US Army Corps of Engineers®

Prepared by:

New York District

North Atlantic Division

South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Risk Management Project

Review Plan

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Section 1
Introduction

1.1 Purpose

This Review Plan (RP) for the South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Storm Risk Management Project (P2-108929), will help ensure a quality-engineering project is developed by the Corps of Engineers in accordance with EC 1165-2-217, "Review Policy for Civil Works". As part of the Project Management Plan, this RP establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products and lays out a value added process and describes the scope of review for the current phase of work. The EC outlines five general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Biddability, Constructability, Operability, and Sustainability (BOCES) Review, Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. This RP will be provided to Project Delivery Team (PDT), DQC, ATR, BCOES, and IEPR Teams. The technical review efforts addressed in this RP, DQC and ATR, are to augment and complement the policy review processes. The District Chief of Engineering has assessed that the life safety risk of this project is significant; therefore a Type II IEPR/Safety Assurance Review (SAR) will be required, see Paragraph Section 6.

1.2 References

- EC 1165-2-217, Review Policy For Civil Works, 20 February 2018
- ER 1110-1-12, Engineering and Design Quality Management, 31Jul 2006, as revised through 31 Mar 2011
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January, 2013
- EM 1110-2-1913 Design, Construction, and Evaluation of Levees, 30 April 2000
- ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 Aug 1999
- ER 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs, 31 Dec 2013
- ER 1110-2-1302, Civil Works Cost Engineering, 30 Jun 16
- ECB 2019-15 Interim Approach for Risk-Informed Designs for Dam and Levee Projects

- Project Management Plan (PMP) for the South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Storm Risk Management Project
- MSC and/or District Quality Management Plan(s)
- Section 2035 of the Water Resources Development Act (WRDA) of 2007 (Public Law 110-114, 8 Nov 2007, as amended by the Water Resources Reform and Development Act (WRRDA) of 2014 (P.L. 113-121)
- Public Law (PL) 113-2, the "DISASTER RELIEF APPROPRIATIONS ACT, 2013"

1.3 Review Management Organization

The USACE Risk Management Center (RMC) is the Review Management Organization (RMO) for this project. This RP will be updated for the construction phase.

Section 2
Project Description

2.1 Project Description

An Interim Feasibility Report and Environmental Impact Statement for the South Shore of Staten Island project, Fort Wadsworth to Oakwood Beach, NY, were completed in October 2016 (revised December 2016) and the Director's Report was signed on 27 October 2016. Construction of the South Shore of Staten Island Project was authorized under the Disaster Relief Appropriations Act of 2013 (P.L 113-2), which was enacted in response to Hurricane Sandy (October 29-30, 2012). The Record of Decision was signed on 8 December 2016.

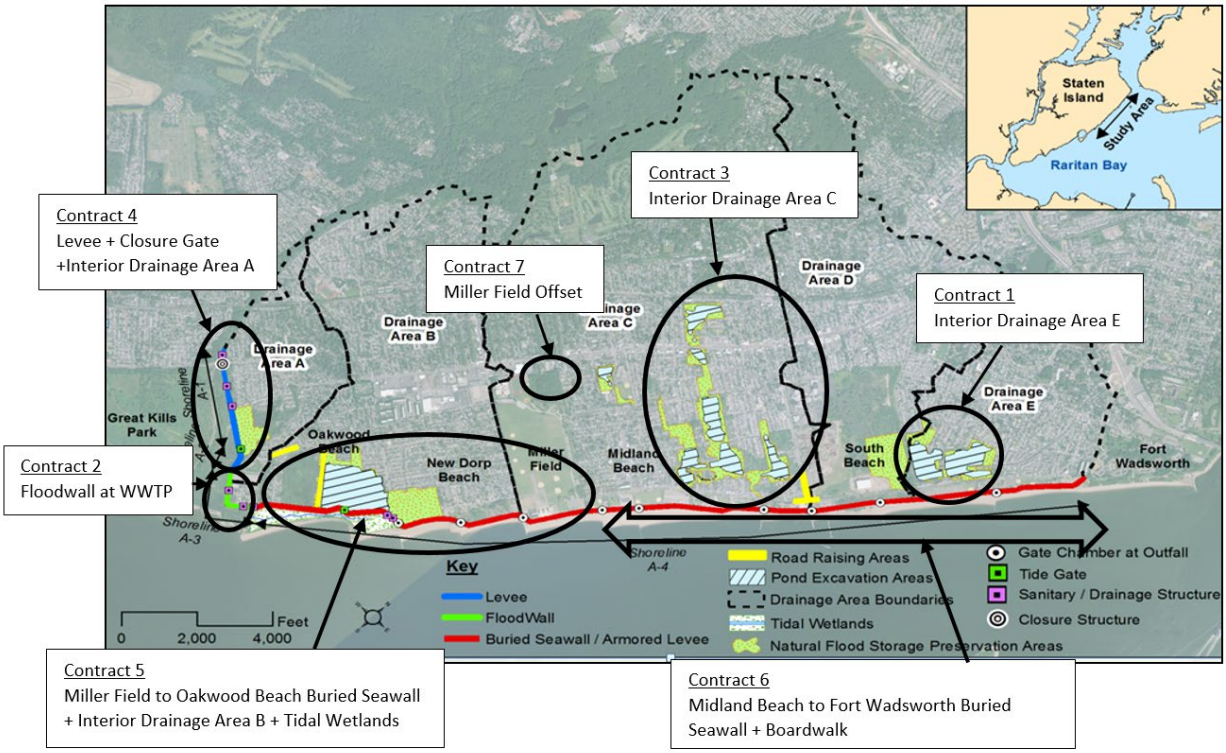
The authorized plan provides a project alignment that acts as the first line of defense against severe coastal storm surge flooding and wave forces, and reduces the risk of storm damage by construction of a buried seawall, floodwall, earthen levee, road closure structure, and associated interior drainage features. The estimated fully funded cost of the project is $615,231,000 (Oct 2017 price level). Figure 1 provides an overview of the project.

The South Shore of Staten Island Coastal Risk Management projects will be constructed under multiple construction contracts:

- **Contract 1-** Interior Drainage Area E: excavated pond; estimated construction cost $20 million.
- **Contract 2**- Floodwall at Oakwood Beach Wastewater treatment Plant (1800 feet); estimated construction cost $18 million.
- **Contract 3** – Interior Drainage Area C: excavated ponds; estimated construction cost $43 million.
- **Contract 4**- Levee, Hylan Blvd Road Closure Structure, and Interior Drainage Area A: earthen levee (3400 feet); road closure structure; tide gate; estimated construction cost $13 million.
- **Contract 5**- Oakwood Beach to Miller Field: 1.75 miles of buried seawall with concrete promenade, tidal wetland, tide gate, interior drainage Area B excavated pond; estimated construction cost $150 million.
- **Contract 6** – Midland Beach to Fort Wadsworth: 2.5 miles of buried seawall with boardwalk; estimated construction cost $225 million.
- **Contract 7**- Miller Field Offset -forested wetlands enhancement; estimated construction cost $1 million.

These contracts are scheduled to be awarded in 2020-2021 and overall construction is scheduled to be completed by Aug 2024.

Figure 1 – South Shore of Staten Island (SSSI) Coastal Storm Risk Management Project



Based on the combination of consequences and the likelihood of failure, the structural measures in Contracts 2, 4, 5 (not including Interior Drainage Area B and tidal wetlands components), and 6 pose a significant threat to human life (public safety). There are nearly 7,300 structures and over 30,000 people within the project area. Risk concerns and possible failure scenarios for the major structural features are as follows:

Buried Seawall- Approximately 4.3 miles of buried seawall, with a height of 5 to 15 feet, is to be constructed as part of Contracts 5 and 6. The buried seawall will have a trapezoidal shaped core constructed with armor stone and bedding stone. It will have an 18.5-ft wide crest and 1.5:1 (horizontal: vertical) side slopes. A vertical steel sheet pile wall will be installed in the interior of the structure to prevent seepage. There is a risk that the buried seawall could be overtopped resulting in flooding of protected areas, and possible full or partial collapse of the seawall. Potential failure modes include loss of material due to overtopping from storm events exceeding the design level, settlement of the buried seawall due to poor subsurface conditions exceeding the design parameters; seepage through the buried seawall or its foundation material; slope stability failure; and toe erosion leading to slope stability failure.

Levee and Floodwalls- Almost one mile of floodwalls and levees, with a height of 5' to 10', is to be constructed as part of Contracts 2 and 4. There is a risk that the floodwalls and levees could be overtopped resulting in flooding of protected areas, possible full or partial collapse. Potential failure modes include loss of material due to overtopping from storm events exceeding the design level, levee settlement due to poor subsurface conditions exceeding the design parameters; seepage through the levee or its foundation material; slope stability failure (levees); toe erosion leading to slope stability failure on levees or undermining of floodwalls; and inadequate foundation support for floodwalls..

Road Closure Structure- One road closure structure is to be constructed in Contract 4. The structure is about 110 feet wide and 4.5 feet high and is to be utilized during rare coastal events to prevent tidal surge flood water from flanking the line of protection. There is a risk that the structure will not be closed during a flood event resulting in flooding of protected areas. Potential failure modes include damage to structure by vehicles; inadequate foundation support leading to full or partial collapse for the structure; or inadequate equipment on site to close the structure.

Tide Gates- Two tide gates are to be constructed. One tide gate structure is to be constructed as part of Contract 4 to allow Oakwood Creek to flow through the levee. The other tide gate structure is to be constructed as part of Contract 5 on East Pond to allow inflow to, and outflow from, the drainage area. Both tide gates are 23'L x 16' W. Both gates include three 5'x5' sluice gates. There is a risk that the gates will not operate during a flood event resulting in flooding of protected areas. Potential failure modes include, but are not limited to, failure of backup generator (during loss of primary power source) due to lack of fuel or contaminated fuel; obstruction by sediment, trash, timber or other debris; inadequate maintenance resulting in failure to close due to corroded or warped gates; mechanical failure; control malfunctions; failure of the electric motor actuators required for gate lifting operations, and jamming of the tide gates.

Outfalls- Nine existing stormwater outfalls pass beneath or through the buried seawall. At these outfalls, new drainage structures are to be constructed at the line of protection which will contain flap gates and sluice gates to prevent tidal back flow into the drainage system. There is a risk that the gates will not operate during a flood event resulting in flooding of protected area. Potential failure modes include, but are not limited to, obstruction by sediment, trash, timber or other debris; inadequate maintenance resulting in failure to close due to corroded or warped gates; mechanical failure; control malfunctions; failure of the electric motor actuators required for sluice gate lifting operations, and jamming of the sluice gates.

2.2 Project Sponsor

Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, policy and legal compliance, BCOES, and SAR reviews. There will not be in-kind contributions for this effort. The non-Federal sponsors are the New York State, acting through the Department of Environmental Conservation, and New York City. The Project Partnership Agreement was executed in February 2019.

Section 3

District Quality Control

3.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo DQC in accordance EC 1165-2-217. The District's DQC Team shall perform Quality Assurance in accordance with District's Quality Management Plan.

See Attachment 1, Table 6 for the DQC Lead, reviewers, and reviewer's disciplines.

The design work will be performed by Architect-Engineer (A/E) firms. Review of all deliverables will be accomplished by the prime A/E prior to submitting to the District. The documents will be reviewed prior to delivery for consistency among disciplines enabling a coordinated and complete design package. The design documents, including calculations and spreadsheet models, and the plans and specifications will receive detail checking and independent technical review throughout the stages of work. The intent of the Independent Technical Review is to ensure technical accuracy, soundness of approach/design, conformance with standards and to ensure overall product quality. Independent Technical Reviews will be performed by A/E personnel not directly involved with the preparation of the work product. The reviewer will verify that any comments have been adequately addressed by the designer. Each work product by subcontractors will be reviewed by staff from the prime A/E.

To facilitate a coordinated product, the prime A/E will have weekly coordination calls or meetings among key staff. The A/E's Project Manager will be copied on all correspondence regarding the project and will confirm that review of each deliverable has been performed. The A/E will maintain documentation that their quality control plan has been followed. Documentation will include a Project Quality Assurance Plan

Checklist, Calculation Cover Sheets verifying that calculations have been checked, Detailed Checking Reports/Comments, and resolution of Independent Technical Review comments.

3.2 Documentation

Documentation of DQC activities is required and will be implemented by the process described in paragraph 3.1. DrChecks^{SM} (Design Review and Checking System) will be used to record comments and evaluations. A DQC certification will be signed at the completion of the process.

3.3 DQC Schedule and Estimated Cost

Although DQC is always seamless, the following milestone reviews are schedule in Table 1. The cost for the DQC is approximately $1,600,000. Note, the PDT will QA each submittal.

Table 1 DQC Schedule

Project Phase/Submittal	Review Start Date	Review End Date
Contract 1 – Interior Drainage Area E		
DQC 30% P&S Review	Jun 2019	Jul 2019
DQC 60% P&S Review	Nov 2019	Dec 2019
DQC 90% P&S Review	Mar 2020	Apr 2020
DQC 100% P&S	Jul 2020	Jul 2020
Contract 2- Floodwall at Oakwood Beach Wastewater Treatment Plant		
DQC 30% P&S Review	Jul 2019	Aug 2019
DQC 60% P&S Review	Mar 2020	Mar 2020
DQC 90% P&S Review	Jul 2020	Jul 2020
DQC 100% P&S	Nov 2020	Nov 2020
Contract 3- Interior Drainage Area C		
DQC 30% P&S Review	Nov 2019	Dec 2019
DQC 60% P&S Review	May 2020	Jun 2020
DQC 90% P&S Review	Nov 2020	Dec 2020
DQC 100% P&S	Apr 2021	Apr 2021
Contract 4 - Levee, Hylan Blvd Road Closure Structure, and Interior Drainage Area A		

Project Phase/Submittal	Review Start Date	Review End Date
DQC 30% P&S Review	Nov 2019	Dec 2019
DQC 60% P&S Review	May 2020	May 2020
DQC 90% P&S Review	Nov 2020	Dec 2020
DQC 100% P&S	Apr 2021	Apr 2021
Contract 5 - Oakwood Beach to Miller Field - Oakwood Beach to Miller Field: Buried Seawall with Promenade, Tidal Wetland, Interior drainage Area B		
DQC 30% P&S Review	Jul 2019	Aug 2019
DQC 60% P&S Review	Feb 2020	Feb 2020
DQC 90% P&S Review	Sept 2020	Sept 2020
DQC 100% P&S	Feb 2021	Feb 2021
Contract 6 - Midland Beach to Fort Wadsworth - Buried Seawall with Boardwalk		
DQC 30% P&S Review	May 2020	Jun 2020
DQC 60% P&S Review	Dec 2020	Jan 2021
DQC 90% P&S Review	Aug 2021	Aug 2021
DQC 100% P&S	Jan 2022	Jan 2022
Contract 7- Miller Field Offset		
DQC P&S Review	Mar 2020	Apr 2020
DQC 90% P&S Review	Jun 2020	Jun 2020
DQC 100% P&S	Sept 2020	Sept 2020

Section 4
Agency Technical Review

4.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo ATR in accordance EC 1165-2-217. The objective of ATR is to ensure consistency with established criteria, guidance, procedures, and policy. The ATR will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document explains the analyses and results in a reasonably

clear manner. ATR is managed within USACE by the designated RMO and is conducted by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. ATR teams will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. The ATR team lead will be from outside the home MSC.

ATR reviews will occur seamlessly, including early involvement of the ATR team for validation of key design decisions, and at the scheduled milestones as shown in Table 2 in Section 4.6. A single site visit to all contract areas will be scheduled for the ATR Team, those disciplines dealing with life safety issues and other disciplines as appropriate, early in the design phase and periodically as needed in a risk-informed manner during construction.

4.2 Documentation of ATR

Documentation of ATR will occur using the requirements of EC 1165-2-217. DrChecks^{SM} will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:

(1) The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;
(2) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not be properly followed;
(3) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and
(4) The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

The ATR documentation in DrChecks^{SM} will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the district, RMO/MSC, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in ER 1110-1-12. Unresolved concerns can be closed in DrChecks^{SM} with a notation that the concern has been elevated to the vertical team for resolution.

4.3 Products to Undergo ATR

The products that will undergo ATR include the DDR, Plans and Specifications for each contract and initial Semi-Quantitative Risk Assessment (SQRA) reports and final SQRA reports for the project. Per coordination with the Levee Safety Center of Expertise, a SQRA will be implemented during design and post-construction. The results of the first risk assessment, which will be performed during design, will verify whether a positive/negative or inconclusive recommendation for NFIP accreditation can be made and to further refine the design of the project. The second risk assessment will be performed at the end of construction for the official recommendation regarding NFIP accreditation. Both risk assessments shall go through RMC review, similar to other SQRA's, and shall also be presented to the LSOG.

4.4 Required Team Expertise and Requirements

ATR teams will be established in accordance with EC 1165-2-217. The following disciplines will be required for ATR of this project:

ATR Lead: The ATR team lead is a senior professional outside the home MSC with extensive experience in preparing Civil Works documents and conducting ATRs. The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline, in this case, Coastal, Civil, Structural, or Geotechnical Engineering, and must have a strong levee safety background.

Coastal/Hydraulic/Hydrologic Engineer – reviewer shall have expertise in coastal, hydraulics and hydrologic engineering. Reviewer shall have a thorough understanding of application of wave forces, water levels, and implications of sea level change over the likely range of storm return periods. Reviewer shall have experience with designing rubble mound structures and seawalls, utilizing HEC computer modeling programs, and sizing interior drainage features. The reviewer shall be a registered professional engineer.

Civil Engineer- shall have expertise in civil engineering design and review of site/civil layout, grading, drainage and utilities for projects involving levees, floodwalls, seawalls, and gated structures within a coastal environment, and shall be a registered professional engineer.

Geotechnical Engineer - shall have experience in the field of geotechnical engineering, analysis, design, and construction of levees and foundations for floodwalls, seawalls, gate structures, and culverts within a coastal environment. The geotechnical

engineer shall have experience in subsurface investigations, soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, and earthwork construction. The geotechnical engineer also shall have knowledge and experience in the seepage, settlement, stability, and deformation problems associated with levees constructed on soil foundations. The geotechnical engineer shall be a registered professional engineer. A minimum of a Master's degree in geotechnical engineering is also required.

Structural Engineer – shall have experience in design and review of floodwalls, road closure gates, tide gates and outfall structures within a coastal environment and shall be a registered professional engineer.

Mechanical Engineer –shall have experience in design and review of mechanical components of closure gates, tide gates, and sluice gates within a coastal environment and shall be a registered professional engineer.

Electrical Engineer- shall have experience in electrical engineering design and review of electrical components and instrumentation for closure gates, tide gates, and sluice gates, and shall be a registered professional engineer.

Construction Engineer – Reviewer shall be a senior level, professionally registered engineer with extensive experience in the engineering construction field, with particular emphasis on coastal construction projects. Reviewer shall have experience as an Administrative Contracting Officer for projects involving construction of rubble mound structures, seawalls, levees, floodwalls, tide gates, road closure gates, and outfalls in a coastal environment. The Construction reviewer should have a minimum of 10 years of experience.

Environmental - The environmental reviewer shall have independently completed EA/EIS's and be well versed in the NEPA process. Expertise in freshwater and tidal wetland resources is required, as well as participation in partnerships with other environmental resource agencies. The reviewer shall have experience with identifying and resolving environmental issues in a coastal ecosystem, and shall have experience with Section 106 actions and documentation.

Risk Reviewer – The reviewer shall have experience in SQRA and levee risk.

Consequences Reviewer - The economist (or consequence specialist) will have experience evaluating coastal storm risk management projects in accordance with ER 1105-2-100 and USACE models and techniques to estimate population at risk, life loss, and economic damages for levee safety risk analysis.

Please note, a Cost Engineer ATR member is not required as per Public Law 113-2 – Jan 29 2013. Due to specific language included in the Law regarding Hurricane Sandy Funds, provisions of section 902 of the WRDA of 1986 do not apply to this project. Additionally, the appropriate Cost Engineering Reviews will be conducted by NAN Cost Engineering Branch to ensure all cost products are in compliance with Corps regulations.

4.5 Statement of Technical Review Report

At the conclusion of each ATR effort, the ATR team will prepare a review report with a template provided by the RMC that includes a completion and certification memo. The report will be prepared in accordance with EC 1165-2-217.

Review Reports will be considered an integral part of the ATR documentation and shall:

(1) Identify the document(s) reviewed and the purpose of the review;
(2) Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
(3) Include the charge to the reviewers;
(4) Describe the nature of their review and their findings and conclusions;
(5) Identify and summarize each unresolved issue (if any); and
(6) Include a copy of each ATR comment, the PDT response, a brief summary of the pertinent points in the follow on discussion, including any vertical coordination, and the agreed upon resolution.

ATR will be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR Lead will prepare a Statement of Technical Review certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team).

4.6 ATR Schedule and Estimated Cost

Although ATR is always seamless, the preliminary ATR milestone schedule is listed in Table 2. The cost for the ATR is approximately $400,000.

Table 2 ATR Schedule

Project Phase/Submittal	Review Start Date	Review End Date
Design Review Site Visit	Feb 2020	Feb 2020
Contract 1 – Interior Drainage Area E		

Project Phase/Submittal	Review Start Date	Review End Date
ATR 60% Review	Feb 2020	Feb 2020
ATR 90% Review	Apr 2020	May 2020
ATR Backcheck & Certification	Jun 2020	Jul 2020
Construction Site Visit	TBD	TBD
Contract 2 - Floodwall at Oakwood Beach Wastewater Treatment Plant		
ATR 60% Review	Apr 2020	May 2020
ATR 90% Review	Aug 2020	Sept 2020
ATR Backcheck & Certification	Oct 2020	Nov 2020
Construction Site Visit	TBD	TBD
Contract 3 – Interior Drainage Area C		
ATR 60% Review	Jun 2020	Jul 2020
ATR 90% Review	Jan 2021	Feb 2021
ATR Backcheck & Certification	Mar 2021	Apr 2021
Construction Site Visit	TBD	TBD
Contract 4 - Levee, Hylan Blvd Road Closure Structure, and Interior Drainage Area A		
ATR 60% Review	Jun 2020	Jul 2020
ATR 90% Review	Jan 2021	Feb 2021
ATR Backcheck & Certification	Mar 2021	Apr 2021
Construction Site Visit	TBD	TBD
Contract 5 - Oakwood Beach to Miller Field - Oakwood Beach to Miller Field: Buried Seawall with Promenade, Tidal Wetland, Interior drainage Area B		
ATR 60% Review	Mar 2020	Apr 2020
ATR 90% Review	Nov 2020	Nov 2020
ATR Backcheck & Certification	Dec 2020	Feb 2021
Construction Site Visit	TBD	TBD
Contract 6 - Midland Beach to Fort Wadsworth - Buried Seawall with Boardwalk		
ATR 60% Review	Feb 2021	Mar 2021
ATR 90% Review	Oct 2021	Nov 2021
ATR Backcheck & Certification	Dec 2021	Jan 2022
Construction Site Visit	TBD	TBD

Project Phase/Submittal	Review Start Date	Review End Date
Risk Assessment		
Initial SQRA	Mar 2020	Apr 2020
Final SQRA	May 2024	May 2024
Contract 7- Miller Field Offset		
ATR 90% Review	Jul 2020	Aug 2020
ATR Backcheck & Certification	Aug 2020	Sep 2020
Construction Site Visit	TBD	TBD

Section 5
BCOES Review

5.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo BCOES review in accordance ER 415-1-11 and ER 1110-1-12. BCOES reviews are done during design for a project using the design-bid-build (D-B-B) method or during development of the request for proposal (RFP) for a design-build (D-B) project. The BCOES review results are to be incorporated into the procurement documents for all construction projects.

5.2 Documentation of BCOES

The BCOES review will be documented using DrChecks^{SM}. The BCOES reviewers will include local sponsors' facility operators and maintenance staff, as well as construction, operations, and environmental staff to improve the BCOES aspects of designs. The BCOES roster is provided in Attachment 1.

Section 6
Safety Assurance Review

6.1 Decision on SAR

The District Chief of Engineering has made a risk-informed-decision that portions of this project pose a significant threat to human life (public safety); these being the portions associated with the structural measures of the South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Risk Management Project. Based on the combination of consequences and the likelihood of failure, it has been determined that there is no threat to life and safety due to the pond excavation and wetland planting work in Contracts 1, 3, and 5 and wetland enhancement work in Contract 7. Accordingly, it is recommended that a Type II IEPR, Safety Assurance Review (SAR) is warranted for Contracts 2, 4, 5 (structural features only), and 6 of the coastal risk management project.

6.2 Products to Undergo SAR

The products that will undergo SAR include the DDR, Plans and Specifications for each contract.

6.3 Required SAR Panel Expertise

SAR panels will be established in accordance with EC 1165-2-217. One of the reviewers shall also function as the SAR Panel Lead, responsible to perform the administrative contract functions to run the meetings, compile the comments, and reports. The following disciplines will be required for SAR of this project:

Coastal Engineer – The Panel Member should have experience with engineering analysis related to coastal risk management projects. The Panel member will hold a minimum of a Master's degree in Civil Engineering, or Water Resources Engineering, a minimum of a Master's degree in engineering is also required. Panel member shall be a registered professional engineer from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of experience in coastal, hydraulics and hydrologic engineering, including extensive experience in the application of wave

forces, water levels and implications of sea level change over the likely range of storm return periods, and with coastal and HEC computer modeling programs, and be familiar with USACE application of risk and uncertainty analyses.

Geotechnical Engineer - Panel member shall be a registered professional engineer from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of experience in the geotechnical design of levees, and foundations for floodwalls, seawalls and gated structures within a coastal environment, experience in subsurface investigations; field & laboratory testing and the determination of in-situ material properties; soil compaction and earthwork construction; soil mechanics; seepage and piping; slope stability evaluations; bearing capacity and settlement; and scour protection design. A minimum of a Master's degree in geotechnical engineering is also required.

Structural Engineer – Panel member shall be a registered professional engineer from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of experience in the structural engineering design and construction of hydraulic structures for civil works projects including T-wall and I-wall floodwalls (including lessons learned from Katrina on gap formation), tide gates, and road closure gates within a coastal environment.

6.4 Documentation of SAR

Documentation of SAR will be prepared in accordance with EC 1165-2-217.

6.5 Scope, Schedule, and Estimated Cost of SAR's

The SAR's will be performed in accordance with EC 1165-2-217. SAR reviews will occur at the milestones shown in Table 3. The estimated cost for the SAR's of this project are in the range of $600,000 to $800,000. This estimate will be refined when the Scope of Work for the SAR task order is completed. Milestones to consider for a SAR are at the midpoint and final design in the Design Documentation Report; at the completion of the plans, specifications, and cost estimate; at the midpoint of construction for a particular contract, prior to final inspection, or at any critical design or construction decision milestones. The estimated cost accounts for the scheduled construction reviews as well as two additional construction reviews if needed.

Table 3 SAR Scheduled Milestone Reviews

Project Phase/Submittal	Coastal Engineer	Geotechnical Engineer	Structural Engineer	Site Visit Duration (days)	Review Start Date	Review End Date
Design Review Site Visit	X	X	X	1	Apr 2020	Apr 2020
Contract 2 - Floodwall at Oakwood Beach Wastewater Treatment Plant						
SAR 60% Review	O	O	O		Apr 2020	May 2020
SAR 90% Review	O	O	O		Aug 2020	Sept 2020
Construction Review #1	X	X	X	1	Feb 2022	
Construction Review #2	X	X	X	1	Aug 2022	
Contract 4 - Levee, Hylan Blvd Road Closure Structure, and Interior Drainage Area A						
SAR 60% Review	O	O	O		Jun 2020	Jul 2020
SAR 90% Review	O	O	O		Jan 2021	Feb 2021
Construction Review #1	X	X	X	1	Aug 2022	
Construction Review #2	X	X	X	1	Apr 2023	
Contract 5 - Oakwood Beach to Miller Field - Oakwood Beach to Miller Field: Buried Seawall with Promenade, Tidal Wetland, Interior drainage Area B						
SAR 60% Review	O	O	O		Mar 2020	Apr 2020
SAR 90% Review	O	O	O		Nov 2020	Nov 2020
Construction Review # 1	X	X	X	1	Aug 2022	
Construction Review # 2	X	X	X	1	Apr 2023	
Contract 6 - Midland Beach to Fort Wadsworth - Buried Seawall with Boardwalk						
SAR 60% Review	O	O	O		Feb 2021	Mar 2021
SAR 90% Review	O	O	O		Oct 2021	Nov 2021
Construction Review # 1	X	X	X	1	Apr 2023	
Construction Review # 2	X	X	X	1	Jun 2024	

(X - indicates attendance at the site visit. O - indicates participation via conference call)

Section 7

Public Posting of Review Plan

As required by EC 1165-2-217, the approved RP will be posted on the District public website (https://www.nan.usace.army.mil/Missions/Civil-Works/Review-Plans-and-Documents/). This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the RP are necessary.

Section 8

Review Plan Approval and Updates

The MSC Commander, or delegated official, is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope, level of review, and endorsement by the RMC. The RP is a living document and should be updated in accordance with 1165-2-217. All changes made to the approved RP will be documented in Attachment 3, Table 11. The latest version of the RP, along with the Commanders' approval memorandum, will be posted on the District's webpage and linked to the HQUSACE webpage. The approved RP should be provided to the RMO.

Section 9

Engineering Models

The use of certified, validated, or agency approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, BCOES, policy and legal review, and SAR (if required). Where such approvals have not been completed, appropriate independent checks of critical calculations will be performed and documented. The following engineering models, software, and tools are anticipated to be used:

Table 4 Models and Status

Model Name	Version	Release Date
AdH	4.6	
AGi32	19.1	
Autodesk AutoCAD Civil 3D	2018	
Autodesk Civil 3D 2019	2019	2019
Bluebeam Revu CAD	18.5	
ENERCALC	10.18.1.31	2018
Ensoft Inc - Apile	2018.8.5	May 2018
Ensoft Inc - Group	2016.10.13	May 2018
ESRI ArcCatalog	10.6.1.9270	
ESRI ArcMap	10.6.1.9270	
Geostudio 2016 Seepage/W by GEOSLOPE	8.16.2.14053	2016
Geostudio 2016 Sigma/W by GEOSLOPE	8.16.2.14053	2016
Geostudio 2016 Slope/W by GEOSLOPE	8.16.2.14053	2016
HEC-HMS	4.3	November 2018
HEC-HMS	4.2.1	March 2017
HEC-RAS	5.0.6	November 2018
Highway Capacity Manual (HCM)		2000
HOBOWare Pro	3.7.17	
Mathcad	15.0 (M005)	November 2010
Mathcad	15.0 (M045)	
Matlab	R2017b (9.3.0.713579)	
MicroStation V8i (SELECT series 4) - Bentley Systems	08.11.09.867	2016
MIKE Zero (MIKE 21)	2017 Service Pack 2	
Power InRoads V8i (SELECTseries 4)	08.11.09.878	April 2016
ProSheet	2.2	August 2017
R	3.5.3	

Model Name	Version	Release Date
R Studio	1.1.463	
RIVERMorph	5.2	
SAFE 2016	16.0.1	March 2017
SAP2000	V19	November, 2017
Shoring Suite CivilTech Shoring	8.16h	2016
SpecsIntact	5.0.0.98	
SpecsIntact	4.6.2.996	
United Facilities Guide Specifications (UFGS) Master		May 2019
USACE Computer-Aided Struct. Engin. (CASE) program, CPGA		3/29/1993
Visual Lighting	2017	
Visual MODFLOW (VMOD) Flex - Waterloo Hydrogeologic, 2018	5.1	2018

Section 10
Review Plan Points of Contact

Table 5 RP POC's

Title	Organization	Phone
Project Manager	CENAN-PP	917-790-8212
Technical Manager	CENAN-EN-MC	917-790-8297
Senior Reviewer	CEIWR-RMC	304-399-5217

ATTACHMENT 1
Team Rosters (FOUO)

Table 6 DQC Reviewers

Discipline/Role	Name	Description of Credentials
DQC Review Lead	Encer Shaffer	Mr. Shaffer is a NY licensed professional engineer with over 18 years of civil and geotechnical design and construction experience. He has a MS in Civil Engineering from Manhattan College and a BS in Civil Engineering from the United States Military Academy at West Point.
Civil Engineering	Kevin Whorton	Mr. Whorton is a NY licensed professional engineer with over 23 years of civil engineering design and construction experience. He has a BS in Civil Engineering from Villanova University.
Coastal Engineering	David Yang	Mr. Yang is Coastal Engineering Team leader with a PE from New York State. Mr. Yang has a PhD Coastal Engineering and an MCE Ocean Engineering from U Delaware. He also has a BS Civil Engineering, National Taiwan University. Mr. Yang has 20 years Consulting Experience in Coastal, Navigation, Offshore/Waterfront Structure, and Breakwater/Harbor Design/Construction; 19 years USACE with experiences in planning, design, construction of beach fill, groins, seawalls, revetments, floodwall, breakwater/pier/floating berth and navigation/harbor design with the aid of numerical models.
Hydraulic Engineering	Arun Heer	Mr. Heer is a registered Professional Engineer in the State of Illinois and a Certified Floodplain Manager with 11+ years of experience in hydraulic design and watershed planning. His areas of expertise include hydraulic modeling, floodplain mapping, ecosystem restoration, stream bank stabilization, dam removal, roadway drainage, and water/reservoir management. Additionally, Mr. Heer possesses a coastal engineering certificate from old Dominion University and maintains experience in coastal structure and beach design.
Geotechnical Engineering	Stanley Sedwick III	Mr. Sedwick is a NJ licensed professional engineer with 24 years of geotechnical design and construction experience. He has a MS in Civil Engineering from

Discipline/Role	Name	Description of Credentials
		New Jersey Institute of Technology, BS in Civil Engineering from Rutgers, The State University of New Jersey.
Structural Engineering	X. Michael Chen	Mr. Chen is a Structural Leader & NAD Regional Technical Specialist. He holds a BS/MS/Dr. Eng. Prog. in Structural Engineering and is a licensed PE in NYS with 30+ years of structural & foundation engineering experience in design/construction of flood mitigation facilities, coastal infrastructures, bridges, buildings, and mass transit structures. Prominent projects of Mr. Chen include Coastal Protection Programs for Mississippi (MsCIP) and Louisiana (LaCPR); Coastal Storm Damage Reduction for Elliott Bay in Seattle, Pt Monmouth Hurricane & Storm Damage Reduction, and Downtown Manhattan Seawall & Pier Replacement.
Electrical Engineering	Thomas Sessa	Mr. Sessa is a NY licensed professional engineer with over 40 years of electrical engineering design and construction experience. He has a both a MS and BS in Electrical Engineering
Mechanical Engineering	Claudio Sang	Mr. Sang has 25 years of experience with the NY District, the last 5 years of which included Civil Works projects. He has experience designing the mechanical components of road closure structures, motor operated sluice gates and gravity operated check flap-valve and "Duck-Bill" check valve structures, as well as pump stations.
Specifications	Luis Rosario-Lluveras	Holds a Bachelor of Architecture and a Master of Science in Urban Design from Pratt Institute. Certifications/Licenses: Licensed architect, CSI - Construction Document Technologist (CDT), by the US Green Building Council (USGBC), LEED Accredited Professional (AP), Building Design and Construction (BD+C). Lead Architect in the Design Control and Specifications Section, U.S. ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT, Engineering Branch. Registered Architect in the State of New Jersey with 23 years of experience as an architectural designer, architect, specifications writer and project manager.
Ecosystem Restoration	Michael Morgan	Mr. Morgan serves as the team Lead of the Engineering Division Civil resources branch Ecosystem restoration team. He has nearly 20 years' experience in ecosystem restoration, GIS and dynamic modeling and also serves

Discipline/Role	Name	Description of Credentials
		as the Engineering Division GIS lead. He has been involved in numerous ecosystem restoration and FRM projects including constructed projects such as the Yellow Bar and Elders West Marsh Island Ecosystem Restoration Projects in Jamaica Bay, New York.
	Gail Woolley	Ms. Woolley is a licensed Professional Engineer with over 12 years' experience designing tidal wetlands throughout Jamaica Bay, the Hackensack Meadowlands, the Hudson River Estuary and Staten Island. Equal experience gathering and analyzing tide data to help determine elevations for different vegetation communities within the wetlands. Performs sea level rise analyses to project the potential level of success over the life of the project.
Biology/NEPA	Catherine Alcoba	Ms. Alcoba is the Chief of the Coastal Ecosystem Section within Planning Division Environmental Analysis Branch. She has 18 years of experience in a variety of positions within in the environmental field. Ms. Alcoba holds an M.P.A. in Environmental Science and Policy from Columbia University and a B.S. in Biology from Siena College.
Cultural Resources	Anna Jansson	Ms. Jansson has a Masters of Arts degree in Applied Archaeology and meets the Secretary of the Interior's Guidelines as a Qualified Archaeologist. She has nine years of experience working in the field of cultural resources.
Dam and Levee Safety Program Manager	Jeff Gross	Mr. Gross is a licensed professional engineer with over 17 years of experience in structural engineering, dam, and levee safety. He has extensive experience in the analysis of existing flood control features as well as the design and construction of new features. Jeff was the lead structural engineer for the I-Walls within the district's portfolio.

Table 7 ATR Team

Discipline	Name	Description of Credentials
ATR Lead/ Geotechnical Engineering	Andy Hill (CEIWR-RMC-WD)	Mr. Andrew Hill is a Civil P.E. with 13 years of experience and has been with the USACE for 11 years, 8 of those with the RMC.
Civil Engineer	Jen Savitz (CEIWR-RMC-ED)	Ms. Savitz is a Registered Professional Civil Engineer currently working as the Deputy Chief of the Eastern Division for the U.S. Army Corps of Engineers (Corps) Risk Management Center. Ms. Savitz has 15+ years of experience working on the design, development, oversight, management, and review of levee safety, dam safety, flood risk management, aquatic ecosystem restoration, land use development, recreation, and municipal engineering programs and projects with the Corps of Engineers and private consulting firms. She has a Bachelor of Science degree in Civil Engineering from the Pennsylvania State University and a Master of Science degree in Civil Engineering from the University of Pittsburgh. Ms. Savitz has served in a variety of roles with the Pittsburgh District, including Chief of the Dam and Levee Safety Section, Levee Safety Program Manager, and Project Engineer. She has performed numerous technical and quality control reviews for both design and feasibility level projects, including leading an ATR effort for the design of a levee system for Kansas City District.
Coastal/Hydraulics & Hydrologic Engineering	Kari Hauck (CEMVP-EC-H)	Ms. Hauck graduated from Valparaiso University in 1997 with a Bachelor of Science degree in Civil Engineering and the University of Minnesota in 2001 with a Master of Science degree in Civil Engineering. She is a registered engineer in the State of Minnesota with over 20 years of experience in hydraulics analysis and design. Ms. Hauck has experience with the evaluation and design of embankment dams and levees. She assisted in the development and implementation of of dam safety design guidance for the Devils Lake and Fargo Moorhead Metro projects. She has participated in numerous dam safety periodic inspections and assisted with St. Paul District's dam safety training. Since 2006 Ms. Hauck has been involved with efforts to evaluate dams and levees on a risk basis, participating in screening level and higher level risk assessments. Ms. Hauck served as cadre lead for the St. Paul Risk Cadre which undertook risk assessments for the St. Paul, North Kansas City, Sutter Basin, and Freeport levees. Additionally, she has facilitated and reviewed numerous periodic assessments and semi-quantitative risk assessments for the USACE Risk Management Center. Ms. Hauck is currently the Chief of Hydraulics Section in the St. Paul District.
	Alex Nelson (CEMVP-EC-H)	Alex is a registered professional engineer with over 10 years of experience in both riverine and coastal hydrology & hydraulics related to dam and levee safety. Alex received a MS degree in Civil Engineering from the University of Minnesota and a BS degree in Civil Engineering from North Dakota State University. His technical

Discipline	Name	Description of Credentials
		experience includes 1D & 2D hydraulic modeling for hundreds of miles of rivers, dozens of reservoirs, and numerous coastal levee areas. He is proficient at utilizing many of the Corps' H&H modeling software packages from HEC, the RMC, and CHL including HEC-RAS, HEC-HMS, HEC-SSP, RMC-RFA, and ADH. Alex has been involved in the feasibility and design of various projects including the New Orleans Hurricane & Storm Damage Risk Reduction System, the Fargo-Moorhead Diversion project, and the Souris River Feasibility Study. He has also participated, led, and reviewed numerous dam and levee risk assessment activities for projects such as Rathbun, Pawnee, and Success Dams; Winona, Port Arthur, and Freeport Levees, and the Herbert Hoover Dike Hydrologic Hazard Assessment.
Consequences Reviewer	TBD	TBD
Structural Engineering	David Lovett (CEMVN-EDS)	PE that has 17 years of experience in the field of structural engineering, analysis and design with specialized experience in the design, construction and analysis of reinforced concrete floodwalls and large gated structures.
Electrical Engineering	Darold Sanderson (CEMVP-EC-D)	Mr. Sanderson is a registered Professional Electrical Engineer in the States of Minnesota and California. Currently working as an Electrical design engineer in the St. Paul district office. Mr. Sanderson has a BEE and MSEE degree from the University of Minnesota. In 2009 Mr. Sanderson began working for USACE for the Far East District, in South Korea as a COR. He was the principal COR in the office overseeing Milcon, civil works, and DODEA, (school) projects. As such he conducted monthly contractor meetings, met with Korean contractors and stakeholders, worked with QA, (Con Reps) on resolving issues, and presenting and speaking at ground breaking and ribbon cutting ceremonies. In 2012 Mr. Sanderson began working in the St. Paul District office as an electrical design engineer. In this capacity he has been the principal design engineer on the Upper and Lower St. Anthony Falls locks, electrical upgrade. These projects were completed in 2015. He was the principal electrical and controls engineer for the Seattle Chittenden (Ballard) lock Stoney Valve replacement and controls upgrade and after that the small lock machinery replacement project. He has participated in VE studies for Afghanistan projects, and numerous ATR reviews for other districts. Currently he is the principal electrical design engineer on the Fargo Diversion Project. Completing electrical designs on two dam structures. Now working on the Red River Structure electrical design. In addition Mr. Sanderson contributes M II Cases electrical take-off estimates of his projects to the cost team, and is the specification author for his projects.

Discipline	Name	Description of Credentials
Mechanical Engineering	Long Truong (CELRN-EC-DE)	Long Truong is a P.E. Mechanical Engineering Regional Technical Specialist (RTS) has 19 years of experience for all engineering aspects of complex mechanical equipment and features of multi-purpose dams, river navigation structures, levee systems, pump stations, campgrounds, and hydropower systems.
Construction Engineering	Matt Folk (CELRH-DSPC-TS)	Matt is a Registered Professional Civil Engineer currently working in the Dam Safety Modification MCX and CELRD Dam Safety Production Center. He has over 29 years of construction, civil design and geotechnical engineering experience with the US Army Corps of Engineers and private industry. His education includes a Bachelor's degree in Civil Engineering from the West Virginia Institute of Technology and a Master of Civil Engineering degree with construction management emphasis from North Carolina State University. He has broad work experience that includes construction management and design of complex dam safety, navigation, flood damage reduction, hydropower, environmental, utility installation, and disaster recovery projects in five USACE districts. As Resident Engineer, Matt has worked with domestic and international contractors using complex fixed price and cost reimbursement contract vehicles. He now serves as a Construction Liaison in the regional Dam Safety Production Center and national Dam Safety Mandatory Center of Expertise (MCX). Matt currently provides technical construction support to on-going dam safety construction projects to include East Branch Dam, Center Hill Dam, C-44 Reservoir, and Herbert Hoover Dike. He also participates in Constructability Evaluations for dam safety designs, Dam Safety Modification Studies (DSMS) and Agency Technical Reviews.
Environmental	Hannah Hadley (CENWD-NWW)	Ms. Hadley is currently the Environmental Compliance Technical Lead for the Columbia River System Operations Project. Ms. Hadley has 15 + years of experience working as a NEPA lead responsible for accomplishing the environmental compliance for planning studies, military projects as well as work in support of other Seattle District programs, other Corps Districts, and Northwest Division. Ms. Hadley has a Bachelor of Liberal Arts from University of Texas, Austin with a major in Anthropology. As an environmental coordinator, Ms. Hadley has prepared NEPA, Clean Water Act, and Endangered Species Act documents such as environmental assessments, Environmental Impact Statements and biological assessments for a number of multi-agency complex multi-purpose, comprehensive, regional/statewide projects such as dam safety, flood risk management, recreation, wildlife habitat management plans, and Army's master plans. Specifically, Ms. Hadley was environmental lead for the Howard A. Hanson Dam Safety Modification Study, Skagit River General Investigation Project, a number of PL84-99 levee rehabilitation

Discipline	Name	Description of Credentials
		projects, and Columbia River System Operations Project. As environmental leads, Ms. Hadley has ensured conformity to requirements of project design and specifications, and environmental compliance of Federal laws, regulations, and executive orders. Ms. Hadley has been on the ATR teams for Natomas East Main Drain Canal Project, Natomas Basin Reaches A, D, H and I Projects, Sacramento Weir Widening Project, and Sutter Basin Flood Risk Management Project.
Risk Reviewer	Emily Calla (CEMVK-EC-P)	Ms. Calla is a PE with 19 years of experience in the field of hydraulic engineering, risk assessments, and levee safety with a Bachelor's Degree in Civil Engineering from the Pennsylvania State University. Ms. Calla has experience leading virtual review teams and has been an advisor on multiple levee Semi-Qualitative Risk Assessments.

Table 8 SAR Panel

Discipline	Name	Description of Credentials
Coastal Engineering	TBD	TBD
Geotechnical Engineering	TBD	TBD
Structural Engineering	TBD	TBD

Table 9 BCOES Panel

Discipline	Name	Description of Credentials
Biddability	TBD	TBD
Constructability	TBD	TBD
Operability	TBD	TBD
Environmental	TBD	TBD
Sustainability	TBD	TBD

ATTACHMENT 2
Project Risk Information (FOUO)

CENAN-EN 22 January 2020

MEMORANDUM FOR RECORD

SUBJECT: South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Storm Risk Management Project, Risk Informed Assessment of Significant Threat to Human Life

1. **Project Information:** The South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Storm Risk Management (CSRM) Project is located on the south shore of Staten Island, New York. The authorized plan provides a project alignment that acts as the first line of defense against severe coastal storm surge flooding and wave forces, and reduces the risk of storm damage by construction of a buried seawall, floodwall, earthen levee, road closure structures, and associated interior drainage features.

2. **Project Description**: The components of this CSRM project include the following:

- Buried seawall with promenade/boardwalk (4.3 miles)
- Floodwalls (1800 LF) and levees (3400 LF)
- Road closure structure
- Tide gates
- Interior drainage excavated ponds
- Tidal wetland
- Wetland enhancement

3. **Risk Informed Assessment**: In accordance with EC 1165-2-217 (20 February 2018), Review Policy For Civil Works, a risk informed assessment was made as to whether there is a significant threat to human life from the CSRM components (see attached table). In accordance with ECB 2019-15 Interim Approach for Risk-Informed Designs for Dam and Levee Projects, the risk assessment will include an evaluation of the life and economic consequences, hazard curves, potential failure mode analysis, and determination of the annual probability of inundation. The results will be used to further refine the design of the constructed project as well as provide initial

recommendations for NFIP accreditation.

4. **Determination**: Based on a cursory risk informed assessment which considered the combination of consequences to life safety and the likelihood of failure, I have determined that there is a significant threat to human life associated with the structural components of the South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Storm Risk Management Project. There is no threat to human life and safety for Contracts 1, 3, 5 (Interior Drainage Area B + Tidal Wetlands only) and 7 which includes forested wetland enhancement, tidal wetland, and the interior drainage ponds. Accordingly, it is recommended that a Safety Assurance Review (SAR), as part of a Type II IEPR, is warranted for Contracts 2, 4, 5 (structural components only), and 6 of this project.

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MICHAEL ROVI, PE
Chief, Engineering Division

Table 10 Risk Informed Assessment of Significant Threat to Human Life for South Shore of Staten Island, Fort Wadsworth to Oakwood Beach, NY, Coastal Risk Management Project

No.	Risk Factor (Possible Threat to Life Safety)	Risk Magnitude (H/M/L)	Basis of Concern	Risk Assessment
1	Land use adjacent to the project	Low	The land use adjacent of the project is residential single family homes, apartments, businesses, municipal buildings and facilities, and a waste water treatment plant.	See 1a-1c below.
1a	Population Density	Moderate	The project area is densely populated.	Due to population density, many people could be affected by flooding or project failure.
1b	Critical Facilities Affected (e.g. schools, hospitals, assisted living/nursing homes, evacuation routes)	Moderate	Critical facilities and a wastewater treatment plant	Structures within the floodplain could be adversely affected by flooding or project failure.
1c	Numbers/types of structures in project area	Moderate	Residential single family homes, apartments, businesses, municipal buildings and facilities, and a waste water treatment plant.	Structures within the floodplain could be adversely affected by flooding or project failure.
2	Inundation due to Project Failure	High	Increased inundation will occur due to project failure.	Project consists a buried seawall, floodwall, and levee systems.
3	Overtopping of Coastal Structures	Moderate	Overtopping of structure will occur during design storm conditions. However, overtopping rates are limited to minimize damage on the	Project consists a buried seawall, floodwall, and levee systems. Storm induced scour will be accounted for in design.

No.	Risk Factor (Possible Threat to Life Safety)	Risk Magnitude (H/M/L)	Basis of Concern	Risk Assessment
			lee of the structures. Scour aprons are integrated into design.	
4	Wave Attack	Moderate	This project will not increase the risk of wave attack.	Project consists a buried seawall, floodwall, and levee systems.
5	Use of non-traditional design methods	Low	Traditional design methods have been used.	Use of non-traditional design methods will not be used.
6	Use of unique of non-traditional design features	Low	Use of non-traditional design features will not be used.	Use of non-traditional design features will not be used.
7	Use of unique non-traditional construction materials or methodologies	Low	Use of non-traditional construction materials or methodologies will not be used.	Use of non-traditional construction materials or methodologies will not be used.
8	Does this project have unique sequencing or a reduced or overlapping design or construction schedule	Low	Unique or accelerated construction sequencing may lead to poor quality work, leading to greater possibility of project failure.	This project will not require unique sequencing.
9	Does the project require:			
9a	Redundancy	Low	Project consists a buried seawall, floodwall, and levee systems.	This project includes redundancy through the use of flapper gates in the outfall pipes.
9b	Resiliency	Moderate	Project consists a buried seawall, floodwall, and levee systems.	This project will be designed with adaptation for future sea level rise.
9c	Robustness	Moderate	Project consists a buried seawall, floodwall, and	This project will be designed to withstand

No.	Risk Factor (Possible Threat to Life Safety)	Risk Magnitude (H/M/L)	Basis of Concern	Risk Assessment
			levee systems.	the forces associated with the 300-yr (0.33-percent chance annual) event with a project life of 100 years.

ATTACHMENT 3
Review Plan Revisions

Table 31 RP Revisions

Revision Date	Description of Change	Page/Paragraph Number