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Independent External Peer Review of the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Final Report

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Executive Summary

This Independent External Peer Review (IEPR) Final Report provides the results of an IEPR that assessed the documents associated with the *East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement* dated August 2016 (Draft HSGRR/EIS). The New York District of the US Army Corps of Engineers (USACE) has prepared the Draft HSGRR/EIS.

Project Background

The USACE project encompasses the area around Jamaica Bay on Long Island in the New York City Boroughs of Queens and Brooklyn. The project area includes the communities along the Atlantic Coast, on the Rockaway Peninsula, and those surrounding Jamaica Bay.

The USACE New York District has been involved with projects to protect the Rockaway Peninsula since 1965. Because of the high cost of construction and beach nourishment and the continuing challenge of the eroding shoreline, the USACE was directed in 2003 to "reformulate" the original plan with the objective of finding a long-term, cost-effective solution to the effects of continuing erosion on the Rockaway Peninsula. The variability of federal funding delayed progress on the study until it was fully funded after Hurricane Sandy in 2013. The USACE has expanded the study area beyond the Atlantic Coast of the Rockaway Peninsula to include vulnerable communities surrounding Jamaica Bay that were significantly affected by Hurricane Sandy.

The USACE Tentatively Selected Plan (TSP) to protect the project area consists of approximately 152,000 linear feet of constructed barriers of various types, which includes a storm surge barrier across Rockaway Inlet.

Independent External Peer Review Process

The LMI Team, consisting of the Logistics Management Institute (LMI) and Analysis, Planning and Management Institute (APMI), has conducted the IEPR of the Draft HSGRR/EIS. The IEPR has been conducted in accordance with the procedures described in the Department of the Army, USACE Engineer Circular (EC) No. 1165-2-214, *Civil Works Review*, dated 15 December 2012. The IEPR was conducted to analyze the adequacy and acceptability of methods, modeling, data, and analyses used. The IEPR focused on an engineering, economic, and environmental technical review and did not involve policy review.

A panel of subject matter experts with the following expertise and experience conducted the review:

- Biological Resources and Environmental Law Compliance
- Civil Engineer/Risk Reviewer
- Civil Works Planner/Economist
- Coastal/Hydrology and Hydraulic Engineer
- Structural/Geotechnical Engineer.

The IEPR Panel was charged with providing a broad technical evaluation of the material contained in the Draft HSGRR/EIS and supporting documentation. This IEPR report provides the final comments of the IEPR Panel.

Results of the Independent External Peer Review

The IEPR Panel was impressed by the sheer scale and dimension of the proposed flood mitigation program and the planning that went into its development. The program is comprehensive in nature and includes both Atlantic Ocean flood mitigation measures as well as measures to protect residents and infrastructure around Jamaica Bay. The IEPR Panel also applauds USACE for considering use of more natural alternatives as part of the "residual risk" portion of the project. These may be more sustainable and seem to be more compatible with existing natural features and biota. The proposed project seems to be thoroughly justified when considering an overall benefit-to-cost ratio and net national economic development benefits to the nation. If the program were implemented, the damages recorded in the study area would be much less if another Sandy-like storm were to arrive. However, while the IEPR Panel appreciates the hard work completed to date by USACE, there are some shortcomings in the effort and a need for revisions to the report and appendices. In addition, while the IEPR Panel appreciates that the level of effort is typically reduced during the SMART (Specific, Measurable, Achievable, Realistic and Timely) planning process, the level of detail in some areas is lacking even by those standards.

The IEPR Panel has outlined issues that need to be addressed by USACE. Among these, and perhaps most important, is the adequacy of the EIS. As the report now stands, the IEPR Panel believes that the EIS is not sufficient under the National Environmental Policy Act (NEPA) to document impacts and mitigation required for such a massive project. The IEPR Panel recommends reissuing the Draft HSGRR/EIS with additional information and analyses or issuing a Supplemental Draft HSGRR/EIS in the future. Besides the environmental issues, the IEPR Panel has also identified engineering deficiencies such as questions regarding modeling, flood wall design, constructability, design top elevations, and cost estimating.

Table ES-1 summarizes the number of IEPR Panel comments for each significance level.

Table ES-1: Tabulation of IEPR Panel Comments by Significance Level

Significance	Number of comments
High	6
Medium/High	5
Medium	16
Medium/Low	3
Low	4

The following sections summarize the issues for each IEPR technical review area.

Biological Resources and Environmental Law Compliance

The Draft HSGRR/EIS document does not in its present form meet the procedural requirements of NEPA for an EIS for this stage of project development, even for the lesser documentation requirements of the USACE SMART planning process. The purpose and need for the project and the USACE planning process are explained well. However, other aspects of the environmental analysis are not adequate.

Major concerns are inadequate descriptions of Existing Conditions to allow the reader to understand the analyses presented, lack of data and sourcing of data to support analyses, and important areas of concern that are not analyzed.

The Existing Conditions descriptions of the study area's natural resources lack sufficient detail to provide a basis for evaluating project impacts. This can be partly remedied by moving information that is presented in appendices into the main body of the document. However, other sections, though they may not be important to the benefit/cost ratio, lack an adequate description of existing resources as a basis for comparison with future project conditions (e.g., navigation, recreation) or lack sufficient detail and backup on methodology to allow a reader to understand and evaluate the analyses of impacts. These issues were also raised in public comments by reviewing agencies and stakeholders.

The structure of the Draft HSGRR/EIS makes it difficult to follow and for the reader to gain an overall understanding of how the TSP would result in significant environmental impacts and if the proposed mitigation would be sufficient to offset those impacts. The SMART planning process may reduce the need for in-depth analyses at this stage of project development. However, at a minimum adequate data and sourcing of the data should be presented to support impact analyses and conclusions presented in the EIS. For example, if mitigation would offset wetlands acreage impacts, the reader should be able to follow how that will occur by reviewing tables of acreages and other documentation regarding proposed mitigation sites. Similarly, the reader should be able to follow how the amount of scouring or other impacts on sediment transfer attributable to the proposed plan would be mitigated. Similar comments can be made for air quality, sediment quality, and other resources potentially impacted by the project. Also, a succinct section describing potential impacts and mitigation measures should be presented in the Executive Summary so that the public, legislators, reviewing agencies, and other stakeholders can determine how the TSP will impact the environment, how the impacts will be mitigated, and how the project is in the public interest after environmental impacts are considered.

Civil Engineering/Risk Review

The IEPR Panel has completed a detailed civil engineering technical review of the Draft HSGRR/EIS. The review included an assessment of proposed flood mitigation alternatives, evaluation of the TSP, a check of general engineering calculations and assumptions, and an appraisal of plan sheet drawings.

Overall, a majority of the civil engineering work was sound and assumptions reasonable. The engineering alternatives included a wide array of flood mitigation options ranging from total structural protection to more ecologically-friendly soft structures. Impacts on public spaces, parks, and resident "view sheds" were also considered. The project appears to offer significant benefits to the residents in the study area and those benefits appear much higher than estimated costs thereby resulting in a feasible project moving forward. However, the IEPR Panel has also noted some shortcomings and deficiencies in the civil engineering efforts. The most important of these include inaccurate or incomplete cost estimates and inconsistencies in design top elevations for many proposed protective features.

Cost estimates appear to be somewhat inaccurate, incomplete, or inadequately documented. The Cost Engineering Appendix is missing almost all supporting backup information that is customarily included at this stage of project development. The IEPR Panel recognizes that some of this information is spread about other engineering appendices but usually these data are consolidated into one appendix. The Micro-Computer Aided Cost Estimating System (MCACES) Second Generation (MII) cost estimate appears to be low, and it is not clear to the IEPR Panel if critical cost items are all included since cost

estimate narratives and assumptions are not included in Appendix C. Also, costs of interior drainage for the TSP appear to be low and perhaps missing for the case of "residual risk" measures. Lastly, the assumed cost percentages for Planning-Engineering-Design (PED) and construction management are very low in the MII estimate. These costs may be embedded in the base construction cost presented but, if so, this is inconsistent with customary USACE practice.

The IEPR Panel also noted important inconsistencies with design top elevations for the various flood mitigation components in the Jamaica Bay portion of the project area. The design top elevations differ by up to 3 feet in many areas resulting in possible systemic system weakness as well as varying actual levels of protection provided to residents. USACE needs to review these elevation differences to determine if less deviation is practical. Less than a 2-foot difference throughout the system would be preferable to what is currently proposed.

Civil Works Planning/Economics

Overall, the plan implementation used was sound and appropriately sequential in an analytical fashion. The economic methods, models, and analyses were correct and defensible. The data used in the different sections and the steps to determine the follow-on activities for the TSP seemed appropriate to the degree available.

An important issue was the lack of detail for the assumptions that were used in the models and analyses presented. In several instances, the (probably) valid analysis was presented as completed, but the lack of specificity or sourcing of the data and analyses made it difficult for the reviewer to determine if the analysis was done correctly or thoroughly. The lack of documentation on sources and timing of cost elements in sections of the report hinders the comfort level of the reviewer in accepting the benefits and costs findings. Inadequate documentation of the residual risk associated with alternatives is important even under the SMART planning paradigm. A thorough editing of the report would improve readability, flow, understanding, and reviewer comfort with the analyses and findings as the project moves forward.

Coastal/Hydrology and Hydraulics Engineering

The IEPR Panel noted a few issues and clarifications that need to be addressed. It is not clear how the TSP would perform if a large storm such as Hurricane Sandy were to occur in the project area. It would be beneficial to discuss how land subsidence in the project area compares with land subsidence in Sandy Hook and, thus, why the same relative sea level rise value for Sandy Hook can be used in the project area. The applicability of using breakwater structures has not been discussed in comparison with other measures and alternatives that were considered. The report seems to lack the discussion of the adaptability of mitigation approaches to the uncertainty of future climate conditions. The analysis supporting the elimination of purchasing/demolishing (retreat) or elevating structures in the flood zone has not been presented adequately in the report.

The IEPR Panel noted several issues with the coastal processes and hydrodynamic modeling used in the project analysis. CSHORE – a cross-shore numerical model for waves, currents, sediment transport, and beach profile evolution – could be a good tool to use for this study and for qualitative comparison of beach profile erosion with other models that were used. There is no discussion of utilizing regional 2D or 3D suites of coastal system models for the coastal processes for the entire project area. More

clarification is needed to determine if the storm on 21 October 2012 in the project region was considered for antecedent beach profile conditions when calibrating the models used for the project analysis.

Structural/Geotechnical Engineering

The geotechnical analyses contained in the Draft HSGRR/EIS utilized available subsurface information in a comprehensive manner to evaluate the foundation conditions and develop preliminary designs for the structural features. The design effort provides the basis for a reasonable overall cost estimate, although there is some question regarding the appropriateness of the factors of safety utilized in these analyses. The barrier gate structure design and cost estimate was based upon conventional "in the dry" construction methodology utilizing cast-in-place concrete structures. Alternative procedures utilizing "in the wet" construction similar to that used on the USACE Olmsted project may reduce the project costs and should be evaluated in the future. Another cost-saving alternative would be to utilize permanent cellular sheet pile structures to replace the costly combi-wall sections of the barrier.

To reduce damages for flood events that occur at a 5-year frequency or less (residual risk), the TSP includes construction of 26 reaches of low-height levee or floodwall around the perimeter of Jamaica Bay. The $380 million estimated cost for these structures does not include any allocation for controlling interior drainage and therefore may significantly increase when these costs are evaluated. The $380 million expenditure for the residual risk structures is approximately 10 percent of the overall project cost. The report does not provide any economic justification for protection of features that have historically been flooded at a 5-year frequency. If economically justified, flood proofing and/or acquisition of properties and land may be a better alternative than structural solutions for many of the 26 residual risk reaches included in the TSP.

The following lists the IEPR Panel comments. Complete comments can be found in Section 5.

No.	Final Panel Comment
Significance: High	
1	It is unlikely that sufficient information has been provided in this Environmental Impact Statement (EIS) for it to be considered an adequate EIS under the National Environmental Policy Act (NEPA).
2	The Draft HSGRR/EIS Executive Summary does not contain any conclusions regarding whether the proposed Tentatively Selected Plan (TSP) would cause significant environmental impacts, and, if so, whether they would be mitigated, which result in weakening the compliance of this with Council on Environmental Quality (CEQ) regulations.
3	The EIS provides insufficient quantitative data and discussion of methodology to justify the assessment of impacts on ecological communities and mitigation of these impacts, described in Table 5-6 and Section 6.1, making conclusions regarding project impacts difficult to understand and confirm.

4	Table 7-2 and associated text on p. 163 of the Draft HSGRR/EIS inappropriately describes the acreage changes associated with the Action Alternative as benefits and is confusing because a similar table is not provided for the Proposed Action.
5	There is insufficient discussion for the TSP of the environmental impacts of groin placement on other shoreline areas including areas outside of the study area.
6	The Draft HSGRR/EIS does not address regional traffic safety and transportation issues.
Significance: Medium/High	
7	The structure of the EIS made it difficult to follow and to reach conclusions regarding the overall significance of impacts of the Future No-Action conditions.
8	There is inadequate documentation of methodologies, analyses, sources of information, cost estimates, and lack of literature citations in sections of the report, which affects the credibility of the report conclusions.
9	Several places in the EIS inappropriately describe future conditions under Existing Conditions.
10	The EIS inadequately addresses the baseline recreation conditions and the project impacts and benefits on recreation within the study area.
11	It is not clear how the TSP would perform if a large storm such as Hurricane Sandy were to occur in the project area.
Significance: Medium	
12	Retreat or elevating structures in the flood zone have not been considered adequately in the report to justify why these alternatives were eliminated from further consideration.
13	Mitigating residual risk as described in Appendix A-2 H of the Draft HSGRR/EIS considers only structural means to protect shoreline property under low-frequency surge events and does not evaluate nonstructural alternatives such as flood proofing or acquisition.
14	The projected sea level rise (SLR) for the project area is based on historical SLR data of 3.99 mm/year (0.013 ft/year) for Sandy Hook, NJ, which includes land subsidence. The report does not discuss how land subsidence in the project area compares to subsidence in Sandy Hook to validate using the Sandy Hook relative SLR value for the project area.
15	The report does not justify why other coastal processes models and integrated hydrodynamic models were not used for project analysis.
16	The Panel could not determine if the storm on 21 October 2012 in the project region was considered as an antecedent event when calibrating the models used for the project analysis.
17	The Draft HSGRR/EIS does not describe how the proposed mitigation approaches are adapta-

	ble to the uncertainty in future climate conditions.
18	The same level of information in the tables in Appendix E for Jamaica Bay is not provided in the tables for the project oceanfront reach.
19	Socioeconomic considerations are not addressed adequately in the EIS.
20	The Draft HSGRR/EIS contains no analysis of potential noise impacts to adjacent communities resulting from construction activities.
21	The estimated costs are too low in the MCACES Second Generation (MII) cost estimate for planning, engineering, and design (PED) and for construction management.
22	Estimated pump station costs to manage interior drainage appear low for the project alternatives.
23	The estimated costs appear to be underestimated for the structures required to protect against residual risk because the report does not provide estimated costs for interior drainage structures associated with the 26 segments of flood barrier.
24	There is limited discussion of the potential for cost-growth risk of the project in the main report and in Appendix C.
25	It is not clear how the proposed groins will be constructed in the field given their deep invert elevations.
26	The measure design elevations for various hydraulic reaches for the project alternatives vary from 14 feet NAVD88 to 18 feet NAVD88, which is too large a variation in the system.
27	An offshore or detached breakwater does not appear to have been considered as part of the project plan.
Significance: Medium/Low	
28	The construction methodology described in the report for the storm barrier gate system employed standard “in the dry” construction procedures and did not evaluate alternative “in the wet” methodologies that have been utilized for other USACE projects.
29	The TSP includes costly Combi-wall sections to form a barrier connecting the gate sections across the Rockaway Inlet and did not identify or consider alternatives for the wall section.
30	The required factors of safety stated under the design criteria contained in Appendix A2-F do not conform to the USACE requirements for stability of gravity structures as stated in Engineering Manual (EM) 1110-2-2100.

Significance: Low	
31	The three-foot bottom width for the core trench utilized below the proposed levee section is too narrow to obtain adequate material compaction.
32	Converting units from knots to ft/s on page 18 of the Draft HSGRR/EIS is incorrect. This raises the issue that other conversion factors used in the study may be incorrect.
33	The Draft HSGRR/EIS and relevant engineering appendices include a number of important inconsistencies regarding estimated cofferdam top elevations.
34	The report needs to be edited to correct errors and improve readability and understanding.

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1 Introduction

1.1 Introduction and Report Overview

This Independent External Peer Review (IEPR) Final Report provides the results of an IEPR that assessed the documents associated with the *East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement* dated August 2016 (Draft HSGRR/EIS). The New York District of the US Army Corps of Engineers (USACE) has prepared the Draft HSGRR/EIS.

The USACE project encompasses the area around Jamaica Bay on Long Island in the New York City Boroughs of Queens and Brooklyn. The project area includes communities along the Atlantic Coast, on the Rockaway Peninsula, and those surrounding Jamaica Bay.

Section 1 of the IEPR Final Report provides a description of the objectives of this IEPR, general background information on the IEPR, and a brief introduction to the Logistics Management Institute (LMI) and Analysis, Planning and Management Institute (APMI) Team that managed the IEPR process and supported and assisted the IEPR Panel. Section 2 provides an overview description of the USACE project reviewed in this IEPR. Section 3 summarizes the process followed to perform the IEPR. Section 4 describes the IEPR Panel composition and the IEPR Panel Members' expertise. Section 5 presents the IEPR Panel comments. Appendix A reproduces the USACE Charge to Reviewers provided to the IEPR Panel to use as guidance for the IEPR. Appendix B provides short resumes for the IEPR Panel Members.

1.2 Independent External Peer Review Overview

The USACE lifecycle review strategy for Civil Works projects provides for a review of project documents from initial planning through the project phases of design; construction; and operation, maintenance, repair, replacement and rehabilitation. The strategy provides procedures for ensuring the quality and credibility of the USACE decision, implementation, and operations and maintenance documents and work products.

Peer reviews, such as this IEPR, are one of the important procedures used to ensure that the quality of USACE 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 objective of this IEPR was to review the Draft HSGRR/EIS in accordance with the procedures described in the Department of the Army, USACE Engineer Circular (EC) No. 1165-2-214, *Civil Works Review*, dated 15 December 2012. The review was of the technical basis for the economic, engineering, and environmental methods, models, data, analyses, and assumptions supporting the East Rockaway Inlet report. The review did not consider policy issues.

The IEPR was conducted by a panel of experts (IEPR Panel) composed of subject matter experts with extensive experience in engineering, economic, and environmental issues associated with the USACE project.

1.3 IEPR Management Team

A group of independent experts conducted the IEPR under the auspices of APMI as a subcontractor to LMI, collectively referred to hereafter as the Team. Both organizations are not-for-profit science and technology entities that provide impartial, independent assistance, free of conflict of interest (COI), to federal government organizations. Neither organization has performed or advocated for or against any federal water resources projects or has real or perceived COI for conducting IEPRs. LMI, APMI, and the Panel Members for this IEPR have not been involved in any capacity with the projects documented in the Draft HSGRR/EIS. For this IEPR, both organizations are free from COI with the USACE.

2 Project Description

The USACE project encompasses the area around Jamaica Bay on Long Island in the Boroughs of Queens and Brooklyn in New York City (Figure 1). The project area includes the Atlantic Coast and communities of the Rockaway Peninsula and those surrounding Jamaica Bay.

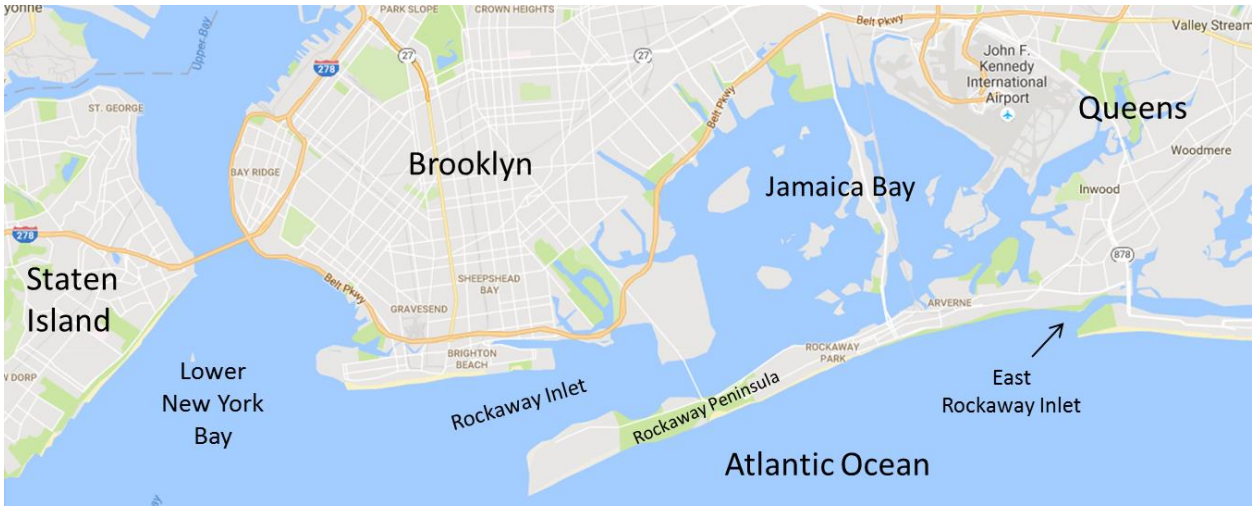

Figure 1: The Region of Jamaica Bay on Long Island in New York City

2.1 Background

The USACE New York District has been involved with projects on the Rockaway Peninsula since 1965. The original federal authorization provided for initial construction and periodic beach nourishment for a 10-year period, which was completed in 1977. Severe storms during 1977 and 1978 caused significant beach erosion, and emergency repairs were made in 1978 and 1979 to the affected areas. Periodic beach nourishment continued from 1980 to 1988. Further erosion from storms led to authorization of a second major construction effort, allowing continued federal participation in periodic beach nourishment. Under this authority, a reevaluation report approved in May 1994 prescribed three additional nourishment cycles occurring 3 years apart.

Because of the high cost of the construction and beach nourishment and the continuing challenge of the eroding shoreline, the USACE was directed in 2003 to "reformulate" the original plan with the objective of finding a long-term, cost-effective solution to the effects of continuing erosion on the Rockaway Peninsula. The variability of federal funding delayed progress on the study until it was fully funded after Hurricane Sandy in 2013.

The USACE has expanded the study area beyond the Atlantic Coast of the Rockaway Peninsula to include vulnerable communities surrounding Jamaica Bay that were significantly affected by Hurricane Sandy. Figure 2 shows the study area boundaries. Figure 3 shows the regulated 100-year floodplain area as designated by the Federal Emergency Management Agency (FEMA). The regulated floodplain area contains approximately 10,400 buildings.

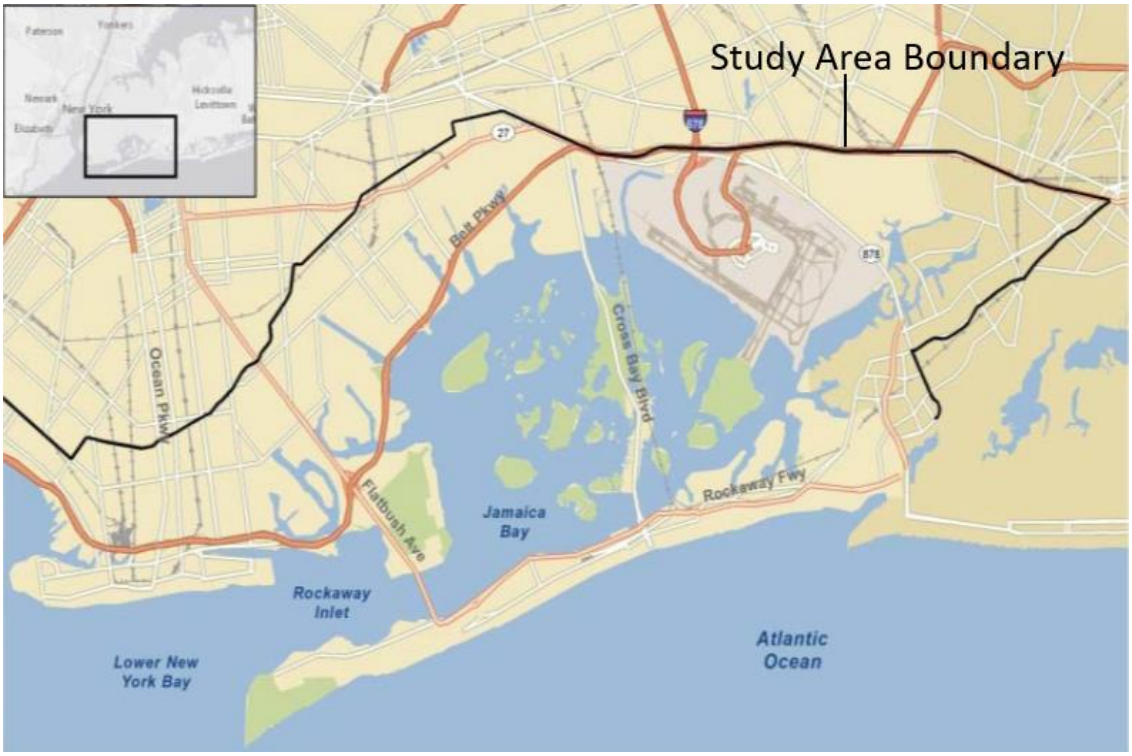

Figure 2: Boundary of the East Rockaway Inlet Project

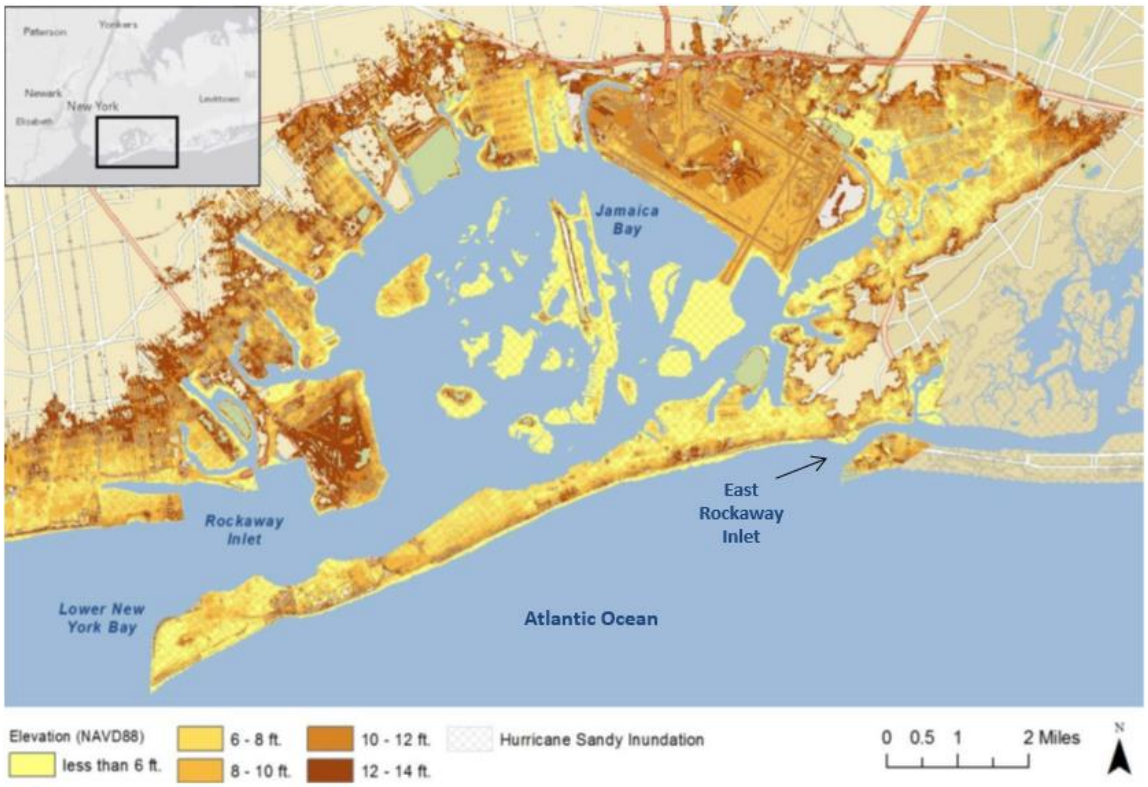

Figure 3: Area Flooded at Different Flood Heights in the Jamaica Bay Area

2.2 Tentatively Selected Plan

Figure 4 shows the USACE Tentatively Selected Plan (TSP) that was considered in this IEPR. The plan consists of approximately 152,000 linear feet of constructed barriers of various types, which includes a storm surge barrier across Rockaway Inlet.

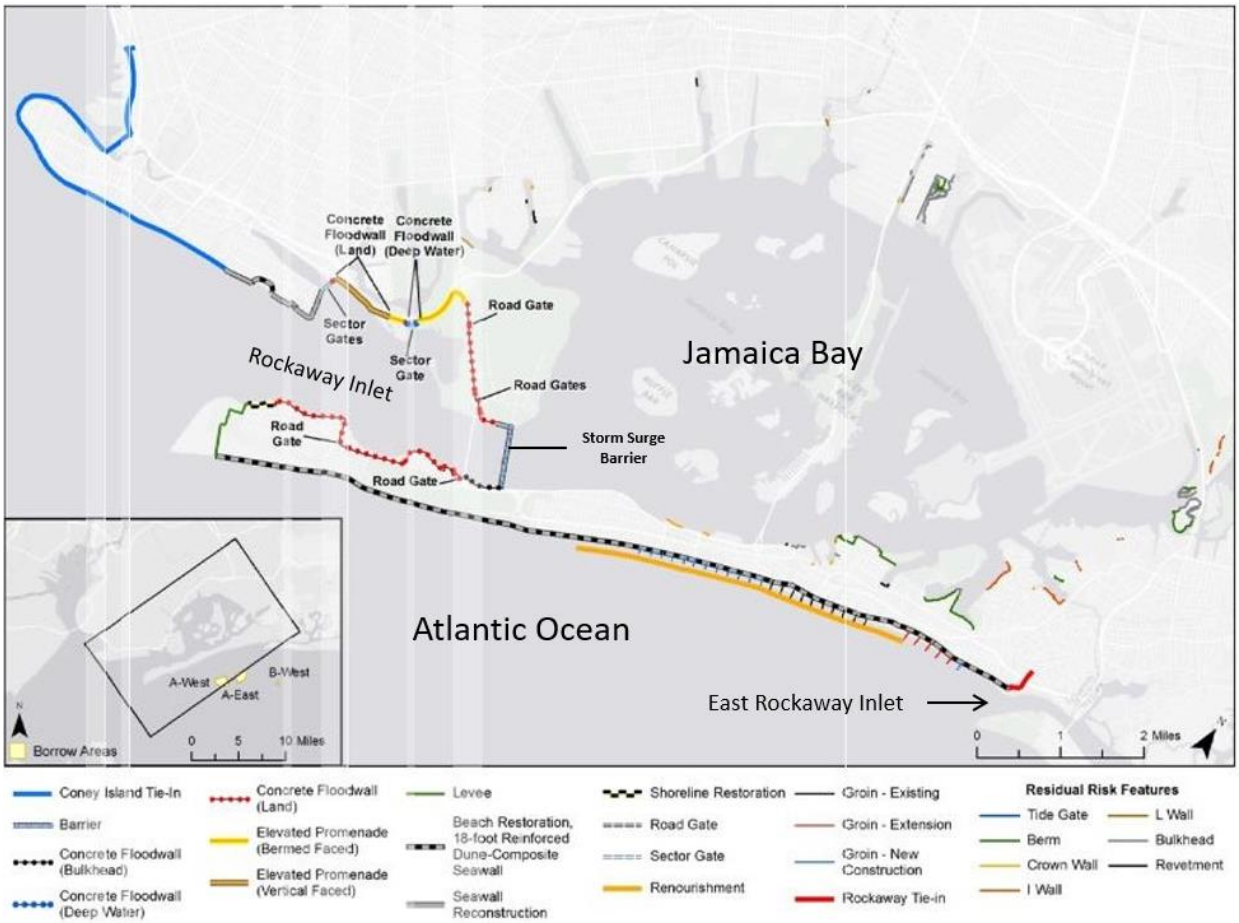

Figure 4: Tentatively Selected Plan Considered in the IEPR

The TSP along the Atlantic Ocean shorefront on the Rockaway Peninsula consists of the following elements (elevations are NAVD88):

- A reinforced dune (composite seawall) with a structure crest elevation of +17 feet and dune elevation of +18 feet, and a design berm width of 60 feet extending approximately 35,000 linear feet from Beach 19th Street to Beach 149th Street. The bottom of dune reinforcement extends up to 15 feet below the dune crest (see Figures 5 and 6).
- A beach berm elevation of +8 feet and a depth of closure of -25 feet.
- A total beach fill quantity of approximately 804,000 cubic yards (cy) for the initial placement, including tolerance, overfill, and advanced nourishment with a 4-year beach nourishment cycle of approximately 1,021,000 cy, resulting in an advance berm width of 60 feet.

- Obtaining sand from borrow areas located approximately 2 miles south of the Rockaway Peninsula and about 6 miles east of the Rockaway Inlet (Figure 4). The borrow area is about 2.6 miles long and 1.1 miles wide with depths of 36 to 58 feet and contains approximately 17 million cy of suitable beach fill material, which exceeds the required initial fill and all periodic beach nourishment fill operations.
- Extension of 5 existing groins and construction of 13 new groins.

The TSP along Jamaica Bay and Rockaway Inlet consists of the following elements:

- Reinforced dune along the shoreline in Reaches 1 and 2 of the Atlantic Coast Planning Reach from Beach 149th Street to Breezy Point.
- Levee from approximately Beach 227th Street north overland across Breezy Point, thence eastward from Beach 222nd Street to Beach 201st Street. Approximately 450,000 cy of sediment is required for levee construction.
- Concrete floodwall south along Beach 201st Street extending east along north side of Rockaway Boulevard to Beach 184th Street, thence north to existing shoreline. Concrete floodwall continues east to storm surge barrier approximately 2,300 feet east of the Gil Hodges Memorial Bridge/Marine Parkway Bridge.
- A 3,970-foot-long storm surge barrier across Rockaway Inlet from near Jacob Riis Park to Floyd Bennett Field. The barrier would have seven 100-foot wide vertical lift gates and two 200-foot-wide sector gates.
- Concrete floodwall on land running north along Flatbush Avenue towards the Belt Parkway.
- Berm-faced elevated promenade running west along the waterside of the Belt Parkway to a concrete floodwall at Gerritsen Inlet.
- Sector gate across Gerritsen Inlet, which ties in to a concrete floodwall.
- Elevated promenades (berm faced and vertical faced) extend from Gerritsen Inlet around Plumb Beach westward to the inlet at Sheepshead Bay.
- Sector gate across Sheepshead Bay.
- Seawall reconstruction around the eastern end of Coney Island at Kingsborough Community College.
- Reinforced dune across sandy beach at Kingsborough Community College/Oriental and Manhattan Beach.
- Seawall reconstruction from Manhattan Beach to approximately Corbin Place.
- Coney Island tie-in where the line of protection continues west until Norton Point. From Norton Point, the line of protection continues on the north side of Coney Island, crossing Coney Island Creek. From Coney Island Creek, it continues north along the shoreline to high ground.

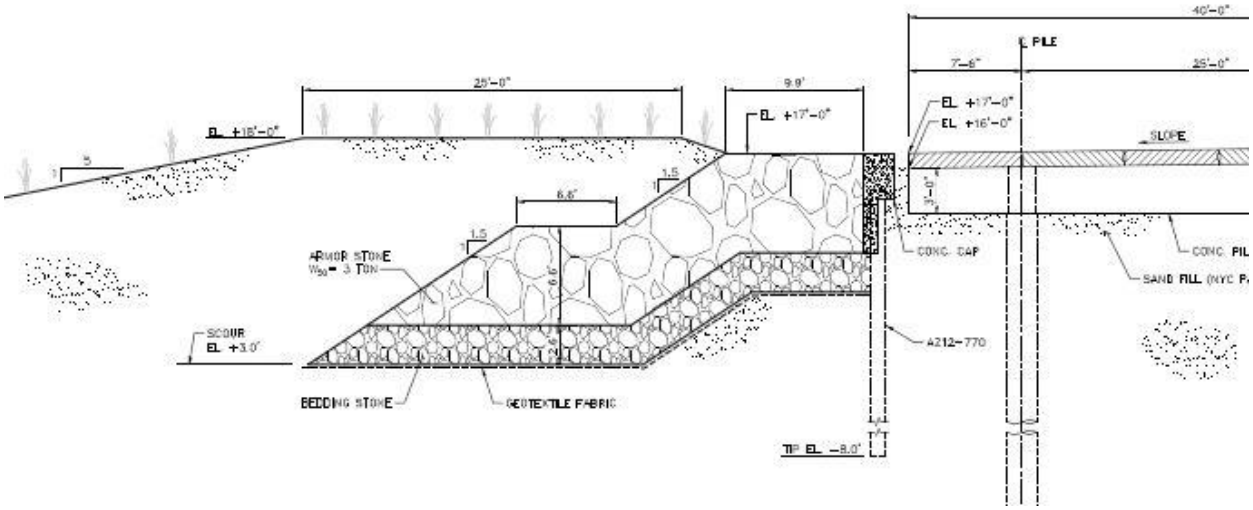

Figure 5: Composite Seawall to be Constructed from Beach 19th Street to Beach 126th Street

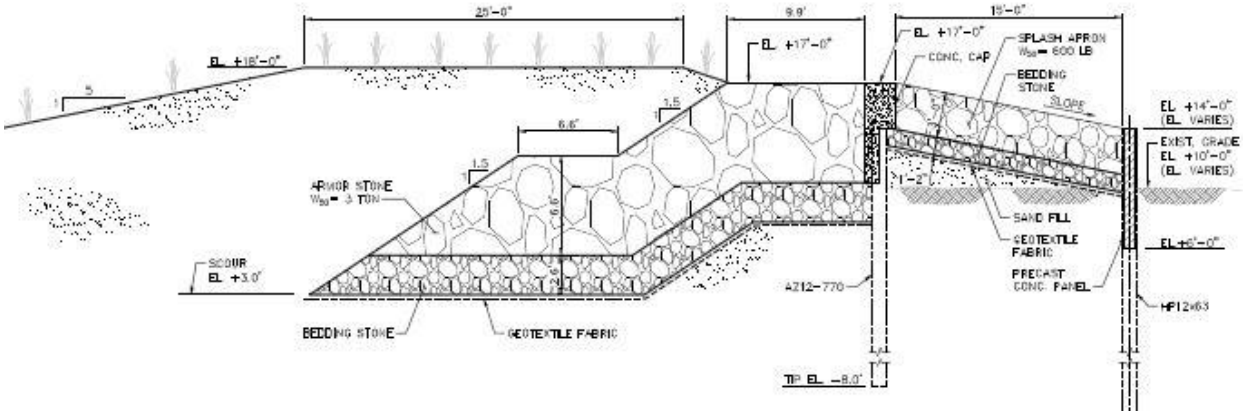

Figure 6: Composite Seawall to be Constructed from Beach 126th Street to Beach 149th Street

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3 Independent External Peer Review Process

This section summarizes the process for conducting this IEPR. The LMI Team performed the IEPR in accordance with the procedures described in EC 1165-2-214.

3.1 Project Management

The Team developed and executed a Work Plan to define and manage the process for conducting the IEPR. The Work Plan described the process for screening and selecting independent reviewers, communicating and meeting with the USACE project team, maintaining the project schedule and quality control, compiling and disseminating the independent reviewers' comments, and project management and administration.

3.2 Selecting the Independent External Peer Review Panel

Reaching out to its various pools of experts, the Team identified experts who met and exceeded the technical expertise and other requirements of this IEPR. We provided potential candidates with a scope of work, which included the required expertise and project schedule, and conducted informal and formal discussions to identify any technical expertise concerns or potential COI issues. Consistent with the guidelines of the US Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review (M-05-03)*, issued 16 December 2004, the following criteria were considered in screening the candidates:

- Expertise – Ensuring the selected reviewer has the knowledge, experience, and skills necessary to perform the review.
- Independence – The reviewer was not involved with projects for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay study or in producing the documents to be reviewed.
- Conflict of Interest – Identifying any financial or other interest that conflicts with the service of an individual on the review panel because it could impair the individual's objectivity or could create an unfair competitive advantage for a person or organization.
- Availability – Assessing the candidates' availability to meet the project schedule.

After screening candidates to exclude those with inadequate expertise or potential COI issues in accordance with the requirements and guidelines of the National Academy of Sciences (NAS) and OMB M-05-03, several candidates were selected for further screening and evaluation to ensure they met or exceeded the requirements of this task (one candidate was disqualified because of COI). The Team then selected from the list the most qualified candidates available to serve on the IEPR Panel. The Team provided the list of selected panelists along with their detailed résumés to the USACE to determine if any had a potential COI based on USACE knowledge of the individual's past involvement with the project. USACE acknowledged the proposed Panel Members' experience relative to the requirements of the IEPR and that there were no perceived COI issues. Information about the Panel Members is in Section 4.

3.3 Preparing and Charging the Panel

The USACE provided to the Team the documents to be reviewed by the IEPR Panel. Table 1 provides the list of the documents used in this review. We provided these documents to the panel members along with the Charge to Reviewers. These charge questions established the general boundaries for the IEPR. The charge questions are in Appendix A.

Table 1: Documents Reviewed in the Independent External Peer Review

Documents for Review	# Pages
East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement	270
Engineering Appendix A1 – Shoreline Engineering and Design Appendix	657
Engineering Appendix A2 – Jamaica Bay Reach	1,156
Appendix A3 – Plates Appendix	116
Appendix B – Borrow Area Engineering	27
Appendix B2 – Borrow Area Environmental	311
Appendix C – Cost	13
Appendix D – Benefits Appendix	142
Appendix E – Plan Formulation	190
Appendix F – Draft Real Estate Plan	26
Appendix G – Public Access Plan	7
Appendix H – Pertinent Correspondence	47
Appendices I to S – EIS Appendices	536
Total	3,498

The IEPR Panel received templates and instructions for preparing their comments to ensure proper coverage of all important issues and consistency in preparing the IEPR comments. The IEPR Panel was instructed that the Team would be the conduit for information exchange between the IEPR Panel and USACE throughout the project in order to ensure an independent review.

3.4 Performing the Independent External Peer Review

This IEPR involved reviewing the Draft HSGRR/EIS to analyze the adequacy and acceptability of engineering methods, models, data, and analyses presented in the documents. The review focused on conducting a technical review and did not involve policy issues. The IEPR Panel used the charge questions as guidance for identifying relevant information and developing their comments and recommendations.

Throughout the review process, the Team communicated to the IEPR Panel all relevant project information, instructions, and required actions and deadlines. We acted as the conduit for information exchange between the IEPR Panel and USACE throughout the project in order to maintain the integrity of the IEPR process.

3.5 Finalizing the Panel Comments

After completing the review, the IEPR Panel submitted a draft of their comments to the Team. We collated the IEPR Panel comments and ensured they were complete and responsive to the charge. We identified overall themes raised by multiple peer reviewers or repeated by one reviewer, comments that indicated conflicting peer review opinions, and other noteworthy comments. The Team ensured that the Panel comments focused on performing a technical review of the documents and did not comment on policy-related issues.

The Team coordinated with the IEPR Panel to reach consensus on the comments, identify any overlapping comments, and resolve any contradictions. Further refinement and consolidation of the comments occurred via email exchange and telephone discussions.

Each IEPR Final Panel Comment consisted of four parts:

- **Comment:** A clear statement of the concern.
- **Basis for Comment:** A narrative describing the basis for the concern.
- **Significance:** A significance rating (see Section 5) of the concern (the importance of the concern with regard to project implementability) as well as a statement supporting this significance rating. Comments are rated as "high," "medium high," "medium," "medium low," or "low" to indicate the general significance the comment has to project implementability.
- **Recommendation[s] for Resolution:** Recommended actions necessary to resolve the concern, including a description of any additional research that would appreciably influence the conclusions.

3.6 USACE Responses to Panel Comments

After submitting the IEPR Report, APMI will enter the Final Panel Comments into the Design Review and Checking System (DrChecks) for USACE internal tracking of the Final Panel Comments and recommendations as well as the formal responses by the USACE and Backcheck by the IEPR Panel to complete the IEPR process. DrChecks is an Internet-based review and checking application that the USACE uses.[1]

The USACE will review and respond to the Final Panel Comments. The USACE will either "Concur" or "Non-Concur" with each panel comment and will "Adopt" or "Not Adopt" each recommendation provided with that comment. The USACE will prepare a draft written Evaluator Response to each comment.

The IEPR Panel will then review the USACE draft Evaluator Responses. The Team will hold a meeting with the Panel Members and the USACE evaluators so that the IEPR Panel and USACE can discuss the draft Evaluator Responses and ensure there is a clear understanding of the intent of the original panel comments. After this meeting, the USACE will finalize their Evaluator Responses and enter them into DrChecks. The USACE's responses usually indicate whether documentation will or will not be expanded, revised, or changed.

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[1] Hosted on the USACE's PROJect extraNET (ProjNet), a web service that allows secure exchange of information.

3.7 Panel BackCheck Responses

After the USACE enters the final Evaluator Responses into DrChecks, the Team will meet with the IEPR Panel, as needed, to discuss the responses and the approach for preparing the IEPR Panel's responses (called the BackCheck). In the BackCheck process, the IEPR Panel will select either "Concur" or "Non-Concur" with each USACE final Evaluator Response and provide comments (as needed) to indicate whether each USACE response adequately addresses the IEPR Panel's identified concerns. The Team will enter the IEPR Panel's BackCheck responses to each USACE Evaluator Response into DrChecks.

4 Panel Organization

The Team assembled a panel of experts that met the qualifications set forth by the USACE in the Performance Work Statement (PWS) for the task. We supported and assisted the IEPR Panel in carrying out its review and served as the intermediary for communications between the IEPR Panel and USACE during the IEPR process.

4.1 IEPR Management

Figure 7 shows the organization of this IEPR. The purpose of this organization is to assure the independence of the review.

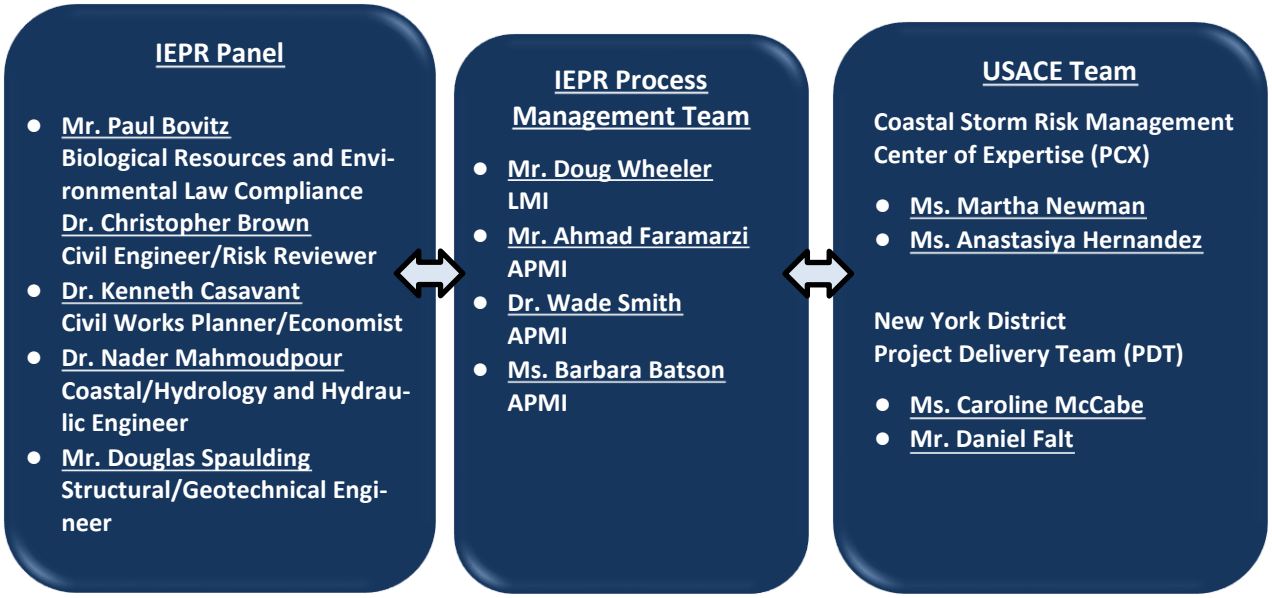

Figure 7: IEPR Organization

4.2 IEPR Panel Members

The IEPR Panel Members satisfied the qualification requirements for each of the areas of expertise called for in the USACE PWS:

- Biological Resources and Environmental Law Compliance
- Civil Engineer/Risk Reviewer
- Civil Works Planner/Economist
- Coastal/Hydrology and Hydraulic Engineer
- Structural/Geotechnical Engineer.

The IEPR Panel Members have experience working in academia, industry, and government.

Mr. Paul Bovitz
Role: Biological Law Resources and Environmental Law Compliance

Mr. Bovitz is a certified professional wetlands scientist and ecologist with an MS degree in Ecology and over 30 years of experience, much of it directly applicable to the issues being addressed in the peer review. He is experienced in National Environmental Policy Act (NEPA) compliance, having completed several Environmental Assessments (EA), Dredged Material Management Plans (DMMPs), EISs, and other NEPA documents. He also has extensive USACE contracting experience in preparing NEPA compliant feasibility studies for habitat restoration and environmental remediation projects. Thus, he is well familiar with the USACE planning process for Civil Works projects.

Mr. Bovitz has conducted and reviewed cultural resources surveys for several NEPA-related projects, performed and reviewed biological assessments nationwide, evaluated endangered species issues, worked in both lake and river ecosystems, having performed aquatic surveys and ecological risk assessments at several sites. In addition, he has performed extensive cumulative impacts analyses, including one for the Meadowlands Mills EIS on behalf of the New York District Regulatory Branch, wherein he evaluated potential impacts of several concurrent projects within the Hackensack Meadowlands on flooding, wildlife, and other wetland values.

Dr. Christopher Brown
Role: Civil Engineering/Risk Reviewer

Dr. Brown is an Associate Professor at the University of North Florida (UNF) teaching civil engineering, fluid mechanics, hydraulics, senior design, and engineering geology. He earned his PhD in Civil Engineering in 2005 from the University of Florida, his Master's Degree from Villanova University in 1997, and his BS degree in Civil Engineering from Temple University in 1991. He has over 25 years of experience working on public works projects for the City of Philadelphia, Waste Management, USACE, and for Golder Associates Inc. as a private consultant for various complex civil engineering projects. While working for the USACE, he was employed within the Planning, Engineering, and Construction Divisions. He was consistently recognized for his excellent technical skills including award of "engineer of the year" twice over 16 years with USACE. He has also recently been recognized for excellence in teaching and mentoring and was awarded several teaching accolades at UNF and the national Bliss Medal from the Society of American Military Engineers (SAME).

Dr. Brown is a registered Professional Engineer in both Pennsylvania and Florida. During his career, Dr. Brown has worked on flood-risk management structures including dams, levees, retaining walls, gates, closure structures, etc., looking at both geotechnical and general civil engineering aspects. Specific project examples include the Prompton Dam spillway modification project, Molly Ann's Brook flood mitigation project, Portugués Dam design, Everglades Agricultural Area Reservoir project, C-111 levees, and many others. Dr. Brown has extensive experience on public works projects for the City of Philadelphia, City of Savannah, City of Jacksonville, Environmental Protection Agency (EPA), USACE, State of Florida, and Commonwealth of Puerto Rico. Dr. Brown has also designed projects to meet requirements

outlined in Engineering Manual (EM) 1110-2-1913.[2] As an expert peer reviewer, Dr. Brown has been involved with review projects in eight USACE districts over a period of 8 years.

Dr. Brown has worked on the geotechnical side of water resources and the hydrologic modeling side of design and modeling projects. Dr. Brown has completed both stability studies using SLOPE/W and UTEXAS and seepage studies using SEEP/W, SEEP2D, and MODFLOW. Dr. Brown has used reliability and stochastic analysis studies on all types of water resources projects dating back to version 1.0 of "@Risk" software. Dr. Brown served on the first USACE ad-hoc committee on levee assessment, which included the initial development of the current USACE fragility curve/risk management design approach.

Dr. Brown has extensive knowledge of USACE cost-estimating systems, with direct experience using Micro-Computer Aided Cost Estimating System (MCACES) and working knowledge of MCACES Second Generation (MII). Dr. Brown has also developed his own risk-based cost estimates using both @Risk and Crystal Ball. He is experienced in developing estimated construction costs and is knowledgeable regarding construction methods related to large civil works projects, including levee design, floodwall design, box culverts, bridge pier modifications, utility relocations, and drainage structure design. Dr. Brown has acted as cost-estimating IEPR reviewer on some of the largest civil works projects in USACE, including the most expensive lock and dam replacement in USACE history.

Dr. Brown is familiar with and has participated in the design of floodwalls and gated structures as well as non-structural flood mitigation solutions (e.g., buy-out or minor flood proofing). Specific project examples of direct design experience include Molly Ann's Brook project (included t-walls, l-walls, underpinning of buildings, levee, bridge modification), Portugués Dam (included access road, foundation prep, arch dam, drainage gallery, rock bolts), and City of Savannah storm sewer upgrade (included new conduit, cut/fill construction, utility relocation and hardening, vibration monitoring). Dr. Brown was also a key designer for the F. E. Walter Dam access road replacement (on design team and field inspection) as well as the design of new bridges across Everglades National Park along the Tamiami Trail in Florida. Dr. Brown has also been involved in other large civil works projects including the Chesapeake and Delaware Canal Deepening Project in Maryland and Delaware and the Delaware Main Channel Deepening Project in Pennsylvania and New Jersey.

Dr. Kenneth Casavant
Role: Civil Works Planner/Economist

Dr. Casavant is a professor and economist at the School of Economic Sciences at Washington State University, Director of the Freight Policy Transportation Institute, and adjunct professor at North Dakota State's Upper Great Plains Transportation Institute since 2002. He earned his PhD in Agricultural Economics from Washington State University in 1971. He has published three textbooks on applied economics and has 14 chapters in other books and monographs. A nationally known transportation and policy economist, he has published over 150 articles and given over 340 presentations, including testifying before state legislatures, regulatory bodies, and the U.S. Congress. During his 48-year career, he has gained extensive experience as an economist, planner, university professor, and consultant, with specific expertise in transportation economics and planning, civil works planning, and NEPA compliance. He is a sought-after colleague, having been invited to and served as a Visiting Professor in Alaska, North Dakota

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2 EM 1110-2-1913, "*Engineering and Design, Design and Construction of Levees,*" USACE, 30 April 2000.

State University, and University of New England, Australia. He has won teaching awards locally, regionally, and nationally in different professional associations and has various best paper awards. He has developed curricula that deal with welfare economics (cost/benefits analysis, externalities, Regional Economic Development (RED)/National Economic Determination (NED), etc.). He has at least 15 years of active experience in economic analysis and plan formulation, including the evaluation and comparison of alternative plans for USACE projects, often on projects with deep draft navigation analysis. Some of his work with USACE has dealt with those plans and subsequent evaluation/rewriting. He has served as the Civil Works planning and plan formulation expert for eight previous USACE IEPRs and as the economics expert on four others; for several other reviews, he fulfilled both roles. For these reviews, Dr. Casavant tested assumptions, examined alternatives, replicated and corroborated analyses, and requested changes using USACE's planning *Principles and Guidelines* (P&G) framework. In addition, he evaluated projects against the USACE six-step planning process governed by Engineering Regulation 1105-2-100.

Dr. Nader Mahmoudpour
Role: Coastal/Hydrology and Hydraulics Engineer

Dr. Mahmoudpour has a PhD and professional engineering registration as a civil engineer. He has over 24 years of experience as a water resources engineer conducting hydrologic and hydraulics analyses for riverine systems and for 2D hydrodynamic storm surge, waves, and sediment transport modeling. He has provided technical expertise for Federal Emergency Management Agency (FEMA) flood hazard risk analysis for riverine and coastal studies for many miles of riverine and coastal shoreline. He has experience in stormwater management analysis and design; in National Pollutant Discharge Elimination System (NPDES), Total Maximum Daily Load (TMDL), and Municipal Separate Storm Sewer System (MS4) requirements; and in watershed studies utilizing Geographic Information System (GIS) applications. He has thorough knowledge of near-shore coastal processes, including refraction/diffraction analysis, run-up, littoral transport, shoaling, and beach erosion. He has served on a variety of water resources projects in transportation, water supply, bridge hydraulics and scour analysis, and sewer system design and construction.

Dr. Mahmoudpour provided technical assistance on Wave Damage Functions of the USACE Coastal Storm Damage Prevented Research and Development (R&D) project, and was a lead engineer for Limit of Moderate Wave Action Operating Guidance and Primary Frontal Dune Best Practices documents prepared for FEMA. He has co-presented at the Ocean Studies Board meeting on the topic "Developing a Coastal Impact Factor to Assess Hurricane Intensity," for the Ocean Studies Board, Board on Atmospheric Sciences and Climate, National Research Council, NAS, March 2013.

Mr. Douglas Spaulding
Role: Structural/Geotechnical Engineer

Mr. Spaulding has over 48 years of experience in the design, evaluation, and inspection of water retaining structures such as dams, levees, and flood walls. His experience includes 10 years with the USACE where he served as Chief of the Levee & Channel Design Section for the USACE St. Paul District. He also has worked as an independent consultant conducting inspections, evaluation, and design of over 70 flood control and hydroelectric dams throughout the United States. His recent experience includes serving as a facilitator for the Federal Energy Regulatory Commission's (FERC's) Potential Failure Mode Evaluation for over 70 dams located throughout the United States. Mr. Spaulding has an MS degree in Civil Engineering in geotechnical engineering and is currently a registered professional engineer in four

states. He has served on several IEPR Panels for projects located throughout the United States and has provided design services, project management, and peer review for over 18 local flood protection projects located around the country. These projects have included earth levee systems, diversion channels, concrete channels, floodwalls, gate wells, and pumping stations. The foundation conditions for these projects have ranged from soft lacustrine clay deposits to stratified granular deposits requiring seepage berms and relief well design. The majority of the projects were located in urban areas, which involved analyses of trade-offs between right away costs and structural costs. Mr. Spaulding's career includes evaluation of risks associated with the long-term performance and design associated with water-retaining structures and conveyance facilities. This process requires evaluating appropriate analytical procedures, making appropriately conservative assumptions, and obtaining sufficient geotechnical data to both describe the subsurface profiles and performance characteristics. Each project is unique and must be viewed and evaluated without preconceived concepts of risk or performance.

4.3 IEPR Process Management Team

The IEPR process management team consisted of the following members.

Doug Wheeler, PMP, CCP, RMP, Program Manager (LMI)

Mr. Wheeler is an industrial and mechanical engineer with more than 20 years of experience in strategic process engineering and financial analysis, including work for USACE, Department of Energy (DOE), and General Services Administration (GSA). For USACE, he led a consultant and client team in a business process reengineering effort for the Navigation Locks and Dams High-Performing Organization. He also led project teams in a variety of tasks to provide reengineering services to the USACE information technology function. Because of his work leading the review of the USACE McClellan-Kerr Arkansas River Navigation System maintenance activity and his support for the USACE Inland Marine Transportation System, Mr. Wheeler understands USACE's water navigation business area and supporting projects. He has also focused on real property and lease-related projects for GSA as well as economic assessments of infrastructure projects for DOE. Mr. Wheeler will apply LMI's COI process by reviewing each task order (TO) Performance Work Statement (PWS) with LMI's management team. LMI's process ensures that each LMI business unit manager is aware of TO scope and can raise organizational COI issues before LMI responds. He currently is focused on LMI's project cost engineering practice, privatization, and competitive sourcing services. Mr. Wheeler holds an MBA and a BS in Mechanical Engineering from Columbia University and an MSE in Industrial Engineering from Arizona State University.

Ahmad Faramarzi, PE, PMP, Project Manager (APMI)

Mr. Faramarzi supervised project personnel and communicated policies, procedures, and goals to the IEPR Team. In coordination with Mr. Wheeler, Mr. Faramarzi maintained regular contact with USACE and was responsible for the overall project plan, project performance, and client satisfaction on this as well as future tasks for USACE. He will also have multiple technical and administrative staff as direct reports. Mr. Faramarzi is a registered professional engineer and a Certified Project Management Professional with 35 years of experience providing managerial and technical expertise to government clients, including the USACE, Office of the Secretary of Defense (OSD), the U.S. Army, the U.S. Air Force, and Defense Nuclear Facilities Safety Board. He has organized and managed several important and highly visible expert panels in response to recommendations by the NAS. Mr. Faramarzi has a Post-Masters applied scientist/engineer degree from the George Washington University in Aerospace and Mechanical

Engineering (fluid mechanics), an MS in Thermofluid Engineering, and a BS in Nuclear Engineering. He is on the Board of Directors of the Washington, DC, Section of the American Society of Mechanical Engineers and an active member of the Fluid Dynamics branch.

Dr. Wade Smith, Task Leader (APMI)

Dr. Smith is an ecologist and environmental scientist who received his PhD in environmental engineering sciences from the University of Florida. He has over 30 years of experience with environmental regulations, including the NEPA process, and with analyzing the environmental impacts of a wide variety of types of federal projects. Examples include dredging and dredged material disposal, offshore oil and gas exploration and production, domestic and industrial wastewater disposal, operation of electric power generating stations, construction and operation of coastal recreational developments, pipeline construction and operation, realignment and re-stationing of military forces, closing of military installations, operation of chemical munitions destruction facilities, and dismantling of chemical warfare agent production facilities. Dr. Smith is experienced in working on scientific and engineering issues involving complex and controversial projects. He has participated in all aspects of the NEPA process. He has prepared programmatic and site-specific EISs, EAs, and subject-specific environmental analyses. Dr. Smith has been responsible for all elements of analysis of the physical, biological, and socioeconomic environments. He has participated in all NEPA phases: scoping, draft EIS, public hearings, response to public comments, final EIS, and record of decision. Dr. Smith has also prepared NEPA and environmental analysis guidance documents to be used by federal environmental managers and planners.

Tom Cain, Task Support (APMI)

Mr. Cain is a Principal Chemical/Process Engineer with over 30 years of experience providing managerial and technical expertise to government clients, including the USACE, OSD, the U.S. Army, the U.S. Air Force, the Department of Justice, and other government agencies. He has organized and managed and/or participated in several important and highly visible expert panels and conducted numerous studies in response to recommendations by the NAS. Mr. Cain has experience with environmental regulations, including the NEPA process, and with analyzing the environmental impacts of a wide variety of types of federal projects, particularly the technical aspects. Mr. Cain has routinely applied his engineering, scientific, and analytical skills to unclassified, sensitive, and classified government programs. Areas of expertise are primarily related to the Chemical, Biological, Radiological, Nuclear, and high-yield Explosive field with particular subject matter expertise in chemical and explosives areas. Roles range from team contributor to technical lead to task/project/program manager while working across multiple disciplines and organizations to solve challenges, collaborate in research, and share expert knowledge.

5 Independent External Peer Review Findings

The IEPR Panel has completed a detailed independent technical review of the Draft HSGRR/EIS prepared by the USACE New York District. The review included review of engineering and economic issues, models, assumptions, and calculations as well as an assessment of the environmental studies documenting potential project impacts.

The IEPR Panel was impressed by the sheer scale and dimension of the proposed flood mitigation program and the planning that went into its development. The program is comprehensive in nature and includes both Atlantic Ocean flood mitigation measures as well as measures to protect residents and infrastructure around Jamaica Bay. The IEPR Panel also applauds USACE for considering use of more natural alternatives as part of the "residual risk" portion of the project. These may be more sustainable and seem to be more compatible with existing natural features and biota. The proposed project seems to be thoroughly justified when considering an overall benefit-to-cost ratio and net national economic development benefits to the nation. If the program were implemented, the damages recorded in the study area would be much less if another Sandy-like storm arrived. However, while the IEPR Panel appreciates the hard work completed to date by USACE, there are some shortcomings in the effort and a need for revisions to the report and appendices. In addition, while the IEPR Panel appreciates that the level of effort is typically reduced during the SMART (Specific, Measurable, Achievable, Realistic and Timely) planning process, the level of detail in some areas is lacking even by those standards.

The IEPR Panel has outlined issues that need to be addressed by USACE. Among these, and perhaps most important, is the adequacy of the EIS. As the report now stands, the IEPR Panel believes that the EIS is not sufficient under NEPA to document impacts and mitigation required for such a massive project. The IEPR Panel recommends reissuing the Draft HSGRR/EIS with additional information and analyses or issuing a Supplemental Draft HSGRR/EIS in the future. Besides the environmental issues, the IEPR Panel has also identified engineering deficiencies such as questions regarding modeling, flood wall design, constructability, design top elevations, and cost estimating. The specific issues for these items are detailed herein.

There were a total of 34 comments. Of these, 6 were identified as having High significance, 5 as Medium/High significance, 16 as Medium significance, 3 as Medium/Low significance, and 4 as Low significance. The following paragraphs provide a summary of the Panel's comments in specific subject matter areas.

Biological Resources and Environmental Law Compliance

The Draft HSGRR/EIS document does not in its present form meet the procedural requirements of NEPA for an EIS for this stage of project development, even for the lesser documentation requirements of the USACE SMART planning process. The purpose and need for the project and the USACE planning process are explained well. However, other aspects of the environmental analysis are not adequate. Major concerns are inadequate descriptions of Existing Conditions to allow the reader to understand the analyses presented, lack of data and sourcing of data to support analyses, and important areas of concern that are not analyzed.

The Existing Conditions descriptions of the study area's natural resources lack sufficient detail to provide a basis for evaluating project impacts. This can be partly remedied by moving information that is presented in appendices into the main body of the document. However, other sections, though they may not be important to the benefit/cost ratio, lack an adequate description of existing resources as a basis for comparison with future project conditions (e.g., navigation, recreation) or lack sufficient detail and backup on methodology to allow a reader to understand and evaluate the analyses of impacts. These issues were also raised in public comments by reviewing agencies and stakeholders.

The structure of the Draft HSGRR/EIS makes it difficult to follow and for the reader to gain an overall understanding of how the TSP would result in significant environmental impacts and if the proposed mitigation would be sufficient to offset those impacts. The SMART planning process may reduce the need for in-depth analyses at this stage of project development. However, at a minimum adequate data and sourcing of the data should be presented to support impact analyses and conclusions presented in the EIS. For example, if mitigation would offset wetlands acreage impacts, the reader should be able to follow how that will occur by reviewing tables of acreages and other documentation regarding proposed mitigation sites. Similarly, the reader should be able to follow how the amount of scouring or other impacts on sediment transfer attributable to the proposed plan would be mitigated. Similar comments can be made for air quality, sediment quality, and other resources potentially impacted by the project. Also, a succinct section describing potential impacts and mitigation measures should be presented in the Executive Summary so that the public, legislators, reviewing agencies, and other stakeholders can determine how the TSP will impact the environment, how the impacts will be mitigated, and how the project is in the public interest after environmental impacts are considered.

Civil Engineering/Risk Review

The IEPR Panel has completed a detailed civil engineering technical review of the Draft HSGRR/EIS. The review included an assessment of proposed flood mitigation alternatives, evaluation of the TSP, a check of general engineering calculations and assumptions, and an appraisal of plan sheet drawings.

Overall, a majority of the civil engineering work was sound and assumptions reasonable. The engineering alternatives included a wide array of flood mitigation options ranging from total structural protection to more ecologically-friendly soft structures. Impacts on public spaces, parks, and resident "view sheds" were also considered. The project appears to offer significant benefits to the residents in the study area and those benefits appear much higher than estimated costs thereby resulting in a feasible project moving forward. However, the IEPR Panel has also noted some shortcomings and deficiencies in the civil engineering efforts. The most important of these include inaccurate or incomplete cost estimates and inconsistencies in design top elevations for many proposed protective features.

Cost estimates appear to be somewhat inaccurate, incomplete, or inadequately documented. The Cost Engineering Appendix is missing almost all supporting backup information that is customarily included at this stage of project development. The IEPR Panel recognizes that some of this information is spread about other engineering appendices but usually these data are consolidated into one appendix. The Micro-Computer Aided Cost Estimating System (MCACES) Second Generation (MII) cost estimate appears to be low, and it is not clear to the IEPR Panel if critical cost items are all included since cost estimate narratives and assumptions are not included in Appendix C. Also, costs of interior drainage for the TSP appear to be low and perhaps missing for the case of "residual risk" measures. Lastly, the assumed cost percentages for Planning-Engineering-Design (PED) and construction management are very

low in the MII estimate. These costs may be embedded in the base construction cost presented but, if so, this is inconsistent with customary USACE practice.

The IEPR Panel also noted important inconsistencies with design top elevations for the various flood mitigation components in the Jamaica Bay portion of the project area. The design top elevations differ by up to 3 feet in many areas resulting in possible systemic system weakness as well as varying actual levels of protection provided to residents. USACE needs to review these elevation differences to determine if less deviation is practical. Less than a 2-foot difference throughout the system would be preferable to what is currently proposed.

Civil Works Planning/Economics

Overall, the plan implementation used was sound and appropriately sequential in an analytical fashion. The economic methods, models, and analyses were correct and defensible. The data used in the different sections and the steps to determine the follow-on activities for the TSP seemed appropriate to the degree available.

An important issue was the lack of detail for the assumptions that were used in the models and analyses presented. In several instances, the (probably) valid analysis was presented as completed, but the lack of specificity or sourcing of the data and analyses made it difficult for the reviewer to determine if the analysis was done correctly or thoroughly. The lack of documentation on sources and timing of cost elements in sections of the report hinders the comfort level of the reviewer in accepting the benefits and costs findings. Inadequate documentation of the residual risk associated with alternatives is important even under the SMART planning paradigm. A thorough editing of the report would improve readability, flow, understanding, and reviewer comfort with the analyses and findings as the project moves forward.

Coastal/Hydrology and Hydraulics Engineering

The IEPR Panel noted a few issues and clarifications that need to be addressed. It is not clear how the TSP would perform if a large storm such as Hurricane Sandy were to occur in the project area. It would be beneficial to discuss how land subsidence in the project area compares with land subsidence in Sandy Hook and, thus, why the same relative sea level rise value for Sandy Hook can be used in the project area. The applicability of using breakwater structures has not been discussed in comparison with other measures and alternatives that were considered. The report seems to lack the discussion of the adaptability of mitigation approaches to the uncertainty of future climate conditions. The analysis supporting the elimination of purchasing/demolishing (retreat) or elevating structures in the flood zone has not been presented adequately in the report.

The IEPR Panel noted several issues with the coastal processes and hydrodynamic modeling used in the project analysis. CSHORE – a cross-shore numerical model for waves, currents, sediment transport, and beach profile evolution – could be a good tool to use for this study and for qualitative comparison of beach profile erosion with other models that were used. There is no discussion of utilizing regional 2D or 3D suites of coastal system models for the coastal processes for the entire project area. More clarification is needed to determine if the storm on 21 October 2012 in the project region was considered for antecedent beach profile conditions when calibrating the models used for the project analysis.

Structural/Geotechnical Engineering

The geotechnical analyses contained in the Draft HSGRR/EIS utilized available subsurface information in a comprehensive manner to evaluate the foundation conditions and develop preliminary designs for the structural features. The design effort provides the basis for a reasonable overall cost estimate, although there is some question regarding the appropriateness of the factors of safety utilized in these analyses. The barrier gate structure design and cost estimate was based upon conventional "in the dry" construction methodology utilizing cast-in-place concrete structures. Alternative procedures utilizing "in the wet" construction similar to that used on the USACE Olmsted project may reduce the project costs and should be evaluated in the future. Another cost-saving alternative would be to utilize permanent cellular sheet pile structures to replace the costly combi-wall sections of the barrier.

To reduce damages for flood events that occur at a 5-year frequency or less (residual risk), the TSP includes construction of 26 reaches of low-height levee or floodwall around the perimeter of Jamaica Bay. The $380 million estimated cost for these structures does not include any allocation for controlling interior drainage and therefore may significantly increase when these costs are evaluated. The $380 million expenditure for the residual risk structures is approximately 10 percent of the overall project cost. The report does not provide any economic justification for protection of features that have historically been flooded at a 5-year frequency. If economically justified, flood proofing and/or acquisition of properties and land may be a better alternative than structural solutions for many of the 26 residual risk reaches included in the TSP.

5.1 Independent External Peer Review Panel Comments

This section contains the complete set of comments of the IEPR panel. Each comment consists of four parts:

- Comment
- Basis for comment
- Significance of the concern
- Recommendation for resolution of the comment

The IEPR Panel rated the comments to indicate the general significance the comment has to the project implementability using the following definitions:

- **High:** Comment describes a fundamental problem with the project that could affect the recommendation or justification of the project.
- **Medium/High:** Comment affects the completeness or overall understanding of the recommendation or justification of the project. Resolution of the issue determines if it is a fundamental problem with the project or not.
- **Medium:** Comment affects the completeness or overall understanding of the recommendation or justification of the project.
- **Medium/Low:** Comment affects the technical quality and understanding of the project based on the presentation of information related to the recommendation or justification of the project. However, the panel does not have sufficient information to determine the effect on project implementability.

- **Low:** Comment affects the technical quality and understanding of the project based on the presentation of information related to the recommendation or justification of the project, but there is limited concern regarding project implementability.

Presented below are the final IEPR Panel comments in order of the significance level from high to low.

5.2 Significance: High

Panel Comment #1

It is unlikely that sufficient information has been provided in this Environmental Impact Statement (EIS) for it to be considered an adequate EIS under the National Environmental Policy Act (NEPA).

Basis for Comment

There are many locations in this Draft HSGRR/EIS document where full analysis of impacts have not been or could not be undertaken even considering the stage of the project in the USACE SMART process. As a result, it is difficult to obtain a picture of whether the project as proposed would result in significant impacts, what these impacts are, whether those impacts can adequately be mitigated, and to ultimately determine whether the project as proposed is in the public interest.

Significance: High

Based on the information provided, the Draft HSGRR/EIS as written is unlikely to comply procedurally with the requirements of a NEPA EIS.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. USACE should incorporate additional information and analyses into this document and reissue the Draft HSGRR/EIS for additional public review or issue a Supplemental Draft EIS in the future.

Literature Cited:

- *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, 40 Code of Federal Regulations (CFR) Parts 1500-1508, Council on Environmental Quality, Washington, DC.

Panel Comment #2

The Draft HSGRR/EIS Executive Summary does not contain any conclusions regarding whether the

proposed Tentatively Selected Plan (TSP) would cause significant environmental impacts, and, if so, whether they would be mitigated, which result in weakening the compliance of this with Council on Environmental Quality (CEQ) regulations.

Basis for Comment

The Executive Summary reads as follows:

"Major Findings and Conclusions
Thorough coordination and collaboration was conducted with Federal, State and local agencies, non-governmental organizations and interested stakeholders throughout the study process and public meetings. The recommendations contained herein reflect the information available at this time. This report presents an overview of Coastal Storm Risk Management (CSRM) problems and opportunities in the Rockaway Inlet to East Rockaway Inlet & Jamaica Bay Project Area, evaluated and selected CSRM for the entire area including the most economically efficient plan for the Atlantic Ocean Planning Reach, and for the Jamaica Bay Planning Reach. This approach considers both of these planning reaches as a single, complete system in this Draft HSGRR/EIS. Based on responses from public, policy, and technical reviews of this Draft HSGRR/EIS, USACE may consider a phased decision process. While planned as a system, phased decision making may allow USACE to move forward with implementation of discreet components first, while finalizing the details associated with more technically complex features, acknowledging that the full benefits wouldn't be realized until all components are complete."

According to CEQ NEPA regulations Section 1502.9 (a), "*The draft statement must fulfill and satisfy to the fullest extent possible the requirements established for final statements in section 102(2)(C) of the Act. If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion. The agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternatives including the proposed action."*

In addition, CEQ regulations require that the summary summarize the entire statement, and not be limited to selection of the TSP. Specifically, Section 1502.12 of CEQ states, "*Each environmental impact statement shall contain a summary which adequately and accurately summarizes the statement. The summary shall stress the major conclusions, areas of controversy (including issues raised by agencies and the public), and the issues to be resolved (including the choice among alternatives). The summary will normally not exceed 15 pages.*"

The Panel notes that the word "significantly" does not appear in the Executive Summary, whereas a major component of a NEPA-compliant EIS is to determine whether the proposed action would significantly impact the environment in a positive or negative manner. According to CEQ (Section 1508.27) regulations:

"'Significantly' as used in NEPA requires considerations of both context and intensity:

> *(a) Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.*

(b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

1. *Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.*
2. *The degree to which the proposed action affects public health or safety.*
3. *Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.*
4. *The degree to which the effects on the quality of the human environment are likely to be highly controversial.*
5. *The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.*
6. *The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.*
7. *Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.*
8. *The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.*
9. *The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.*
10. *Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment."*

The Executive Summary of the document does not address any of these issues from an environmental standpoint and focuses entirely on storm flooding and the need for the TSP.

Significance: High

The EIS is not compliant with NEPA.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Include an overall assessment of the information collected to date as to whether or not the project will have "significant" environmental impacts.

Literature Cited:

- *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, 40 CFR Parts 1500-1508, Council of Environmental Quality, Washington, DC.

Panel Comment #3

The EIS provides insufficient quantitative data and discussion of methodology to justify the assessment of impacts on ecological communities and mitigation of these impacts, described in Table 5-6 and Section 6.1, making conclusions regarding project impacts difficult to understand and confirm.

Basis for Comment

1. Section 2.3.7 first paragraph states that *"Biological communities were classified into twelve distinct habitat types that were identified and mapped within the study area"*. The text does not describe who classified these types and on what basis, nor is there a list of preparers with the qualifications of the personnel preparing the section. Moreover, no figure is provided in the text or the Appendix. Therefore, it is difficult to corroborate the acreage extent of project impacts or to verify the District's findings.
2. Table 5-6 on page 101 of the Draft HSGRR/EIS describes the existing habitat acreages, and Section 7.2 describes the habitat acreages that would be impacted by the TSP and the alternative action plan. The methodology of calculating these acreages could not be found in either the text or supporting appendices. This information is critical since the present analysis relies largely on acreage. Similarly, text in Section 6.1 refers to the Evaluation of Planned Wetlands method for wetland valuation but provides no explanation to the public of how this works and how the acreage numbers are integrated with valuation data to arrive at a conceptual mitigation plan.

Significance: High

The project should employ transparent analyses that the reader can follow and confirm.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide more quantitative data and a better description of the methodology used to analyze impacts on habitats. The following are examples of what information is needed: (1) provide a description of how habitat types were identified, (2) provide a habitat map in the EIS showing the extent of existing communities and some text describing how they were quantified, (c) include photos of each habitat so that the public can visualize them and scientists/stakeholders can verify what USACE is describing, and (4) include a detailed discussion of how impacts were quantified.

Panel Comment #4

Table 7-2 and associated text on p. 163 of the Draft HSGRR/EIS inappropriately describes the acreage changes associated with the Action Alternative as benefits and is confusing because a similar table is not provided for the Proposed Action.

Basis for Comment

1. Table 7-2 describes changes in habitat acreage that would result from implementing the "Action Alternative." Review of the table indicates that acreages of several habitat types would increase while acreages of others would decrease. For example, subtidal bottom would decrease from 5.5 acres existing to 4.6 acres in the future, intertidal mudflat would decrease from 13.2 to 12.1 acres, and beach habitat would be reduced from 2.8 acres to 2.2 acres. Other habitats would be greatly increased, but there is no discussion here of quality differences, the Evaluation of Planned Wetlands (EPW) methodology or results, or how the conclusion was reached that the overall result would be an environmental benefit. Also, the table is provided solely for the "Action Alternative", and no such tables are provided for the Future No-Action or the Future with the Project.

Significance: High

The methodology, data presented, and conclusions drawn from the data are unclear and hence not defensible as presented and do not meet the basic requirements of NEPA.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide a discussion of how habitats were valued in order to support a conclusion of project benefits.
2. Provide similar tables of habitat impacts for all scenarios.

Panel Comment #5

There is insufficient discussion for the TSP of the environmental impacts of groin placement on other shoreline areas including areas outside of the study area.

Basis for Comment

P. xiv, Table 5-3 and Figure 5-2 indicate that improvements along the Atlantic Shorefront will include

extension of 5 existing groins and construction of an additional 13 new groins. Per the Draft HSGRR/EIS (Section 2.3.11, p. 56), existing groins have contributed to coastal erosion:

"*The most striking cell is Reach 4, which is predicted to erode by 17.5 ft/yr. This erosion hotspot is caused by 1) overarching trend in longshore sediment transport along eastern Rockaway Beach, and 2) sediment impoundment of updrift groin field in Reach 5.*"

Section 7.1 (p. 149, first paragraph) of the Draft HSGRR/EIS states that "*The groin and seawall structures would help slow the long-term beach erosion within the study area*." A similar statement is made as the first sentence of Section 7.2.1.1 (Bathymetry on p. 150). No discussion of downdrift areas is provided or impacts from translating wave energy from the study area further downgradient.

The discussion of project impacts from groins in Section 7 (e.g., 7.13 and others) appears limited to the footprint of the groins themselves, and while temporary construction impacts are noted, there is no mention of the potential impact of groins on downdrift areas.

The closest discussion to this issue in the Draft HSGRR/EIS appears to be the first sentence of Section 7.2.3.2, which states, "*It is unknown at this time if the Action Alternative would have an adverse effect on the sediment budget of Jamaica Bay.*"

The issue is addressed in part in Appendix J, p. 42, Section 4.1.4 where the document (focusing specifically on piping plovers) states:

"***Groin construction and extension may cause habitat degradation by robbing sand from the downdrift shoreline****. For example, the Coastal Barriers Study Group (1987) and the Ocean City, Maryland and Vicinity Water Resources Study Reconnaissance Report (USACE 1994) attribute the accelerated, landward shoreline recession of the north end of Assateague Island in Maryland to cumulative effects on the natural drift system from inlet stabilization and nourishment of the rapidly eroding beaches at Ocean City. However, loss of sand down-drift of a jetty or groin may be partially off-set by habitat accretion on the up-drift side of a structure. Breezy Point at the western end of southern Long Island, New York, serves as an example of concentrated piping plover numbers on the accreting side of a jetty (Goldin 1990). Beaches on the accreting side of jetties may also be subject to plant succession that makes them less attractive to piping plovers over time (NJDEP 1997, USFWS 2004). The District will monitor the long-term effects of groin placement on habitat for known populations of piping plover or other state or Federally-listed shorebirds/seabirds identified in the greater Project Area and appropriate ameliorative action would be taken. Therefore, because potential impacts and benefits are offsetting, a May Affect, but Not Likely to Adversely Affect determination was made by the District for piping plover from this proposed Project activity. No additional cumulative effects are likely*."

Significance: High

The document does not meet NEPA requirements by addressing all direct and indirect impacts from the proposed action.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide an analysis of the impacts on downdrift areas from erosion potentially caused by groin placement within the study area as proposed.

Panel Comment #6

The Draft HSGRR/EIS does not address regional traffic safety and transportation issues.

Basis for Comment

1. Sections 3.4 *"Life Safety"* and 3.5 *"Critical Infrastructure"* have no discussion of the issue of storm and flooding impacts on the regional transportation network, including egress during major storm events. It is acknowledged that NEPA does not require analysis of worst-case scenarios; however the very nature of this project is to protect the public from storm-surge inundation associated with major storms. Therefore, it is a relevant topic to address.
2. For example, the EIS should address such issues as to whether coastal evacuation routes will be inundated under the Future No Action condition. The EIS should address whether or not implementation of the proposed plan would alleviate such conditions, identify what roadways would be inundated from a 100-year flood, and whether access to the airport would be shut down or limited from inundation under Future No Action and Future Action conditions.
3. Figure 3-3 in this EIS entitled *"Critical Infrastructure and Hurricane Sandy Impact Area"* does not include major roadways within the area, including those that would be used by the public to flee the area.
4. Appendix G (p. 5 through 7) addresses parking issues at beach locations, but does not address traffic issues. Appendix I Section 4.14 contains discussion of the existing road network and traffic count data that should be included in the Existing Conditions section of the EIS.

Significance: High

This omission affects the adequacy of the EIS.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. The existing conditions section of the EIS should describe the regional transportation network – roads, railroads, bridges, tunnels, airport access, etc. – and the degree to which it is susceptible to inundation or failure during the next major storm event. At a minimum the description of existing roadways and traffic presented in Appendix I Section 4.14 should be moved into the EIS in the existing conditions section. Although a traffic study may not be warranted, some discussion of existing traffic conditions is warranted because of the dense network of roadways within the study area and the issue of future beach access.
2. Provide an impact analysis that discusses how the TSP would affect public safety, such as if sufficient time for egress during a major event is affected. Also, provide an analysis of whether traffic patterns and/or volume of traffic in the future will be affected by the TSP.

5.3 Significance: Medium/High

Panel Comment #7

The structure of the EIS made it difficult to follow and to reach conclusions regarding the overall significance of impacts of the Future No-Action conditions.

Basis for Comment

Some sections of the EIS are the following: Section 2 described Existing Conditions, Section 3 was titled *"Future Without-Project Conditions,"* Section 6 described the *"Tentatively Selected Plan,"* and Section 7 described *"Environmental Consequences."* Under Section 7, the subsections addressed *"Impacts Common to Both Action Alternatives," "Proposed Action Impacts," "Action Alternative Impacts,"* and "*No-Action Alternative Impacts."*

This document structure resulted in confusion during the review from multiple perspectives. Some examples are the following:

1. Future No-Action conditions are discussed partially in two sections (Section 2 earlier in the EIS and later as a subsection of Section 7). This results in a fragmented view of what is happening in the Future without the project.
2. Future Action and No-Action conditions are discussed under each different environmental resource potentially impacted by the project. This can be done under NEPA, but it makes it harder to obtain an overall perspective of Future Action conditions versus Future conditions without the project.
3. The Future Action conditions discuss both the TSP and another Action Alternative, which makes the presentation awkward and difficult to follow. For example, Section 5.3 includes a discussion of environmental impacts analysis and costs in order to ultimately identify the TSP. It states: *"The Jamaica Bay Perimeter Plan (Plan D) and the Storm Surge Barrier (Plan C alignments C-1E and C-2) were evaluated for habitat impacts, real estate impacts, costs (construction, mitigation, real estate, and Operations and Maintenance, Repair, and Rehabilitation (OMRR&R), and net benefits."* In Section 5.5 the TSP is identified as Plan C-1E. It is unclear, then, why the other plans are carried through for analysis of impacts in Section 7. Typically, an EIS has an alternatives section that identifies a preferred alternative. This follows the USACE planning process as well (see Section 4.3 of the HSGRR/EIS). The impacts analysis is then performed on the preferred alternative rather than on multiple alternatives that are screened out in advance.
4. This does not mean that the approach used in the Draft HSGRR/EIS is incorrect; it just makes it difficult for the reader to follow and for the District to adequately explain why impacts are being evaluated for an alternative other than the TSP. A much clearer, easier presentation could be to analyze impacts from the TSP in Section 7, with a separate section on Future No-Action conditions. At a minimum, the two sections on Future without project conditions (Section 2 and parts of Section 7) could be combined, as the document suffers from lack of cohesion and continuity.
5. A related point concerns the regulatory framework within which a decision will be made and under which a TSP can be approved and implemented. Section 2.3.5 provides an excellent overview of the various state and federal programs in place that may have influence or pose

constraints on the TSP. It identifies protected areas, but digresses into discussion of regional planning initiatives, etc. The text does not effectively summarize the overall regulatory review process and how the project will ultimately be approved (e.g., Appendix I indicates that New York State Department of State administers the Coastal Zone Management Act, and, therefore, would potentially have veto power over any proposed plan as it affects the coastal zone). Then in Section 6.8 there is a detailed description of the various regulatory programs administered by the state and federal governments. As such, the treatment is fragmented; the District could combine these sections into a single cogent section that explains what is important and why within the regulatory review process.

Section 6.1 appears out of place and would serve the reader better as a separate expanded section describing how the proposed mitigation plan will offset impacts from the TSP. Also, there is no discussion of how mitigation requirements for the two alternatives analyzed would differ. Mitigation is only discussed in terms of what projects might be considered.

Significance: Medium/High

The conclusions in the EIS cannot be easily followed by the public and stakeholders without clearer presentation.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Combine Sections 2 and Future No-Action portions of Section 7.
2. Drop impacts assessment of alternative action and expand Section 6.1 and present as its own "Section 8."
3. Discuss mitigation separately for each alternative if both are to be carried through the impacts analysis.

Panel Comment #8

There is inadequate documentation of methodologies, analyses, sources of information, cost estimates, and lack of literature citations in sections of the report, which affects the credibility of the report conclusions.

Basis for Comment

Even though the project is using the SMART planning paradigm, there is still a need for thorough analyses and backups on sources, methodologies, analyses, and defense of coefficients. Examples of inadequate documentation are described below:

From the EIS

U.S. Council of Environmental Quality (CEQ) regulations (1502.24) are clear on the need for meth-

odology to be described as a basis of the scientific integrity of the document:

"Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement. An agency may place discussion of methodology in an appendix."

Review of the document indicates that some sections (e.g., Subsection 2.3.14 and Section 3.3) do a good job of explaining to the reader where the information and conclusions are drawn from, but others do not. Some sections on biological resources (notably 2.3.7, parts of 2.3.8.3, 2.3.8.5 and 2.3.9.1) make statements that are devoid of citations (e.g., species lists) and in general the biological sections make no note of whether USACE conducted any field surveys or reconnaissance trips or relied solely on literature from others. A list of databases and literature reviewed is warranted up front as a basis for evaluating the information (Section 2.3.14 does this); Section 2.3.11 is a good example of where the methodology is described well.

Under Section 2.3.11, *Sediment Quality*, no sediment data describing existing conditions are provided in the EIS. With all the data available in the area and the ability of the project to influence sediment movement, a baseline summary table or figure is warranted as a basis for analysis of future impacts. A sentence in this section on p. 57 reads, *"Contaminations (sic) adhere to organic compounds and settle into sediments; now found to exceed acceptable levels throughout the Bay (Steinberg et al.2004)."* This sentence as a summary does not sound scientific or indicate the degree to which or extent to which sediments within Jamaica Bay exceed guidelines, what the guidelines are (e.g., National Oceanic and Atmospheric Administration [NOAA] ER-M or NOAA ER-L), and what the implications are for aquatic organisms (other than the fish advisory that is cited). Contamination in Jamaica Bay consists of a variety of different components, from different sources, such as glycol loading from the airport reducing dissolved oxygen, metals and other non-point sources from urban runoff, combined sewer outfalls and regulated discharges within the study area. Describing contamination in general does not provide sufficient treatment of the issue.

Section 7.16 concerns impacts to Navigation. But there is no Existing Conditions section describing the current extent to which Jamaica Bay is used by commercial or recreational vessels.

Regarding plan formulation and economic analysis

The implementation plan and economic analysis are solid but are hindered by the lack of documentation on sources and timing of cost elements. At many places in the text there is little sourcing of the cost and other parameters, such as in the selection of the TSP and other alternatives. It is not possible to evaluate the risk exposure of the cost structure or other assumptions on components of the TSP since many decisions are simply identified as having been made but no analysis, data, or implications are identified. If an estimate of high risk is made, it should be so stated in the text and a discussion provided as to how it will be dealt with in the future analyses for the project. This is particularly bothersome and relevant in Appendix C.

Significance: Medium/High

Adequate documentation is important for a complete analysis and to support the justification for the TSP.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Review the report and provide adequate supporting documentation and sources and as full as possible an explanation of the basis for decisions. The examples in the Basis for Comment are only some examples that need improvement.

Literature Cited:

Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, 40 CFR Parts 1500-1508, Council on Environmental Quality, Washington, DC.

Panel Comment #9

Several places in the EIS inappropriately describe future conditions under Existing Conditions.

Basis for Comment

There are a several places in the Existing Conditions section of the EIS where text is devoted to discussing future conditions. Some specific examples are provided below, p. 30, last sentence of last paragraph of Section 2.3.4. The "Proposed repairs" that US Fish and Wildlife Service (USFWS) will implement will occur in the future and should be discussed under *"Future without the Project"* and not Existing Conditions.

P. 45 Section 2.3.7.2 is devoted to Oyster Reefs, yet the first sentence notes that none are found within the study area, so the intent of this section is unknown. If the intent is to describe what could occur in the Future without project conditions due to regional initiatives by others, then this section should be moved to Section 2.

P. 56, Section 2.3.11*, Sediment Quality*. The first two paragraphs of this section focus on sediment movements (not quality) and make a comparison between the Future with and without the project. This analysis is inappropriate to present under Existing Conditions and should be moved.

P. 57, last sentence of Section 2.3.12:

"*Moreover, the recent rates of decline in contaminants will be difficult to match in the future since current non-point sources of these chemicals and metals (e.g., overland runoff, atmospheric deposition) will not be as easy to control as point sources (Steinberg et al. 2004)*."

P. 57, Section 2.3.13 Greenhouse Gases does not discuss Existing Conditions at all, but focuses on emissions from future construction activities.

Significance: Medium/High

The document should be clear and discussion of impacts relative to Existing Conditions easy for the public to follow. In some cases the document is technically not NEPA-compliant because Existing

Conditions have not been described at all.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. All discussions of Future without project conditions should be in Section 3.

Panel Comment #10

The EIS inadequately addresses the baseline recreation conditions and the project impacts and benefits on recreation within the study area.

Basis for Comment

Recreation benefits of the Alternative Action are described in Sections 5.3 and 7.15 without any initial discussion of Existing Conditions in Section 2. There is no baseline discussion of existing recreational boat access, shoreline fishing, current beach usage by beachgoers, pleasure craft (e.g., water scooters, etc.), birding, and dispersed non-motorized recreation (e.g., bicycle usage) within the study area. As a result, the Future Action discussion appears to focus entirely on beachgoers who would benefit from beach nourishment aspects of the project. There is some mention of Existing Conditions for recreation in Appendix A2, which describes pedestrian and bicycle pathways on top of living vertical shoreline structures (Appendix A2, p. 16), and in Appendix I, which mentions existing recreational facilities. These discussions should be in the EIS under Existing Conditions.

Significance: Medium/High

Recreation is an important activity in the study area and needs to be adequately analyzed for impacts.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Add an Existing Conditions section to the EIS that describes recreation activities and facilities.
2. Provide an adequate analysis of impacts to recreation.

Panel Comment #11

It is not clear how the TSP would perform if a large storm such as Hurricane Sandy were to occur in

the project area.

Basis for Comment

The TSP is designed based on a 100-year storm return period. However, Hurricane Sandy was a much larger storm with a return period of 217 years. Therefore, an analysis of a Hurricane Sandy-like storm would be useful to compare the results with the performance of the design storm and to find out to what degree the TSP would perform as a public investment.

Significance: Medium/High

It is a large investment to implement the TSP for the project site, and an impact of a Sandy-like Hurricane should be carefully considered in order to examine the cost/benefit of the TSP.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Conduct an analysis of the performance of the TSP with a Sandy-like Hurricane and estimate the damages. Compare the results with the actual damages of Hurricane Sandy to determine the cost-benefit ratio with the TSP. Determine if the 100-year design storm is still cost effective.

5.4 Significance: Medium

Panel Comment #12

Retreat or elevating structures in the flood zone have not been considered adequately in the report to justify why these alternatives were eliminated from further consideration.

Basis for Comment

There are few details provided to support the analysis that supports the statement that retreat or elevating structures are too expensive and politically unacceptable to implement. Little information on the residual risk of mitigation alternatives is provided. Although it was suggested that such analysis would be done in the optimization process, it is important for the documentation to describe the methodology, justification, and general findings to show the impact on mitigation risk. Retreat or elevating the structures in the flooded areas might be cost-effective compared with other alternatives. Also, razing or elevating structures only in selected areas, such as those that are most exposed to high surge and wave run up, might help lower the cost of other alternatives when used in conjunction with a structural alternative. A study of Lowest Adjacent Grades of all the buildings affected by Hurricane Sandy could be helpful to determine the cost-benefit ratio of razing or elevating the struc-

tures for the flooded areas.

Significance: Medium

In general, for mitigation studies, an adequate discussion of why these alternatives have not been selected should be included under mitigation alternatives.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide an adequate analysis of the alternative of retreat or elevating structures in the project flood zone. Consider the case of retreat or elevating for the entire flood zone as well as when used in conjunction with other structural alternatives in selected areas. Describe the methodology, data and sources, and findings of the analyses in the report. The information could be presented in the appendix on plan formulation and summarized in the body of the report.

Panel Comment #13

Mitigating residual risk as described in Appendix A-2 H of the Draft HSGRR/EIS considers only structural means to protect shoreline property under low-frequency surge events and does not evaluate nonstructural alternatives such as flood proofing or acquisition.

Basis for Comment

Appendix A-2 H of the Draft HSGRR/EIS describes the residual risk for storm surges with a frequency of 5 years or less during which the inlet gate structures would remain open. Protection against this residual risk as described in the TSP requires constructing 26 different segments of levee and floodwall at an estimated cost of approximately $380 million. The differential head on these structures is estimated to range from 1 to 2 feet. It is difficult to understand how shoreline buildings and other features that historically have been flooded at a 5-year frequency can justify this level of expense. The risk-reduction planning should evaluate using potentially more economical methods such as flood proofing and/or acquisition of flood-prone properties.

Significance: Medium

The estimated cost required to mitigate residual risk represents approximately 10 percent of the total project budget. Obtaining a more definitive assessment of alternative mitigation schemes will provide greater credibility to the overall report.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Conduct a preliminary evaluation to determine the feasibility of flood proofing or acquisition as an alternative to reduce residual risk. In future stages of project development determine a cost-benefit ratio for each of the 26 areas subjected to residual risk and consider nonstructural alternatives on a reach-by-reach basis.

Panel Comment #14

The projected sea level rise (SLR) for the project area is based on historical SLR data of 3.99 mm/year (0.013 ft/year) for Sandy Hook, NJ, which includes land subsidence. The report does not discuss how land subsidence in the project area compares to subsidence in Sandy Hook to validate using the Sandy Hook relative SLR value for the project area.

Basis for Comment

SLR at a specific location includes land subsidence (relative SLR) and is a significant parameter in shoreline changes for future planning. In the absence of site-specific information, it is important to discuss the similarities of the two locations and their close proximity for applying the same relative SLR value from Sandy Hook, New Jersey, to the project area.

Significance: Medium

It is important to discuss the rationale for the applicability of nearby SLR for the project site.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide a better justification for using the relative SLR value at Sandy Hook at the project area. As appropriate, include in the discussion other relevant elements, such as tidal constituents, which affect the applicability of SLR values at Sandy Hook to the project area.

Panel Comment #15

The report does not justify why other coastal processes models and integrated hydrodynamic models were not used for project analysis.

Basis for Comment

The project analysis uses certain hydrodynamic and coastal processes models, but does not discuss why these models are the appropriate ones to use and were selected instead of other integrated models, such as CSHORE and 2-D and 3-D model suites such as Coastal Storm Modeling System (CSMS), MIKE 21, or Delft3D.

CSHORE

Numerical models for longshore and cross-shore sediment transport have been utilized for this project. CSHORE is a well-documented model that has not been mentioned. CSHORE – a cross-shore numerical model for waves, currents, sediment transport, and beach profile evolution – could be a good tool for this study to use and for qualitative comparison of beach profile erosion with other models used.

2-D and 3-D Model Suites

There are few processes involved in shoreline erosion and storm damages to the coastline when considering the best approach for coastal storm risk mitigation. It is important to use a regional model to produce design parameters that includes all the processes and the response of the shoreline for different storm settings. There are model suites that can be set up regionally, calibrated, and utilized for the study area to have a uniform modeling exchange of input and output data for different processes and aspects of the study. This type of model can incorporate both the oceanfront and Jamaica Bay area in the same model for a more efficient approach. 2-D or 3-D modeling suites such as Coastal Storm Modeling System (USACE model), Delft3D, and MIKE 21 that can handle wave, surge, current, water quality, sediment transportation, and morphological changes of the study area. These model suites can model both the open coast and the bay area in one regional model. A regional model is necessary to evaluate the responses of different mitigation measures or approaches (such as flood gates, groins, breakwaters, and beach) for different design storms for the project area. Also, a regional model considering hydrodynamics of surge, wave, and over topping of the barrier island for the open coast and the bay can improve understanding of the effects of the flood gates on the adjacent areas and evaluate the bay response to the range of design storm for different storm settings, hurricanes, and extratropical storms, and evaluate the cost/benefit ratio.

Significance: Medium

CSHORE is one of the well-documented and most recent models that can benefit the project analysis. A more holistic approach is missing for this project and using a 2-D or 3-D model can add value.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Describe how the USACE selected the hydrodynamic and coastal process models were used in the project, and justify why these are the appropriate models to use.
2. Discuss the CSHORE model and 2-D and 3-D model suites and justify why they were not used for this project analysis.

Panel Comment #16

The Panel could not determine if the storm on 21 October 2012 in the project region was considered as an antecedent event when calibrating the models used for the project analysis.

Basis for Comment

Factors such as previous or already eroded beach profile for erosion modeling should be considered for design profile. Page 12, Appendix A1, mentions that on 21 October 2012, about eight days before Hurricane Sandy, there was an extratropical storm in the project region. It could not be determined if this storm was considered as an antecedent event for determining Hurricane Sandy beach profiles and if the models used for the project analysis were adjusted for the 21 October storm for the purpose of calibration.

Significance: Medium

Calibrating the models and profiles should consider duplicating the events and their impacts and comparing them with field measurements. Missing events in the modeling processes might result in calibration error.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. State in the report if and how antecedent storms were used to calibrate the models for this project. If antecedent storms were not used, provide justification in the report for excluding them.

Panel Comment #17

The Draft HSGRR/EIS does not describe how the proposed mitigation approaches are adaptable to the uncertainty in future climate conditions.

Basis for Comment

The project mitigation approaches and design should be adaptable to the climate condition in the future, and if these conditions change to have more frequent storms or more rapid SLR, the design should be able to be modified to fit the situation. Because of the high cost associated with coastal storm mitigation for this project, it would be appropriate to discuss how the project design is adaptable to the climate change impact, as it is uncertain what these conditions will be in the near future,

and plans should be in place to adapt to the new future conditions to protect the public investment and the life of the public in the Jamaica Bay vicinity.

Significance: Medium

Based on our current knowledge, we project the future condition. However, if anything changes for the future condition, the project should have the flexibility to adapt to the new condition, as it is a large investment for the public safety.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Include in the report a discussion of how the project mitigation measures are adaptable to uncertain future climate conditions and how the adaptability protects the planned project investment for coastal storm risk mitigation.

Panel Comment #18

The same level of information in the tables in Appendix E for Jamaica Bay is not provided in the tables for the project oceanfront reach.

Basis for Comment

The following both provide alternative information for Jamaica Bay:

- Appendix E, p. 83, Figure 38: Summary of Preliminary Screening of Jamaica Bay Planning Reach Measures
- Figure 39: Measures Carried Forward by Reach – Jamaica Bay.

Tables with the same level of information are not provided for alternatives for the project oceanfront areas. If possible, the report should be consistent for both Jamaica Bay and the oceanfront areas and provide the same information for both regions.

The Panel recognizes that USACE initiated the project for Jamaica Bay before applying the USACE SMART process for project analysis. Subsequently, USACE added the Rockaway Peninsula oceanfront reach to the project scope when the SMART process was then applied to the project analysis. Therefore, the level of analytical detail is different for Jamaica Bay than for the project oceanfront reach.

Significance: Medium

The report should be as consistent as possible for the oceanfront and bay area analyses.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. If possible, provide the same level of information for the oceanfront reaches as is provided for Jamaica Bay.
2. If the same level of detail cannot be provided, include an explanation in the report as to why the level of detail available is different and justify how the level of detail used in the report for the oceanfront reach is adequate for the decisions that the USACE is making at this stage in the project development.

Panel Comment #19

Socioeconomic considerations are not addressed adequately in the EIS.

Basis for Comment

Section 2.3.16 *"Socioeconomic considerations"* focuses entirely on environmental justice issues and does not address demographics, employment, wages, percent of the population that are beachgoers, or similar items that would form the basis of a NEPA-compliant socioeconomics impact assessment.

The preamble to NEPA requires that impacts on human beings from a proposed activity be assessed. For example, this project, if implemented, would be a large construction project that could create jobs within the community or benefit local businesses. These aspects should be further discussed. There is some discussion in Section 3.4, *Life Safety*, on percent of the population over 65, but this is not in the socioeconomic section and the discussion says little of how the plan would address the needs of this segment of the population.

Significance: Medium

An inadequate analysis affects the understanding of the analysis and the justification for the TSP.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide a more adequate discussion and analysis of socioeconomic considerations in the EIS. Include other aspects of socioeconomics beyond environmental justice. Much of the necessary discussion is provided in Section 4.18 of the original EIS presented in Appendix I and should be moved into the Existing Conditions section of this Draft HSGRR/EIS. In addition, the Future Action and No-Action analyses should address the impacts of the project on these issues.

Panel Comment #20

The Draft HSGRR/EIS contains no analysis of potential noise impacts to adjacent communities resulting from construction activities.

Basis for Comment

P. 177-178 and other locations describe noise impacts as "negligible," short-term impacts, but do not provide any discussion of existing noise levels, comparison of machinery with noise levels, or analysis of distance of machinery to the nearest human receptors. This information is needed to support the conclusion, which is presently unsupported.

Significance: Medium

While noise impacts are not likely to be a decision-making driver for this project, at least some analysis should be provided to support the EIS's contention that noise impacts would be negligible.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Provide an analysis of existing and Future Action noise conditions. Much of this text is included in Appendix I under Sections 4.20 and 4.21 and should be moved into the main document.

Panel Comment #21

The estimated costs are too low in the MCACES Second Generation (MII) cost estimate for planning, engineering, and design (PED) and for construction management.

Basis for Comment

The current MII cost estimate included with the Draft HSGRR/EIS contains $62,786,000 for PED and $47,668,000 for construction management. These costs represent about 1.97 percent and 1.50 percent, respectively, of the estimated construction cost of $3,182,358,000. These percentages are well below standard values used by industry. Typical values are generally 5 to 15 percent of the construction cost. Also, the project is highly complex with many components involving difficult construction (e.g., construction in water for the storm surge barrier). It should be expected that the design, permitting, and construction will be challenging, thus leading to higher PED and construction management costs. The Engineering Appendix A2 Section 6.8.5 recommended 15 percent for the PED percentage and 8 percent for construction management. It is not evident if these costs were already

included in the construction line item of the MII cost estimate; if so, PED and construction management may be double counted.

Significance: Medium

Resolution of this issue will improve the overall understanding of the analysis recommendation and justification of the project. Resolution of the issue may also increase the overall project cost.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Revise the PED and construction management costs in Appendix C to reflect industry norms and to be commensurate with the project complexity.
2. Revise the main report and associated cost-benefit calculations to reflect correct PED and construction management costs.

Literature Cited:

- "*Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement – Appendix C, Cost,*" USACE, New York District, North Atlantic Division, August 2016.

Panel Comment #22

Estimated pump station costs to manage interior drainage appear low for the project alternatives.

Basis for Comment

Interior drainage of protected areas is an important design consideration for both alternatives C and D (perhaps more for D). The unit cost for interior drainage was estimated using an approximate cost of $15,000 per cubic feet per second (cfs). Many large pump stations have been recently constructed in South Florida as part of the Comprehensive Everglades Restoration Plan (CERP). The unit cost of these pump stations appear higher than the unit cost used for this study, even though the labor rates are probably lower in Florida than in the New York City area. The Faka Union Pump Station (2,650 cfs capacity) for the CERP is one example among many.

Significance: Medium

Resolution of this issue will improve the overall understanding of the recommendation and justification of the project. Resolution of the issue may also increase the overall project cost.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Review cost assumptions regarding interior drainage pump stations used in the Draft HSGRR/EIS. Research actual USACE pump station costs for the CERP and for the New Orleans Flood Control Project.
2. Revise cost estimates as required based upon realistic pump station estimates.
3. Check to see if revised costs result in any changes in the TSP selection.

Literature Cited:

- "*Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement – Appendix C, Cost and Appendix A2 – Engineering,*" USACE, New York District, North Atlantic Division, August 2016.

Panel Comment #23

The estimated costs appear to be underestimated for the structures required to protect against residual risk because the report does not provide estimated costs for interior drainage structures associated with the 26 segments of flood barrier.

Basis for Comment

Appendix A-2 H of the Draft HSGRR/EIS provides a description of the various types of flood protection that could be employed at 26 locations to reduce residual risk from low-frequency storm surge events. The description contained in this Appendix indicates that the $380 million estimated cost of these barriers was "*determined by multiplying the generic prototype measure construction cost by the project segment length.*" These costs were based upon appropriate unit costs. There is no indication that any allocation was made in the cost estimates for interior drainage features such as gate wells and modifications to the existing stormwater system. The cost of interior drainage features is often a significant portion of the cost for local flood protection projects. Ignoring or excluding the cost of interior drainage features results in an underestimation of the overall risk reduction features' costs.

Significance: Medium

The lack of a cost allocation for interior drainage will result in an underestimation of the project costs for the risk reduction features. An estimate of this omitted cost is needed to determine how significant this cost is to the total project cost.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Adjust the cost for the risk reduction features to include an allocation for interior drainage features. At this stage of the project development, this cost could be obtained by using the cost of interior drainage features for other USACE local flood control projects as adjusted for the length of the barrier.

Panel Comment #24

There is limited discussion of the potential for cost-growth risk of the project in the main report and in Appendix C.

Basis for Comment

The order of magnitude costs presented for the project range up to perhaps $4 billion, making this a USACE "mega-project." As noted by USACE during the mid-point conference call, Hurricane Sandy costs have been authorized but no funds have yet been appropriated. Therefore, cost minimization is critical to make accomplishing the project feasible. In addition, cost growth for a project of this magnitude is likely. However, the overall discussion regarding cost risks is limited and is not included in the Cost Engineering Appendix C.

Significance: Medium

Resolution of this issue will improve the overall understanding of the recommendation and justification of the project. Resolution may lead to more economical designs.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Revise the main report and relevant appendices to expand discussions of cost-growth risk and ways to minimize these risks.
2. Consider undertaking pilot projects or "test construction sections" to refine final design and reduce cost uncertainty, especially for the proposed storm surge barrier or for larger floodgates.

Panel Comment #25

It is not clear how the proposed groins will be constructed in the field given their deep invert eleva-

tions.

Basis for Comment

The TSP includes many modified or new proposed groins as a complement to the proposed beach nourishment. Many of the groins will be placed with their bottom elevations well below mean high water. (See for example excavation required for a groin on civil sheet C-401, Details A2 and A4.) However, it is not clear how the groins are to be constructed (in the wet or the dry using sheet pile).

Significance: Medium

Resolution of this issue will improve the overall understanding of the recommendation and justification of the project.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Include a more thorough discussion of groin construction in the Engineering Appendices.
2. Review cost estimate to ensure all costs have been captured regarding groin construction.

Literature Cited:

- *"Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement – Appendix A3 – Engineering,"* USACE, New York District, North Atlantic Division, August 2016.

Panel Comment #26

The measure design elevations for various hydraulic reaches for the project alternatives vary from 14 feet NAVD88 to 18 feet NAVD88, which is too large a variation in the system.

Basis for Comment

Table 2 in Engineering Appendix A2 displays the design top elevation for all hydraulic reaches of interest in the flood mitigation program. The elevations are based upon an allowable "overwash" or overtopping rate at each individual hydraulic reach among other considerations. However, the use of the overwash rate as a primary consideration results in a hodgepodge of design elevations varying by 4 feet in the study area. For example, sheet CF-104 of the drawing set has elevations varying from 14.5 feet NAVD88 to 17.5 feet NAVD88 at the floodgate. After the poor performance of the New Orleans flood control system during Hurricane Katrina, the Interagency Performance Evaluation Task Force indicated that one key weakness in the system was varying elevations of levees and floodwalls throughout the system. Therefore, it may be better if a more consistent protection top elevation is used in the final design.

Significance: Medium

Resolution of this issue will improve the overall understanding of the recommendation and justification of the project. Resolution may also result in cost increases to the project.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Review the proposed design top elevations presented in Table 2, Appendix A2, and shown in the civil design sheets. Based upon some engineering judgment AND the allowable overwash rate, revise the design top elevations to be more consistent across the project area. Elevation differences should be minimized to a maximum of 2 feet if possible.
2. Ensure that resulting final elevations do not result in vastly different levels of protection for the various hydraulic reaches.

Literature Cited:

- "*Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement – Appendix C, Cost and Appendix A2 – Engineering,*" USACE, New York District, North Atlantic Division, August 2016.
- "*Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement – Appendix A3 – Engineering,*" USACE, New York District, North Atlantic Division, August 2016.

Panel Comment #27

An offshore or detached breakwater does not appear to have been considered as part of the project plan.

Basis for Comment

An offshore or detached breakwater as one of the coastal structures is often an effective mitigation measure for beach erosion control and, depending on the wave environment, is often studied and evaluated for effectiveness. A breakwater has been mentioned in the Draft HSGRR/EIS, p. 82, under *Management Measures for Atlantic Ocean Shorefront Planning Reach*. However, on the same page, the table that lists all the alternatives and their applicability for each reach does not include a breakwater for any of the reaches. A buried onshore breakwater is discussed and considered, but an offshore or detached breakwater has not been discussed. The conclusion of which alternative to be considered seems to be based on what has been done in the area in the past and on what has proved to work in the region. More emphasis has been given to groin fields and beach nourishment as mitigation measures. Breakwater structures can be combined with groin fields and beach nourishment for an open coast and could form a living shoreline and possibly provide more effective results for the back bay area.

Significance: Medium

Breakwaters are effective wave energy dissipaters. The technology to build them is available and should be studied for possible application.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. The report should discuss the applicability of a breakwater structure and its pros and cons in comparison with other measures and alternatives.

5.5 Significance: Medium/Low

Panel Comment #28

The construction methodology described in the report for the storm barrier gate system employed standard "in the dry" construction procedures and did not evaluate alternative "in the wet" methodologies that have been utilized for other USACE projects.

Basis for Comment

The construction of the gate structure across the Rockaway Inlet as depicted in alternative C1E is a major cost component of the TSP. As described in Appendix A2 and as shown on drawings CF 155 and 156 contained in Appendix A3, the "in the dry" construction of the gate structure will require using an extensive system of costly cellular sheet pile cofferdams, which will be removed at the completion of each construction phase. The planning process did not evaluate or discuss the possibility of using "in the wet" methods for constructing all or a portion of the gate structure system. The USACE has successfully utilized this type of a system for the ongoing construction of the Olmsted Lock and Dam on the Ohio River. It is possible that this methodology could provide significant cost savings for the Jamaica Bay protection system.

Significance: Medium/Low

Although a detailed evaluation of alternative construction procedures is not consistent with the current planning milestone, it is important to identify potential cost-saving alternatives for valuation at future stages in the project development.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. The report should contain a section that describes alternatives, such as the "in the wet" construction technique, that can possibly lower project costs in future stages of project development.

Panel Comment #29

The TSP includes costly Combi-wall sections to form a barrier connecting the gate sections across the Rockaway Inlet and did not identify or consider alternatives for the wall section.

Basis for Comment

The TSP includes a storm barrier formed by a combination of sector gates and vertical lift gates separated by sections of Combi-wall. A sectional view of the Combi-wall section is shown on plate CF-301 and a plan view on plates CF 155 and 156. Construction of these sections will require constructing a cellular cofferdam with a diameter of 52.5 feet. An alternative to using the Combi-wall could involve using a cellular sheet pile structure similar to those used for the cofferdam. Cellular sheet pile structures filled with sand have been successfully used on permanent hydroelectric structures with differential heads up to 50 feet. Alternatively, cellular sheet pile structures filled with concrete have been used in the recent rehabilitation of a lock and dam on the Kentucky River. Using cellular sheet pile structures would significantly decrease the overall project cost and also would decrease the length of the construction period.

Significance: Medium/Low

The use of alternate types of structures for the storm barrier is something that should be considered in the future development of the project, but is not required at the current project development level. For this reason the significance is considered Medium/Low.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Include a section in the report documenting the need to evaluate the future use of alternative structures to provide a more cost effective plan.

Panel Comment #30

The required factors of safety stated under the design criteria contained in Appendix A2-F do not conform to the USACE requirements for stability of gravity structures as stated in Engineering Manual (EM) 1110-2-2100.

Basis for Comment

Although the design criteria stated in Appendix A2-F includes a reference to USACE EM-1110-2-2100,

the referenced factors of safety appear to be based upon American Association of State Highway and Transportation Officials (AASHTO) requirements, which are significantly less than those stated in the EM. The factors of safety in the design criteria range from 1.125 to 1.5 in the AASHTO requirements, while the factors of safety stated in EM-1110-2-2100 range from 2.2 to 3.0 when there is limited subsurface data available. It is unclear what factors of safety were utilized in the computer analyses of the stability of the various pile-supported structures proposed for the TSP. It is also unclear why the AASHTO criteria were referenced for this project instead of the USACE criteria.

The Panel recognizes that the purpose of the design at this stage is to arrive at a preliminary cost estimate based upon available information. Using the AASHTO factors of safety would be inappropriate for final design but may not have a significant effect on the overall cost estimates and the validity of the economic analyses used to evaluate the TSP.

Significance: Medium/Low

Using AASHTO criteria for a gravity water retaining structure is not appropriate and likely resulted in a less conservative design, which affects the credibility of the project cost estimates.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Review the computer-generated structural computations to determine what factors of safety were utilized for the preliminary design of the stability of gravity structures. If the factors of safety do not correspond to those contained in EM-110-2-2100, review the structural design and piling support for the structures to determine if there would be a significant increase in estimated costs if the appropriate factors of safety conforming to the requirements of EM-1110-2-2100 were utilized.

Literature Cited:

Stability Analysis of Concrete Structures, EM 1110-2-2100, 1 December 2006, US Army Corps of Engineers, Washington, DC.

5.6 Significance: Low

Panel Comment #31

The three-foot bottom width for the core trench utilized below the proposed levee section is too narrow to obtain adequate material compaction.

Basis for Comment

Drawings CF 304, 305, and 306 contained in Appendix A3, Part 2-3, show typical levee sections with an impervious core that includes a trench below the ground surface to serve as an inspection trench or cutoff trench. The 3-foot bottom width of this trench is inadequate to allow compaction equipment to adequately compact the impervious core material.

Significance: Low

The narrow court trench depicted on the drawings is not constructible using conventional compaction material. An increase in the bottom width will result in an increase in earthwork quantities, but will not have a major impact on the assessment of project costs or feasibility.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. The width of the bottom of the impervious core trench should be increased to a minimum of 8 feet, and the earthwork quantities should be increased to reflect this change.

Panel Comment #32

Converting units from knots to ft/s on page 18 of the Draft HSGRR/EIS is incorrect. This raises the issue that other conversion factors used in the study may be incorrect.

Basis for Comment

The report shows that converting the ebb current velocity for the maximum tidal current speeds in the North Channel at Canarsie Pier from “0.7 knots” would be “0.84 ft/s,” which is not correct. The 0.7 knots converts to 1.18 ft/s. The correct conversion factor for knots to ft/s is 1.688. Finding this error raises the issue that other conversion factors could possibly be incorrect as well. The Panel did not check all conversion factors used in the report.

Significance: Low

Unit conversions must be checked to make sure the right conversion factors have been applied. Using incorrect conversion factors will affect analytical results, which could affect project decisions.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Use the correct factor for converting knots to ft/s. Check to determine how significantly using the correct conversion factor changes the outcome of the analysis.
2. Check the report to make sure that all conversion factors used for project analyses are correct.

Panel Comment #33

The Draft HSGRR/EIS and relevant engineering appendices include a number of important inconsistencies regarding estimated cofferdam top elevations.

Basis for Comment

The Panel has noticed several differences in the apparent estimated top elevation of temporary cofferdams. In some civil sheets it appears that the cofferdam top elevation is designed to contain mean higher high water (MHHW) plus some allowance for run-up, waves, and overwash. However, civil sheet CF-301, Detail B, appears to show the cofferdam top elevation is designed to contain the 2070 still water elevation and not MHHW.

Significance: Low

Comment affects the technical quality and understanding of the project, which may potentially lead to other errors.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. Review engineering appendices to ensure that there are no inconsistencies with estimated cofferdam top elevations.
2. If errors or omissions are discovered, revise civil drawing sheets as necessary.
3. Revise cost estimates as required as well.

Literature Cited:

- "*Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement – Appendix A3 – Engineering,*" USACE, New York District, North Atlantic Division, August 2016.

Panel Comment #34

The report needs to be edited to correct errors and improve readability and understanding.

Basis for Comment

It is a common and necessary practice for sections of the report to be prepared by different project team members. However, the result is that the report is somewhat difficult to read or follow. A good editing would allow a third-party look at the continuity and clarity of the text and find obvious errors.

There are places in the document where material appears to have been taken from other sources and not edited appropriately. For example, in Section 2.3.9.1 there is a statement that reads, *"There is no population estimate for the Delaware River, but it is believed to have less than 300 spawning adults per year. The spawning population of this distinct population segment is thought to be one to two orders of magnitude below historical levels."* The relevance of this statement to the Jamaica Bay study area is hard to follow and it appears to have been taken from another document.

On p. 42 the discussion of soils appears to be taken from elsewhere and states without editing:

"The soils on the Rockaway peninsula are formed in a mantle of eolian and marine washed sand (United States Department of Agriculture (USDA), 2001). These landforms are highly dynamic and can change readily with each coastal storm. Some areas have also been affected by human activities such as hydraulic filling or dredging to control erosion from hurricanes and nor'easters, and to maintain depth in nearby shipping channels. Soils found on the eolian and marine deposits ***within these portions of the park*** *include Hooksan and Jamaica"* [emphasis added].

Significance: Low

Low at this stage, but would be medium/high in the next stages of the project.

Recommendation for Resolution

The Panel has the following recommendation(s) related to this comment:

1. USACE should conduct an additional round of senior editorial review to improve clarity and readability to help readers to understand the analyses and findings.

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Appendix A Charging the Independent External Peer Review Panel

The text below reproduces the Charge to Reviewers as prepared by the USACE. APMI provided the charge to the Independent External Peer Review (IEPR) Panel at the beginning of the review process. The IEPR Panel used this charge to guide its review.

ATLANTIC COAST OF NEW YORK
EAST ROCKAWAY INLET TO ROCKAWAY INLET AND JAMAICA BAY
GENERAL REFORMULATION REPORT
INDEPENDENT EXTERNAL PEER REVIEW
CHARGE TO REVIEWERS

The following Charge to Reviewers outlines the objective of the Independent External Peer Review (IEPR) for the subject study and the specific advice sought from the IEPR panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the charge. The panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the charge.

The panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The panel should not make recommendations on whether a particular alternative should be implemented or present findings that become "directives" in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances, the panel may have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the panel's intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment. The IEPR Performance Work Statement provides additional details on how comments should be structured.

Broad Evaluation Charge Questions

1. Is the need for and intent of the decision document clearly stated?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical information?

Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:

3. Project evaluation data used in the study analyses,
4. Economic, environmental, and engineering assumptions that underlie the study analyses,
5. Economic, environmental, and engineering methodologies, analyses, and projections,
6. Models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives,
7. Methods for integrating risk and uncertainty,
8. Formulation of alternative plans and the range of alternative plans considered,
9. Quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans, and
10. Overall assessment of significant environmental impacts and any biological analyses.

Further,

11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable, and
12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

For the tentatively selected plan, assess whether:

13. The models used to assess life safety hazards are appropriate,
14. The assumptions made for the life safety hazards are appropriate,
15. The quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards, and
16. 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.

Appendix B Qualifications of the Independent External Peer Review Panel Members

The qualifications or the IEPR Panel Members are provided in this appendix. Appendix B.1 shows how the IEPR Panel Members meet the qualifications for this task. Appendix B.2 provides the overall qualifications and experience of each IEPR Panel Member,

B.1 IEPR Panel Member Technical Requirements

Table 2 shows how the IEPR Panel Members meet the qualifications for the IEPR as specified in the USACE PWS for this task.

Table 2: Summary of IEPR Panel Member Qualifications by Discipline

Requirements		Mr. Paul Bovitz	Dr. Chris Brown	Dr. Kenneth Casavant	Dr. Nader Mahmoudpour	Mr. Doug Spaulding
Subject Matter Expertise	**Highest Degree**	**MS**	**PhD /PE**	**PhD**	**PhD**	**BS**
	Years of Experience	**31**	**27**	**45**	**24**	**48**
	Experience with USACE (Direct (D), Indirect (I), and none (N))	**I**	**D**	**D**	**I**	**D**
Biological Resources and Environmental Law Compliance	A scientist from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm.	✓				
	Have a minimum of 15 years' demonstrated experience directly related to water resource environmental evaluation or review and National Environmental Policy Act (NEPA) compliance, with a minimum MS degree or higher in a related field.	✓				
	Have experience in describing and evaluating complex relationships and dynamics of coastal ecosystems and experience assessing the consequences of altering environmental conditions, particularly projects in urbanized coastal areas and familiarity with Nature-Based Infrastructure.	✓				
	Familiar with the habitat, and fish and wildlife species, that may be affected by the project alternatives in this study area.	✓				
	Familiar and have experience with US Fish and Wildlife Service (USFWS) Habitat Evaluation Procedure (HEP) (USFWS, 1980), Endangered Species Act (ESA), Essential Fish Habitat (EFH), and the Marine Mammals Protection Act (MMPA).	✓				
	Capable of addressing the USACE Safety Assurance Review (SAR)* aspects of all projects. - *Since project designs are initiated in the decision document phase, SAR is incorporated into Type I IEPR. The initial evaluation of SAR as part of Type I IEPR includes, at a minimum, addressing the following questions (EC 1165-2-214, Appendix D, Para. 2.c(3)): *In accordance with Engineering Regulation (ER) 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design?	✓				

Requirements		Mr. Paul Bovitz	Dr. Chris Brown	Dr. Kenneth Casavant	Dr. Nader Mahmoudpour	Mr. Doug Spaulding
Subject Matter Expertise	**Highest Degree**	**MS**	**PhD /PE**	**PhD**	**PhD**	**BS**
	Years of Experience	**31**	**27**	**45**	**24**	**48**
	Experience with USACE (Direct (D), Indirect (I), and none (N))	**I**	**D**	**D**	**I**	**D**
	*Are the models used to assess hazards appropriate? *Are the assumptions made for the hazards appropriate? *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?					
Civil Engineering/ Risk	From academia, a public agency whose mission includes coastal storm risk management, a non-governmental entity, or an Architect-Engineer or Consulting Firm.		✓			
	A registered professional engineer having a minimum of 15 years' experience in engineering or architecture.		✓			
	Have experience in large public works projects and have a thorough understanding of design of culverts and channel improvements in an urban setting.		✓			
	Familiar with the USACE application of risk and uncertainty analyses in coastal storm risk management projects, particularly projects in urbanized coastal areas.		✓			
	Capable of addressing the USACE SAR* aspects of all projects. - *Since project designs are initiated in the decision document phase, SAR is incorporated into Type I IEPR. The initial evaluation of SAR as part of Type I IEPR includes, at a minimum, addressing the following questions (EC 1165-2-214, Appendix D, Para. 2.c(3)): • In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design? • Are the models used to assess hazards appropriate? • Are the assumptions made for the hazards appropriate? • 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?		✓			
Civil Works Planner/ Economist	From academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum of 10 years' demonstrated experience in public works planning.			✓		
	Very familiar with USACE plan formulation process, procedures, and standards.			✓		
	Familiar with evaluation or alternative plans for hurricane and coastal storm risk management projects and ecosystem restoration.			✓		
	Familiarity with USACE standards and procedures is required.			✓		
	Have experience related to evaluating traditional civil works plan benefits associated with hurricane and coastal storm risk management projects, to include experience in determining the cost-effectiveness of alternatives evaluations.			✓		
	Capable of evaluating traditional National Economic Development plan benefits associated with hurricane and coastal storm risk management as well as have experience working with Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA) and the USACE BeachFX model.			✓		
	Capable of addressing the USACE SAR* aspects of all projects. - *Since project designs are initiated in the decision document phase, SAR is incorporated into Type I			✓		

Requirements		Mr. Paul Bovitz	Dr. Chris Brown	Dr. Kenneth Casavant	Dr. Nader Mahmoudpour	Mr. Doug Spaulding
Subject Matter Expertise	**Highest Degree**	**MS**	**PhD /PE**	**PhD**	**PhD**	**BS**
	Years of Experience	**31**	**27**	**45**	**24**	**48**
	Experience with USACE (Direct (D), Indirect (I), and none (N))	**I**	**D**	**D**	**I**	**D**
	IEPR. The initial evaluation of SAR as part of Type I IEPR includes, at a minimum, addressing the following questions (EC 1165-2-214, Appendix D, Para. 2.c(3)): • In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design? • Are the models used to assess hazards appropriate? • Are the assumptions made for the hazards appropriate? • 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?					
Coastal/ Hydrology and Hydraulic Engineering	A registered professional engineer with a minimum of 10 years' experience in coastal and hydraulic engineering emphasis on coastal storm risk management projects, particularly projects in urbanized coastal areas, or a professor from academia with extensive background in coastal processes and hydraulic theory and practice.				✓	
	Have extensive experience in estuarine systems and be familiar with USACE applications of standard USACE coastal, hydrologic and hydraulic computer models such as Coastal Modeling System Wave (CMS-WAVE), Steady State Spectral WAVE (STWAVE), Advanced Circulation (ADCIRC), and spreadsheet models for storm damages on bulkheads and structures behind them.				✓	
	Capable of addressing the USACE SAR* aspects of all projects. - *Since project designs are initiated in the decision document phase, SAR is incorporated into Type I IEPR. The initial evaluation of SAR as part of Type I IEPR includes, at a minimum, addressing the following questions (EC 1165-2-214, Appendix D, Para. 2.c(3)): • In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design? • Are the models used to assess hazards appropriate? • Are the assumptions made for the hazards appropriate? • 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?				✓	
Structural/ Geotechnical Engineering	A registered professional engineer from academia, a public agency whose mission includes coastal storm risk management, or an Architect-Engineer or Consulting Firm, having a minimum of 15 years' experience in geotechnical/structural engineering with a minimum MS degree or higher in engineering.					✓
	Have demonstrated experience in performing geotechnical evaluation and geo-civil design for all phases of coastal storm risk management projects.					✓
	Have experience in design and review of floodwalls and closure gates as well as levee construction and bendway weirs. Specifically, the Panel Member should have knowledge in levee stability, vegetations variance for levees, levee design, sediment transport, construction and modification of new levees.					✓
	Familiar with and have demonstrated experience related to USACE geotechnical practices associated with flood management channels, construction, and soil engineering.					✓

Requirements		Mr. Paul Bovitz	Dr. Chris Brown	Dr. Kenneth Casavant	Dr. Nader Mahmoudpour	Mr. Doug Spaulding
Subject Matter Expertise	**Highest Degree**	**MS**	**PhD /PE**	**PhD**	**PhD**	**BS**
	Years of Experience	**31**	**27**	**45**	**24**	**48**
	Experience with USACE (Direct (D), Indirect (I), and none (N))	**I**	**D**	**D**	**I**	**D**
	Active participation in related professional engineering and scientific societies is encouraged.					✓
	Capable of addressing the USACE SAR* aspects of all projects. - *Since project designs are initiated in the decision document phase, SAR is incorporated into Type I IEPR. The initial evaluation of SAR as part of Type I IEPR includes, at a minimum, addressing the following questions (EC 1165-2-214, Appendix D, Para. 2.c(3)): • In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design? • Are the models used to assess hazards appropriate? • Are the assumptions made for the hazards appropriate? • 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?					✓

Direct experience: A past USACE employee
Indirect experience: Work experience with USACE projects
None: No working experience with USACE projects

B.2 IEPR Panel Qualifications and Experience

The qualifications of the IEPR Panel Members (in alphabetical order) are provided below in summary form.

B.2.1 Mr. Paul Bovitz

Role: Biological Resources and Environmental Law Compliance

Mr. Bovitz has over 30 years' experience as an Environmental Project Manager with expertise in leading interdisciplinary, high-performing teams on national and international projects. He has extensive professional experience in ecological assessment and natural resources management in public, private, and academic sectors, engaging in both theoretical and applied aspects of ecological research and encompassing a variety of geographic regions, habitats, and taxa. Mr. Bovitz earned his BS in Wildlife Biology from Colorado State University, an MS in Ecology from Rutgers University, and an MBA in Finance from Rutgers University.

Mr. Bovitz is an experienced peer reviewer of USACE ecological restoration plans, environmental impact statements, and feasibility studies. Much of his career has been spent as an EPA and USACE contractor directing ecological investigations of sites requiring environmental restoration. Mr. Bovitz is experienced in NEPA compliance, having completed several EAs, DMMPs, EIS, and other NEPA documents,

including extensive USACE contracting experience in preparing NEPA compliant feasibility studies for habitat restoration and environmental remediation projects. He has worked nationwide, and for the past 5 years has been working as lead ecological risk assessor for investigation and cleanup of two contaminated sites at Tyndall Air Force Base in Panama City, FL. He has performed aquatic surveys and ecological risk assessments at several sites, and his NEPA experience includes cumulative impacts analyses. He has served as an IEPR Panel Member for both ecological issues and NEPA compliance on projects for the USACE, including dam safety projects for the Albuquerque, Dallas, St. Louis, and New York Districts.

Mr. Bovitz currently serves as acting member of the New Jersey Governor's Science Advisory Board, Ecological Sciences Committee, and formerly served on the Comparative Risk Analysis Panel of the New Jersey Department of Environmental Protection. In July 2014, he served as Chair for a session he organized on "Integrating Ecological Restoration Projects into a Regional Framework" at the Conference for Ecological and Ecosystem Restoration, which focused on regional approaches for coastal restoration projects.

Mr. Bovitz holds the following credentials; Licensed Site Remediation Professional – New Jersey (#586403, 2010); Certified Professional Wetland Scientist – Society of Wetland Scientists; Certified Energy Manager – Association of Energy Engineers (No. 14394; 2009); Leadership in Energy and Environmental Design Accreditation Professional – U.S. Green Building Council and Certification in Green Supply Chain Management – Rutgers University.

B.2.2 Dr. Chris Brown

Role: Civil Engineer/Risk Reviewer

Dr. Brown is an Associate Professor at the University of North Florida (UNF) teaching civil engineering, fluid mechanics, hydraulics, senior design, and engineering geology. He earned his PhD in Civil Engineering in 2005 from the University of Florida, his Master's Degree from Villanova University in 1997, and his BS degree in Civil Engineering from Temple University in 1991. He has over 25 years of experience working on public works projects for the City of Philadelphia, Waste Management, USACE, and for Golder Associates Inc. as a private consultant for various complex civil engineering projects. While working for the USACE, he worked within the Planning, Engineering, and Construction Divisions. He was consistently recognized for his excellent technical skills, including the award of "engineer of the year" twice over 16 years with USACE. He has also recently been recognized for excellence in teaching and mentoring with the award of several teaching accolades at UNF and the national Bliss Medal from the SAME.

Dr. Brown is a registered Professional Engineer in both Pennsylvania and Florida. During his career, Dr. Brown has worked on flood-risk management structures including dams, levees, retaining walls, gates, closure structures, etc., looking at both geotechnical and general civil engineering aspects. Specific project examples include the Prompton Dam spillway modification project, Molly Ann's Brook flood mitigation project, Portugués Dam design, Everglades Agricultural Area (EAA) Reservoir project, C-111 levees, and many others. Dr. Brown has extensive experience on public works projects for the City of Philadelphia, City of Savannah, City of Jacksonville, EPA, USACE, State of Florida, and Commonwealth of Puerto Rico. Dr. Brown has also designed projects that met requirements outlined in EM 1110-2-1913. As an expert peer reviewer, Dr. Brown has been involved with review projects in eight USACE districts over a period of 8 years.

Dr. Brown has worked on the geotechnical side of water resources and the hydrologic modeling side of design and modeling projects. Dr. Brown has completed both stability studies using SLOPE/W and UTEXAS and seepage studies using SEEP/W, SEEP2D, and MODFLOW. Dr. Brown has used reliability and stochastic analysis studies on all types of water resources projects dating back to version 1.0 of "@Risk" software. Dr. Brown served on the first Corps of Engineers ad-hoc committee on levee assessment, which included the initial development of the current USACE fragility curve/risk management design approach.

Dr. Brown has extensive knowledge of USACE cost estimating systems with direct experience using MCACES and working knowledge of MII. Dr. Brown has also developed his own risk-based cost estimates using both @Risk and Crystal Ball. He is experienced in developing estimated construction costs and is knowledgeable regarding construction methods related to large civil works projects including levee design, floodwall design, box culverts, bridge pier modifications, utility relocations, and drainage structure design. Dr. Brown has acted as cost-estimating IEPR reviewer on some of the largest civil works projects in USACE, including the most expensive lock and dam replacement in USACE history.

Dr. Brown is familiar with and has participated in the design of floodwalls and gated structures, as well as non-structural flood mitigation solutions (e.g., buy-out or minor flood proofing). Specific project examples of direct design experience include Molly Ann's Brook project (included t-walls, l-walls, underpinning of buildings, levee, bridge modification), Portugués Dam (included access road, foundation prep, arch dam, drainage gallery, rock bolts), and City of Savannah storm sewer upgrade (included new conduit, cut/fill construction, utility relocation and hardening, vibration monitoring). Dr. Brown was also a key designer for the F. E. Walter Dam access road replacement (on design team and field inspection) as well as the design of new bridges across Everglades National Park along the Tamiami Trail in Florida. Dr. Brown has also been involved in other large civil works projects including Chesapeake and Delaware Canal Deepening Project in Maryland and Delaware and the Delaware Main Channel Deepening Project in Pennsylvania and New Jersey.

B.2.3 Dr. Kenneth Casavant

Role: Civil Works Planner/Economist

Dr. Casavant is a professor and agricultural economist at the School of Economic Sciences at Washington State University, Director of the Freight Policy Transportation Institute, and adjunct professor at North Dakota State's Upper Great Plains Transportation Institute since 2002. He earned his PhD in Agricultural Economics from Washington State University in 1971. Dr. Casavant has published three textbooks on applied economics and has 14 chapters in other books and monographs. A nationally known transportation and policy economist, he has published over 150 articles and given over 340 presentations, including testifying before state legislatures, regulatory bodies, and the U.S. Congress, leading to public debate and understanding within all sectors of the economy of the freight mobility crisis. He was chosen to speak at the last three national agricultural transportation summits, hosted by the U.S. Department of Agriculture and the US Department of Transportation. This prominence has brought in over $8 million of grants and contracts to his personal research program and over $1 million to multidiscipline research teams on which he served as a member. During his 48-year career, he has gained extensive experience as an economist, planner, university professor, and consultant, with specific expertise in transportation economics and planning, civil works planning, and NEPA compliance.

He is a sought-after colleague, having been invited to serve as a Visiting Professor in Alaska, North Dakota State University, and University of New England, Australia. He has won teaching awards locally, regionally, and nationally in different professional associations and has various best paper awards. He has developed curricula that deal with welfare economics (cost/benefits analysis, externalities, RED/NED, etc.)

Dr. Casavant has at least 15 years of active experience in economic analysis and plan formulation, including the evaluation and comparison of alternative plans for USACE projects, often on projects with deep draft navigation analysis. Some of his work with USACE has dealt with those plans and subsequent evaluation/rewriting. Two recent work efforts for the Institute for Water Resources focused on determining procedures for derivation of deep draft vessel operating costs, then extending this into shallow draft vessel operating costs. He has applied this past and current expertise into USACE projects, reviewing the Upper Mississippi and Illinois Navigation Study, the Lower Columbia River Channel Deepening Project, the Port of Iberia Channel Deepening Project, the Savannah Harbor Improvement Project, and others where costing underlay comparison among alternatives. He has served as the civil works planning and plan formulation expert for eight previous USACE IEPRs and as the economics expert on four others; for several other reviews, he fulfilled both roles. The earlier-mentioned navigation projects all included detailed analyses of alternative plans and the assumptions underlying each alternative, all leading to sensitivity analyses of the benefit-cost ratios.

For these reviews, Dr. Casavant tested assumptions, examined alternatives, replicated and corroborated analyses, and requested changes using USACE's planning P&G framework. In addition, he evaluated projects against the USACE six-step planning process governed by ER 1105-2-100. He has worked as an independent technical reviewer, as well as a member of technical peer reviews, on numerous projects that demonstrate his experience working with USACE P&G as applied to civil works projects. In addition to the projects already mentioned, they include, among other, Barataria Basin Shoreline Restoration Project, Delaware River Main Channel Deepening Project, Upper Mississippi River Gulf Outlet Ecosystem Restoration Plan, Freeport Harbor Project, Donaldsonville to Gulf Hurricane and Flooding Protection Project, Morganza Study, Port Everglades Project, Upper Des Plaines Project, and West Slope Lake Ponchartrain Project. The focal point of many of the activities mentioned above is the determination of the NED benefits for the TSP alternatives for each project. Whether assessing the Delaware River Deepening Project or the Savannah Harbor Improvement Project, the focus is on the benefit-to-cost ratio that measures the public interest in supporting the improvement, and it is based not on RED, but on NED benefits. At least five of these projects have this focus. Dr. Casavant was also a member of the team that conducted an external independent economic opinion on identifying and measuring NED benefits for navigation shipping.

B.2.4 Dr. Nader Mahmoudpour

Role: Coastal/Hydrology and Hydraulic Engineer

Dr. Mahmoudpour has a PhD and professional engineering registration as a civil engineer. He earned his BA degree in Civil Engineering, Master's in Hydraulic Structures, and PhD in Water Resources. He has over 24 years of experience as a civil and water resources engineer conducting hydrologic and hydraulics analysis for riverine systems, and for 2D hydrodynamic storm surge, waves, and sediment transport modeling. He has provided technical expertise for FEMA flood hazard risk analysis for riverine and coastal studies for many miles of riverine and coastal shoreline. He has experience in stormwater man-

agement analysis and design, and in NPDES, TMDL and MS4 requirements, watershed studies utilizing GIS applications. He has thorough knowledge of near-shore coastal processes including refraction/ diffraction analysis, run-up, littoral transport, coastal structures, and beach erosion. He has served on a variety of water resources projects in transportation, water supply, bridge hydraulics and scour analysis, and sewer system design and construction.

Dr. Mahmoudpour provided technical assistance on Wave Damage Functions of the USACE Coastal Storm Damage Prevented R&D project, and was a lead engineer for Limit of Moderate Wave Action Operating Guidance and Primary Frontal Dune Best Practices documents prepared for FEMA. He has co-presented at the Ocean Studies Board meeting under the topic "Developing a Coastal Impact Factor to Assess Hurricane Intensity," for the Ocean Studies Board, Board on Atmospheric Sciences and Climate, National Research Council, NAS, March 2013.

Dr. Mahmoudpour has extensive experience in Stormwater Management, Erosion Sediment Control, and Best Management Practices design for linear and land development projects. Using USACE publications HEC-18, he has served as the technical lead for analyses of hydrologic, hydraulic, and scour issues pertaining to the full design demolition and replacement of Fort Benning and Pennsylvania Department of Transportation bridges.

Dr. Mahmoudpour performed flood hazard risk analysis and prepared flood insurance studies for Hillsborough, Lee, Monroe, and Flagler counties in Florida. He supervised 2D storm surge and wave modeling exercises and a number of other projects dealing with coastal near-shore processes and analysis; coastal flood hazard statistical analysis, using event- and response-based approaches; overland wave propagation utilizing WHAFIS, CHAMP, and Runup, utilizing CSHORE for Great Lakes studies; and supervising the entire flood hazard risk mapping effort for the entire shorelines of the states of Connecticut, Massachusetts, and Maine, and for Clatsop (Oregon), and Thurston (Washington) Counties.

He provided technical services for sediment transportation utilizing Soulsby's equation for Currents and Sediment Dynamics Studies for the Raritan Bay Slag Superfund Site. He also provided technical services supporting the coastal structure of the Hurricane Barrier Walkway Design, for USACE New Bedford, Massachusetts, and provided quality review for Rondout Reservoir (New York) Spillway Siphon Design, Environmental Loads (e.g., wave forces in the conceptual design).

Dr. Mahmoudpour has overseas experience as a hydraulic engineer. He conducted a review of the pre-feasibility study of a water supply project from Iran to the United Arab Emirates, prepared by La-Mayer consultant, in which he investigated and reanalyzed water hammer issues for the project. He served as design engineer and marine installation manager to design and install a 10-mile sub-sea pipeline from Bandar-Abass to Hormuz Island in the Persian Gulf, Iran.

B.2.5 Mr. Doug Spaulding

Role: Structural/Geotechnical Engineer

Mr. Spaulding is a registered engineer with over 40 years of experience specializing in geotechnical design, local flood protection, dam inspection, dam rehabilitation, Part 12 inspections, and PFMA facilitation. He holds an MSCE in Geotechnical Engineering from Purdue University and a BSCE from Valparaiso University. He is affiliated with the American Society of Civil Engineers, Minnesota Geotechnical

Society, Society of American Military Engineers, is a member of the American Arbitration Association, and is on the Construction Claims Panel, Minneapolis, MN.

He served 10 years with the USACE, which included serving as Chief of the Levee Design Section and Program Manager for the National Dam Safety Program in Wisconsin and Minnesota. Duties included project management, feasibility and siting studies, economic analyses, regulatory coordination, and management of final design for flood control and navigation structures.

Mr. Spaulding has served on several independent peer reviews including:

- Currently serving on FERC Board of Consultants for the design of the 24 megawatt Lake Livingston Hydroelectric Project in Texas.
- Currently serving on the FERC Board of Consultants for the design of the 400 megawatt Gordon Butte pumped storage project.
- Served as geotechnical representative on External Peer Review to evaluate the USACE $190 million seepage control upgrade project in East St. Louis, MO. Evaluation included review design for relief wells, slurry trenches, and seepage berms.
- Fargo Moorhead Flood Control Project – Served on IEPR Panel to review USACE feasibility study for flood protection for the Fargo Moorhead area. Alternatives plans included levees, floodwalls and two diversion alternatives. The recommended diversion plan involves a 35-mile-long channel with an estimated cost of $1.3 billion.
- Evaluation of Levee Cracking – Geotechnical Engineer for study and evaluation of the cause of cracking in Corps of Engineers earth levees located throughout the Red River of the North. Investigations included literature review, field inspection, subsurface investigations, and evaluation of potential causes of cracking.
- Eau Pleine Dam, Mosinee, WI – This project was part of a program to upgrade the discharge capacity and increase the stability of the downstream embankment slopes. Project included the use of transient finite element analyses to evaluate the potential for sudden drawdown failures and stability analyses to determine the configuration of a sloping drain and stability berm section.
- Byllesby Dam, Dakota County, MN – Studies at the Lake Byllesby Dam included stability of Ambursen Dam and the rock spillway. This included core holes to identify the character of bedrock at depth and recommendations regarding potential remediation. The work at Byllesby Dam included a sensitivity study to evaluate potential for sliding along the bedrock/concrete contact using "CSLIDE" (USACE's Sliding stability of concrete structures program).
- Breckenridge Flood Control Stage 1 – The project involved design of 7-mile long, 20-foot-deep flood diversion channel in western Minnesota. Services included evaluation of stability and utilization of clay fill material. The value engineering study on project resulted in $1.5 million cost savings.
- Seneca Falls Hydroelectric Project, Seneca Falls, NY – Project included stability analysis using a sensitivity analysis for this 50-foot high gravity structure and implementation of an exploration program to investigate soluble voids and foundation of powerhouse. On-site work included dye testing, preliminary grout testing, and down-the-hole photography.
- Served as FERC approved independent consultant on more than 60 Part 12 inspections for projects located nationwide.
- Lorella Pumped Storage Project – Served as project manager for the development of the preliminary design of this $1 billion pumped storage project. Design included an underground power-

house and evaluation of 80-foot-high embankments founded on soft clay deposits in addition to design of a 170-foot-high rock fill dam. The upper reservoir utilized an asphaltic concrete membrane to control seepage and reservoir losses in the upper portion of this project.

- Baldhill Dam – Evaluation of project alternatives to increase the spillway capacity at the USACE Baldhill Dam. Project included preliminary structural and geotechnical design, earthwork layout, and quantity estimates. Also responsible for design of remedial measures to stop earth movements in the discharge channel area.
- Highway 75 Dam – Developed geotechnical and civil designs for the USACE Highway 75 Dam near Odessa, MN. Design elements for this 3.5-mile-long structure included embankments, outlet channels, two outlet works and related access roads and other features. Project included stability evaluation for 25-foot-high dam founded on soft clay.
- High Falls Embankment Stabilization, Crivitz, WI – Project required design of a downstream berm to increase the embankment stability and to provide a seepage control system for emerging seepage.

Mr. Spaulding was responsible for developing and implementing training programs for operators at both USACE dams (1981 to 2011) and electric utility owned structures (1995 and 2008). Training included a program on identification of potential harmful conditions. He is an approved facilitator for the FERC's PFMA program and has served as facilitator for PFMA evaluations on 45 projects in a nine state area. He has served on the "Development of the Lower St. Anthony Falls Hydroelectric Project" HydroVision (2010), and "Computing Sliding Factors of Safety for Concrete Structures" HydroVision (2004).

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADCIRC	An Advanced CIRCulation model for oceanic, coastal, and estuarine waters
APMI	Analysis, Planning and Management Institute
BS	Bachelor of Science
CEQ	US Council on Environmental Quality
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
CMS-WAVE	Coastal Modeling System-Wave – A two dimensional wave spectral transformation model
COI	Conflict of Interest
CSHORE	Cross-Shore Numerical Model for Waves, Currents, Sediment Transport, and Beach Profile Evaluation
CSLIDE	Program developed by USACE that assesses the sliding stability of concrete structures
CSMS	Coastal Storm Modeling System
CSRM	Coastal Storm Risk Management
CY	Cubic Yards
DMMP	Dredged Material Management Plan
DOE	US Department of Energy
DrChecks	Design Review and Checking System
EA	Environmental Assessment
EAA	Everglades Agricultural Area
EC	Engineer Circular
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EM	Engineering Manual
EPA	US Environmental Protection Agency
EPW	Evaluation for Planned Wetlands
ER	Engineering Regulation
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GSA	General Services Administration

HEC-FDA	Hydrologic Engineering Center's Flood Damage Reduction Analysis
HEP	Habitat Evaluation Procedure
HSGRR	Hurricane Sandy General Reevaluation Report
IEPR	Independent External Peer Review
LMI	Logistics Management Institute
MBA	Masters of Business Administration
MCACES	Micro-Computer Aided Cost Estimating System
MII	MCACES Second Generation
MHHW	Mean Higher High Water
MMPA	Marine Mammals Protection Act
MODFLOW	US Geological Survey's modular, finite-difference flow model for groundwater flow equation used to simulate the flow of groundwater through aquifers
MS	Master of Science
MS4	Municipal Separate Storm Sewer System
MSCE	Masters of Science in Civil Engineering
MSE	Master of Science in Engineering
N	None
NAS	National Academy of Sciences
NAVD 88	North American Vertical Datum of 1988
NED	National Economic Development
NEPA	National Environmental Policy Act
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OMB	Office of Management and Budget
OMRR&R	Operations and Maintenance, Repair, Replacement, and Rehabilitation
OSD	Office of the Secretary of Defense
PED	Planning, Engineering, and Design
PFMA	Potential Failure Mode Analysis
P&G	Principles and Guidelines
PhD	Doctor of Philosophy
PWS	Performance Work Statement
RED	Regional Economic Development
R&D	Research and Development
SAME	Society of American Military Engineers
SAR	Safety Assurance Review

SEEP/W	Groundwater flow analysis model by GEO-Slope
SEEP2D	2D Seepage Analysis Program by the USACE
SLOPE/W	Geotechnical modeling software by GEO-SLOPE
SLR	Sea Level Rise
SMART	Specific, Measurable, Achievable, Realistic and Timely
STWAVE	Steady-State, Finite Difference, Spectral Wave Model
TMDL	Total Maximum Daily Load
TO	Task Order
TSP	Tentatively Selected Plan
UNF	University of North Florida
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
UTEXAS	Simulation model by the University of Texas