verifying that cost estimates were performed using the correct quantities, and revising the cost estimates, if necessary.

Geotechnical Engineering: Another major concern of the Panel was that construction-phase water control has the potential to be a significant driver of project cost, schedule, and/or flood risk during project implementation. A more robust consideration of construction-phase water control issues, including desired level of performance, constructability, and cost, is therefore warranted to validate project assumptions. To address this, USACE can provide additional discussion of construction-phase water control requirements, schedule requirements, risks, and acceptable methodologies; define, at least in a preliminary manner, the performance standard likely to be required of any construction-phase water control plan proposed by a contractor; perform a concept-level constructability review, including hydraulic

modeling, to verify that the desired construction-phase water control performance standard is possible, given watershed characteristics, channel configurations, and a typical water control approach; and, finally, review cost estimate assumptions regarding construction-phase water control (and revise costs, if needed).

The Panel also identified an important issue with the assumptions used to estimate the cost for sediment disposal and whether the potential for premium costs associated with handling and disposal of contaminated sediment was considered. Premium costs for sediment handling and disposal could increase overall project cost and result in changes to the benefit-cost ratio of the project. To address this issue, USACE can clarify assumptions, including existing laboratory analytical results, used in estimating the costs of sediment disposal with respect to potential sediment contamination; provide additional discussion describing the level of uncertainty with possible sediment contamination; perform a sediment quality screening study to identify potential sources of sediment contamination; obtain preliminary representative sediment samples and perform a suite of analytical tests to assess sediment chemical quality; and revise project costs, as needed, to account for any anticipated premium cost for handling and disposal of contaminated sediment.

Biological Resources and Environmental Law Compliance: Another important concern of the Panel was that the Cumulative Impacts section of the DEIS does not fully meet NEPA requirements; it does not discuss specific planned projects such as upstream reservoir decommissioning, potential associated environmental impacts, and potential opportunities for additional flood detention. Without considering potential cumulative impacts on resources in the area and the opportunity to use the former reservoir area for flood detention, the possible impact of the anticipated reservoir decommissioning on the proposed project cannot be determined. USACE can address this by analyzing the cumulative impacts of the reservoir decommissioning and by considering the potential use of the decommissioned reservoir as a location to create additional flood detention volume in consideration of flood detention as a management measure.

Economics/Civil Works Planning: The optimization of alternatives from the original alternative #1 is well-documented, and the economic analysis and methodologies appear to be sound overall. The Panel did note that economic damages resulting from business interruption do not appear to have been considered in the economic analysis, which could affect the calculation of the benefit-cost ratios. Estimated benefits of the project alternatives might be increased by including business interruption impacts; conceivably the selection of the TSP and the BCR might be affected by this consideration as well. USACE can address this by providing estimates of business interruption damage reduction for the alternatives, modifying the benefit-cost calculations accordingly, and reviewing whether the selection of the TSP would be influenced by inclusion of business interruption benefit considerations.

Table ES-1. Overview of 26 Final Panel Comments Identified by the Mamaroneck-Sheldrake IEPR Panel

No.	Final Panel Comment
	Significance – High
1	Stream flows are not systematically recorded and instead some are estimated using various correlation techniques, which may affect the flow frequency and associated confidence limit curves used in the analysis.
2	Quantities cited for excavation, length of channel work, and retaining walls are inconsistent and raise uncertainty regarding the accuracy of cost estimates, including the optimization of alternative #1.
	Significance – Medium/High
3	Several issues with the HEC-HMS hydrologic modeling affect the precision and accuracy of the hydrologic analyses, which increase the uncertainty of water surface elevations and flood damage calculations.
4	The Cumulative Impacts section of the DEIS does not fully meet NEPA requirements as it does not discuss upstream reservoir decommissioning, potential associated environmental impacts, and potential opportunities for additional flood detention.
5	Construction-phase water control has the potential to result in schedule and cost risk since the project schedule and cost estimate may not fully account for the appropriate level of effort for water quality control and flood protection.
6	The assumptions used to estimate the cost for sediment disposal are not provided and it is not clear whether the potential for premium costs associated with handling and disposal of contaminated sediment was considered.
7	The project feasibility-level drawings do not show the type of transitions between sloped channel sections and retaining walls that will likely be developed under final design, which could result in significant design modifications, changes in project hydraulics, and an increase in project costs.
	Significance – Medium
8	The proposed channel improvements include trapezoidal and rectangular sections, but a 2-dimensional model was not developed or applied to represent channel and overbank hydraulics, particularly in the transition zones.
9	Retaining wall construction cost may be significantly understated in the decision documents.
10	The approach for analyzing storm surge and tides coupled with high fluvial flows does not include several historic storm events and therefore the downstream boundary condition for the hydraulic modeling may be underestimated.
11	The assumption that flood damages will be uniform over the 50-year life of the project does not take into consideration the effects of climate change on storm surge and fluvial flows, which could affect the calculation of the benefit-cost ratio.
12	A sediment transport analysis was not conducted to identify areas within the channel that are prone to sediment deposition or to determine the potential for increased erosion downstream of the project area.
13	Potential alternative methodologies for slope stabilization and channel improvements that would allow for retention of riparian vegetation, use of bioengineering stabilization techniques, or mitigation of impacts on vegetation within the watershed are not addressed.

Table ES-1. Overview of 26 Final Panel Comments Identified by the Mamaroneck-Sheldrake IEPR Panel (Continued)

No.	Final Panel Comment
14	Assumptions regarding the cost of treating existing masonry retaining walls may be understated if the walls are deemed to have historical significance.
15	The discount rate presented in the GRR is inconsistent with the rate used in the HEC-FDA analysis, which could affect the benefit-cost ratio.
16	Economic damages resulting from business interruption do not appear to have been considered in the economic analysis, which could affect the calculation of the benefit-cost ratios.
17	The geotechnical investigations completed for the previous 1988 GDM have not been supplemented or updated to reflect the configuration of the TSP, which adds uncertainty to the assumptions made about subsurface conditions and could result in changes in the overall project cost.
Significance – Medium/Low	
18	The elevation of the top of bedrock and the specific information about rock competency is uncertain throughout the project area and could result in increased costs if additional rock excavation volumes or effort (e.g., blasting, drilling, and splitting, etc.) is required during construction.
19	The impacts of greenhouse gases from the perspective of vegetation loss associated with project implementation or the potential benefits of conserving existing vegetation are not addressed.
20	Environmental impacts are frequently described qualitatively in the GRR and DEIS and may not completely represent certain quantitative environmental impacts for the project.
21	The overall benefits of the project may be underestimated since the full implications of the improvements to storm water quality entering Mamaroneck Harbor are not presented in the DEIS.
22	The evaluation of operational public safety is incomplete since fall protection treatment for the top of retaining walls, channel egress, and culvert access is not addressed.
23	The life safety analysis in the decision documents is presented only in a brief summary that does not allow for a qualitative assessment of these analyses.
24	An advanced warning system for alerting residences and businesses to impending flood conditions, which could reduce life safety risks and loss of property, is not evaluated as a non-structural alternative.
25	The description of the without-project condition in the DEIS inappropriately includes references to “impacts,” terminology normally reserved for the effects of the tentatively proposed plan (i.e. tentatively selected plan).
26	The risk and uncertainty analyses of flood risk reduction benefits (avoided damages) are not well-documented, and the adequacy and acceptability of these methods could not be determined.

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List of Acronyms

ATR	Agency Technical Review
BCR	benefit-cost ratio
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CLR	Constant Loss Rate
COI	Conflict of Interest
CSRA	Cost and Schedule Risk Analysis
CWRB	Civil Works Review Board
DDT	dichlorodiphenyltrichloroethane
DEIS	Draft Environmental Impact Statement
DrChecks	Design Review and Checking System
EC	Engineer Circular
EIS	Environmental Impact Statement
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
FRM	Flood Risk Management
GDM	General Design Memorandum
GHG	greenhouse gas
GRR	General Reevaluation Report
HEC-HMS	Hydrologic Engineering Center Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center River Analysis System
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
LPP	locally preferred plan
MOA	Memorandum of Agreement
NED	National Economic Development
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRCC	Northeast Regional Climate Center
NRCS	National Resources Conservation Service
NYSDEC	New York State Department of Environmental Conservation
O&M	operations and management

OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OMRR&R	operation, maintenance, repair, replacement, and rehabilitation
PED	Preconstruction Engineering and Design
PDT	Project Delivery Team
SAR	Safety Assurance Review
TSP	tentatively selected plan
TWAE	Temporary Work Area Easement
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Services
WRDA	Water Resources Development Act

1. INTRODUCTION

The Mamaroneck and Sheldrake Rivers Basin has a 23-square-mile drainage area and is located along the northern coast of Long Island Sound within the New York City metropolitan area. The Mamaroneck and Sheldrake Rivers Basin lies entirely within Westchester County, New York and contains portions of the Village and Town of Mamaroneck, the Cities of New Rochelle and White Plains, the Towns of Harrison and North Castle, and the Village of Scarsdale. Both the Mamaroneck and Sheldrake Rivers travel through heavily urbanized areas and have inadequate capacity to control flood flows. The Village of Mamaroneck is located at the bottom of the drainage basin. Twice in the spring of 2007, the Village of Mamaroneck was inundated by flooding from both rivers.

The study is a single-purpose flood risk management study. The types of measures/alternatives to be considered in the study are channel improvements, diversions (reevaluation of the authorized tunnel plan), detention, as well as non-structural (flood proofing, acquisition, etc.) and combinations of structural and non-structural solutions. The estimated range of costs for a potentially recommended plan is between $50M and $100M. The non-Federal sponsor is the New York State Department of Environmental Conservation, which has Westchester County as a local sponsor. The original project was authorized by Section 101(a) of the Water Resources Development Act (WRDA) of 1986. The purpose of this study is to identify and evaluate Flood Risk Management (FRM) options for the Mamaroneck and Sheldrake Rivers Basin authorized project, specifically within the Village of Mamaroneck, Westchester County, New York. The decision documents will present planning, environmental, and engineering details for the alternative analysis, as well as the National Economic Development Plan (NED Plan) for review and approval. The effort is a General Investigations-funded study undertaken to evaluate structural and non-structural flood risk management measures, including but not limited to, a diversion tunnel and channel modifications. The General Reevaluation of this study is cost-shared 75/25 with the project sponsor, the New York State Department of Environmental Conservation. Approval of the GRR will be by Headquarters, U.S. Army Corps of Engineers (HQUSACE) and will require new Congressional authorization, as the tentatively selected plan is not the previously authorized plan. An Environmental Impact Statement (EIS) will be prepared to support the National Environmental Policy Act (NEPA) requirements for this study.

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 Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY, Flood Risk Management General Reevaluation Report (hereinafter: Mamaroneck-Sheldrake IEPR) in accordance with procedures described in 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 Mamaroneck-Sheldrake 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 June 8, 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 Mamaroneck-Sheldrake 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 Mamaroneck-Sheldrake 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 Mamaroneck-Sheldrake IEPR. Due dates for milestones and deliverables are based on the award/effective date of April 27, 2015. Note that the work items listed under Tasks 5 and 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 January 7, 2016. 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 completed.

Table 1. Major Milestones and Deliverables of the Mamaroneck-Sheldrake IEPR

Task	Action	Due Date
1	Award/Effective Date	4/27/2015
	Review documents available	6/1/2015
2	Battelle submits list of selected panel members[a]	5/20/2015
	USACE confirms the panel members have no COI	5/26/2015
3	Battelle convenes kick-off meeting with USACE	5/14/2015
	Battelle convenes kick-off meeting with USACE and panel members	6/15/2015
4	Panel members complete their individual reviews	7/2/2015
	Panel members provide draft Final Panel Comments to Battelle	7/20/2015
5	Battelle submits Final IEPR Report to USACE[a]	8/6/2015
	USACE PCX provides decision on Final IEPR Report acceptance	8/13/2015
4[b]	Battelle receives the public comments from USACE	10/5/2015
	Panel completes review of the public comments	10/9/2015
	Panel finalizes Final Panel Comment regarding public comments	10/16/2015

Table 1. Major Milestones and Deliverables of the Mamaroneck-Sheldrake IEPR (Continued)

Task	Action	Due Date
5 [b]	Battelle submits revised Final IEPR Report (based on Panel review of public comments) to USACE[a]	10/23/2015
	USACE PCX provides decision on revised Final IEPR Report acceptance	10/28/2015
6 [b]	Battelle convenes Comment-Response Teleconference with Panel and USACE	12/11/2015
	Battelle submits pdf printout of DrChecks project file[a]	1/7/2016
	Agency Decision Milestone (ADM) Meeting [b,c]	TBD
	Civil Works Review Board (CWRB) Meeting [b,c]	TBD
	Contract End/Delivery Date	5/27/2016

[a] *Deliverable*

[b] *Tasks occur 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.*

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: economics/Civil Works planning, biological resources and environmental law compliance, civil/structural engineering, hydrology and hydraulic engineering, and geotechnical engineering. The Panel reviewed the Mamaroneck-Sheldrake IEPR documents and produced 26 Final Panel Comments in response to 20 charge questions provided by USACE for the review. This charge included two overview questions 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.

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 Mamaroneck-Sheldrake IEPR review documents. Table ES-1 lists the Final Panel Comment statements

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Based on the Panel's review, the review documents are well-written and well-organized, and provide an excellent presentation and support of information through the use of graphics to illustrate important project concepts. The need and intent for the FRM project is clearly defined in the Mamaroneck-Sheldrake GRR and its appendices. The Panel, however, did identify elements of the project that that require further analysis and evaluation and sections of the GRR and appendices that should be clarified or revised.

Hydrologic and Hydraulic (H&H) Engineering: The Panel's most significant finding was that stream flows are not systematically recorded and some are estimated using various correlation techniques, which may affect the flow frequency and associated confidence limit curves used in the hydrologic analysis. If significant changes in the flow frequency curves are required, the future of the project could be affected since the benefit-cost ratio is relatively low. To address this, USACE can include gage data from 2011 to the current year, perform a detailed analysis of historic development and imperviousness in the watershed to support any "updating function" used to modify historic stream gage data, provide more detailed description as to why certain correlation methodologies were used for specific years of the missing gage data, provide more information on initial loss and infiltration parameters used for the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) estimated gage flows, and consider using a shorter gage record for the confidence limits analysis.

The Panel also identified several important issues with the HEC-HMS hydrologic modeling performed, which may affect the precision and accuracy of the hydrologic analyses, thus increasing the uncertainty of water surface elevations and flood damage calculations. Adjustments to the model may also result in significant changes to peak flow estimates that would impact peak flood elevations and corresponding flood damage cost estimates. To address this, USACE can analyze watershed soils to determine if the constant loss rates used in the analysis are consistent with potential infiltration rates, consider using consistent constant loss rates for the design storm flow frequency curve development, document the development of Clark Unit Hydrograph parameters used in the analysis, updating the outdated NOAA TP-40 rainfall data used in the analyses, and revise the project benefits and costs, as needed, to reflect the resulting modifications to the hydrographic considerations listed above.

Civil/Structural Engineering: A primary concern of the Panel was that quantities cited for excavation, length of channel work, and retaining walls are inconsistent and raise uncertainty regarding the accuracy of cost estimates, including the optimization of alternative #1. Cost estimates based on incorrect and inconsistent quantities can erroneously affect the optimization of alternative #1 and identification of the tentatively selected plan (TSP). USACE can address this by confirming that wall and excavation quantities are based on reviewed engineering analyses (versus estimates), correcting text and tables in the review documents to reflect the correct and consistent quantities, verifying that cost estimates were performed using the correct quantities, and revising the cost estimates, if necessary.

Geotechnical Engineering: Another major concern of the Panel was that construction-phase water control has the potential to be a significant driver of project cost, schedule, and/or flood risk during project implementation. A more robust consideration of construction-phase water control issues, including desired level of performance, constructability, and cost, is therefore warranted to validate project assumptions. To address this, USACE can provide additional discussion of construction-phase water control requirements, schedule requirements, risks, and acceptable methodologies; define, at least in a preliminary manner, the performance standard likely to be required of any construction-phase water control plan proposed by a contractor; perform a concept-level constructability review, including hydraulic

modeling, to verify that the desired construction-phase water control performance standard is possible, given watershed characteristics, channel configurations, and a typical water control approach; and, finally, review cost estimate assumptions regarding construction-phase water control (and revise costs, if needed).

The Panel also identified an important issue with the assumptions used to estimate the cost for sediment disposal and whether the potential for premium costs associated with handling and disposal of contaminated sediment was considered. Premium costs for sediment handling and disposal could increase overall project cost and result in changes to the benefit-cost ratio of the project. To address this issue, USACE can clarify assumptions, including existing laboratory analytical results, used in estimating the costs of sediment disposal with respect to potential sediment contamination; provide additional discussion describing the level of uncertainty with possible sediment contamination; perform a sediment quality screening study to identify potential sources of sediment contamination; obtain preliminary representative sediment samples and perform a suite of analytical tests to assess sediment chemical quality; and revise project costs, as needed, to account for any anticipated premium cost for handling and disposal of contaminated sediment.

Biological Resources and Environmental Law Compliance: Another important concern of the Panel was that the Cumulative Impacts section of the DEIS does not fully meet NEPA requirements; it does not discuss specific planned projects such as upstream reservoir decommissioning, potential associated environmental impacts, and potential opportunities for additional flood detention. Without considering potential cumulative impacts on resources in the area and the opportunity to use the former reservoir area for flood detention, the possible impact of the anticipated reservoir decommissioning on the proposed project cannot be determined. USACE can address this by analyzing the cumulative impacts of the reservoir decommissioning and by considering the potential use of the decommissioned reservoir as a location to create additional flood detention volume in consideration of flood detention as a management measure.

Economics/Civil Works Planning: The optimization of alternatives from the original alternative #1 is well-documented, and the economic analysis and methodologies appear to be sound overall. The Panel did note that economic damages resulting from business interruption do not appear to have been considered in the economic analysis, which could affect the calculation of the benefit-cost ratios. Estimated benefits of the project alternatives might be increased by including business interruption impacts; conceivably the selection of the TSP and the BCR might be affected by this consideration as well. USACE can address this by providing estimates of business interruption damage reduction for the alternatives, modifying the benefit-cost calculations accordingly, and reviewing whether the selection of the TSP would be influenced by inclusion of business interruption benefit considerations.

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

Stream flows are not systematically recorded and instead some are estimated using various correlation techniques, which may affect the flow frequency and associated confidence limit curves used in the analysis.

Basis for Comment

The General Reevaluation Report (GRR) and Hydrology Appendix present the hydrologic analysis as a continuation and update to the hydrologic modeling completed for the 1989 General Design Memorandum (GDM). A key component of the update was the inclusion of data for the Mamaroneck River stream gage for the years 1990-2010. While the availability of additional data would typically serve to increase the accuracy and reliability of hydrologic analyses, the additional data were not actually recorded at the gage. Instead, they were estimated by various correlation methodologies, including Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) modeling, correlation with the Saw Mill River at Yonkers gage, and correlation with the Norwalk River at South Wilton Connecticut gage. The Panel has several concerns with the updated gage analyses that ultimately could affect the flow frequency and associated confidence limit curves used in the analysis:

- The GRR is dated June 2015, but the stream gage analyses extend only through 2010. This excludes several recent years of data, including significant flooding from Hurricane Irene in August 2011.
- The reason for selecting multiple correlation techniques and the selected methodology for the various years is not well-documented.
- The gage analyses use an updating function to adjust (increase) flows recorded at the Mamaroneck gage for years 1945-1973. The flow adjustments were made to account for historic urbanization in the watershed. This approach has some logical merit and has been applied on other regional USACE flood control projects. However, the updating function used in the analysis is not supported by any urbanization data, such as review of aerial imagery or historic building permits to estimate watershed imperviousness. In addition, the 1989 GDM (Appendix A, p. A13) stated that, “A detailed review of the land use and population data indicates that the Mamaroneck River Basin did not experience any significant urbanization since 1955.” As such, the 1989 GDM only made adjustments to a single flood in 1944. It is unclear why the 1989 GDM report noted that major urbanization ceased around 1955 while the current GRR made flow adjustments through 1973.
- The flood of record (April 2007) peak flow is estimated with the HEC-HMS model. The text supporting the HEC-HMS analysis indicates that variable constant loss rates were used for historic storm calibration as well as for the design storm analysis. It is not clear what infiltration rate was used to develop the April 2007 storm peak and the basis for the selected value.
- The Risk and Uncertainty of Peak Flow vs. Frequency analysis uses gage records for 67 years and an equivalent record length of 60.3 years in development of confidence limits. Since about 20 years of the gage data have been estimated and almost 30 years of recorded data have been modified, using a gage record length greater than 60 years may be overstating the accuracy of the flow frequency curves.

The flow frequency curve(s) developed for the GRR differ from those of the 1989 GDM, and generally result in lower peak flows for storms with a greater than 25-year recurrence interval, and higher peak flows for storms with less than the 25-year recurrence interval. Also, the assumptions made in updating the gage analyses are not well-supported and in some cases conflict with the 1989 GDM analysis. The

Final Panel Comment 1

Panel is concerned that if significant changes in the flow frequency curves are required, the future of the project could be affected since the benefit-cost ratio is relatively low.

Significance – High

The flow frequency curves developed for the Mamaroneck and Sheldrake Rivers flood control project, including confidence limits, serve as the foundation for flood risk management in the Village of Mamaroneck, and are ultimately used to quantify the economic benefits of the proposed project.

Recommendation for Resolution

1. Include in the gage analysis water years from 2011 to the current year.
2. Perform a detailed analysis of historic development and imperviousness in the watershed to support any “updating function” used to modify historic stream gage data.
3. Provide a more detailed description as to why certain correlation methodologies were used for specific years of the missing gage data.
4. Provide more information on initial loss and infiltration parameters used for the HEC-HMS estimated gage flows.
5. Consider the use of a shorter gage record for the confidence limits analysis.

Final Panel Comment 2

Quantities cited for excavation, length of channel work, and retaining walls are inconsistent and raise uncertainty regarding the accuracy of cost estimates, including the optimization of alternative #1.

Basis for Comment

The Panel finds that inconsistencies in the basic construction quantities within the decision documents raise uncertainties regarding cost estimates. The cost estimate is a primary factor in project decisions. To ensure an accurate comparison of alternatives, cost estimates are based on construction quantities derived through engineering analysis. As shown in specific examples below, the construction quantities cited in various portions of the decision documents are not consistent. Thus, it is unclear which quantities were based on the reviewed and accepted engineering analysis and which quantities were used in the MII estimates. Some of these inconsistencies include the following:

- **Sheldrake River National Economic Development (NED) channel work length quantities**. GRR, Table 20 – 3,470 feet; Real Estate Appendix, Section 3.b.I – 1,440 feet; Cost Appendix, Table C-4 – 2,800 feet. These quantities result in a variance of over 50% between the GRR and the Real Estate Appendix and nearly 20% between the GRR and the Cost Appendix.
- **NED Plan soil and rock excavation quantities**. GRR, Table 20 – 60,990 and 11,250 cubic yards (CY), respectively; Cost Appendix, Table C-4 – 79,423 and 13,656 CY, respectively. (Note that Table 20 uses units of 'CYD,' whereas the Cost Appendix, Table C-4 uses 'CY.' The abbreviation CYD is not defined in the decision documents and is not a common term such as bank or bulk yards used in measuring earthwork quantities.) These quantities result in a variance of approximately 30% in soil excavation and 20% in rock excavation between the GRR and the Cost Appendix. Similar variations are found in the two documents for the locally preferred plan (LPP).
- **Wall type designators, heights, and lengths**. Wall types and lengths shown in the Cost Appendix, Table C-4 are largely inconsistent with those shown in the Structural Appendix. The only wall height listed in the Cost Appendix, Table C-4 that matches any wall in the Structural Appendix is referenced as a Type 3 in the Cost Appendix (2,726 linear feet or LF) and Type 4 in the Structural Appendix (1,760 LF). This is a 50% variance in Type 3/Type 4 wall quantities and suggests that more than a mere mislabeling of walls types is occurring. Other wall types and lengths of wall could not be correlated between the Cost and Structural Appendices.
- **Soil fill quantities in the channels**. Cost Appendix Table C-4 – 2.6 CY and 5.90 CY for the NED Plan and LPP, respectively. While these quantities do not present an inconsistency with fill quantities cited elsewhere in the decision documents, the extremely small values of these quantities is inconsistent with the scale of other construction quantities by orders of magnitude. It raises questions as to how the MII cost estimates treated the quantity labeled as 'Channel Fill.'

Channels and walls are the largest single cost feature in the project cost estimates. The resultant cost estimates, if they are based on erroneous quantities, can affect the optimization of alternative #1 and subsequent identification of the tentatively selected plan (TSP).

Significance – High

Cost estimates based on incorrect and inconsistent quantities can deleteriously affect the optimization of alternative # 1 and identification of the TSP.

Final Panel Comment 2

Recommendation for Resolution

1. Confirm wall and excavation quantities from reviewed engineering analyses.
2. Correct text and tables in the decision documents to reflect the correct and consistent quantities.
3. Verify that cost estimates were performed using the correct quantities. If not, revise the cost estimates using the correct quantities.

Final Panel Comment 3

Several issues with the HEC-HMS hydrologic modeling affect the precision and accuracy of the hydrologic analyses, which increase the uncertainty of water surface elevations and flood damage calculations.

Basis for Comment

While a comprehensive technical review of the HEC-HMS hydrologic modeling was beyond the scope of the IEPR, the information contained in the GRR indicates there may be several potential problems with the HEC-HMS hydrologic modeling performed:

- **Rainfall Data.** The HEC-HMS model uses design rainfall data from the National Oceanic and Atmospheric Administration's (NOAA's) Technical Paper No. 40 (TP-40), which dates from 1961 and is missing over 50 years of subsequent rainfall data. A more current and thorough source of rainfall is the Northeastern Regional Climate Center (NRCC), which has recorded extreme precipitation in New York and New England (DeGaetano and Zarrow, 2010). Rainfall data from the NRCC generally indicate increased design storm rainfall depths when compared to TP-40 data. For example, for the 100-year 24-hour design storm in the Mamaroneck River watershed, the GRR Hydrology Appendix Table 7 notes that a rainfall depth of 6.80 inches was used in the HEC-HMS hydrologic model, whereas the NRCC gives a rainfall depth of 9.03 inches, The GRR Hydrology Appendix (p. 21) also notes that a symmetrical triangular rainfall distribution was used in the HEC-HMS modeling. The NRCC data include a more appropriate rainfall distribution for the watershed. (NOAA's Atlas 14 rainfall data for New York should be available in September 2015.)
- **Unit Hydrograph Methodology and Parameter Development.** The HEC-HMS model uses the Clark Unit Hydrograph methodology and has equivalent values for the Time of Concentration (Tc) and Clark Storage Coefficient (R) for each sub-basin. The GRR does not state how these values were computed and whether they were refined through calibration. The New York District performed separate modeling of the Mamaroneck River watershed as part of the 1977 Lower Hudson River Hydrologic Flood Routing using the Snyder Unit Hydrograph methodology and calibrated to floods from 1955 and 1972.
- **Hydrologic Loss Methodology.** The initial and constant loss rate methodology is used in the HEC-HMS models. Table 8 from the GRR Hydrology Appendix indicates that the Constant Loss Rate (CLR) used in the analysis of both historic and design storms varied between 0.1 and 0.4 inches/hour. The CLR should be a function of the pervious areas soil saturated hydraulic conductivity, which is generally categorized by the National Resources Conservation Service (NRCS) as the hydrologic soils group. Since the loss rate is based on soil properties, it should typically not fluctuate among the various design and historic storm events. A discussion or map of watershed soils was not provided in the GRR. The initial loss used in the modeling is 0 for every storm event except May 1989, which has a value of 2.99 inches. Initial loss rates can vary for storms as they are a function of vegetation, development, and antecedent moisture conditions; however, a value of 0 is not consistent with typical hydrologic modeling approaches and the 1989 GDM used values ranging from 0.50 inches to 1.50 inches. A physical watershed condition does not exist that could explain why one storm would have an initial loss of almost three inches, whereas every other storm analyzed had initial losses of zero.
- **Stream Gage Flow Development.** The HEC-HMS model is used to replicate the flow frequency curves developed from the stream gage analysis. However, the HEC-HMS model is also used to generate peak flows for some of the years that the gage was not active. Since the modeling used constant loss rates that varied significantly among the various design storm events, it is not clear

Final Panel Comment 3

whether this is a valid approach. In addition, the constant loss rates used to generate the missing stream gage data are not given. If more recent rainfall data for the 100-year and other design storms are used in the HEC-HMS model, the initial loss and constant loss parameters would need to be adjusted to ensure that peak flow rates remain consistent with the gage data. This would then change the peak flows computed by the HEC-HMS model for estimation of missing stream gage data. It is important to note that the peak flow estimate for the reported flood of record in April 2007, characterized as a 100-year storm event, was estimated with the HEC-HMS model. It also appears that a 24-hour design storm was used in development of the hypothetical flow frequency curves; however, an analysis of the rainfall duration and distribution associated with the peak flows used in the gage analysis was not presented.

Significance – Medium/High

The HEC-HMS modeling may not be consistent with typical hydrologic modeling techniques and assumptions, and adjustments to the model may result in significant changes to peak flow estimates that would impact peak flood elevations and corresponding flood damage cost estimates.

Recommendation for Resolution

1. Analyze watershed soils to determine if the constant loss rates used in the analysis are consistent with potential infiltration rates.
2. Consider the use of consistent constant loss rates for the design storm flow frequency curve development.
3. Document the development of Clark Unit Hydrograph parameters used in the analysis.
4. Update rainfall data used in the analyses.
5. Perform additional calibration to historic storm events. The Lower Hudson Flood Routing Model report calibrated the modeling performed under that study to storms from 1955 and 1972.
6. Revise values of initial loss used in the analyses.
7. Revise the project benefits and costs, as needed, to reflect the resulting modifications to the hydrographic considerations listed above.

Literature Cited:

DeGaetano, A., and Zarrow, D. (2010). Extreme Precipitation in New York & New England, Technical Documentation and User Manual. Northeast Regional Climate Center, Cornell University, Ithaca, New York. Available online at: http://precip.eas.cornell.edu/docs/xprecip_techdoc.pdf

Final Panel Comment 4

The Cumulative Impacts section of the DEIS does not fully meet NEPA requirements as it does not discuss upstream reservoir decommissioning, potential associated environmental impacts, and potential opportunities for additional flood detention.

Basis for Comment

During the mid-review teleconference with USACE and the Panel (facilitated by Battelle), the Panel was made aware that an upstream reservoir will be decommissioned. While this is a separate project with potential impacts that would be evaluated independently, the cumulative impacts assessment in Section 6 of the Draft Environmental Impact Statement (DEIS) does not discuss this project, potential cumulative environmental impacts, or potential implications for the assessment of potential management measures.

Cumulative effects are defined by 40 CFR 1508.7 as: "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time. Unrelated but foreseeable future actions in the project area such as the planned reservoir decommissioning may adversely or beneficially affect the Federal project, but they are not discussed in sufficient detail to meet the requirements of NEPA.

Such a proposed project, as well as any other known development projects within the watershed, could affect future impervious cover and hence the watershed rainfall/runoff response, sedimentation into the rivers, vegetation removal, or other environmental impacts discussed in the DEIS. It is not clear whether the reservoir would still continue to function in receiving sediment from upstream within the watershed, or if closing it would increase the sediment load to either the Mamaroneck or Sheldrake rivers. Some discussion in the DEIS is warranted as to whether the sediment within the reservoir is contaminated and, if it would be released into either river, whether it would potentially affect construction considerations as well as cumulative impacts on Mamaroneck Bay sediments.

In addition, a key issue is whether the reservoir would be maintained in its current state, with water levels presumably being managed, or would it be allowed to revert to some "natural" condition that is not maintained over time. This issue could also affect sedimentation rates and flows within the newly designed channels.

GRR Section 22.2 (p. 22-4) discusses several upstream sites within the Mamaroneck and Sheldrake Rivers Basin at which potential flood detention reservoirs were evaluated. Alternative #8A discusses the use of the Mamaroneck Reservoir for flood detention, predicated on the current configuration of the dam and reservoir. If this dam is anticipated to be removed, then the potential exists to instead modify the structure such that full former normal pool volume could be used as flood detention volume. This could affect the conclusions regarding the viability of this approach/alternative.

Significance –Medium/High

Without considering potential cumulative impacts on resources in the area and the opportunity to use the former reservoir area for flood detention, the possible impact of the anticipated reservoir decommissioning on the proposed project cannot be thoroughly assessed.

Final Panel Comment 4

Recommendation for Resolution

1. Analyze the cumulative impacts of the reservoir decommissioning.
2. Consider the potential use of the decommissioned reservoir as a location to create additional flood detention volume in consideration of flood detention as a management measure.

Final Panel Comment 5

Construction-phase water control has the potential to result in schedule and cost risk since the project schedule and cost estimate may not fully account for the appropriate level of effort for water quality control and flood protection.

Basis for Comment

Water control during construction is a vital and key component for the success and cost-effective implementation of projects that must be performed within waterways and other areas that have the potential to be affected by typical flows and unusual flood conditions. The GRR correctly notes the need for the implementation of industry standard Best Management Practices (BMPs) to protect water quality and wetlands during in-stream work and to reduce the potential for impacts during construction. Such BMPs are not, however, necessarily the same as the temporary water control measures necessary to divert and bypass water such that work can be performed "in the dry." The Panel did not find discussion of construction-phase water control within the review documents.

Construction-phase water control is often considered a "means and methods" issue that is handled by the contractor. The contractor assumes the risk of temporary disruption (damage and schedule) to his/her work by floods that occur during the execution of the work. However, project specifications often impose water control criteria/restrictions to protect life safety, property, or the environment during construction (e.g., no increase of upstream flood elevations). Such standards are often tied to a specific flow rate, flow depth, flood return period, or other hydrologic/hydraulic parameter.

A typical means of water control on a linear waterway project where there is no alternative conveyance system might involve isolating one half of the channel within a cofferdam. River flows are passed through the portion of the channel outside the cofferdam while work is conducted "in the dry" within the cofferdam perimeter. However, this system often results in a significant temporary restriction of channel capacity, which could lead to increases in upstream flood elevations. The work to increase inadequate channel capacity can thus result in a temporary decrease in channel capacity. Depending on the level of protection required, special temporary flood control measures such as sheet piles (which are designed for specific foundation conditions) might be required to handle the magnitude/frequency of flood event cited in the final project specifications. Given the granular nature of the soil, groundwater control for retaining wall foundation excavations in the channel may also require a more-than-typical level of effort.

These factors cited above could influence the cost of the project depending on the level of temporary flood protection that the contractor is required to provide, and the amount of risk the contractor is asked to bear. If the specified performance standard for temporary water control is set at an impractical level, the project may not be constructible. Alternatively, flood risks to the community may be temporarily increased by construction-phase water control measures if no other option exists.

In addition, because of the length of the project, any temporary water control scheme implemented by a contractor will likely only encompass a limited area of the project. This system will therefore need to be relocated multiple times to implement the full project. This type of procedure has cost and schedule implications. The Panel did not find information regarding the assumptions that were used in estimating the cost of water control for the project. Likewise, no discussions of the scheduling aspect of temporary water control, such as wet season/dry season construction, were found.

Final Panel Comment 5

Significance – Medium/High

Construction-phase water control has the potential to be a significant driver of project cost, schedule, and/or flood risk during project implementation; therefore a more robust consideration of construction-phase water control issues, including desired level of performance, constructability, and cost, is warranted to validate project assumptions.

Recommendation for Resolution

1. Provide additional discussion of construction-phase water control requirements, schedule requirements, risks, and acceptable methodologies.
2. Define, at least in a preliminary manner, the performance standard likely to be required of any construction-phase water control plan proposed by a contractor.
3. Perform a concept-level constructability review, including hydraulic modeling, to verify that the desired construction-phase water control performance standard is possible, given watershed characteristics, channel configurations, and a typical water control approach.
4. Review cost estimate assumptions regarding construction-phase water control. Revise project costs, as needed, to account for any anticipated increased costs for construction-phase water control based on the constructability review. Alternatively, provide justification that such costs are marginal and/or are covered in the contingency.

Final Panel Comment 6

The assumptions used to estimate the cost for sediment disposal are not provided and it is not clear whether the potential for premium costs associated with handling and disposal of contaminated sediment was considered.

Basis for Comment

The Mamaroneck and Sheldrake Rivers are located within urbanized areas where sediment quality concerns are typical. DEIS Sections 3.4.2 (p. 45) and 3.6.2 (p. 56) make note of reported pesticide-contaminated sediments in both rivers. GRR Section 4.4.2 (p. 4-31) states that sampling at two sites in the Mamaroneck River by the New York State Department of Environmental Conservation (NYSDEC) indicated elevated levels of dichlorodiphenyltrichloroethane (DDT) and chlordane. The reference to the sampling at these two sites does not provide sufficient information for the Panel to discern whether the contamination might be strictly a fish consumption issue or one that affects worker safety and sediment disposal. The GRR (p. 4-32) further states the source of this contamination is considered to be contaminated sediment resulting from past applications of these pesticides emanating from both point and non-point sources. Additional sediment quality impacts may have resulted during periods when floods inundated adjacent industrial and commercial areas (as occurred multiple times) and washed contaminates back into the river channel. The Sheldrake River is specifically noted to flow through a manufacturing/industrial zone.

The need for sediment excavation appears to have been well-considered in the project documents. However, the Panel did not find information regarding potential sediment quality, other than references to pesticide contamination in the project documents. No screening level investigation for potential contamination sources is presented beyond a statement that a database search found no potential contaminant sources within the limits of the NED or LPP. No analytical data are presented in the project documents or reference material provided to the Panel.

Sediment that contains elevated levels of contaminates of concern may require special characterization, excavation techniques, handling processes, and disposal procedures. Project costs could rise if contaminated sediments are identified that require such an elevated level of effort to address and remove.

Significance – Medium/High

Given the potential for sediment contamination issues, the premium costs for sediment handling and disposal could increase overall project cost and result in changes to the benefit-cost ratio of the project.

Recommendation for Resolution

1. Clarify assumptions, including existing laboratory analytical results, used in estimating the costs of sediment disposal with respect to potential sediment contamination.
2. Provide additional discussion describing the level of uncertainty regarding possible sediment contamination.
3. Perform a sediment quality screening study to identify potential sources of sediment contamination.
4. Obtain preliminary representative sediment samples and perform a suite of analytical tests to assess sediment chemical quality.
5. Revise project costs, as needed, to account for any anticipated premium cost for handling and disposal of contaminated sediment. Alternatively, provide justification that such costs are marginal and/or are covered in the contingency.

Final Panel Comment 7

The project feasibility-level drawings do not show the type of transitions between sloped channel sections and retaining walls that will likely be developed under final design, which could result in significant design modifications, changes in project hydraulics, and an increase in project costs.

Basis for Comment

The Plates depicting the final conditions plans (Engineering Plates Appendix, Sheets C-101 to C-114) show the project alignment and the various locations of improved channel side slopes and retaining walls. The transitions between sloped channel sections and retaining walls are shown as abrupt changes (see Sheet C-110 near Sta. 53+50M and C-111 near Sta. 62+25M). The Panel's opinion is that the conceptual depiction of the transitions will require substantial alteration in later design phases. A smooth transition detail will be needed for civil, structural, and hydraulic continuity.

The final disposition of the transition details could ultimately result in changes to the channel sides (slope versus wall) at several sections along the channels. For example, short sections of sloped channel sides between upstream and downstream sections of retaining walls might be removed to eliminate the need for two transitions. Such changes to the project layout could have the effect of changing (increasing) the total length of retaining walls. The substitution of retaining walls for channel slopes could result in increases in project cost, because the cost per linear foot of retaining walls is greater than the cost per linear foot of sloped channel bank. Changes to the channel design would also require reconfiguration and a reanalysis of the improved conditions hydraulic model.

Significance – Medium/High

Refinement of the channel side slope/retaining wall transition detail may lead to changes in the proposed project configuration, which could increase cost and alter the anticipated hydraulic performance of the project.

Recommendation for Resolution

1. Provide additional civil and structural details regarding the channel side slope/retaining wall transition.
2. Reassess the locations of improved side slopes and retaining walls in light of the need for a smooth transition between the two types of channel bank configurations.
3. Revise project costs, as needed, in light of any changes to channel bank configurations made as a result of the consideration of the transition detail. Alternatively, provide justification that the extent of such changes is marginal and additional costs are covered in the contingency.
4. Revise project hydraulics, as needed, in light of any changes to channel bank configurations made as a result of the consideration of the transition detail.

Final Panel Comment 8

The proposed channel improvements include trapezoidal and rectangular sections, but a 2-dimensional model was not developed or applied to represent channel and overbank hydraulics, particularly in the transition zones.

Basis for Comment

The drawings depicting the NED and LPP channel improvements do not show transitions between rectangular retaining wall channel segments and trapezoidal earthen channel segments. A 1-dimensional Hydrologic Engineering Center River Analysis System (HEC-RAS) hydraulic model was used to develop flood profiles for the proposed channel improvements. The Panel could not discern from the decision documents how these transition areas will be treated from a design perspective. Abrupt channel transitions and flow around buildings can create complex flow patterns that a 1-dimensional hydraulic model cannot capture and may underestimate hydraulic losses. This may lead to underestimates of the flood profiles, which could result in over-predicting project benefits.

In addition, the 1-dimensional hydraulic modeling provides only an average channel velocity that was used for the design of riprap channel protection. A 2-dimensional hydraulic model, such as HEC-RAS 5.0, may better replicate the potential hydraulic losses and flow distribution/velocities within the channel and overbank areas and allow for a refined assessment of scour/sedimentation. High resolution LiDAR-based topographic data are available for Westchester County and, when combined with the surveyed channel cross sections, would serve as an excellent source of data for development of a 2-dimensional hydraulic model of the project reach.

Significance – Medium

Hydraulic modeling with a 1-dimensional model may underestimate hydraulic losses, particularly in channel transition areas and around buildings, which could affect project performance and result in the need for project design changes and/or revised project benefits and costs analysis.

Recommendation for Resolution

1. Perform 2-dimensional hydraulic modeling to support a detailed design of the proposed channel improvements.
2. Revise project benefits and costs if the 2-dimensional modeling indicates changes in hydraulic performance and the need for project design changes.

Final Panel Comment 9

Retaining wall construction cost may be significantly understated in the decision documents.

Basis for Comment

The extent of foundation excavation for cantilever retaining walls is incompletely portrayed in the GRR and Structural Appendix cross-sections. Retaining wall foundations, based on the average height of walls as stated in GRR Table 20, is 8.4 feet. Allowing for the limitation of excavation equipment, frost line depth, scour concerns, and over-excavation to allow construction activities and base course placement, that average wall will require a footing excavation 2 to 5 feet deeper than the finish channel elevation and 6 to 10 feet landward from the face of the wall. Allowing for constructability, a worst case Type 6 wall excavation could be as much as 10 to12 feet horizontal landward from the face of the wall and 22 to 24 feet vertical into the landside formation from the face of the finished wall. Based on the current conceptual cantilever wall designs and assuming a 1.5H to 1V temporary excavation backslope for OSHA Type 3 granular soils, this could result in excavation limits at the top of slope of over 20 feet from the face of an average wall and up to 48 feet for the highest walls. This is exclusive of any additional temporary easement needed at the top of slope. Without quantity take offs or cost-estimating details, it is not possible to determine from the review documents whether these specific construction features were included in the project cost estimate.

Non-cantilever retaining walls in the lower Mamaroneck River reach will require far less excavation. The retaining wall foundation could be replaced by anchoring the vertical wall directly to bedrock. This will likely require grouting vertical reinforcement or tendons into holes drilled into sound rock. This discussion of non-cantilever wall construction occurs in one line of the Structural Appendix, Section 2.2.1, p. 13. Without cost-estimating details, it is not possible to determine whether these specific construction features, including drilling into rock and adjusted production rates, were included in the project estimate.

USACE Safety Manual EM 385-1-1 (USACE, 2008) will require measures to insure worker safety where foundation cuts are 4 feet or deeper. The project retaining walls are typically being placed where structures or infrastructure do not allow for sloping channel sides for channel capacity, therefore sloping the excavation on the landside for construction safety will be limited. Even though the soil angle of repose for construction safety will likely be steeper than 2.5:1 and some side slope can be used, it is risky to assume that some sort of asymmetric shoring, or other type of slope stabilization will not be required, particularly where existing structures are close to the construction area. The constructability impact of this added excavation is not discussed in the GRR. Without quantity take take-offs or cost-estimating details, it is not possible to determine whether these specific construction features were included in the project cost estimate.

The Plates Appendix indicates retaining walls close to existing structures (Sheet C-105 near Sta. 23+50S and Sheet C-113 near Sta. 79+50). The Structural Appendix recognizes that there are industrial buildings close to the river's edge and discusses the potential need for surcharge loading. The Geotechnical Appendix recognizes the potential need for underpinning of nearby existing structures during construction. Concrete cantilever retaining walls may not be appropriate where existing buildings are close to the proposed wall alignment unless temporary shoring/underpinning is provided and may limit wall placement. The GRR does not address this condition. The need for underpinning of existing structures during construction of cantilever walls could increase project costs.

The GRR (p. 31-10) and several locations in the DEIS indicate that a construction work area would extend landward 15 feet from the edge of the bank. During the mid-review teleconference with USACE

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and the Panel (facilitated by Battelle), USACE clarified that they established construction areas generally from the line of improvements (i.e., landside of new retaining wall/top hinge point of slope, etc.), which could vary depending on location from less than 15 to 30 feet. On average, the Temporary Work Area Easement (TWAE) would be 15 feet less whatever is needed for excavation and slope stability. This forces the contractor to accept the risk of a constrained work area or to provide temporary shoring at additional cost, or will require increased real estate requirements.

Significant cost risk is introduced to the project if the construction methodologies cited above are not captured in the project cost estimate, affecting project efficiency and completeness.

Significance – Medium

Retaining wall construction may require construction methods with greater excavation, lower production rates, and foundation underpinning not accounted for in the project cost estimate.

Recommendation for Resolution

1. Verify that the cost estimate includes excavation quantities and appropriate production rates for the wall foundation space wall heel.
2. Verify that the cost estimate includes allowances for sloping (additional) excavation or shoring for worker safety and stabilization of adjacent existing structures.
3. Verify that the cost estimate includes backfill quantities and appropriate production rates for the excavation landside of the wall plus any excavation required to provide safe working conditions.
4. Provide additional discussion in the GRR and Structural Appendix on the need for retaining wall alternative configurations, including underpinning, where existing structures may be within the area affected by retaining wall construction, including construction-phase land-side excavation.
5. Clarify in the GRR and the Real Estate Appendix the relationship between the TWAE, the retaining wall excavation, and proximity of building and roads. (The TWAE will extend landward the lesser of 15 feet from the furthest extent of excavation or half the distance to the nearest structure, utility, or roadway.)
6. Update, as required, the project cost estimates based on updated quantities and production rates.

Literature Cited:

USACE (2008). Safety – Safety and Health Requirements. Engineer Manual (EM) 385-1-1. Department of the Army, U.S. Corps of Engineers, Washington, D.C. 15 September. Available online at: http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_385-1-1_2008Sep_Consolidated_2011Aug.pdf.

Final Panel Comment 10

The approach for analyzing storm surge and tides coupled with high fluvial flows does not include several historic storm events and therefore the downstream boundary condition for the hydraulic modeling may be underestimated.

Basis for Comment

Based on the Tidal-Fluvial Correlation section (GRR Hydraulics Appendix), the Willits Point tide gage data used in the analysis only had records from 1966 to 2000, and the Kings Point gage had data ranging from 1999 to 2010. Analysis of fluvial flows and peak tides for these years was used to develop a downstream elevation of 5.35 NAVD 88, which was used as the boundary condition for all hydraulic model runs.

Based on the Panel's review of NOAA and National Weather Service tide gage data, it appears that the period of record for each gage dates back well before 1966, with Willets Point having data extending back to 1931 and the Long Island at Kings Point having data that extends at least to 1938. A list of historic crests at Kings Point from the National Weather Service is presented below. Note that the three highest crests occur in years not included in the tidal-fluvial correlation analysis performed for this project.

Historic Crests – Kings Point
(1) 16.75 ft on 09/21/1938
(2) 14.76 ft on 08/31/1954
(3) 14.31 ft on 10/29/2012
(4) 14.29 ft on 12/11/1992
(5) 13.60 ft on 02/07/1978
(6) 13.05 ft on 11/25/1950
(7) 12.95 ft on 11/12/1968
(8) 12.70 ft on 10/19/1996
(9) 12.68 ft on 10/25/1980
(10) 12.41 ft on 02/19/1972

As many of the historic tides are associated with hurricanes, which are capable of extreme rainfall, the exclusion of the expanded period of record would likely result in increases to the downstream elevation curves. For example, the highest tide crest on record that also resulted in a significant fluvial flow for the Mamaroneck River was recorded in 1938.

The Panel has noted that the hydraulic analyses do indicate that the actual project reach is located at elevations above tidal influence. Therefore increases in the hydraulic model downstream boundary condition may not result in significant increases in predicted flood profiles through the project reach. However, if a revised downstream boundary condition does result in changes to the flood profiles, the project benefits and costs analyses would need to be revised.

Significance – Medium

The tidal-fluvial correlation performed as a component of the hydraulic analysis may underestimate potential tidal/storm surge conditions.

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Recommendation for Resolution

1. Revise the tidal-fluvial analysis to include the full period of record for regional tide gages.
2. Revise hydraulic models as needed based on the results of expanded tidal gage analysis.
3. Consider possible revisions to project benefits and costs analysis based on the above recommended revisions to the hydraulic modeling.

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The assumption that flood damages will be uniform over the 50-year life of the project does not take into consideration the effects of climate change on storm surge and fluvial flows, which could affect the calculation of the benefit-cost ratio.

Basis for Comment

The project benefit calculations are based on the assumption that damages will be uniform over the 50-year life of the project. This assumption is at variance with current research that indicates that extreme storm frequencies are increasing as a result of climate change (EPA, 2015). Increases in sea level, which USACE is required to consider, combined with increased storm surges (such as occurred in Superstorm Sandy) could increase the likelihood of damaging storms impacting the project area (NOAA, 2013). Engineer Technical Letter 1100-2-1 (USACE, 2014) specifies how sea level change is to be treated on USACE projects.

GRR Section 5.3.2 (p. 5-6) notes that Geoff Bonnin of the National Weather Service stated that climate change appears to be impacting (increasing) frequent events like the 1-year to 10-year return periods, but has little impact on major events like the 50-year and greater. Based on review of the Tidal-Fluvial correlation presented in the Hydraulics Appendix, the Panel finds the combined tidal-fluvial events included in the analysis generally had tidal return periods ranging from <1 year to 5-year return periods. Thus, corresponding storm-induced surge in Long Island Sound may experience similar increases in levels.

Furthermore, the Panel noted that the tidal-fluvial evaluation of historic events did not include several storm events that had high fluvial flows combined with high storm surge levels. When potential increases to the existing conditions downstream boundary condition are combined with potential increases associated with future climate change, the with-project flood benefits and residual damages and without-project flood damages might be higher than those estimated. GRR Section 5.3.2 (p. 5-5) notes that the design and the effectiveness of the TSP in reducing flood risk would not be changed with increased storm frequency. However, if the frequency of storms and corresponding storm surge does increase over time, the estimated benefits of the TSP would increase.

Significance – Medium

The potential greater magnitude of storm surge, sea level change, and fluvial flows associated with climate change over the lifespan of the project introduces uncertainty in project benefits.

Recommendation for Resolution

1. Rectify the magnitude of storm surge used in GRR Table 5 (p. 5-7) when compared to surges from Hurricane Sandy and other significant events such as September 1938.
2. Demonstrate by means of a comparison of top of bank/wall elevation vs. surge height elevation the frequency and location of overbank flows due to surge-induced backwater.
3. Consider modifying the flood probability analysis and the flood risk reduction benefit to reflect increasing likelihood of damaging storms and the effect of storm surges above the project boundary elevations during the project life associated with climate change.
4. Consider revising the future without-project flood probability and damage projections.

Literature Cited:

EPA (2015). Climate Impacts in the Northeast. U.S. Environmental Protection Agency. Available only online at: http://www.epa.gov/climatechange/impacts-adaptation/northeast.html#ImpactsPrecipitation

NOAA (2013). New analyses find evidence of human-caused climate change in half of the 12 extreme weather and climate events analyzed from 2012. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 5 September. Available only online at: http://www.noaanews.noaa.gov/stories2013/20130905-extremeweatherandclimateevents.html

USACE (2014). Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation. Engineer Technical Letter (ETL) 1100-2-1. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 30 June.

Final Panel Comment 12

A sediment transport analysis was not conducted to identify areas within the channel that are prone to sediment deposition or to determine the potential for increased erosion downstream of the project area.

Basis for Comment

The proposed channel improvements generally include widening and deepening of the channel, with some segments having a trapezoidal earthen channel section and other areas using a rectangular channel section with vertical concrete retaining walls. In areas where the channel will be deepened, the proposed design uses a constant longitudinal slope. This contrasts with the existing channel profile, which has local undulations common to streams with a pool-riffle geomorphic regime and is indicative of erosional and depositional segments. The GRR Hydraulic Appendix Section 4.5 (p. 107) notes that the HEC-RAS hydraulic model was used to examine channel velocities and that riprap/concrete are proposed for bank protection at areas with high velocities. GRR Section 32.1 and Hydraulics Appendix Section 4.7 (p. 117) also include a qualitative discussion on sedimentation that describes a small but general scouring trend based on comparison of cross-sections from the 1989 GDM and current GRR; however, sediment transport modeling was not performed.

The Panel is concerned that in the long term, the channel may be geomorphically unstable and may attempt to develop a more undulating longitudinal profile through regions of scour and deposition. GRR Section 32.1 (p. 32-1) and Hydraulics Appendix Section 4.7 (p. 117) note that some segments of the existing channel have developed shoals on the upstream side of several bridges following large storm events, but also state that sediment removal required for maintenance should be less than existing conditions because of the proposed erosion protection measures (Hydraulics Appendix Section 4.8). A sediment transport model was not used to support this statement.

The Panel also has concerns regarding potential erosion/sedimentation issues downstream of the project reach. Channel velocities through the project reach will likely increase due to the more efficient channel sections and removal of constrictions. This may increase the sediment transport capacity, which may induce increased erosion downstream of the project reach.

While a qualitative assessment of scour and sedimentation is included in the GRR, a geomorphic assessment and sediment transport modeling were not performed to quantify potential impacts on upstream and downstream reaches or the potential amount of sediment that may need to be removed from the channel as part of long-term operations and maintenance cost.

Significance – Medium

The flood reduction benefits of the project rely on the proposed channel cross-sections and improved longitudinal profile; however, areas of sediment deposition could reduce channel capacity and the corresponding flood reduction benefit.

Recommendation for Resolution

1. Perform a geomorphic assessment and sediment transport modeling of existing and proposed conditions.
2. Revise the operations and maintenance costs if transport modeling indicates that erosion and sedimentation will vary over the project life.

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Potential alternative methodologies for slope stabilization and channel improvements that would allow for retention of riparian vegetation, use of bioengineering stabilization techniques, or mitigation of impacts on vegetation within the watershed are not addressed.

Basis for Comment

Review of the decision documents indicates that proposed channel modification and stabilization methods will rely entirely on concrete, hard armor, and traditional engineering methods for flood control and bank stabilization. This is understandable in that the majority of the study area within the watershed consists of impervious cover and there are limited options for addressing flooding issues. However, because significant vegetation loss will result, there are associated environmental impacts within the river corridor and on the Mamaroneck community, including less shading and potential associated urban heat island effect, aesthetic impacts, and some limited wildlife habitat destruction.

On other projects (e.g. Rahway River, New Jersey Continuing Authorities Program 1135 project) USACE has typically looked at a variety of bioengineering techniques (including articulated blocks, integrated with vegetation plantings) as a means of achieving slope stabilization, while maintaining or improving wildlife habitat within the riparian corridor. Incorporating vegetation into the concept could help improve habitat for migrating birds, small mammals, raccoons, or other suburban wildlife inhabiting the area. DEIS Section 5.1 (p. 110) refers to plans to be developed to mitigate loss of vegetation in accordance with the local stakeholders. However, no rendering or concept sketch is provided showing where vegetation will be affected, and how the replanting program will offset vegetation loss.

Further, DEIS Appendix D, "New York State Department of State, Coastal Management Program:State Coastal Policies" references NYSDEC policies and conformance of the TSP with them. Specifically Policy 17 states:

> "Non-structural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible. Policy 17 recognizes the costs of structural protection measures against flooding and erosion hazards that are related to the planning, siting, and design of proposed activities and development. As a result, it encourages the use of nonstructural measures within coastal erosion hazard areas (e.g., planting appropriate vegetation to strengthen coastal landforms) and flood hazard areas including "(a) the avoidance of risk or damage from flooding by the siting of buildings outside the hazard area, and (b) the flood-proofing of buildings or their elevation about the base flood level." (NYSDOS, 2001)

Also, the DEIS cumulative impacts discussion does not provide details as to how historical vegetation loss within this watershed will not be further exacerbated by the TSP. For example, replanting with younger trees would not offset the impact, and a larger number of trees might be required, more "strategically" placed in order to offset impacts on the watershed as a whole.

Significance – Medium

Incorporation of design elements that include vegetation would help ameliorate potential environmental effects and ensure that long-term project objectives are met.

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Recommendation for Resolution

1. Evaluate potential methods of slope stabilization that would incorporate vegetation (e.g., articulated blocks that allow willow planting) and work with the community to develop a watershed level tree planting approach to address the fundamental issue of impervious cover within the watershed.

Literature Cited:

NYSDOS (2001). State Coastal Policies: New York State, Department of State Coastal Management Program. Albany, New York. Available online at: http://www.dos.ny.gov/opd/programs/pdfs/CoastalPolicies.pdf

Final Panel Comment 14

Assumptions regarding the cost of treating existing masonry retaining walls may be understated if the walls are deemed to have historical significance.

Basis for Comment

The GRR, as detailed below, indicates that existing masonry walls that may be considered historic or otherwise significant will be removed where they interfere with proposed project features. The need for mitigation for the removal of these walls, or rehabilitation of these walls in place is uncertain and may impact project completeness.

- GRR Section 2.1.4, Existing Projects, indicates that 1000 feet of masonry walls over 50 years old and therefore potentially considered historic remain in the project footprint.
- GRR Section 31.1.2, Cost and Benefit Summaries of the NED and LPP Plans (and other locations within the decision documents), indicates that from an engineering perspective, the existing walls will not withstand the channel work required and that the final plans require replacement of the existing walls.
- GRR Section 32.5.8, Cumulative Effects-Cultural Resources, indicates that, from the cultural resources perspective, the mitigation efforts for the masonry walls is part of the ongoing consultation as USACE looks to reduce the cumulative effects on the walls.
- GRR Section 33.4.4, Avoidance, Minimization and Mitigation Measures-Cultural Resources on indicates (p. 33-10) that a draft Memorandum of Agreement (MOA) is being reviewed and developed to minimize or mitigate the adverse effects on walls. The nature of the mitigation proposed in the draft MOA is not detailed in the decision documents.

The study appears to assume that the walls will be demolished during construction and that any required mitigation would be incorporated into the project. According to USACE in their June 17, 2015 kick-off briefing to the IEPR Panel and Battelle, the State of New York may designate these masonry walls as having historical or other significance. Should this designation become official, the design and construction of the retaining walls in those areas could require mitigation, including more complicated foundation and vertical design and construction methods to incorporate, not demolish, the walls.

The Cost/Schedule Risk Analysis (CSRA) generally assigns risk and contingency for the uncertainty. New retaining wall construction is a major cost and schedule driver in this project. Based on the documentation provided; the length of existing walls (1000 feet); the unspecified nature of proposed mitigation included in the draft MOA; and the degree of detail the Project Delivery Team shared this risk during the CSRA brainstorming meeting conducted September 16, 2014, it is unclear if the CSRA captured the magnitude of this risk, which could affect 25% of the overall wall length.

Should the State of New York designate all or some of these masonry walls as having historical or other significance, the project may require some degree of plan reformulation (avoidance and minimization of impacts); mitigation could require all or some of the masonry walls to be strengthened in place to withstand anticipated loads. Since these existing masonry walls affect 25% of the overall new retaining wall length, such plan reformulation and mitigation could significantly impact project cost and schedule.

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Significance –Medium

If all or some of the existing masonry walls are designated as having historical or other significance, the implications to project cost and schedule could affect formulation and selection of the alternatives.

Recommendation for Resolution

1. Use the most current state historic office consultation and the status of the indicated MOA under review to measure the probability of risk occurrence and the cost of the specific risk to mitigate disturbance of the existing masonry walls.
2. Verify that the CSRA considered this risk and incorporated cost and schedule contingency into the project accordingly.

Final Panel Comment 15

The discount rate presented in the GRR is inconsistent with the rate used in the HEC-FDA analysis, which could affect the benefit-cost ratio.

Basis for Comment

Tables 7, 11, and 19 of the GRR base the discount rate on the 2012 rate of 4%. Tables 21, 24, and 25 of the GRR use the 2014 rate of 3.3.75%. The HEC-FDA run Mamaroneck Base Model assumes yet another discount rate, 3.75%.

The discount rate can influence the benefit-cost ratio (BCR) when there is a temporal spread between costs and benefits. For example, current costs weigh less heavily than future benefits as the discount rate decreases, thus increasing the BCR. The different rates reported in the decision documents should be reconciled to a single value and used throughout.

Significance – Medium

Although the discount rate has changed over the course of the project, it is important that the decision documents reflect a consistent rate since the rate used could affect the BCR and thus the economic justification of the project.

Recommendation for Resolution

1. Decide which discount rate should be applicable to the project and apply this value throughout the decision documents.

Final Panel Comment 16

Economic damages resulting from business interruption do not appear to have been considered in the economic analysis, which could affect the calculation of the benefit-cost ratios.

Basis for Comment

The flood risk reduction benefits reported in the decision documents focus on reduction of damage to structures and property. Although commercial structures constitute a major component of the value of the structures protected in the proposed project area of the TSP, the decision documents do not include any estimates of the benefit of flood risk reduction in reducing business interruption.

Considering the frequency of flood experienced in the project area, reduction in flood damage to structures might also result in significant reduction in business interruption losses. Even if business interruption losses are insured, reducing these losses is an NED benefit. Estimating the reduction in business interruption losses might result in an increased benefit-cost ratio. Inclusion of business interruption impacts might also influence the selection of the alternatives since the business interruption benefit is not closely correlated with reduced damage to commercial structures.

Significance – Medium

The estimated benefits of the project alternatives might be increased by including business interruption impacts. The selection of the TSP and the BCR might be affected by this consideration as well.

Recommendation for Resolution

1. Provide estimates of business interruption damage reduction for the alternatives. Modify the benefit-cost calculations accordingly.
2. Review whether the selection of the TSP would be influenced by inclusion of business interruption benefit considerations.

Final Panel Comment 17

The geotechnical investigations completed for the previous 1988 GDM have not been supplemented or updated to reflect the configuration of the TSP, which adds uncertainty to the assumptions made about subsurface conditions and could result in changes in the overall project cost.

Basis for Comment

The geotechnical information used in the GRR was acknowledged as obtained from previous studies, including the 1988 GDM, without supplement from new data. This strategy is, in the Panel's opinion, adequate and acceptable for the current purposes in that subsurface conditions are unlikely to have changed substantially in the time since the data were collected. However, there are two specific areas where additional data will be necessary during future phases: the Waverly Place bridge and the Harbor Heights area. Because retaining wall locations are now specified in the concept plans for the TSP, the extent of future subsurface explorations to validate subsurface conditions in these locations can likewise be more readily understood. Additional data are also desirable to better define current sediment thicknesses, sediment character, top of rock elevations, and rock competency.

As with all projects, subsurface conditions can vary from those assumed. The level of uncertainty (and thus the risk level of changed-condition claims during construction) can be reduced, but not eliminated, by obtaining additional data through test borings, geophysics, or similar investigations. The project documents acknowledge the need for additional subsurface investigations, which will reduce the level of risk and uncertainty. The Geotechnical Appendix acknowledges the need for additional data to confirm certain assumptions by saying in the Conclusions section (p. 12), "Some areas for the soil and rock conditions need to be defined for additional borings along the Sheldrake River and also rock depth to refine the rock line in the Mamaroneck River."

Certain information in the Geotechnical Appendix is outdated (New York State seismicity data) and certain parts of the discussion (bridge replacements) have been superseded by the new preferred alternatives. The Panel also notes that assignment of cohesion values to soils typically considered as non-plastic, such as SW and SM (and potentially the ML soils, given the notes on the soil test logs) is non-standard. Other soil parameters such as phi angles and friction factors appear consistent with the data contained in the available subsurface exploration logs. No discussion of the potential for foundation liquefaction is provided. Some of the non-plastic soil types present in the project area may be vulnerable to liquefaction, though the in-situ densities will likely mitigate at most locations, based on available subsurface data.

No slope stability analyses were performed as a part of this study to justify the assumed 2½ to 1 (H to V) channel slopes. This is a key project parameter as the need for flatter slopes would change project real estate requirements and/or potentially lead to the need for additional retaining walls. Both the Geotechnical and Structural appendices acknowledge the need for future slope stability analyses.

The conclusion of the Geotechnical Appendix (p. 12) is that, "The overall project site is geologically feasibility for construction of the proposed channel improvements, along with retaining walls, bridge replacements, and reconstructed side slopes." It is the Panel's opinion that there is sufficient evidence to support this general conclusion. However, the current level of geotechnical information creates a relatively high level of uncertainty in the assumptions used for conceptual design, which should be reflected in the project cost estimates. The primary risk regarding the availability of geotechnical data is that project costs might increase if additional rock excavation is found necessary or if sediment

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contamination requires premium costs for material handling and disposal.

Significance – Medium

The available geotechnical data were developed for the 1988 GDM, which raises the level of uncertainty regarding current assumptions made in preparing quantity and cost estimates and could thus affect the accuracy of the estimated overall project cost.

Recommendation for Resolution

1. Provide additional discussion of the type, locations, and extent of additional geotechnical investigations required if the project advances to the next stage.
2. Revise the Geotechnical Appendix to be more clearly consistent with the current project preferred alternative configuration, specifically regarding actions at bridge structures.
3. Revise the discussion of seismicity in the geotechnical appendix to be consistent with the Structural Appendix.
4. Reassess the soil properties (specifically cohesion) assigned to the SW, SM, and ML soils.
5. Provide qualitative discussion of foundation liquefaction issues.
6. Provide qualitative discussion of, and justification for, stability of 2½:1 side slopes in the absence of analytical slope stability analysis.
7. Discuss the level and implications of uncertainty resulting from the currently available geotechnical data, with specific emphasis on the quantities and costs that could be affected.
8. Review cost estimate assumptions in light of uncertainty resulting from the current level of geotechnical information, and revise project costs, as needed. Alternatively, provide justification that uncertainty is low or that the appropriate level of uncertainty is covered in the contingency.

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The elevation of the top of bedrock and the specific information about rock competency is uncertain throughout the project area and could result in increased costs if additional rock excavation volumes or effort (e.g., blasting, drilling and splitting, etc.) is required during construction.

Basis for Comment

The GRR acknowledges that it uses geotechnical information obtained from previous studies without supplement from new data. Assumptions are made regarding subsurface conditions throughout the project area based on the current availability of subsurface data. Available data are interpolated to estimate soil and rock profiles throughout the project area. This is standard practice in geotechnical engineering and is appropriate, particularly for this level of study. However, the sparseness of data from previous studies and lack of new data create uncertainty about actual existing conditions, specifically the depth of rock in the project area and the competency of rock (i.e. weathering, hardness, excavation characteristics) in areas where excavation is required. The Geotechnical Appendix acknowledges the need for additional data to confirm certain assumptions by saying in the Conclusions section (p. 12), "Some areas for the soil and rock conditions need to be defined for additional borings along the Sheldrake River and also rock depth to refine the rock line in the Mamaroneck River."

Rock excavation is likely to be a relatively important component of project costs. The primary risk regarding the availability of geotechnical data on rock surfaces and rock character (competency) within the project area is that project costs might increase if additional rock excavation is found necessary. In addition, rock excavation creates certain secondary impacts, including noise and vibration. Additional rock excavation could increase these environmental impacts.

Significance – Medium/Low

Data regarding rock surface elevations and competency are based on previous studies and may not fully describe existing conditions, thereby raising the level of uncertainty regarding environmental impacts and the cost of rock excavation

Recommendation for Resolution

1. Provide additional discussion on the type, locations, and extent of additional geotechnical investigations needed to better define the top of rock surface if the project advances to the next stage.
2. Provide additional discussion about likely and acceptable types of rock excavation methods and how such methods are compatible with the character of the bedrock based on existing information.
3. Describe how environmental impacts (specifically noise and vibration) might change if the estimated quantity of rock excavation were to increase.
4. Discuss the level and implications of uncertainty with respect to data on the bedrock surface and estimated rock excavation quantities.
5. Review cost estimate assumptions in light of uncertainty resulting from the current level of geotechnical information about top of rock elevation and character. Revise project costs, as needed. Alternatively, provide justification that uncertainty is low or that the actual level of uncertainty is covered in the contingency.

Final Panel Comment 18

The impacts of greenhouse gases from the perspective of vegetation loss associated with project implementation or the potential benefits of conserving existing vegetation are not addressed.

Basis for Comment

The DEIS discussion focuses on short-term air quality impacts from construction activities, which would include greenhouse gas (GHG) emissions. However, mature trees within the existing river corridor actively sequester carbon dioxide daily, and their removal and replacement with smaller trees would result in a net gain in greenhouse gases emitted to the atmosphere. This impact and its potential mitigation is not addressed in the DEIS.

According to the Council on Environmental Quality (CEQ) guidance on assessing environmental impacts of GHG emissions (CEQ, 2010):

> "[C]limate change issues arise in relation to the consideration of:
> 1. The GHG emissions effects of a proposed action and alternative actions; and
> 2. The relationship of climate change effects to a proposed action or alternatives, including the relationship to proposal design, environmental impacts, mitigation and adaptation measures."

The second consideration has not been effectively addressed in the DEIS. This is not meant to imply that impacts are significant, or that climate change modeling or specific emissions calculations from vegetation removal be prepared. Rather, some qualitative discussion of the impacts of vegetation removal (acreage or number of mature trees) and their nature (mature deciduous hardwood forest, woody old field, etc.) and its potential impact relative to the Future No Action condition appears warranted from the perspective of GHG emissions. Extending this discussion to include the cumulative impacts of the project relative to GHG emissions and climate change would be beneficial as well.

Significance – Medium/Low

Climate change is an important issue, and while the project will likely not have significant impacts, the relationship between vegetation and climate change in the future should be considered and discussed in the DEIS.

Recommendation for Resolution

1. Discuss the active role of vegetation in sequestering carbon within the study area, and the potential impacts of vegetation removal as well as how the impact would be mitigated.

Literature Cited:

CEQ (2010). Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions. Memorandum for Heads of Federal Departments and Agencies. Executive Office of the President of the United States, Council on Environmental Quality. 18 February. Available online at: https://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf.

Final Panel Comment 20

Environmental impacts are frequently described qualitatively in the GRR and DEIS and may not completely represent certain quantitative environmental impacts for the project.

Basis for Comment

The Panel is concerned that a number of qualitative characterizations of environmental impacts, especially on vegetation, wetlands, riparian habitats, recreation, and aesthetic resources, do not completely disclose certain discrete and quantifiable impacts that could affect project completeness and acceptability. These concerns include:

- **Parking Lot Closure**: The new 389 LF, 8 ft x 25 ft cross-section bypass culvert will pass under a parking lot used by commuters at the train station. Installation of this culvert will close one roadway approach (Station Plaza Drive) to the train station and 75% to 100% of the parking lot during construction of the culvert. Schedules shown in Figures C-1 and C-2 (Cost Appendix) appear to indicate this work could take as long as 5 months. The GRR cites the objective of avoiding impacts on train commuters in several locations and further describes transportation impacts as minor and short-term. While many project impacts are best described in general terms, in this case, the decision documents could more clearly describe the nature of this discrete identifiable environmental impact and discuss potential mitigation.
- **Retaining Wall Excavation**: The extent of foundation excavation for cantilever retaining walls is incompletely portrayed in the GRR and Structural Appendix cross-sections. Retaining wall foundations, based on the average height of walls as stated in GRR Table 20, are 8.4 feet deep. Allowing for constructability, that average wall will require a footing excavation 2 to 5 feet deeper than the finish channel elevation and 6 to 10 feet landward from the face of the wall. A worst case Type 6 wall excavation could be as much as 10 to12 feet horizontal landward from the face of the wall and 22 to 24 feet vertical into the landside formation from the face of the finished wall. Further, worker safety during construction could require a 1.5H to 1V temporary excavation backslope that could result in excavation limits at the top of slope of over 20 feet from the face of an average wall and up to 48 feet for the highest walls. While many project impacts are best described in general terms, in this case, the decision documents could more clearly describe the nature of this discrete identifiable environmental impact
- **Removal of Vegetation**: The decision documents state that existing trees, shrubs, and other vegetation in the construction area will be removed and replaced to the extent practicable. The GRR Executive Summary (pp. iv and v) and GRR Section 32.5 (p. 32-3) states that this action will result in minor short-term and moderate long-term impacts on vegetation, and minor short-term and moderate long-term impacts on aesthetics and scenic resources. The nature of the construction in this constrained landscape indicates that virtually 100% of vegetation will be removed wherever permanent work features will be placed. In addition, there is the potential for further vegetation removal 15 to 30 feet inland from the edge of any permanent feature in the temporary work area easement. GRR Section 33-2 (p. 33-2) states that as a requirement of operations and maintenance (O&M), no trees will be replanted in the channel or side slopes. Woody shrubs and bushes would only be allowed above the mid-point of the slope in channels. O&M requirements do not indicate how much of permanent easement will be needed at the top of retaining walls and the extent that trees and vegetation will be allowed at the top of walls. While many project impacts are best described in general terms, in this case, the decision documents do not clearly describe the nature of this discrete identifiable environmental impact or discuss potential mitigation.

Final Panel Comment 20

- **Permanent Loss of Habitant**: Review of project cross-sections and text indicate that shaded riparian habitant will be essentially eliminated permanently from those sections of the river with permanent project features. O&M requires greatly restricted planting in the channel for the project life. While many project impacts are best described in general terms, in this case, the decision documents do not clearly describe the nature of this discrete identifiable environmental impact or discuss potential mitigation.
- **Vibration Due to Ripping**: The need for blasting rock is addressed only in DEIS Section 4.1.1.1 (p. 79) states that the project will not require blasting and removal of rock can be accomplished by ripping. The DEIS does not address the impacts from vibration of ripping rock, primarily in the lower Mamaroneck River. The common threshold for potential damage to building is 0.5 mm/s. Depending on equipment, relative existing rock fracturing, and distance to structures, this vibration could be a concern. While details will be determined in the design phase, the decision documents do not acknowledge vibration as a potential issue to be evaluated later in the project.
- **Noise and Vibration Due to Drilling**: Non-cantilever retaining walls in the lower Mamaroneck River will require anchoring the vertical wall directly to bedrock. This will likely require grouting vertical reinforcement or tendons into holes drilled into sound rock using rotary air impact drills. No calculations are provided in the decision documents for reinforcement spacing, but based on cantilever wall structural calculations, this may require drilling holes every 9 inches. Drilling into rock will produce significant noise and vibration. The DEIS does not address the impacts from noise and vibration caused by drilling rock. The common threshold for potential damage to building is 0.5 mm/s, but the threshold for human perception much lower. While details will be determined in the design phase, the decision documents do not acknowledge vibration and noise specific to rock drilling as a potential issue to be evaluated later in the project.

Significance – Medium/Low

Full disclosure of probable environmental impacts and the magnitude of quantifiable impacts will improve the completeness of the decision documents.

Recommendation for Resolution

1. Add text to the GRR and DEIS that discloses environmental impacts on Station Plaza Drive and the train station commuter parking lot that will be closed by construction for a period of 5 months (or other duration as detailed in engineering analysis used in the cost estimate).
2. Add text to the GRR and DEIS that discloses the environmental impact that no trees will be allowed in the newly constructed channel or slide slopes for the life of the project.
3. Add text to the DEIS that discloses environmental impacts of tree removal not only by citing the number of trees to be removed, but also the percentage of trees and vegetation to be removed from the work area.
4. Add typical ‘before’ and ‘after’ artist renderings to the GRR and DEIS that better depict environmental impacts on vegetation, wetlands, riparian habitats, recreation, and aesthetic resources.
5. Add typical ‘before,’ ‘during,’ and ‘after’ cross-sections to the GRR that show environmental impacts due to excavation for retaining walls, and Temporary Work Area Easements.
6. Add text to the GRR and address only in DEIS Section 4.1.1.1 to better qualify environmental impacts due to noise and vibration from ripping rock and drilling rock. This disclosure of

Final Panel Comment 20
environmental impacts should include the expected duration as detailed in engineering analysis used in the cost estimate.

Final Panel Comment 21

The overall benefits of the project may be underestimated since the full implications of the improvements to storm water quality entering Mamaroneck Harbor are not presented in the DEIS.

Basis for Comment

The executive summary of the DEIS (p. iv) references recreational benefits to users of Mamaroneck Harbor for fishing and swimming as a result of "a reduction in increased sediment loads delivered to Mamaroneck Harbor during flooding events that affect water quality and water-related recreation." The discussion of surface water impacts appears to focus primarily on short-term adverse impacts from project construction activities. The DEIS does not present detailed discussion of potential long-term project benefits from improved storm water quality in the context of sediment, fecal coliform, metals, oils, and other non-point source pollutant reduction and its beneficial impacts on fish and wildlife habitat as well as recreation.

The DEIS discussion in Section 4.6.1.1 (p. 90) states, "Long-term beneficial effects on shellfish are expected from implementation of the NED plan due to expected improvements within the study area as described in Section 4.4.1.2." This presumably refers to improvements in surface water quality and sedimentation in the watershed, but Section 4.4.1.2 appears to focus solely on the role of BMPs in controlling short-term project impacts.

A more detailed discussion is warranted to allow the reader to evaluate exactly how surface water quality will improve (e.g., by showing the area of inundation and emphasizing current sedimentation levels and quality entering Mamaroneck Harbor). The area that will be inundated by different flood events will be significantly less under the TSP than under existing or future without-project conditions and could easily be presented using figures. Inundation of the watershed during major storm events results in inputs of fecal coliform, metals, oils, and other non-pollutants that can eventually flow into Mamaroneck Harbor sediments. As currently described in the future without-project conditions, these inputs are contributing to impacts on fish and shellfish quality, other aquatic life, and recreational activities.

Significance – Medium/Low

The analysis of impacts presented focuses on short-term impacts, and does not provide sufficient analysis of potential long-term impacts. As a result, the DEIS sections on water quality and impacts on natural resources may be considered incomplete.

Recommendation for Resolution

1. Add figures showing the extent of flood plain area inundated at present and under the TSP.
2. Add a discussion of how sedimentation rates and surface water quality will improve under the TSP.

Final Panel Comment 22

The evaluation of operational public safety is incomplete since fall protection treatment for the top of retaining walls, channel egress, and culvert access are not addressed.

Basis for Comment

The Panel finds that significant risks to public safety resulting from implementation of this project are not addressed in the decision documents:

- The top of retaining walls are flush at grade so as to not impede surface interior draining. The vertical drop from the top of these retaining walls to the riverbed below can be up to 17 feet, with a cited average of approximately 8 feet. One location where retaining walls are used is in the vicinity of homes where pedestrian traffic would be expected and in the vicinity of businesses where pedestrian and even light vehicular traffic would be expected. Fall protection cannot impede interior drainage, may need to fit the architecture of the adjoining properties, and will add to operation, maintenance, repair, replacement and rehabilitation (OMRR&R) cost.
- During significant rainfall events, the project will result in a swiftly flowing channel, portions of which will have vertical walls on one or both sides and channel banks devoid of woody vegetation. These conditions will make it difficult for anyone in the channel to safely egress.
- The culvert at the confluence of the Mamaroneck and Sheldrake Rivers will provide an attractive nuisance for adolescent recreation and for homeless camping. Trash racks at the inlet of the culvert cited in the decision documents will not be sufficient safeguard from these issues. Rising water and swift flow through the culvert will pose a life safety hazard to any occupants during a storm event. When not in use for storm flows, the culverts may have a negative societal impact that does not appear to have been considered in the decision documents.

Significance – Medium/Low

Including these public safety risks as project features to be further addressed during the Preconstruction Engineering and Design (PED) phase would improve study completeness and the technical quality of the decision documents.

Recommendation for Resolution

1. In both the GRR and the Structural Appendix, describe treatment at the top of retaining walls that will address the public safety fall issue and state that the issue will be further addressed during the PED phase.
2. In the GRR, state that the issue of channel egress with be further addressed during the PED phase.
3. In both the GRR and the Structural Appendix, describe treatment for the entrance and exit of the culvert that will address the public safety/societal impact issue as well as the hydraulic impacts on the culvert from these added features. State that the issue will be further addressed during the PED phase.

Final Panel Comment 23

The life safety analysis in the decision documents is presented only in a brief summary that does not allow for a qualitative assessment of these analyses.

Basis for Comment

The decision documents provides very little documentation on life safety. GRR Section 11 (p. 11-1) states in its entirety**: "**The analysis indicated that, while the with-project conditions provide a reduction in the estimated life-loss, the overall life-loss is still very low for either existing or with-project conditions." The Panel could not find any documentation of this analysis in the decision documents or any discussion of flood safety considerations in addition to loss of life.

USACE (2012) (p. 10) states:

> "(1) Type I IEPR is mandatory if any of the following are true:
>
> (a) Significant threat to human life. The decision documents phase is the initial concept design phase of a project. Therefore, when life safety issues exist, a Type I IEPR that includes a Safety Assurance Review is required[.]"

No support for the statement in GRR 11-1 is provided in the decision documents. Other information that the Panel was charged to review, e.g., the IEPR Pre-TSP Briefing (pp. 37-40), suggests that life safety issues might possibly be relevant to the project. If USACE has reason to believe otherwise, evidence should be presented in the decision documents, as mandated by USACE 2012.

Significance – Medium/Low

Although the project-specific importance of life safety is apparently low in the future with- or without-project conditions, documentation of the life and safety analysis would improve the completeness of the decision documents.

Recommendation for Resolution

1. Provide documentation to support the conclusion that loss of life is low with or without the project.

Literature Cited:

USACE (2012). Water Resources Policies and Authorities – Civil Works Review Engineer Circular (EC) 1165-2-214. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 15 December. Available online at: http://www.publications.usace.army.mil/Portals/76/Publications/EngineerCirculars/EC_1165-2-214.pdf.

Final Panel Comment 24

An advanced warning system for alerting residences and businesses to impending flood conditions, which could reduce life safety risks and loss of property, is not evaluated as a non-structural alternative.

Basis for Comment

The GRR Section 22 (p. 22-2) indicates that, while a flood warning system could reduce damages, no flood warning system is in place or included for implementation in any of the project alternatives. It further states that, "Although a state-of-the-art flood warning system would increase the awareness of residents and allow for a more orderly evacuation, a warning system alone would not provide sufficient time to significantly reduce flood damages."

The Panel agrees that a warning system "alone" would not be sufficient. However, without any cost or benefit information, the Panel cannot determine whether such a system might be a cost-effective addition to the proposed project. No cost estimates are provided for a warning system in the decision documents, nor is there any information on the potential flood damage reduction benefits that could result from the implementation of a warning system as a non-structural measure. Including benefit and cost information in the decision documents would provide a rationale for rejecting this non-structural component of project alternatives.

Significance – Medium/Low

The absence of information on costs and benefits of a flood warning system affects the completeness of the decision documents.

Recommendation

1. Estimate the benefits and costs associated with a flood warning system as a non-structural component of the alternatives under consideration.
2. If these benefits and costs justify its inclusion, add it to the evaluation of alternatives and modify the benefit-cost ratio accordingly.

Final Panel Comment 25

The description of the without-project condition in the DEIS inappropriately includes references to "impacts," terminology normally reserved for the effects of the tentatively proposed plan (i.e. tentatively selected plan).

Basis for Comment

Federal NEPA regulations (40 CFR 1502.14(d)) describe the Future No Action condition (i.e., future without-project condition) as "the alternative where current conditions and trends are projected into the future without another proposed action." The term "impacts" is normally reserved for the effects of the proposed project alternatives or tentatively proposed plan (i.e. tentatively selected plan). The DEIS does not adhere to this definition, as shown in the following examples:

- The Executive Summary (p. ii) states that "The No Action alternative would therefore result in long-term impacts to land use and zoning, water resources, fish and wildlife, human health including loss of life, socioeconomics including personal property and housing, aesthetics and scenic resources, recreation and transportation within the study area," as opposed to limiting discussion to future trends without the project.
- Section 4.4.3 (p. 88) states "Selection of the No Action alternative would have a significant impact on the study area." The study area is already significantly impacted so this is inappropriate as a description. It could be stated that existing flooding trends would likely continue and could get worse over time, citing data on recent storms in support, but it is not accepted practice to present the No Action condition as a justification for the proposed project.
- Section 4.5.3 (p. 89) states that the No Action alternative would have no effect on the plant communities in the study area. The discussion of vegetation could instead briefly describe the composition of flora currently found in the study area, and how this composition is expected to change over time (e.g., existing woody old field would mature into a deciduous forest over the 20-year planning horizon), rather than discussing the alternative as having no impacts.
- Section 4.6.3 (p. 94) describes the No Action condition as having impacts because improvements in water quality from the proposed project would not occur. It does not address other regional initiatives to improve water quality, for example, or what might really happen in the future without the project. While many streams and rivers in the northeastern U.S., including these two, remain impaired, there have been significant improvements in water quality since implementation of the Clean Water Act. This trend is expected to continue as states enact their own stricter criteria, public awareness and education increases regarding non-point source pollution (e.g., not disposing of waste motor oil in storm drains), and industrial emissions and air particulates that settle out continue to improve. Water quality may actually gradually improve in the future, but not at the same rate as implementation of the project would allow. Without a more thorough discussion of these issues, their presentation appears overly simplified.
- There are many other examples of this language in the DEIS; no attempt has been made to list them all here.

Significance – Medium/Low

Correcting the terminology used to describe the future without-project conditions will improve the objectivity, accuracy, and readability of the DEIS.

Final Panel Comment 25

Recommendation for Resolution

1. Remove the term “impacts” in descriptions of future trends without the project.
2. Include a discussion that extrapolates existing environmental trends occurring in the study area to the Future No Action conditions.

Final Panel Comment 26

The risk and uncertainty analyses of flood risk reduction benefits (avoided damages) are not well-documented, and the adequacy and acceptability of these methods could not be determined.

Basis for Comment

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 The risk and uncertainty relating to project costs are well-documented and presented in the CSRA Report. However, the decision documents do not include a comparable level of detail on the risk and uncertainty of treatment of damages, therefore it was not possible for the Panel to evaluate the adequacy and acceptability of these methods. Furthermore, the Panel could not find a discussion of how risk and uncertainty of flood risk reduction benefits were assessed in the decision documents.

Significance – Medium/Low

Including a discussion of the assessment of the risk and uncertainty analysis of the avoided damage benefits would improve the completeness of the decision documents.

Recommendation for Resolution

1. Provide documentation of how risk and uncertainty of flood risk reduction benefits were assessed.

5. REFERENCES

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APPENDIX A

IEPR Process for the Mamaroneck-Sheldrake 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 Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY, Flood Risk Management General Reevaluation Report Independent External Peer Review (hereinafter: Mamaroneck-Sheldrake IEPR). Due dates for milestones and deliverables are based on the award/effective date of April 27, 2015. The review documents were provided by U.S. Army Corps of Engineers (USACE) on June 1, 2015. Note that there are work items listed under Tasks 4, 5, and 6 that occur after the submission of this report.

Battelle will enter the 26 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. Mamaroneck-Sheldrake Complete IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	4/27/2015
	Review documents available	6/1/2015
	Public comments available	10/5/2015
	Battelle submits draft Work Plan[a]	5/21/2015
	USACE provides comments on draft Work Plan	5/29/2015
	Battelle submits final Work Plan[a]	6/8/2015
2	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	5/5/2015
	USACE provides comments on COI questionnaire	5/7/2015
	Battelle submits list of selected panel members[a]	5/20/2015
	USACE confirms the panel members have no COI	5/26/2015
	Battelle completes subcontracts for panel members	6/9/2015
3	Battelle convenes kick-off meeting with USACE	5/14/2015
	Battelle sends review documents to panel members	6/10/2015
	Battelle convenes kick-off meeting with panel members	6/11/2015
	Battelle convenes kick-off meeting with USACE and panel members	6/15/2015
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	6/29/2015
4	Panel members complete their individual reviews	7/2/2015
	Battelle provides panel members with talking points for Panel Review Teleconference	7/9/2015
	Battelle convenes Panel Review Teleconference	7/10/2015
	Battelle provides Final Panel Comment templates and instructions to panel members	7/13/2015
	Panel members provide draft Final Panel Comments to Battelle	7/20/2015
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	7/21/2015 - 7/28/2015

Table A-1. Mamaroneck-Sheldrake Complete IEPR Schedule (Continued)

Task	Action	Due Date
	Panel finalizes Final Panel Comments	7/29/2015
5	Battelle provides Final IEPR Report to panel members for review	7/31/2015
	Panel members provide comments on Final IEPR Report	8/4/2015
	Battelle submits Final IEPR Report to USACE[a]	8/6/2015
	USACE PCX provides decision on Final IEPR Report acceptance	8/13/2015
4[b]	Battelle receives the public comments from USACE	10/5/2015
	Battelle sends public comments to Panel	10/6/2015
	Panel completes their review of the public comments	10/9/2015
	Battelle and Panel review Panel's responses to public comments	10/13/2015
	Panel drafts Final Panel Comment, if necessary	10/14/2015
	Panel finalizes Final Panel Comment regarding public comments	10/16/2015
5[b]	Battelle provides Revised Final IEPR Report (based on Panel review of public comments) to panel members for review	10/20/2015
	Panel members provide comments on the Revised Final IEPR Report	10/21/2015
	Battelle submits Revised Final IEPR Report to USACE[a]	10/23/2015
	USACE PCX provides decision on revised Final IEPR Report acceptance	10/28/2015
6[b]	Battelle inputs Final Panel Comments to the Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	11/6/2015
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	11/6/2015
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	11/23/2015
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	12/1/2015
	USACE PCX provides draft PDT Evaluator Responses to Battelle	12/2/2015
	Battelle provides the panel members the draft PDT Evaluator Responses	12/4/2015
	Panel members provide Battelle with draft BackCheck Responses	12/9/2015
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	12/10/2015
	Battelle convenes Comment-Response Teleconference with panel members and USACE	12/11/2015
	USACE inputs final PDT Evaluator Responses to DrChecks	12/18/2015
	Battelle provides final PDT Evaluator Responses to panel members	12/22/2015
	Panel members provide Battelle with final BackCheck Responses	12/29/2015
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	1/6/2016
	Battelle submits pdf printout of DrChecks project file[a]	1/7/2016

Table A-1. Mamaroneck-Sheldrake Complete IEPR Schedule (Continued)

Task	Action	Due Date
	Agency Decision Milestone (ADM) Meeting[b,c]	TBD
	Civil Works Review Board (CWRB) Meeting[b,c]	TBD
	Contract End/Delivery Date	5/27/2016

a Deliverable.
b Tasks occur 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 Mamaroneck-Sheldrake 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). 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 overview questions 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). Battelle added two questions that seek summary information from the IEPR Panel.

Prior to beginning their review and within 2 days of their subcontracts being finalized, all five 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 Mamaroneck-Sheldrake 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.

- **GRR Main Report (229 pages)**
- **Appendix A1 Prior Studies Reports (5 pages)**
- **Appendix A2 April 15 2007 (15 pages)**
- **Appendix B Mamaroneck-Sheldrake Final DEIS (271 pages)**
- **Engineering Appendix C1 Hydrology (81 pages)**
- **Engineering Appendix 1a Hydrology Tables (62 pages)**
- **Engineering Appendix C1b Hydrology Figures (19 pages)**
- **Engineering Appendix C2 Hydraulics (127 pages)**
- **Engineering Appendix C3 Geotechnical (156 pages)**
- **Engineering Appendix C4 Structural (65 pages)**
- **Engineering Appendix C5 Cost (17 pages)**
- **Engineering Appendix C6 Plates (22 pages)**
- **Appendix D Economics (55 pages)**
- **Appendix E Real Estate Plan (27 pages)**
- Risk Register (June 2015)
- Decision Log (June 2015)
- 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 halfway through the review of the Mamaroneck-Sheldrake 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 13 panel member questions to USACE. USACE was able to provide responses to all the questions during the teleconference or later that day via email.

In addition, throughout the review period, USACE provided documents at the request of panel members. The following documents were provided to Battelle and then sent to the Panel as additional information only and were not part of the official review:

- Inundation Maps Mamaroneck Sheldrake
- Tidal - Fluvial Correlation
- Locally Preferred Plan (LPP) With Project 100 Year Flood Map
- NED With Project 100 Year Flood Map
- NED Wet/Dry Structures 25 Year Flood Map
- LPP Wet/Dry Structures 25 Year Flood Map
- Guidance Letter No. 16, Clarification of Policy on Relocations at Flood Control Projects (24 May 1989)
- Mamaroneck Sheldrake River Cost Schedule Risk Analysis (June 2015)
- Mamaroneck Sheldrake Hydrology Figures 1-24
- Mamaroneck Sheldrake HEC-FDA Analysis Model Runs
- Mamaroneck Sheldrake HEC-1 and HEC-HMS Analysis Model Runs
- Mamaroneck Sheldrake HEC-RAS Analysis Model Runs.

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 30 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 4-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member 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 28 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 Mamaroneck-Sheldrake 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. During the Final Panel Comment development process, the Panel determined that two of the Final Panel Comments could be either dropped or merged into other Final Panel Comments; therefore, the total Final Panel Comment count was reduced to 26. 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

The public comment review will be conducted in October 2015 when Battelle receives the public comments on the Mamaroneck-Sheldrake IEPR from USACE. Battelle is scheduled to submit the revised Final IEPR Report in October 2015, which documents the public comment review process and any findings from the IEPR Panel. Battelle

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APPENDIX B

Identification and Selection of IEPR Panel Members for the Mamaroneck-Sheldrake Project

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B.1 Panel Identification

The candidates for the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY, Flood Risk Management General Reevaluation Report (hereinafter: Mamaroneck-Sheldrake IEPR) Panel were evaluated based on their technical expertise in the following key areas: economics/Civil Works planning, biological resources and environmental law compliance, civil/structural engineering, hydrology and hydraulic engineering, and geotechnical engineering. These areas correspond to the technical content of the Mamaroneck-Sheldrake IEPR review documents and overall scope of the Mamaroneck-Sheldrake 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 Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report and technical appendices.
- Previous and/or current involvement by you or your firm[2] in flood control and ecosystem restoration projects located in the Mamaroneck and Sheldrake Rivers Basin or Village of Mamaroneck, Westchester County, NY.
- Previous and/or current involvement by you or your firm[2] in the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report-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 Mamaroneck and

[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.

Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report-related projects.

- Current employment by the U.S. Army Corps of Engineers (USACE).
- Previous and/or current involvement with paid or unpaid expert testimony related to the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report.
- Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, state, county, local, and regional agencies, environmental organizations, and interested groups: New York State Department of Environmental Conservation, Westchester County, NY, Village of Mamaroneck, NY (for pay or pro bono).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the New York District.
- Previous or current involvement with the development or testing of models that will be used for, or in support of the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report project.
- Current firm[2] involvement with other USACE projects, specifically those projects/contracts that are with the New York 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 New York District. Please explain.
- Any previous employment by USACE as a direct employee, notably if employment was with the New York 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 20 years, notably if those projects/contracts are with the New York 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 ecosystem review, or flood management, and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from contracts with the non-Federal sponsor (New York State Department of Environmental Conservation).

- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report
- Participation in relevant prior and/or current Federal studies relevant to this project and/or the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report
- Previous and/or current participation in prior non-Federal studies relevant to this project and/or Mamaroneck and Sheldrake River Basin, Village of Mamaroneck, Westchester County, NY, Flood Risk Management General Reevaluation Report
- 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.

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. Three of the five final reviewers were affiliated with consulting companies; the other two reviewers were independent consultants. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

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

Table B-1. Mamaroneck-Sheldrake IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Feldman	Bovitz	Brozek	Ruswick	Cox
Economics/Civil Works Planning					
Minimum 15 years of experience in economics	X				
Direct experience working for or with USACE (preferred)	X				
Expertise in flood risk management evaluating and conducting complex multi-objective public works projects with high public and interagency interests.	X				
USACE flood risk management analysis	X				
Familiarity with economic benefit calculations	X				
Familiarity with expertise in economic analysis for flood risk management	X				
Familiarity with acceptable methodologies for estimating damages	X				
Familiarity with use of Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA)	X				
Significant familiarity with USACE plan formulation process, procedures, and standards as it relates to flood risk management.	X				

Table B-1. Mamaroneck-Sheldrake IEPR Panel: Technical Criteria and Areas of Expertise (Continued)

Technical Criterion	Feldman	Bovitz	Brozek	Ruswick	Cox
Minimum of five years of experience directly dealing with the USACE six-step planning process, governed by ER 1105-2-100, Planning Guidance Notebook.	X				
Active participation in related professional societies	X				
M.S. degree or higher in economics	X				
Biological Resources and Environmental Law Compliance					
Minimum 15 years of experience directly related to water resource environmental evaluation or review and National Environmental Policy Act (NEPA) compliance		X			
Familiarity with large, complex Civil Works projects with high public and interagency interests		X			
Familiarity with the habitat, fish and wildlife species, and tribal cultures and archeology in the study area (i.e., Mamaroneck and Sheldrake Rivers Basin, NY)		X			
Familiarity with wetlands		X			
Familiarity with riparian habitats		X			
Knowledge of riverine systems		X			
Expertise in compliance with additional environmental laws, policies, and regulations, including compliance with the Fish and Wildlife Coordination Act,		X			
Endangered Species Act		X			
Civil/Structural Engineering					
Minimum 15 years of experience in engineering			X		
Familiarity with large, complex Civil Works projects with high public and interagency interests			X		
Thorough understanding of design of channel improvements in an urban setting			X		
Familiarity with common non-structural measures.			X		
Familiarity with design and construction of bridges			X		
Registered professional engineer			X		
Hydrology and Hydraulic Engineering					
Minimum 15 years of experience in hydrologic and hydraulic engineering				X	
Familiarity with large, complex Civil Works projects with high public and interagency interests				X	
Experience with all aspects of hydrology and hydraulic engineering				X	
Experience with Northeast hydrology				X	
Experience with urban hydrology and hydraulics				X	
Experience with open channel systems				X	
Experience with detention reservoirs				X	
Experience with diversion tunnels				X	
Experience with effects of management practices and low impact development on hydrology				X	
Experience with use of non-structural systems as they apply to flood proofing, warning systems, and evacuation				X	

Table B-1. Mamaroneck-Sheldrake IEPR Panel: Technical Criteria and Areas of Expertise (Continued)

Technical Criterion	Feldman	Bovitz	Brozek	Ruswick	Cox
Familiarity with Hydraulic Engineering Center (HEC) modeling computer software including HEC River Analysis System (RAS) and HEC Hydrologic Modeling System (HMS)				X	
Registered professional engineer				X	
Geotechnical Engineering					
Minimum 15 years of experience in geotechnical engineering					X
Familiarity with large, complex Civil Works projects with high public and interagency interests					X
Demonstrated experience in performing geotechnical evaluation and geo-civil design for all phases of flood risk management projects					X
Experience with culverts					X
Experience with channel stability					X
Experience with detention structures					X
Experience with diversion tunnels					X
Experience with bridge design and construction					X
Experience with utility relocations					X
Experience with application of non-structural flood risk management measures					X
Familiarity with and demonstrated experience related to Corps of Engineers geotechnical practices associated with flood management channels					X
Familiarity with and demonstrated experience related to Corps of Engineers geotechnical practices associated with construction					X
Familiarity with and demonstrated experience related to Corps of Engineers geotechnical practices associated with soil engineering					X
Experience in geotechnical risk and fragility analysis					X
Ability to address the USACE Safety Assurance Review (SAR)* aspects of all projects per EC 1165-2-214, Appendix D, Para. 2.c(3)					X
Active participation in related professional engineering and scientific societies					X
M.S. degree or higher in engineering					X
Registered professional engineer					X

B.3 Panel Member Qualifications

Marvin Feldman, Ph.D.

Role: Economics and Civil Works planning expert
Affiliation: Resource Decisions

Dr. Feldman is an independent consultant and principal economist at Resource Decisions with more than 35 years of experience in water resource and environmental economics for clients throughout the United States. He earned his M.S. in water resource management in 1969 and Ph.D.in natural resource economics in 1979 from the University of Wisconsin. He has direct experience working with USACE, both as a consultant and subcontractor and through his past service as a principal economist for the Sacramento District. Dr. Feldman has participated on a previous USACE IEPR (model certification review) panel as an economics expert for the Institute of Water Resources Planning Suite and actively participates in professional societies. He is a member of the American Economic Association, Society for Risk Analysis, and the Association of Environmental and Resource Economists.

Dr. Feldman is experienced in the evaluation and conduct of complex multi-objective public works projects with high public and interagency interests including flood risk analysis. As a senior economist at the University of Wisconsin under contract to the U.S. Department of Energy, he worked on developing a multi-attributable site selection model for evaluating risks of alternative sites for the Preliminary Nevada High-level Nuclear Waste Siting Analysis. For the Smith Lake Improvement and Stakeholder Association (SLISA), Alabama, he provided economic evaluation of alternative costs and benefits of municipal and industrial, navigation, recreation, and hydroelectric water uses and non-power evaluations for recreation, property values flood control, navigation, and erosion control to support SLISA's negotiations with the Federal Energy Regulatory Commission and Alabama Power.

Dr. Feldman has a strong working knowledge of USACE economic benefit calculations, and throughout his career has conducted numerous studies requiring economic benefit analysis for flood risk management. For example, he conducted a study of the state-of-the-art of municipal and industrial water conservation benefit evaluation techniques for the California Urban Water Conservation Council (CUWCC), and identified promising methods for application by CUWCC member water agencies in evaluating their conservation options. His advanced expertise and extensive experience in flood damage analysis and risk and decision analysis is reflected in his work on such studies as the Smith Lake-Black Warrior River (Alabama) benefit-cost analysis of lake levels, studies of cost-benefit tradeoffs for the North Fork of the Feather River (Pacific Gas and Electric, California), and an economic analysis of agricultural diversion alternatives for the Glenn-Colusa Irrigation District (California).

He is also familiar with methodologies for estimating damages, including the Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA) software. His familiarity with HEC-FDA includes his knowledge of inputs, assumptions, calculations and results attributed to the program. He has applied his knowledge of USACE flood risk management and damage calculations/analysis in his work as economist/planner on the USACE/Bureau of Reclamation Central Arizona Water Control Study. This study was a flood control and dam safety study involving the consideration of feasibility alternatives and the selection of preferred alternatives. Other studies requiring the assessment of risk and damage included the aforementioned Preliminary Nevada High-level Nuclear Waste Siting and the SLISA studies.

Dr. Feldman is familiar with the USACE plan formulation process, procedures, and standards as they relate to flood risk management and has demonstrable experience dealing directly with the USACE Six-Step Planning Process, governed by ER 1105-2-100, Planning Guidance Notebook. In addition to applying the Six-Step Process to his work on the aforementioned USACE/Bureau of Reclamation Central

Arizona Water Control Study, he has also worked on such studies as the Financial and Economic Feasibility of the Reynolds Creek Hydroelectric Project, Northeast Alaska, where he conducted a financial and cost-benefit analysis of a proposed hydroelectric project in Southeastern Alaska and the Shoshone Falls Recreational Benefit/Cost Analysis (Idaho Power Study), where he evaluated the recreation and power production benefits associated with alternative hydroelectric by-pass flows at Shoshone Falls.

Paul Bovitz, LSRP, CPWS, MBA

Role: Biological resources and environmental law compliance expert
Affiliation: WorleyParsons Group

Mr. Bovitz is a principal consultant with the WorleyParsons Group in Reading, Pennsylvania. He is an environmental scientist with more than 30 years of technical experience in ecological assessment and natural resources management in public, private, and academic sectors, engaging in both theoretical and applied aspects of ecological research encompassing a variety of geographic regions, habitats, and taxa. Of these, 25 years included work as a project biologist, environmental scientist, project manager, and NEPA Environmental Impact Statement (EIS) lead, much of it working as a contractor for USACE, New York District. Mr. Bovitz earned both an M.S. in ecology and an MBA from Rutgers University. He is a Licensed Site Remediation Professional (LSRP) in New Jersey, a Certified Professional Wetland Scientist (CPWS), a LEED® Accredited Professional, and a Certified Energy Manager.

Mr. Bovitz is familiar with large, complex Civil Works projects with high public and interagency interests. In addition to having been an IEPR panel member on several high profile projects such as the Dallas Floodway Feasibility Report and EIS and the Bubbly Creek Ecosystem Restoration Feasibility Study, Chicago, Illinois, he has been involved in Remedial Investigation/Risk Assessment (RI/RA) for the Housatonic River Project for USACE, New England District. He was project manager for the Meadowlands Mills EIS for the USACE, New York Regulatory Branch, which dealt extensively with wetland mitigation and flooding issues associated with an applicant's proposal to fill 206 acres of wetlands in the New Jersey Meadowlands. He has completed assessments for a number of New York District mitigation projects, and acted as project manager for remedial investigation and cleanup of the former Raritan Arsenal site in Edison, N.J, which involved stakeholder communication, and significant public involvement, including risk communication and interface with other agencies (e.g., New Jersey Department of Environmental Protection).

He has extensive experience performing ecological and environmental assessments in New York state, including Westchester County, for private developers and public agencies, and is familiar with the habitat, fish, wildlife species, and tribal cultures of the region. Relevant project experience includes a water resources study/Environmental Assessment for upper Hackensack River, which included archaeological evaluation of floodplain wetlands potentially impacted by proposed flood control measures near Route 59 in Clarkstown; an American Marine Rail proposed marine waste transfer facility in the Bronx; wetland and water quality impacts associated with alternatives for the Fresh Kills landfill; proposed housing developments in Westchester County and Staten Island; a floodplain soil evaluation of the Hudson River for polychlorinated biphenyls; and post-Sandy recovery response.

Mr. Bovitz has completed over 100 wetland delineations in the New York/New Jersey area alone, including within Westchester county. He has obtained permits for freshwater and estuarine wetland impacts in New York state, directed wetland restoration work associated with site cleanups in New Jersey, and evaluated wetlands for U.S. Environmental Protection Agency/National Priority List sites throughout New York state.

Mr. Bovitz has conducted ecological surveys and performed risk assessments on several riverine systems: Sudbury and Housatonic Rivers, Massachusetts; Arkansas River, Colorado; Aquashicola Creek, Pennsylvania; James and Nansemond Rivers, Virginia; Raritan River and Toms River, New Jersey; Delaware River, Pennsylvania; Christiana River, Delaware; Kalamazoo River oil spill, Michigan. This includes experience within New York State (e.g., Marathon Battery site along the Hudson River, Hudson River flood plain soil assessment) and several smaller streams. He has also been involved in peer reviews of USACE water resources projects in Dallas along the Trinity River, and Bubbly Creek in the City of Chicago.

Several of the above projects involved permitting and regulatory review, including the Fish and Wildlife Coordination Act, such as resource trustees (U.S. Fish and Wildlife Service, National Marine Fisheries Service), and Endangered Species Act Section 7 consultations for wind turbine projects, Federal site cleanups, and other NEPA reviews. Mr. Bovitz has direct experience working for the U.S. Fish and Wildlife Service as a contractor on the Wind River Indian Reservation in Wyoming.

Mr. Bovitz serves on the New Jersey Governor's Science Advisory Board Ecological Sciences Subcommittee (2010-present) and was an invited panel member of the New Jersey Comparative Risk Assessment Project (2005). He is a member of the Society of Ecotoxicology and Environmental Chemistry, the Society of Wetland Scientists, and the Society of American Military Engineers.

Phillip Brozek, P.E.

Role: Civil and structural engineering expert
Affiliation: Brozek & Associates

Mr. Brozek is a principal with Brozek & Associates with 34 years of experience as a practicing engineer. In his current position Mr. Brozek provides analysis and consultation to governments, non-profit organizations, and private business in the development and review of project plans to implement a wide range of desired outcomes for capital, natural resource conservation, and infrastructure projects. He earned his B.S. in civil engineering in 1979 from California State University, Sacramento, and is a registered professional engineer in California and Oregon. Mr. Brozek holds a Certificate in Hazardous Material Management from the University of California Extension, Davis, an Associates Certificate in Project Management from George Washington University, and was a founding member of the Practitioner Advisory Committee at the California State University Sacramento, Department of Civil Engineering. He has extensive experience regarding the USACE project implementation process gained through over 30 years of service at the USACE Sacramento District (1979-2009) in diverse roles, including construction resident engineer, engineering design section chief, and senior project manager. Mr. Brozek made presentations on USACE Planning Modernization 'lessons-learned' to the Society of American Military Engineers, as well as presentations on the USACE Civil Works process and implementation to state agencies and regional planning agency boards.

Mr. Brozek is familiar with large, complex Civil Works projects with high public and interagency interests. He has served as a Civil Works Senior Project Manager for 11 years with the USACE Sacramento District, where he was responsible for managing the planning, design, and construction of flood control projects. His experience in the design of channel improvements in urban settings includes service as the Pre-Construction Engineering & Design project manager on the South Sacramento Stream Group project (e.g., Morrison Creek, Elder Creek, Unionhouse Creek, Bushy Lake) in Sacramento, California. Its objective was to increase existing protection in a dense urban setting with social justice, utility conflicts, severely constrained Land, Easements, Rights-Of-Way, Relocation, and Disposal Areas, internal drainage, and environmental issues. He was also project manager on the Yuba River General Reevaluation Report, a flood risk management study focused on the Yuba and Feather River (California)

confluence, and involved a river system than transitioned from foothills to urban area and then to an agricultural setting with multiple highway and railroad bridges, floodplain recreation sites, riparian habitat benefits and constraints, and legacy land uses that challenged the reduction of flood risk while staying within authorized estimate. Other relevant studies include the feasibility phase on the Upper Truckee River Watershed project in South Lake Tahoe, California, which required balancing natural and build environment in a multi-objective study in an urban and alpine landscape. He also served as feasibility, design, and construction project manager for several small streams (e.g., Incline Creek, Blackwood Creek, Third Creek, Mill Creek, three phases of Upper Truckee River, Lake Forest Stream and Meadow) located in extremely sensitive environmental areas; the projects involved balancing the needs of urban growth and flood plain restoration, as well as application of National Economic Development policy.

Mr. Brozek is experienced in the evaluation of common non-structural flood reduction measures including the relocation of damageable structures, acquisition and demolition of structures, flood proofing,; raising structures above the flood elevation, flood warning systems, and land use restrictions including flood easements. Example projects include South Sacramento Stream Group project (e.g., Morrison Creek, Elder Creek, Unionhouse Creek, Bushy Lake) and Incline Creek, Blackwood Creek, Third Creek, three phases of Upper Truckee River, Lake Forest Stream and Meadow in the Lake Tahoe Basin. In addition, during Mr. Brozek's 11-year tenure a project and program manager for the Lake Tahoe Watershed Restoration and Management program, he worked with non-Federal sponsors in an active program of acquisition and retirement of real estate rights for parcels located in stream zones.

Mr. Brozek's experience with integrated flood risk management projects (South Sacramento Stream Group, San Lorenzo River, Yuba River GRR, several Lake Tahoe Basin projects as indicated above) includes planning, design, and construction phase work on bridges. Specifically, he is experienced in tying new flood walls into existing bridge structures, installing new bridge parapets, retrofitting bridges to resist uplift to mitigate increased channel design flood flows that result in bridges decks acting as a pressure conduit, designing and constructing new urban stream crossing structures to minimize entrance and exit headloss and hydraulic jump conditions, and accounting for community requirements on bridges that serve as primary traffic linkages.

His experience with planning, design, and construction of recreation measures includes his work on the South Sacramento Streams Group project in the Sacramento Valley, San Lorenzo River (Santa Cruz, California) and numerous stream restoration projects in the Lake Tahoe Basin (e.g., Upper Truckee River, Lake Forest Stream and Meadow, Incline Creek, Blackwood Creek, Third Creek).

Kevin Ruswick, P.E.

Role: Hydrology and hydraulic (H&H) engineering expert
Affiliation: Schnabel Engineering, Inc.

Mr. Ruswick is a water resources engineer for Schnabel Engineering, Inc. in Clifton Park, New York. He is a registered professional engineer in New York and Illinois, a Certified Floodplain Manager, and a Construction Specifications Institute (CSI) Construction Documents Technologist. He earned his M.S. in water resources engineering in 1996 from the University of California Berkeley and has more than 20 years of demonstrable experience in the field of H&H engineering. He has experience in the private sector, state, local, and Federal government, and has worked directly with USACE, both as a consultant and subcontractor and through his past service as a hydraulic engineer for USACE Chicago District.

Mr. Ruswick is familiar with large complex Civil Works projects with high public and interagency interests, and has extensive experience in large-scale flood reduction projects and the H&H analysis of flood control reservoirs. While with the USACE Chicago District, he served as technical hydraulic lead for a

flood reduction study along the Kankakee River spanning Indiana and Illinois. Recently, he evaluated the spillway compliance of the George B. Stevenson Dam in Pennsylvania, a large flood control dam in the Susquehanna River Basin. For this project, his detailed hydrologic modeling, which was validated to historic storm events, demonstrated that the existing facility met all regulatory requirements and serves as an effective flood reduction facility. Another example is his recent work on the Fulmer Creek flood reduction study in Herkimer, N.Y. As a follow-up study to a previous USACE ice jam flooding analysis, Mr. Ruswick evaluated the potential for upstream flow attenuation facilities within the watershed to reduce recurrent rainfall-induced flooding through this urban area in the Mohawk River valley.

Mr. Ruswick has significant experience in conducting H&H engineering analyses for projects in the northeastern United States as well as throughout the county and has substantial experience in urban hydrology and hydraulics. He has conducted H&H engineering investigations and analyses for urban projects in the Northeast on studies that include the Village of Ossining, Indian Brook Reservoir Dam Safety Compliance, Ossining, N.Y.; the Cooper Lake Dam rehabilitation for the City of Kingston, N.Y.; and the Mead Reservoir Dam, City of Plattsburgh, N.Y. He has also conducted detailed dam breach analyses for Hillview Reservoir in Yonkers, N.Y. and performed a detailed storm sewer assessment and system upgrade evaluation for the Westchester Country Club and surrounding residential development. His background in urban hydrology involves the analysis and design of flood mitigation systems ,including retention/detention facilities, regional stormwater management facilities, and both open channel and closed conduit conveyance system upgrades.

Mr. Ruswick is versed in open channel hydraulics, detention reservoirs, and diversion tunnels, and has applied his expertise on numerous studies such as the Catskill Aqueduct Dewatering Program involving the hydraulic design of bypass diversion tunnels and energy dissipation. Mr. Ruswick's work on the D.R. Horton-Melody Series, Marshall Lake Dam Subdivision, Thornton, Colorado involved the development of rehabilitation plans for an existing earthen dam and retrofitting the dam to provide storm water detention storage to mitigate downstream hydrologic impacts from the low-impact residential development. He has also helped to develop and provide expert direction for the establishment of regional relationships for Snyder and Clark Unit Hydrograph hydrologic parameters for the Capital Region and Hudson Valley regions of New York.

Mr. Ruswick is proficient with the Hydraulic Engineering Center (HEC) modeling computer software including HEC-RAS and HEC-HMS. He received training from program developers while working for the Chicago District USACE and applies both models to engineering studies on a routine basis. He has also taught short training courses on each model at the college level. Example projects include the Monroe County Water Authority, Denise Cover Design, Rochester, N.Y., where he used the HEC-HMS hydrologic model to estimate the peak outflow hydrograph during a catastrophic failure of the dam embankment and then HEC-RAS to estimate resultant flood profiles and development of approximate inundation limits. Similar to numerous dam breach studies he has performed, the resulting inundation maps support development of Emergency Action Plans with detailed flood wave arrival time to provide time-sensitive evacuation information to emergency responders. Another example is the Kankakee River Basin Flood Control and Environmental Restoration Project, State of Indiana, State of Illinois, where as lead hydraulic engineer for flood damage reduction and environmental restoration of the 5,150 square mile Kankakee River watershed, he developed and calibrated continuous hydrologic simulation for entire watershed using GIS-based models including HEC-Geo-HMS. He also developed HEC-Geo-RAS and UNET hydraulic models for the Kankakee River and major tributaries to support preliminary design of structural and non-structural flood damage reduction alternatives, water quality enhancement features and environmental restoration alternatives. He also has significant experience applying 2-dimension hydraulic analyses for complex floodplain and inundation mapping analyses.

Chad Cox, P.E.

Role: Geotechnical engineering expert
Affiliation: GZA GeoEnvironmental, Inc.

Mr. Cox is a principal and civil engineer with GZA GeoEnvironmental, Inc. in Norwood, Massachusetts. He has 20 years of extensive experience in many aspects of civil engineering, including dam safety and design, hydroelectric project development, water supply, transportation, and geotechnical construction. Mr. Cox holds a B.S.E. in civil engineering/water resources from Princeton University and an M.Eng. in civil and environmental engineering from the Massachusetts Institute of Technology. He is a registered professional engineer in Massachusetts.

Mr. Cox has worked on numerous large water, drainage, and flood-control related public projects, including the Gilboa Dam in New York and the Upper Mystic Lake Dam and the Ponkapoag Brook Hydraulic Analysis study, both in Massachusetts. These projects are all public facilities and required interagency coordination. He has demonstrated experience in performing geotechnical evaluation and geo-civil design for all phases of flood risk management projects. Currently he is working on the USACE Muddy River flood mitigation project in Boston, which involves daylighting stream and construction of new culverts over fill and organics. The project requires development of a construction water control plan, supplemental subsurface investigations, a geotechnical report, and the design of sheetpile cofferdam systems.

Mr. Cox has broad experience with projects on water courses. He managed the Ponkapoag Brook Hydraulic Analysis project, which involved analysis of flooding issues resulting from undersized culverts. He has also been involved in numerous stream restoration projects involving design of "hard" and "soft" channel stabilization measures. Examples include the design of construction-phase riprap channel stabilization for the Merrimack River bridge replacement project, and channel stabilization for the Muddy River project. In addition, Mr. Cox has been responsible for the inspection and/or design of numerous flood detention facilities on site scale and river-system scale, such as National Resources Conservation Service (NRCS) flood detention facilities. He has also inspected a diversion tunnel at the USACE Blackstone River Flood Control Project for City of Worcester, Massachusetts, and is experienced with post-Fukushima drainage analyses, which included analysis of multiple culverts.

In the area of bridge design and construction, he worked on an H-20 rated bridge over the Upper Mystic Lake Dam spillway, and is currently involved in a bridge replacement project for the Massachusetts Department of Transportation at the USACE Flood Control project in Framingham, Massachusetts. Utility (underground and overhead) relocation has also been a component of many projects that Mr. Cox has been involved in. The current Muddy River project involves relocation of active sewer lines under a river channel. His work on post-Fukushima nuclear projects includes consideration of both structural and non-structural flood mitigations, including permanent and non-permanent structures (portadams, etc.). Other examples of non-structural flood risk management measures include work at a private office park in a flood plain where the proposed flood response plan included temporary sewer line backflow prevention, and the Upper Mystic Project, which included consideration of buyouts to reduce dam hazard classification.

Mr. Cox is familiar with, and has demonstrated experience related to, USACE geotechnical practices associated with flood management channels, construction, and soil engineering. The Muddy River project, currently under construction, illustrates Mr. Cox's experience in all three areas. This USACE flood control project involves replacing large urban culverts with new stabilized open channels; Muddy River project construction work is dependent on a temporary water control plan developed under Mr. Cox's supervision that involves pumping, cofferdam diversions, groundwater control, and emergency response;

and the Muddy River project required the implementation of a supplemental subsurface investigation and development of soil structural characteristics to facilitate the design of sheet pile structures.

Mr. Cox also has experience with applying risk assessment principles with respect to geotechnical (seismic) design and general conceptual familiarity with the use of fragility analysis as per the USACE ERDC SR-10-1 publication. He has frequently used probabilistic methods for flood risk assessment. In addition, he is capable of applying guidance contained in EC 1165-2-214, Civil Works Review, Appendix D, Para.2.c(3) as it relates to a panel's responsibilities for Safety Assurance Reviews (SARs). He is familiar with this guidance regarding questions to be asked and answered during the course of an SAR.

Mr. Cox is a member and presenter at the Association of State Dam Safety Officials, the United States Society on Dams, and the International Commission on Large Dams.

APPENDIX C

Final Charge to the IEPR Submitted to USACE on June 8, 2015 for the Mamaroneck-Sheldrake Project

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CHARGE QUESTIONS AND GUIDANCE TO THE PANEL MEMBERS FOR THE IEPR OF THE Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY, Flood Risk Management General Reevaluation Report

BACKGROUND

The Mamaroneck and Sheldrake Rivers basin has a 23-square-mile drainage area and is located along the northern coast of Long Island Sound within the New York City metropolitan area. The Mamaroneck and Sheldrake Rivers Basin lies entirely within Westchester County, New York and contains portions of the Village and Town of Mamaroneck, the Cities of New Rochelle and White Plains, the Towns of Harrison and North Castle, and the Village of Scarsdale. Both the Mamaroneck and Sheldrake Rivers travel through heavily urbanized areas and have inadequate capacity to control flood flows. The Village of Mamaroneck is located at the bottom of the drainage basin. Twice in the spring of 2007, the Village of Mamaroneck was inundated by flooding from both rivers.

The study is a single-purpose flood risk management study. The types of measures/alternatives to be considered in the study are channel improvements, diversions (reevaluation of the authorized tunnel plan), detention, as well as non-structural (flood proofing, acquisition, etc.) and combinations of structural and non-structural solutions. The estimated range of costs for a potentially recommended plan is between $50M and $100M. The non-Federal sponsor is the New York State Department of Environmental Conservation, who has Westchester County as a local sponsor. The original project was authorized by Section 101(a) of WRDA 1986. The purpose of this study is to identify and evaluate Flood Risk Management (FRM) options for the Mamaroneck and Sheldrake Rivers Basin authorized project, specifically within the Village of Mamaroneck, Westchester County, New York. The decision documents will present planning, environmental, and engineering details for the alternative analysis, as well as the National Economic Development Plan (NED Plan) for review and approval. The effort is a General Investigations-funded study undertaken to evaluate structural and non-structural flood risk management measures, including but not limited to, a diversion tunnel and channel modifications. The General Reevaluation of this study is cost-shared 75/25 with the project sponsor, the New York State Department of Environmental Conservation. Approval of the GRR would be at HQUSACE level and will require new Congressional authorization, as the tentatively selected plan is not the previously authorized plan. An Environmental Impact Statement (EIS) will be prepared to support the National Environmental Policy Act (NEPA) requirements for this study.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY Flood Risk Management General Reevaluation Report (hereinafter: Mamaroneck-Sheldrake 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, December 15, 2012), and the Office of Management and Budget'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 Mamaroneck-Sheldrake 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 economics/Civil Works planning, biological resources and environmental law compliance, civil/structural engineering, hydrologic and hydraulic engineering, and geotechnical engineering issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

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

DOCUMENTS PROVIDED

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

Documents for Review

Table C-1. Review and Supplemental Documents

Title	Approx. No. of Pages	Required Disciplines
GRR Main Report	150	All disciplines
Appendix A: Hydrology	62	Hydrologic and hydraulic engineering
Appendix B: Hydraulics	127	Hydrologic and hydraulic engineering
Appendix C: Geotechnical	12	Geotechnical engineering
Appendix D: Structural	31	Civil/structural engineering
Appendix E: Cost Estimate	113	Economics/Civil Works planning; civil/structural engineering; hydrologic and hydraulic engineering; geotechnical engineering
Appendix F: EIS	232	All disciplines
Appendix G: Economics	59	Economics/Civil Works planning
Public Comments	50	All disciplines
Total Page Count	**836**	

Documents for Reference

- 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.

SCHEDULE

Table C-2, the final schedule, is based on the June 1, 2015 receipt of the final review documents.

Table C-2. Final Review Schedule

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	6/10/2015
	Battelle convenes kick-off meeting with panel members	6/11/2015
	Battelle convenes kick-off meeting with USACE and panel members	6/15/2015
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	6/22/2015
	Panel members complete their individual reviews	7/2/2015
Prepare Final Panel Comments, Final IEPR Report, and Revised Final IEPR Report	Battelle provides panel members with talking points for Panel Review Teleconference	7/9/2015
	Battelle convenes Panel Review Teleconference	7/10/2015
	Battelle provides Final Panel Comment templates and instructions to panel members	7/13/2015
	Panel members provide draft Final Panel Comments to Battelle	7/20/2015
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	7/21/2015 - 7/28/2015
	Panel finalizes Final Panel Comments	7/29/2015
	Battelle provides Final IEPR Report to panel members for review	7/31/2015
Prepare Final Panel Comments, Final IEPR Report, and Revised Final IEPR Report	Panel members provide comments on Final IEPR Report	8/4/2015
	Battelle submits Final IEPR Report to USACE*	8/6/2015
	Battelle sends public comments to Panel	10/6/2015
	Panel completes their review of the public comments	10/9/2015
	Battelle and Panel review Panel's responses to public comments	10/13/2015
	Panel drafts Final Panel Comment, if necessary	10/14/2015
	Panel finalizes Final Panel Comment regarding public comments	10/16/2015
	Battelle provides Revised Final IEPR Report to panel members for review (if needed)	10/20/2015

Table C-2. Final Review Schedule (Continued)

Task	Action	Due Date
	Panel members provide comments on the Revised Final IEPR Report	10/21/2015
	Battelle submits Revised Final IEPR Report to USACE*	10/23/2015
	USACE Planning Center of Expertise (PCX) Provides Decision on Revised Final IEPR Report Acceptance	10/28/2015

* *Deliverables*

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Mamaroneck-Sheldrake IEPR 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 Mamaroneck-Sheldrake IEPR 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 (Julian DiGialleonardo digialleonardoj@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 Julian Digialleonardo, digialleonardoj@battelle.org , no later than July 2, 2015, 5 pm ET

IEPR of the Mamaroneck and Sheldrake River Basin, Village of Mamaroneck Westchester County, NY, Flood Risk Management General Reevaluation Report

CHARGE QUESTIONS AND RELEVANT SECTIONS AS SUPPLIED BY USACE

Broad Evaluation Charge Questions

1. Is 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. Assess whether the models used to assess life safety hazards for the tentatively selected plan are appropriate.
12. Assess whether the assumptions made for the life safety hazards for the tentatively selected plan are appropriate.
13. Are the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards?
14. Does the analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project?
15. From a public safety perspective, is the proposed alternative reasonably appropriate or are there other alternatives that should be considered?

Specific Technical and Scientific Charge Questions

16. Is the authorized project clearly described in terms of location, function, size, and land requirements?
17. Are the changes to the authorized plan clearly described and is the rationale for the changes clear?

Overview Questions

18. Please identify the most critical concerns (up to five) you have with the project and/or review documents.
19. Please provide positive feedback on the project and/or review documents

Public Comment Questions (provided to the Panel separately for their review of the public comments)

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

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APPENDIX D

Conflict of Interest Form

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Conflicts of Interest Questionnaire

[Independent External Peer Review]

[Mamaroneck GRR]

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: **Gina M. Crabtree**
TELEPHONE: **614-424-5097**
ADDRESS: **505 King Avenue, Columbus, OH 43210**
EMAIL ADDRESS: crabtreeg@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? No

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.

Gina Caltree _____ 4/23/15

YOUR SIGNATURE DATE

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