



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NORTH ATLANTIC DIVISION
FORT HAMILTON MILITARY COMMUNITY
302 JOHN WARREN AVENUE
BROOKLYN, NY 11252-6700

CENAD-PD-P (1105-2-10c)

30 Jan 2023

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, New England District, 696 Virginia Road Concord, MA 01742-2751

SUBJECT: Request for Approval of the City of Boston, MA Coastal Storm Risk Management Feasibility Study Review Plan

1. Reference Memorandum, CENAE-PD dated 30 December 2022, subject as above.
2. The Coastal Storm Risk Management Planning Center of Expertise of the North Atlantic Division (NAD) is the lead office to execute the referenced Review Plan. The Review Plan includes Independent External Peer Review.
3. The enclosed Review Plan is approved for execution and is subject to change as study circumstances require, consistent with study development under the Project Delivery Business Process. Subsequent revisions to this Review Plan or its execution require new written approval from NAD.
4. The point of contact is Mr. Larry Cocchieri, NAD Planning Program Manager at 347-370-4571 or Lawrence.J.Cocchieri@usace.army.mil.

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REINHARD W. KOENIG, PE, SES
Programs Director
North Atlantic Division



DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD MA 01742-2751

CENAE-PD

30 December 2022

MEMORANDUM FOR Commander, USACE North Atlantic Division, (CENAD-PD-X Larry Cocchieri), 301 John Warren Avenue, Fort Hamilton Community, Brooklyn, New York 11252

SUBJECT: Submission of the Review Plan for the City of Boston Coastal Storm Risk Management (CRRM) Feasibility Study (P2 No. 497351) for Approval.

1. References: ER 1165-2-217, Review Policy for Civil Works, 1 May 2021.
2. Background: The New England District developed the enclosed Review Plan dated December 2022 for the City of Boston CSRM Feasibility Study. The Review Plan has been reviewed for technical sufficiency and policy compliance by the National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSRM). The PCX's endorsement of the Review Plan is provided in the enclosed memorandum dated 15 December 2022.
3. Request: The New England District requests that the North Atlantic Division approve the attached Review Plan.
4. Point of Contact: Questions should be directed to Mr. Jeffrey A. Herzog, Lead Planner and Project Manager. He can be reached at 808-398-1106.

3 Encls

1. Review Plan (Final)
2. PCX-CSRM Endorsement
3. Review Plan (PCX Track Changes)


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DEPARTMENT OF THE ARMY
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302 JOHN WARREN AVENUE
BROOKLYN, NY 11252-6700

CENAD-PD-X (1105-2-10c)

15 Dec 2022

MEMORANDUM FOR: Commander, U.S. Army Corps of Engineers, New England District (CENAE-PDP/Jeffrey Herzog) 696 Virginia Road Concord, MA 01742-2751

SUBJECT: City of Boston Coastal Storm Risk Management Feasibility Study

1. The National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSR) has reviewed the Review Plan (RP) for the subject study and concurs that the RP complies with current peer review policy requirements contained in ER 1165-2-217, entitled "Civil Works Review Policy".
2. The review was performed by Mr. Donald Cresitello and me.
3. PCX-CSR has no objection to RP approval by the Commander, North Atlantic Division.
4. Thank you for the opportunity to assist in the preparation of the RP. PCX-CSR is prepared to lead the Agency Technical Review for the subject study and will continue to coordinate with the project delivery team. For further information, please contact me at 347-370-4571.

A handwritten signature in black ink, appearing to read "Larry Cocchieri", is positioned above the printed name.

LARRY COCCHIERI
Deputy, National Planning Center of
Expertise for Coastal Storm Risk
Management

REVIEW PLAN

January 2023

Project Name: City of Boston Coastal Storm Risk Management Study

P2 Number: 497351

Decision Document Type: Feasibility Report & Environmental Impact Statement

Project Business Line: Single-Purpose Coastal Storm Risk Management

District: New England District, (CENAE)

District Contact: Jeffrey A. Herzog, Lead Planner, (808)202-7204

Major Subordinate Command (MSC): North Atlantic Division (NAD)

MSC Contact: Joseph Vietri, NAD Planning Chief, (917) 613-3873

Review Management Organization (RMO): National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSR)

RMO Contact: Larry Cocchieri, Deputy, PCX-CSR at (347) 370-4571

Key Review Plan Dates

Date of RMO Endorsement of Review Plan:

Date of MSC Approval of Review Plan:

Date of IEPR Exclusion Approval: N/A

Has the Review Plan changed since PCX Endorsement?

Date of Last Review Plan Revision:

Date of Review Plan Web Posting:

Date of Congressional Notifications:

Milestone Schedule

	<u>Scheduled</u>	<u>Actual</u>	<u>Complete</u>
<u>FCSA Execution:</u>	May 22	02 May 22	Yes*
<u>Alternatives Milestone:</u>	10 Feb 23	(enter date)	No
<u>Tentatively Selected Plan:</u>	Feb 25	(enter date)	No
<u>Release Draft Report to Public:</u>	Apr 25	(enter date)	No
<u>Agency Decision Milestone:</u>	Oct 25	(enter date)	No

<u>Final Report Transmittal:</u>	Dec 26	(enter date)	No
<u>Senior Leaders Briefing:</u>	Mar 27	(enter date)	No
<u>Chief's Report:</u>	Apr 27	(enter date)	No

*Note: FCSA was executed 02 May 2022, as recorded in P2. However, it was coordinated with the vertical team that non-federal funding would not be available until summer 2022 after the start of the non-federal sponsor's fiscal year. Non-federal funding was received 29 August 2022.

Project Fact Sheet

January 2023

Project Name: City of Boston Coastal Storm Risk Management

Location: City of Boston, Boston, Massachusetts

Authority: The study is authorized by Senate Committee on Public Works Resolution dated September 12, 1969.

Sponsor: City of Boston

Type of Study: Coastal Storm Risk Management

SMART Planning Status: This study is anticipated to require a policy exception for schedule and budget (5 years, \$5M) due to scope and complexity of study area. Planning Charette occurred 18-20 October 2022. AMM is scheduled for February 10, 2023.

Project Area: The study area includes the City of Boston, Massachusetts to the Atlantic Ocean and covering approximately 47 miles of coastline. Boston is the largest city in New England and the 23rd largest city in the United States, with a population of about 635,000, **Figure 1. Study Area.**



The Study area extends from East Boston in the vicinity of Logan International Airport and Charlestown in the north to Dorchester and Moakley Park in the south. Specific areas known locally are Charlestown, East Boston, Downtown and North End, South Boston, as well as Dorchester Peninsula. The area includes Boston's Logan International Airport, as well as Boston Harbor which is used for recreational,

commercial, and maritime passenger transportation. The Study area includes residential communities, government offices, and commercial businesses which range from small businesses to hotel resorts. The wharf and harbor walk themselves are highly trafficked tourist locations which hold both historic and high economic value.

Problem Statement: Due to its location on the Atlantic Ocean, Boston is susceptible to nor'easter storms. Nor'easters refer to extratropical storms in which the winds over the coastal area are typically from the northeast. The storms can occur any time of year but are most typical and most violent between September and April. The storms can produce heavy snow and blizzard conditions, rain, and flooding. The storms also produce huge crashing waves which cause beach erosion and damage to coastal structures and buildings. In addition to nor'easter's, Boston is at risk from hurricanes and tropical storms, which result in both direct and indirect impacts to the city. Hurricane Bob made landfall in Newport, Rhode Island as a Category 2 storm, with winds gusts in Massachusetts reaching Category 3 levels. Although direct impacts have been limited, remnants of both Hurricanes Florence and Michael (2018) made it to Massachusetts as a reminder that the risk is very real.

Figures 2 (left) and 3 (right): Boston experiences coastal threats from nor'easters in which the wind comes from the northeast, often bringing heavy snow and flooding. (Courtesy of businessinsider.com, noreaster-bomb-cyclone-floods-2018-1)



Federal Interest: Coastal Storms, along with the effects of climate change and sea level change, threaten the City of Boston's coastline including its communities, businesses, residences, public infrastructure, and mass transit system both water and landside. Inundation to property, adverse impacts affecting community resilience, as well as community and life safety, warrant federal interest in investigating alternatives to reduce the risks associated with coastal storms in the study area.

Goals and Objectives: The feasibility study will identify coastal flood hazards and potential coastal storm risk management measures for critical areas within the study area. The study will formulate potential alternative plans that provide coastal storm risk management benefits and document the results in a decision document which will serve as the basis for project construction authorization. The alternative plans will be evaluated for engineering adequacy, economic viability, environmental acceptability and project non-federal sponsor support. An analysis of the alternative plans that address

coastal storm risk management needs will be conducted to identify the National Economic Development Plan, as well as the Comprehensive Benefits Plan.

Risk Identification: The problems identified for the study include effects resulting from coastal storm events, which pose a damage risk to coastal communities in the study area- property and structures; and human health and safety. Based on historical storm events in the project area, loss of life has not been a documented risk.

The study is anticipated to be technically and institutionally challenging due to the diversity in the urban ecosystem, sheer size of the study area, and the dense population which varies from affluent to socially vulnerable. The study is not anticipated to be socially challenging. The project will use the same design and construction techniques that have been used in the past on similar projects throughout the region, taking advantage of innovative technologies, models, and expertise. The project is not expecting to be justified by life safety. An analysis of life safety risk will be done to evaluate life safety risk in a future without project condition, as well as, to verify that alternatives recommended do not increase the risk to human life/safety.

1. FACTORS AFFECTING THE LEVELS OF REVIEW

Mandatory IEPR Triggers.

- Is the estimated total project cost, including mitigation, greater than \$200 million?
Yes
- Has the Governor of an affected state requested a peer review by independent experts? No
- Has the Chief of Engineers determined the project study is controversial due to significant public dispute over the size, nature or effects of the project or the economic or environmental costs or benefits of the project (including but not limited to projects requiring an Environmental Impact Statement)? No

Scope of Review.

- Will the study likely be challenging? Yes. The study consists of evaluation of a large study area (48 statute miles of Boston coastline) with a wide range of complex challenges associated with Coastal Storm Risks.

- Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks. The anticipated project risks occur in the sheer size of the study area and being able to develop comprehensive and complete alternative plans to meet the study objectives of addressing the study problem. Risks associated with real estate and land ownership are also a significant risk to developing comprehensive and complete alternative plans. Additionally risks include hazardous, toxic, radioactive, waste (HTRW) material that may potentially be in the study area.

Finally, space constraints in a densely populated urban area may constrain engineering feasibility of alternative plans. All of these risks can be managed through risk informed decision making and conducting the necessary engineering modeling and analysis during the feasibility study. These risks may require a policy exception for schedule and budget to exceed the typical 3 year and \$3M risk informed SMART feasibility study.

- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues? No. The project will not be justified by life safety – it will be justified by the management of risk to infrastructure, with a focus on the reduction of economic damages. The project alternatives would not add significant threat to human life/safety assurance but would rather incidentally reduce the risk of flooding problems related to human safety, quality of life, and resilience.
- Has the Governor of an affected state requested a peer review by independent experts? No. The Governor of Massachusetts has not requested a peer review by independent experts.
- Will the study likely involve significant public dispute as to the project's size, nature, or effects? No. Based on prior public involvement activities, there is significant interest in constructing coastal storm risk management features within the City of Boston.
- Is the project/study likely to involve significant public dispute as to the economic or environmental cost or benefit of the project? No. An integrated strategic communication plan that parallels the technical plan will be used to engage stakeholders and the community. Although there may disagreement with the recommendation, the general consensus among stakeholders and the community is that this project is needed for community resilience and safety.
- Is the information in the decision document or anticipated project design likely to be based on novel methods, involve innovative materials or techniques, present complex challenges for interpretation, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices? Yes. Based on the initial scope, all of the above may be likely in order to identify a complete, implementable, economically justified and environmentally acceptable recommendation to address coastal storm risk in the study area.
- Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule? Potentially. Depending on the final recommendation, the interdependency of the system or plan features may require sequencing in order to avoid temporarily transferring risk. The study will utilize a 50-year planning horizon for economic analysis and risk analysis, however, sea level change and climate change analysis will utilize the traditional 100-year analysis period in order to ensure the recommended plan is adaptable to the 100-year condition.

- Is the estimated total cost of the project greater than \$200 million? Yes. Based on the initial analysis of the study area, other USACE projects of similar size, and the cost of construction, it is anticipated that the total project cost will exceed \$200M to implement.
- Will an Environmental Impact Statement be prepared as part of the study? Yes. Due to the size and diversity of the project area, the number of potential environmental impacts, the cost of alternative plans, as well as the number of stakeholders and residents in the study area; an Environmental Impact Statement is anticipated at this time in the scoping.
- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources? No. The area is heavily developed with significant surveys, research and documentation for both Environmental resources as well as historic resources in the study area.
- Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures? No. The project is not expected to have substantial adverse impacts on fish and wildlife species.
- Is the project expected to have, before mitigation measures, more than a negligible adverse impact on an endangered or threatened species or their designated critical habitat? No. The project is not expected to have more than a negligible adverse impact on endangered or threatened species.

Assessment of the District Chief of Engineering: The District Chief of Engineering performed a preliminary evaluation of risks. There is insufficient information to determine the current risk to human life associated with the study or failure of the project. The study scope includes an evaluation of life safety in the future without and future with project condition.

2. REVIEW EXECUTION PLAN

This section describes each level of review to be conducted. Based upon the factors discussed in Section 1, this study will undergo the following types of reviews:

District Quality Control (DQC). All decision documents (including data, analyses, environmental compliance documents, etc.) undergo DQC. This internal review process covers basic science and engineering work products. It fulfills the project quality requirements of the Project Management Plan.

Agency Technical Review (ATR). ATR is performed by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. These teams will be comprised of certified USACE personnel. The ATR team lead will be from outside the home MSC. If significant life safety issues are involved in a study or project a safety assurance review should be conducted during ATR.

Independent External Peer Review. IEPR is required for this decision document. This is the most independent level of review and is applied in cases that meet criteria where the risk and magnitude of the project are such that a critical examination by a qualified team outside of USACE is warranted. Certain criteria dictate mandatory performance of IEPR and other considerations may lead to a discretionary decision to perform IEPR. For this study, a risk-informed decision has been made that IEPR is appropriate. The information in Section 1 – Factors Affecting the Scope of Review – informed the decision to conduct IEPR.

Cost Engineering Review. All decision documents shall be coordinated with the Cost Engineering Mandatory Center of Expertise (MCX). The MCX will assist in determining the expertise needed on the ATR and IEPR teams. The MCX will provide the Cost Engineering certification. The RMO is responsible for coordinating with the MCX for the reviews. These reviews typically occur as part of ATR.

Model Review and Approval/Certification. EC 1105-2-412 mandates the use of certified or approved models for all planning work to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions.

Policy and Legal Compliance Review. All decision documents will be reviewed for compliance with law and policy. ER 1105-2-100, Appendix H provides guidance on policy and legal compliance reviews. These reviews culminate in determinations that report recommendations and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander. These reviews are not further detailed in this section of the Review Plan.

Table 1 provides the schedules and costs for reviews. The specific expertise required for the teams are identified in later subsections covering each review. These subsections also identify requirements, special reporting provisions, and sources of more information.

Table 1: Levels of Review

Product(s) to undergo Review	Review Level	Start Date	End Date	Cost	Complete
Targeted Review Future Without Conditions for Charlestown (HEC-FDA)	District Quality Control	July 2023		\$5,000	No
Targeted Review Future Without Conditions for Charlestown (go-consequences)	District Quality Control	July 2023		\$5,000	No
Targeted Review Future Without Conditions for Charlestown (HEC-FDA)	Agency Technical Review	August 2023		\$7,500	No
Targeted Review Future Without Conditions for Charlestown (go-consequences)	Agency Technical Review	August 2023		\$7,500	No
Draft Feasibility Report and EIS	IEPR Scoping (Corps Cost)	October 2024		n/a	No
Draft Feasibility Report and EIS	District Quality Control	February 2025		\$45,000	No
Draft Feasibility Report and EIS	Agency Technical Review	April 2025		\$75,000	No
Draft Feasibility Report and EIS	Policy and Legal Review	April 2025		n/a	No
Draft Feasibility Report and EIS	IEPR Contractor Review	April 2025		n/a	No

Final Feasibility Report and EIS	District Quality Control	September 2026		\$45,000	No
Final Feasibility Report and EIS	Agency Technical Review	November 2026		\$50,000	No
Final Feasibility Report and EIS	Policy and Legal Review	November 2026		n/a	No

a. DISTRICT QUALITY CONTROL

The home district shall manage DQC and will appoint a DQC Lead to manage the local review (see ER 1165-2-217, Chapter 4 (4.4.2)). The DQC Lead should prepare a DQC Plan and provide it to the RMO and MSC prior to starting DQC reviews. Table 2 identifies the required expertise for the DQC team.

Table 2: Required DQC Expertise

DQC Team Disciplines	Expertise Required
DQC Lead	A senior professional with extensive experience preparing Civil Works decision documents and conducting DQC. The lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).
Planning	A senior water resources planner with experience in formulation, evaluation, and selection of alternatives for coastal storm risk management.
Economics	The Economics reviewer should have experience in evaluating coastal storm risk management projects including economic analyses required to support alternatives evaluation and plan selection. The reviewer may be required to review HEC-LifeSim, Beach-FX, HEC-FDA, go-consequences, and/or G2CRM.
Environmental and Cultural Resources	The Environmental Resources reviewer should have knowledge of North Atlantic Coast biology and experience on coastal projects. Knowledge of Federal regulations and NEPA is also required.
Coastal Engineering	The Coastal Engineering reviewer should have experience designing coastal storm risk management projects including typical structural and non-structural features and have knowledge of General Investigation requirements for coastal storm risk management engineering. Knowledge of, ADCIRC, STWAVE, SWAN, Beach-fx and G2CRM modeling may also be required.
Climate Preparedness & Resilience	The Climate Preparedness & Resilience reviewer should have knowledge of Climate Preparedness and Resiliency policy and its application in coastal storm risk management projects. The reviewer may be combined with the Coastal Engineering reviewer.
Geotechnical Engineering	The Geotechnical Engineering reviewer should have experience evaluating coastal storm risk management projects including dense urban coastal communities as well as existing hardened shorelines. The reviewer should have experience evaluating both structural and non-structural features, as well as nature and natural based

	features. The reviewer should have knowledge of the risk informed planning process for a General Investigation study.
Civil Engineering	The Civil Engineering reviewer should have experience evaluating coastal storm risk management projects including dense urban coastal communities as well as existing hardened shorelines. The reviewer should have experience evaluating constructability of structural and non-structural features. as well as nature and natural based features. The reviewer should have knowledge of the risk informed planning process for a General Investigation study.
Cost Engineering	The Cost Engineering reviewer should have experience using Micro-Computer Aided Cost Estimating System (MCASES) and experience developing cost estimates for coastal storm risk management projects.
Real Estate	The Real Estate reviewer should have experience developing Real Estate Plans supported by appropriate analyses for coastal storm risk management projects.
Office of Counsel	An OC reviewer will conduct a legal sufficiency review.

Documentation of DQC. Quality Control should be performed continuously throughout the study. A specific certification of DQC completion is required at the draft and final report stages. Documentation of DQC should follow the District Quality Manual and the MSC Quality Management Plan. Dr. Checks will be used for documentation of DQC Comments. An example DQC Certification statement is provided in ER 1165-2-217, Appendix D on page 81.

Documentation of completed DQC should be provided to the MSC, RMO and ATR Team leader prior to initiating an ATR. The ATR team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort. Missing or inadequate DQC documentation can result in delays to the start of other reviews (see ER 1165-2-217, Chapter 5 (5.7.1)).

b. AGENCY TECHNICAL REVIEW

The ATR will assess whether the analyses are technically correct and comply with guidance, and that documents explain the analyses and results in a clear manner. An RMO manages ATR. The review is conducted by an ATR Team whose members are certified to perform reviews. Lists of certified reviewers are maintained by the various technical Communities of Practice (see ER 1165-2-217, Chapter 5, (5.5.3.1)). Table 3 identifies the disciplines and required expertise for this ATR Team.

Table 3: Required ATR Team Expertise

ATR Team Disciplines	Expertise Required
ATR Lead	A senior professional with extensive experience preparing Civil Works decision documents and conducting ATR. The lead should have the skills to manage a virtual team through an ATR. The lead may serve as a reviewer for a specific discipline (such as planning).
Planning	A senior water resources planner with experience in formulation, evaluation, and selection of alternatives for coastal storm risk management.
Economics	The Economics reviewer(s) must be certified for review of coastal storm risk management projects. Depending upon availability, two economics reviewers may be required, one for reviewing the assumptions, methodologies, analysis and conclusions and the other for reviewing economics modeling. The reviewer may be required to review HEC-LifeSim, Beach-fx, HEC-FDA, go-consequences, and/or G2CRM.
Environmental Resources	<p>The Environmental Resources reviewer should have knowledge of North Atlantic Coast biology and experience on coastal projects. Knowledge of Federal regulations and NEPA is also required.</p> <p>The Environmental Resources reviewer may be combined with the Cultural Resources reviewer.</p>
Cultural Resources	<p>The Cultural Resources Reviewer should be a senior archaeologist with experience on Section 106 compliance for coastal storm risk management studies.</p> <p>The Cultural Resources reviewer may be combined with the Environmental Resources reviewer.</p>
Coastal Engineering/Risk and Uncertainty	The Coastal Engineering/Risk and Uncertainty reviewer should have experience designing coastal storm risk management projects including typical structural and non-structural features and have knowledge of General Investigation requirements for coastal storm risk management engineering. Knowledge of ADCIRC, STWAVE, SWAN, Beach-fx and G2CRM modeling may also be required.
Civil Engineering	The Civil Engineering reviewer should have experience evaluating coastal storm risk management projects including dense urban coastal communities as well as existing hardened shorelines. The reviewer should have experience evaluating constructability of structural and non-structural features.

Real Estate	The Real Estate reviewer will have experience in development of SMART Planning Real Estate Plans and will have experience in verification of considerations of utility relocations, staging, and dredged material disposal.
Climate Preparedness and Resilience CoP Reviewer	A member of the Climate Preparedness and Resiliency Community of Practice (CoP) will participate in the ATR review. The reviewer may be combined with the Coastal Engineering reviewer.
Cost Engineering	The Cost Engineering reviewer will be identified by the Cost MCX and will have experience using Micro-Computer Aided Cost Estimating System (MCACES) and experience developing cost estimates for coastal storm risk management projects.

Documentation of ATR. DrChecks will be used to document all ATR comments, responses and resolutions. Comments should be limited to those needed to ensure product adequacy. If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team for resolution using the ER 1165-2-217 issue resolution process. Concerns can be closed in DrChecks by noting the concern has been elevated for resolution. The ATR Lead will prepare a Statement of Technical Review (see ER 1165-2-217, Chapter 5 (5.11.1)), for the draft and final reports, certifying that review issues have been resolved or elevated. ATR may be certified when all concerns are resolved or referred to the vertical team and the ATR documentation is complete.

c. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)

IEPR is managed outside of the USACE and conducted on studies. Type I IEPR panels assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analysis, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in the evaluation of environmental impacts of proposed projects, and biological opinions of the project study.

Decision on IEPR. Based on a risk-informed decision process referencing ER 1165-2-217 (Chapter 6 (figure 6.1)), Type I IEPR will be required. The project meets any of the three mandatory triggers for Type I IEPR outlined in ER 1165-2-217, figure 6.1: the estimated project cost will likely exceed \$200 million and an EIS is anticipated.

Products to Undergo Type I IEPR. The full draft report will undergo IEPR.

Required Type I IEPR Panel Expertise. Panels will consist of independent, recognized experts from outside of the USACE in disciplines representing a balance of areas of expertise suitable for the review being conducted. Table 4 lists the required panel expertise.

Table 4: Required Type I IEPR Panel Expertise

IEPR Panel Member Disciplines	Expertise Required
Economics for Coastal Storm Risk Management	The Economics reviewer(s) must be familiar with review of coastal storm risk management projects. Depending upon availability, two economics reviewers may be required, one for reviewing the assumptions, methodologies, analysis and conclusions and the other for reviewing economics modeling. The reviewer may be required to review HEC-LifeSim, Beach-fx, HEC-FDA, go-consequences, and/or G2CRM.
Environmental	The Environmental Resources reviewer should have knowledge of North Atlantic Coast biology and experience on coastal projects. Knowledge of Federal regulations and NEPA is also required.
Coastal Engineering	The Coastal Engineering reviewer should have experience designing coastal storm risk management projects including typical structural and non-structural features and have knowledge of General Investigation requirements for coastal storm risk management engineering. Knowledge of ADCIRC, STWAVE, SWAN, Beach-fx and G2CRM modeling may also be required.

Documentation of IEPR. The OEO will submit a final Review Report no later than 60 days after the end of the draft report public comment period. USACE shall consider all recommendations in the Review Report and prepare a written response for all recommendations. The final decision document will summarize the Review Report and USACE response and will be posted on the internet.

d. SAFETY ASSURANCE REVIEW.

Safety Assurance Reviews are managed outside of the USACE and are conducted on design and construction products for hurricane, storm and flood risk management projects, or other projects where existing and potential hazards pose a significant threat to human life. In some cases, significant life safety considerations may be relevant to planning decisions. These cases may warrant the development of relevant charge questions for consideration during reviews such as ATR or IEPR. In addition, if the

characteristics of the recommended plan warrant a Safety Assurance Review, a panel will be convened to review the design and construction activities before construction begins, and until construction activities are completed, on a regular schedule.

Decision on Safety Assurance Review. A decision regarding whether or not to conduct Safety Assurance Review will be made at a later date.

e. MODEL CERTIFICATION OR APPROVAL

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models are any models and analytical tools used to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making. The use of a certified or approved for use planning model does not constitute technical review of a planning product. The selection and application of the model and the input and output data is the responsibility of the users and is subject to DQC, ATR, and IEPR.

NAE is planning to use the Next Gen economic model, go-consequences, for the economic analysis in the City of Boston CSRM Study. Go-consequences is a planning-level economic model currently under development by the USACE Hydrologic Engineering Center (HEC) as part of the Next Gen effort and computes a damage output for a structure given a hydraulic hazard. The model is event-based. The study is scoped to include a validation period using an approved economic model to validate go-consequence prior to wide scale use in the study plan formulation. The validation process will use a small segment of the study area with defined inputs from the coastal model to evaluate the future without project economic damages. The two economic model FWOP damages will be compared for results, however, the two models will not have the exact same results. Go-consequence provides greater detail in its economic damage assessment, especially in a densely populated, heavily built out area such as Boston. The validation exercise, will however, identify significant differences and potential changes in the go-consequence code to ensure accuracy in the larger study economic analyses effort. A separate Model Review Plan will be developed and submitted to the RMO for review prior to requesting a one-time use approval from the MSC Chief of Planning.

Table 5: Planning Models. The following models may be used to develop the decision document:

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Certification / Approval
Beach-fx (1.1.12)	Beach-fx is a life-cycle simulation model that evaluates the physical performance and economic benefits and costs of coastal storm risk management projects, particularly beach nourishment along sandy shores.	Undergoing re-certification, approved for use
HEC-FDA: Flood Damage Reduction Analysis Software (1.4.3)	This certified software provides the capability to perform an integrated hydrologic engineering and economic analysis during the formulation and evaluation of flood risk management plans. HEC-FDA is designed to assist USACE study members in using risk analysis procedures for formulating and evaluating flood risk management measures.	Certified
go-consequences (1.0)	Go-consequences is a planning-level economic model currently under development by the USACE Hydrologic Engineering Center (HEC) as part of the Next Gen effort and computes a damage output for a structure given a hydraulic hazard. The model is event-based. Based on discussions between the study team, WHG, and the go-consequences developer, it was determined that the WHG water surface elevation (WSE) data or water levels could be used as an input to go-consequences, allowing the study team to estimate economic damages.	Seeking approval for use
HEC LifeSim (2.0)	The Risk Management Center's (RMC) Life Loss Estimation (LifeSim) software is spatially-distributed dynamic simulation modeling system for estimating potential life loss and direct economic damages from floods. The software is used extensively in the USACE Dam and Levee Safety Programs to inform program priorities and investment decisions; however, for use in traditional USACE planning studies it is certified for estimating potential life loss only.	Approved for use
G2CRM (0.4.564.3)	G2CRM is a desktop computer model developed by USACE, oriented specifically toward analysis of non-sacrificial coastal protection systems in a risk-based life cycle context. It is a planning model, not a detailed engineering model, and is proposed for use in the planning modernization (SMART planning) approach for coastal regions to assist in rapid development of the tentatively selected plan (TSP).	Undergoing certification, approved for use.

RECONS (2.0)	RECONS is a regional economic impact modeling tool developed by the USACE Institute for Water Resources (IWR) to provide estimates of regional economic impacts associated with Federal expenditures. This modeling tool automates calculations and generates estimates of jobs and other economic measures such as income and sales associated with USACE spending on Civil Works programs and projects.	Certified
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EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue. The professional practice of documenting the application of the software and modeling results will be followed. The USACE Scientific and Engineering Technology Initiative has identified many engineering models as preferred or acceptable for use in studies. These models should be used when appropriate. 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, and IEPR.

NAE is planning to use a proprietary coastal model, Massachusetts Coastal- Flood Risk Management (MC-FRM) model for the City of Boston CSRSM Study. This model uses ADCIRC and SWAN model to evaluate coastal inundation while incorporating climate change, overland flow, as well as overtopping analysis into the model. The model is recommended for the study due its refined mesh in a densely populated, built out constrained area. The refined mesh and overland flow will better inform plan formulation and risk informed design for structural alternatives in the project area. The study is scoped to include a validation review by the US Army Eng. Research & Development Center Coastal & Hydraulics of the MC-FRM model and its methodology prior to wide scale use in the study plan formulation. Any changes necessary for USACE policy compliance will be included in the A-E scope of work for the modeling Task Order.

Table 6: Engineering Models. These models may be used to develop the decision document:

Model Name and Version	Brief Model Description and How It Will Be Used in the Study	Approval Status
Microcomputer Aided Cost Engineering System (MCACES) 2 nd Generation (MII)	The MCACES MII construction cost estimating software, developed by Building Systems Design, Inc., is a tool used by cost engineers to develop and prepare all USACE Civil Works cost estimates. Using the features in this system, cost estimates are prepared uniformly allowing cost engineering throughout USACE to function as one virtual cost engineering team.	Cost Engineering MCX Required Model / Enterprise Model
ADCIRC	High fidelity storm surge model.	Approved and HH&C CoP preferred
STWAVE	Nearshore wave model.	Approved and HH&C CoP preferred
SWAN	Nearshore wave model.	Approved
Woods Hole Group Coastal Model	Detailed proprietary coastal model that utilizes ADCIRC and SWAN model to evaluate coastal inundation while incorporating climate change, overland flow, as well as overtopping analysis into the model. The model is a product of a Government Contract with the Architectural and Engineering Firm, Woods Hole Group, Boston MA.	Requires Approval by MSC; concurrence by PCX-CSRM, CPR CoP, HH&C CoP

e. POLICY AND LEGAL COMPLIANCE REVIEW

Policy and legal compliance reviews for draft and final planning decision documents are delegated to the MSC (see Director’s Policy Memorandum 2018-05, paragraph 9). This study is requesting a policy exception for schedule and budget as part of the vertical team alignment memorandum (VTAM) process. The MSC will be the decision maker at the Alternatives Milestone Meeting (AMM) and a request for future delegation will be made during the VTAM process.

(i) Policy Review.

The policy review team is identified through the collaboration of the MSC Chief of Planning and Policy and the HQUSACE Chief of the Office of Water Project Review. The team is identified in Attachment 1 of this Review Plan. The makeup of the Policy

Review team will be drawn from Headquarters (HQUSACE), the MSC, the Planning Centers of Expertise, and other review resources as needed.

- The Policy Review Team will be invited to participate in key meetings during the development of decision documents as well as SMART Planning Milestone meetings. These engagements may include In-Progress Reviews, Issue Resolution Conferences or other vertical team meetings plus the milestone events.

- The input from the Policy Review team should be documented in a Memorandum for the Record (MFR) produced for each engagement with the team. The MFR should be distributed to all meeting participants.

- In addition, teams may choose to capture some of the policy review input in a risk register if appropriate. These items should be highlighted at future meetings until the issues are resolved. Any key decisions on how to address risk or other considerations should be documented in an MFR.

(ii) Legal Review.

Representatives from the Office of Counsel will be assigned to participate in reviews. Members may participate from the District, MSC and HQUSACE. The MSC Chief of Planning and Policy will coordinate membership and participation with the office chiefs.

- In some cases legal review input may be captured in the MFR for the particular meeting or milestone. In other cases, a separate legal memorandum may be used to document the input from the Office of Counsel.

- Each participating Office of Counsel will determine how to document legal review input.

ATTACHMENT 1: TEAM ROSTERS

PROJECT DELIVERY TEAM		
ROLE	NAME	ORG
Project Manager	Jeff Herzog	E6K0110
Planner	Jeff Herzog	E6K0110
Coastal Engineer	Lisa Winter	E6L0510
City of Boston	Hannah Wagner	
Environmental Coordinator	Todd Randall	E6K0220
Cultural Resources	Marc Paiva	E6K0220
Economist	Courtney Jackson	E6K0120
Cost Engineer	Dan Palmer	E6L0110
Real Estate Specialist	Maureen Davi	E6N0200
Civil Engineer	Kate Mueller	E6L0310
GIS/Graphic Design	Paul Morelli	E6K0120
Geotechnical Engineer	Siamac Vaghar	E6L0540
Geology Section	Steve Potts	E6L0430
Structural Section	Josh Dowd	E6L0340
Risk Informed Advisor	Mike Boiardi	E6L0500

DISTRICT QUALITY CONTROL TEAM		
ROLE	NAME	ORG
DQC Team Lead	Byron Rupp	E6K0110
Plan Formulation	Janet Cote	E6K0110
Environmental Compliance	Lawrence Oliver	E6K0200
Cultural Resources	Grace Moses	E6K0220
Economics		
Coastal Engineering	Kristina Ekholm	E6L0510
Climate Preparedness & Resilience	Patrick Blumeris	E6L0510
Civil Engineering	Lee Thibodeau	E6L0310
Geotechnical Engineer	Erik Matthews	E6L0540
Cost Engineering	Jeff Gaeda	E6L0110
Real Estate	Tim Shugert	E6N0000
Office of Counsel	John Mcswiggin	E6E0000

AGENCY TECHNICAL REVIEW TEAM		
Name	Office	Position
Andrew MacInnes	CE-MVN	ATR Lead

VERTICAL TEAM		
Name	Office	Position
Joseph Vietri	CENAD-PD-P	Chief, Planning and Policy Division and Director, PCX-CSRМ
Nate Richards	CECW-NAD	NAD/LRD RIT Planner
Hank Gruber	CENAD-PDP	Deputy Director Planning and Policy Division, NAD
Larry Cocchieri	CENAD-PD-X	Deputy Director for National Operations, PCX-CSRМ
Donald Cresitello	CENAD-PD-P	Technical Director
Roselle Stern	CENAD-PD-P	Deputy Director for Strategic Initiatives, PCX-CSRМ
Chris Ricciardi	CENAD-PD-C	District Support Team Lead, NAD

POLICY AND LEGAL COMPLIANCE REIEW TEAM		
Name	Office	Position
Scott Nicholson	CECW-PC	OWPR Review Manager and Plan Formulation
Heidi Moritz	CENWP-ENC-HP	Climate Preparedness and Resilience Community of Practice
Megan Jadrosich	CENAD-PD-P	Environmental Reviewer
Naomi Frankel	CENAD-PD-PP	Economics
Javier Jimenez-Vargas	CENAD-RB-E	Engineering and Construction
Patricia Bolton	CENAD-RB-E	Cost Engineering
Carlos Gonzalez	CENAD-PD-RE	Real Estate
Nancye Bethurem	CENAD-CECC	OC
Jodi McDonald	CENAD-PD-OR	Operations Reviewer