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

DEC 02 2019

CENAD-PD-P

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, Baltimore District, 2 Hopkins Plaza Baltimore, MD 21201

SUBJECT: Request for Approval of the Baltimore Metropolitan, MD Coastal Storm Risk Management Feasibility Study Review Plan

1. Reference Memorandum, CENAB-PL-P, dated 30 Oct 2019, 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 Management 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.

Encl

KAREN J. BAKER
Programs Director

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, BALTIMORE DISTRICT
2 HOPKINS PLAZA
BALTIMORE, MD 21201

CENAB-PL-P

30 October 2019

MEMORANDUM FOR COMMANDER U.S. Army Engineer Division, North Atlantic (CENAD-PD-C/Cynthia Fowler), 302 General Lee Avenue, Fort Hamilton Military Community, Brooklyn, NY 11252

SUBJECT: Submission of the Baltimore Metropolitan Coastal Storm Risk Management Feasibility Study (P2 No. 404561) Project Review Plan

1. References:

a. EC 1165-2-217, Review Policy for Civil Works, 20 FEB 2018.

b. Memorandum, CEPCX-CSRM, 4 Oct 2019, subject: Baltimore Metropolitan Coastal Storm Risk Management Feasibility Study.

2. Attached, please find the final project review plan for the subject study as required by reference 1a. The National Planning Center of Expertise for Coastal Storm Risk Management reviewed and endorsed the subject review plan.

3. CENAB requests review and approval of the project review plan, and posting on CENAD's project review plan website.

4. If you have any questions regarding the project review plan, please contact Mr. Daniel Bierly, Chief, Civil Project Development Branch, at Daniel.M.Bierly@usace.army.mil or (410) 962-6139.

Encls

JOHN T. LITZ
COL, EN
Commanding

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

CEPCX-CSRM

4 Oct 2019

MEMORANDUM FOR: Commander, Baltimore District, (CENAB-PLP/ Andrew May)
2 Hopkins Plaza Baltimore, MD 21201

SUBJECT: Baltimore Metropolitan Coastal Storm Risk Management Feasibility Study

1. The National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSRM) has reviewed the Review Plan (RP) for the subject study and concurs that the RP complies with current peer review policy requirements contained in EC 1165-2-217, entitled "Review Policy For Civil Works".

2. The review was performed by Mr. Donald Cresitello, PCX-CSRM.

3. PCX-CSRM has no objection to RP approval by the Director, Programs Directorate, North Atlantic Division.

4. Thank you for the opportunity to assist in the preparation of the RP. PCX-CSRM is prepared to lead the Agency Technical Review for the subject study and will continue to coordinate with the PDT. For further information, please contact me at 347-370-4571.

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

# REVIEW PLAN

October 2019

**Project Name:** BALTIMORE COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY

**P2 Number:** 404561

**Decision Document Type:** Feasibility Report

**Project Type:** Coastal Storm Risk Management

**District:** Baltimore

**District Contact:** Andy May, (410) 962-9499

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

**MSC Contact:** Larry Cocchieri, Deputy Director (347) 370-4550

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

**RMO Contact:** PCX-CSRM Deputy Director, (347) 370-4550

## Key Review Plan Dates

**Date of RMO Endorsement of Review Plan:** 04 Oct 2019
**Date of MSC Approval of Review Plan:**
**Date of IEPR Exclusion Approval:** N/A
**Has the Review Plan changed since PCX Endorsement?** N/A
**Date of Last Review Plan Revision:** NONE
**Date of Review Plan Web Posting:** N/A
**Date of Congressional Notifications:** N/A

## Milestone Schedule

| | Scheduled | Actual | Complete |
|---|---|---|---|
| **FCSA Signed:** | 05 Aug 2019 | 05 Aug 2019 | Yes |
| **Alternatives Milestone:** | 18 Nov 2019 | - | No |
| **Tentatively Selected Plan:** | 18 Aug 2020 | - | No |
| **Release Draft Report to Public:** | 05 Oct 2020 | - | No |
| **Agency Decision Milestone:** | 16 Feb 2021 | - | No |
| **Final Report Transmittal:** | 11 Feb 2022 | - | No |
| **HQUSACE PL Chief Briefing:** | 04 Mar 2022 | - | No |
| **Chief's Report Signed:** | 05 Aug 2022 | - | No |

**Project Fact Sheet**
Oct. 2019

**Project Name**: Baltimore Metropolitan Coastal Storm Risk Management Feasibility Study

**Location**: Baltimore Harbor watershed, Maryland

**Authority**: Baltimore Metropolitan Water Resources – Patapsco Urban River Restoration Initiative authority. Committee on Public Works and Transportation of the United States House of Representatives adopted a House resolution on April 30, 1992:

> *Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That the Board of Engineers for Rivers and Harbors, is requested to review the report of the Chief of Engineers on the Baltimore Metropolitan Area, Maryland, published as House Document 589, Eighty-seventh Congress, Second Session, and the reports of the Chief of Engineers on Baltimore Harbor and Channels, Maryland, and Virginia, published as House Document 181, Ninety-fourth Congress, First Session, and House Document 86, Eighty-fifth Congress, First Session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of flood control, hurricane protection, navigation, erosion, sedimentation, fish and wildlife, water quality, environmental restoration, recreation, and other related purposes.*

**Sponsor**: Maryland Department of Transportation (MDOT)

**Type of Study**: Feasibility

**SMART Planning Status**: This study is 3x3x3 compliant.

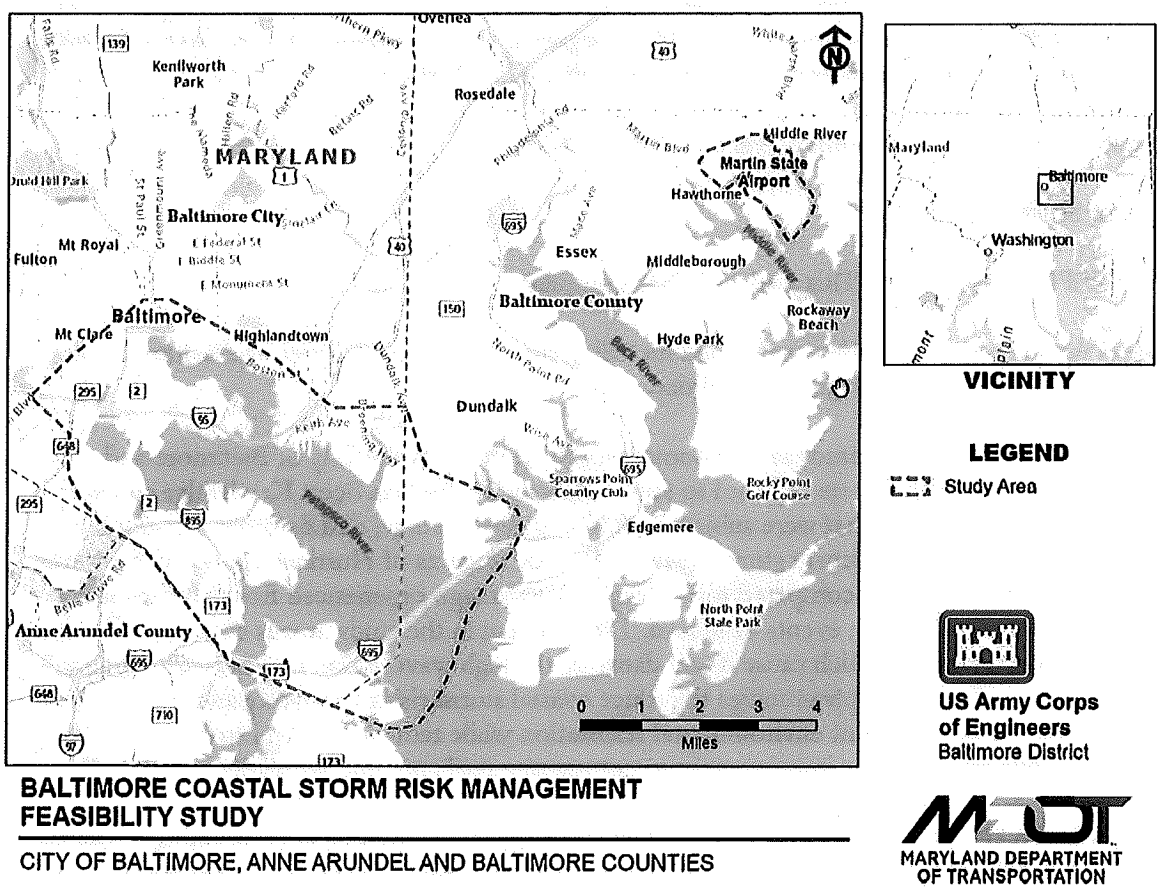
**Project Area**: Baltimore Harbor watershed including the tidal Patapsco River, the Baltimore City Inner Harbor, and Port of Baltimore facilities.

**Problem Statement**: The study area encompasses the portion of the City of Baltimore and surrounding metropolitan areas bayward to approximately the Francis Scott Key Bridge and along the tidally influenced areas that were subject to flooding, storm surge, and damages as a result of Hurricane Sandy and other recent storms (Figure 1). The impacts of Hurricane Sandy in the study area were relatively minimal compared to the large-scale damage experienced from Hurricane Isabel in 2003 and other past storm events of record. The problem in the study area is economic damages caused by coastal storms, which cause direct damages through wave action and cause flooding in low lying areas. There are opportunities to reduce coastal storm risk to property and there may be opportunities for concomitant environmental restoration while reducing coastal storm risk. There may also be opportunities for improvement to community resilience and recreation.

**Federal Interest**: Opportunities exist in the study area for federal participation in multiple purpose projects that reduce economic impacts from coastal storm damage. Coastal storm risk management is needed to reduce property and life safety risk in the study area from flooding, waves, and erosion caused by coastal storms. Possible measures to reduce coastal storm risk include storm surge barriers, stormwater system improvements, berms/levees, acquisition/buyouts and relocation of properties and/or critical infrastructure, elevating structures, building codes and zoning modifications, coastal zone management, wetlands, maritime forests, and vegetated dunes and

beaches. The total cost of the project is to be determined and depends on the alternative and measures selected.

**Risk Identification:** The study area is highly urbanized, and based on existing geography, topography, and proximity to tidally influenced areas, it is highly vulnerable to flooding and other coastal hazards such as erosion, severe winds, and severe weather events. The study area terrain makes it susceptible to coastal and flash flooding. Climate change and sea level rise contribute to increasing future vulnerability. Coastal storm damage in developed areas can pose a threat to human life or safety and infrastruce. Factors such as steady population growth, continuing near-shore development, and sea-level rise effectively increase the vulnerability of the Baltimore Metropolitan area to coastal storm surge. In addition, inundation of these coastal areas may lead to negative environmental impacts. When wastewater treatment facilities are inundated, partially treated or untreated sewage is often released, which can impact water quality. Similarly, inundation of sites identified through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise referred to as Superfund sites, or other hazardous waste sites will also severely impact water quality.




**BALTIMORE COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY**

CITY OF BALTIMORE, ANNE ARUNDEL AND BALTIMORE COUNTIES

Figure 1: Study Area

## 1. FACTORS AFFECTING THE LEVELS OF REVIEW

**Scope of Review.** The Baltimore Metropolitan Coastal Storm Risk Management Feasibility Study will include coastal storm surge modeling and economics analyses to evaluate and compare flood risk management alternatives. Associated with these analyses would be climate and sea level change assumptions and projections to forecast a range of possible future conditions, engineering design and cost estimates, and impacts to environmental and cultural resources.

- Will the study likely be challenging?
  There is a moderate level of uncertainty associated with the study related to forecasted future projections of flood risk within the study area. A range of possible future conditions would result in a range of solutions appropriate to address the flooding problem.

- Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks.
  The study would consider structural and nonstructural alternatives. Non-performance or design exceedance of these measures could result in an increased risk to life safety. Residual flood risk communication will be required for those areas that currently include flood risk management projects. It is expected that information gaps will be encountered that cannot be addressed within the 3x3x3 study framework. These gaps will need to be documented in the Risk Register and appropriate contingencies applied when evaluating project alternatives.

- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues? Implementation of a flood risk management project could potentially reduce flood-related risk to human life/safety. Conversely, life safety is a concern associated with failure of the design for flood risk management infrastructure. Design considerations would consider depth and velocities and how impacts from failure of a recommended plan could affect the study area and those people residing therein.

- Has the Governor of an affected state requested a peer review by independent experts?
  A peer review by independent experts has not been requested by the governor of the State of Maryland.

- Will it likely involve significant public dispute as to the project's size, nature, or effects?
  The study is likely not to involve significant public dispute as to the size, nature, or effects of the project as flood risk management is an important consideration in the flood prone region.

- Is the project/study likely to involve significant public dispute as to the economic or environmental cost or benefit of the project?
  The study is not likely to involve significant public dispute as to the economic or environmental costs or benefits of the study. Communication of the USACE planning policy evaluation of net economic benefits leading to the National Economic Development plan or a locally preferred plan may require specific public involvement activities.

- 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?
The information contained in the study or any anticipated project design is not likely to be based on novel methods, involve the use of 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.

- Does the project design require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule?
At this stage of the investigation, it is unknown to what degree a proposed project design would require redundancy, resiliency, and/or robustness, unique construction, sequencing, or a reduced or overlapping design construction schedule. However, consideration of redundancy, resilience, and robustness of management measures and alternative plans would be considered as part of the feasibility study.

- Is the estimated total cost of the project greater than $200 million?
The total cost of the project is to be determined and depends on the alternative and measures selected.

- Will an Environmental Impact Statement be prepared as part of the study? It is likely that an Environmental Impact Statement will be prepared. Determination of appropriate NEPA decision document will occur following Alternative Milestone and prior to Tentatively Selected Plan.

- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources? The project is not expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources. The project will be formulated to avoid adverse impacts.

- 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 substantial adverse impacts on fish and wildlife species and their habitat is expected prior to the implementation of mitigation measures.

- 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? The project is not expected to have more than a negligible adverse impact on an endangered or threatened species or their designated critical habitat, before mitigation measures.

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

**Agency Technical Review.** 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.** Type I IEPR may be required for decision documents under certain circumstances. 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. A risk-informed decision is made as to whether Type I IEPR is appropriate.

**Cost Engineering Review.** All decision documents shall be coordinated with the Cost Engineering Mandatory 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 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 |
|---|---|---|---|---|---|
| Draft Feasibility Report and EIS | District Quality Control | 08/17/20 | 09/21/20 | $27,500 | No |
| Draft Feasibility Report and EIS | Agency Technical Review | 10/05/20 | 11/05/20 | $35,000 | No |
| Draft Feasibility Report and EIS | Type I IEPR | 10/05/20 | 11/19/20 | $200,000 | No |
| Draft Feasibility Report and EIS | Policy and Legal Review | 10/05/20 | 11/05/20 | n/a | No |
| Final Feasibility Report and EIS | District Quality Control | 09/02/21 | 10/08/21 | $27,500 | No |
| Final Feasibility Report and EIS | Agency Technical Review | 10/08/21 | 11/08/21 | $35,000 | No |
| Final Feasibility Report and EIS | Policy and Legal Review | 02/28/21 | 04/11/22 | n/a | No |

*NOTE: This table may also be used to identify future review work in follow-on phases of a project. This may include products prepared during the pre-construction engineering and design phase or products prepared as part of planning for the Operations and Maintenance phase of a project.*

## a. DISTRICT QUALITY CONTROL

The home district shall manage DQC and will appoint a DQC Lead to manage the local review (see EC 1165-2-217, section 8.a.1). 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). |
| Plan Formulation | A senior water resources planner with experience n the plan formulation process and experience in general planning policy and guidance. |
| Economics | The reviewer should be familiar with the processes used in evaluation of CSRM projects and have recent experience in preparing economic analysis plans for CSRM feasibility studies, including structure inventory, economic damage computation, and benefit-cost analyses. The team member should have knowledge of the applicable models and software used, such as G2CRM and GIS, that will be used in the economic analyses presented in the draft feasibility report documentation. |
| Environmental Resources | A senior environmental resources specialist with experience with environmental evaluation and compliance requirements pursuant to the "Procedures for Implementing NEPA" (ER 200-2-2), national environmental laws and statutes, and other federal planning requirements for Civil Works projects. Specialist should have familiarity with contaminants and environmental justice issues. |
| Cultural Resources | A senior cultural resource specialist with experience with cultural resource survey methodology, area of potential effects, Section 106 of the National Historic Preservation Act, and state and Federal laws/executive orders pertaining to American Indian Tribes. |
| Hydrology and Hydraulic Engineering | The reviewer should be a senior hydrologic and hydraulic engineering specialist with extensive experience associated with coastal H&H modeling and have thorough understanding of coastal processes, and structural and non-structural solutions. The reviewer should have experience with coastal hydrodynamic models including STWAVE and ADCIRC. |
| Engineering-Geotechnical | A geotechnical engineer with experience with geotechnical investigations and design necessary for FRM and coastal storm risk management projects. Should have experience with remediation of contaminants in soils and sediments, as well as managing in-ground infrastructure conflicts. |

| | |
|---|---|
| Cost Engineering | A senior cost engineer with experience in SMART Planning and cost estimating for structural and nonstructural riverine flood risk management measures. The reviewer should also be familiar with designs and quantities associated with existing flood risk management measure modifications. |
| Real Estate | The real estate reviewer should be a senior real estate specialist with experience in the preparation and evaluation of gross real estate appraisals, temporary easements, and rights-of-way associated with flood risk management projects. |

**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. An example DQC Certification statement is provided in EC 1165-2-217, on page 19 (see Figure F).

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 EC 1165-2-217, section 9).

## 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 EC 1165-2-217, section 9(h)(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). |
| Plan Formulation | A senior water resources planner with experience in flood risk management plan formulation for both coastal and riverine flood risk management feasibility studies. The Planner should have experience associated with existing flood risk management infrastructure re-evaluation related to incremental damages prevented. In addition, the planner should have general experience with water resource planning utilizing GIS and geospatial analyses and ESRI ARCInfo software products used for initial problems, needs, and opportunities screening analysis. |
| Economics | The reviewer should be familiar with the processes used in evaluation of CSRM projects and have recent experience in preparing economic analysis plans for CSRM feasibility studies, including structure inventory, economic damage computation, and benefit-cost analyses. G2CRM will be used for economics analyses for the final feasibility report documentation. GIS analyses will be used to estimate economic damages to be presented in the draft feasibility report documentation. |
| Environmental Resources | The environmental resources reviewer should be a senior water resources planner or biologist with extensive experience associated with environmental impact assessment, and NEPA environmental impact statements and environmental assessment preparation. Specialist should have familiarity with urban environmental issues, including air quality, water quality, soil/sediment contaminants, infrastructure, and environmental justice. |
| Cultural Resources | The Cultural Resources reviewer should be a senior archaeologist with extensive experience associated with cultural resources impact assessment and compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. |
| Hydrology and Hydraulic Engineering | The reviewer should be a senior hydrologic and hydraulic engineering specialist with extensive experience associated with coastal H&H modeling. The reviewer should have experience with coastal hydrodynamic models including STWAVE and ADCIRC. |

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| Civil Engineering | The civil engineering reviewer should be a senior civil engineer with a professional engineer license and have extensive experience associated with the design of structural and nonstructural riverine flood risk management measures. The reviewer should also be familiar with designs associated with existing flood risk management measure modifications. Additionally, the reviewer should have some experience associated with the design of coastal storm risk management measures and alternatives, and consideration of urban infrastructure conflicts. |
| Cost Engineering | The cost engineering reviewer should be a senior cost engineer with extensive experience associated with cost estimating for structural and nonstructural riverine flood risk management measures. The reviewer should also be familiar with designs and quantities associated with existing flood risk management measure modifications. |
| Goetechnical Engineering | The geotechnical engineering reviewer should be a senior geotechnical engineer with a professional engineer license and have extensive experience associated with geotechnical requirements of structural and nonstructural riverine flood risk management measures. The reviewer should also be familiar with foundations and geotechnical investigations associated with structural flood risk management measure modifications, such as levees and floodwall modifications. Should have experience with remediation of soil/sediment contaminants. |
| Structural Engineering | The structural engineering reviewer should be a senior structural engineer with a professional engineer license and have extensive expertise in the field of structural engineering, especially in design and review of floodwalls and closure gates, and management of conflicts with existing urban infrastructure. |
| Climate Preparedness and Resilience CoP Reviewer | The reviewer should a member of the Climate Preparedness and Resiliency Community of Practice, and be familiar with sea level rise analysis, impacts to coastal communities as a result of sea level rise, and climate resiliency. |
| Risk Reviewer | The risk analysis reviewer will be experienced with performing and presenting risk analyses in accordance with ER 1105-2-101 and other related guidance, including familiarity with how information from the various disciplines involved in the analysis interact and affect the results. This review discipline can be combined with either the Economics or H&H review disciplines. |
| Real Estate | The real estate reviewer should be a senior real estate specialist with experience in the preparation and evaluation of gross real estate appraisals, temporary easements, and rights-of-way associated with flood risk management projects in urban settings. |

**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 EC 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 EC 1165-2-217, Section 9), 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

### (i) Type I IEPR.

Type I 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 Type I IEPR.** It is anticipated that the study would not meet all of the Type I IEPR exclusion criteria. Because of the scope, H&H, economics analyses completed on the study and a proposed EIS NEPA document, as prescribed in EC 1165-2-217, Section 11.d, Type I IEPR is recommended.

The study will be subject to Type I IEPR on the basis of the factors described above. The general purpose of the IEPR is to consider the adequacy, appropriateness, and acceptability of the design in assuring public health, safety, and welfare.

**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 |
|---|---|
| Plan Formulation | The Panel Member should be from academia, a public agency, a non-governmental entity, or an Architect-Engineer or Consulting Firm with a minimum of 10 years demonstrated experience in public works planning with a Master's Degree in a relevant field. Direct experience working for or with USACE is highly preferred but not required. The panel member shall have a minimum of five years' experience directly dealing with the USACE six-step planning process, which is governed by ER 1105-2-100, Planning Guidance Notebook. Panel Member must be very familiar with USACE plan formulation process, procedures, and standards as it relates to hurricane and coastal storm risk management projects, as well as riverine flood risk management projects. |

| | |
|---|---|
| Economics | The Economics Panel Member should be from academia, a public agency, a non-governmental entity, or an Architect- Engineer or Consulting Firm. Member must have at least 10 years' experience directly related to water resource economic evaluation or review, with a minimum MS degree or higher in economics. Direct experience working for or with USACE is highly preferred but not required. Panel Member should be familiar with the USACE planning process, guidance, and economic evaluation techniques. Active participation in related professional societies is encouraged. Candidate should be familiar with the USACE flood risk management analysis and economic benefit calculations, including use of standard USACE computer programs including HEC-FDA. |
| Environmental | The panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect- Engineer or Consulting Firm with a minimum 10 years demonstrated experience in evaluation and conducting NEPA impact assessments, including cumulative effects analyses. Panel member should have familiarity with urban environmental issues, including contaminants, infrastructure, and environmental justice. The panel member should also be familiar with all NEPA Environmental Assessment requirements as well as have experience with the Clean Air Act, Endangered Species Act, and essential fish habitat. The panel member should have particular knowledge of construction impacts on marine and terrestrial ecology of coastal regions of the mid-Atlantic coast of North America. The panel member should have a minimum of a Master's Degree or higher in an appropriate field of study. Active participation in related professional societies is encouraged. |
| Hydrologic and Hydraulic Engineering | The Hydrologic and Hydraulic Engineering Panel Member should be a registered professional engineer with a minimum of 15 years' experience in hydrologic and hydraulic engineering with an emphasis on large public works projects, with a minimum MS degree or higher in engineering. Active participation in related professional societies is encouraged. The panel member should have extensive experience associated with flood risk management projects with an emphasis on large tidal river control structures, including tidal flood gates, levees and floodwalls. The panel member should have experience modeling large tidal river systems and possesses a thorough understanding of the dynamics of open channel flow systems, floodplain hydraulics, and interior flood control systems. In addition, the panel member should have an understanding of coastal/tidal hydrodynamic influences on riverine hydraulics. The panel member should have a working knowledge of water supply and wastewater infrastructure. The panel member should be familiar with USACE application of risk and uncertainty analyses in flood risk management studies. The |

| | |
|---|---|
| | panel member should also be familiar with standard USACE hydrologic and hydraulic computer models including HEC-1, HEC-HMS, HEC-2, HEC-RAS, ADCIRC, and STWAVE. |

**Documentation of Type I IEPR.** The outside eligible organization (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.

### (ii) Type II IEPR.

The second kind of IEPR is Type II IEPR. These Safety Assurance Reviews are managed outside of the USACE and are conducted on design and construction for hurricane, storm and flood risk management projects or other projects where existing and potential hazards pose a significant threat to human life. A Type II IEPR Panel will be convened to review the design and construction activities before construction begins, and until construction activities are completed, and periodically thereafter on a regular schedule.

### Decision on Type II IEPR.

Type II IEPR, or Safety Assurance Review (SAR), is anticipated to be required on project design and implementation documents. As such, SAR considerations, including an assessment of the analyses and documentation related robustness, redundancy, and resilience of the recommended plan's features, will be completed to the furthest extent practicable on the initial designs presented in the feasibility study documentation provided to the IEPR panel.

## d. 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/approved 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.

**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 |
|---|---|---|
| G2CRM | The Generation II Coastal Risk Model (G2CRM) is a desktop computer model oriented specifically toward analysis of nonsacrificial coastal protection systems I a risk-based life cycle context. It is a desktop computer model that implements an object-oriented probabilistic life cycle analysis model using event-driven Monte Carlo simulation. | Certified for one time use |

| | | |
|---|---|---|
| | The program will be used to evaluate and compare the existing, future without-, and future with-project alternative plans. | |

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.

**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 |
|---|---|---|
| ADCIRC (Advanced CIRculation Model) | This finite element, numerical model is used to simulate depth averaged hydrodynamics of coastal water bodies. ADCIRC can be forced with astronomical tidal constituents, atmospheric wind and pressure fields, wave induced radiation stresses, and river discharge. It will be used to compute the flow fields associated with tides and storm conditions for with and without project conditions. The ADCIRC modeling effort represents the primary forcing for all subsequent modeling applications and builds off of the NACCS. | HH&C CoP Preferred Model |
| STWave (STeady State Spectral Wave) | This steady state wave model will be used to simulate regional wave conditions. Forced with wind fields and/or an offshore wave spectrum, the model will compute wave transmission to the project site accounting for processes like directional spreading, refraction and breaking. STWave output at selected locations areused to force higher resolution wave models such as CMS-Wave or MIKE21. | HH&C CoP Preferred Model |
| MII | MII is the second generation of the Micro-Computer Aided Cost Estimating System (MCASES). It provides an integrated cost estimating system (software and databases) that meets USACE requirements for preparing cost estimates. | Cost Engineering Approved |
| Crystal Ball | Per ECB No. 2007-17, cost risk analysis methods will be used for the development of contingency for the total project cost estimate. Crystal Ball software is approved for use to conduct the total project cost and schedule risk analysis. | Cost Engineering Approved |

## e. POLICY AND LEGAL 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).

**(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 | | | |
|---|---|---|---|
| Name | Office | Position | Phone Number |
| Trevor Cyran | CENAB-PP-C | Project Manager | 410-962-4999 |
| Andrew May | CENAB-PL-P | Study Manager | 410-962-9499 |
| Andrew Roach | CENAB-PL-P | Plan Formulation | 410-962-8156 |
| Komla Jackatey | CENAB-PL-P | Lead Economist | 410-962-2910 |
| TBD | | Support Economist | |
| Vanessa Campbell | CENAB-PL-P | Biologist | 410-962-6704 |
| Ethan Bean | CENAB-PL-P | Archeologist | 410-962-2173 |
| Luis Santiago | CENAB-PL-P | Geographer | 410-962-6691 |
| Mike Martyn | CENAB-ENC-E | Civil Engineer | 410-962-7967 |
| Syed Qayum | CEANB-ENC-W | H&H Engineer | 410-962-2950 |
| TBD *Chuck Frey* | CENAB-ENG-G | Geotech Engineer | |
| TBD *Rick Kridler* | CENAB-END-S | Structural Engineer | |
| Luan Ngo | CENAB-END-T | Cost Engineer | 410-962-3322 |
| TBD *Dennis Powers* | CENAB-ENE-T | Environmental Engineer | |
| Sal Mousa | CENAB-ENE-T | Chemist | 410-962-6121 |
| Kiera Hearn | CENAB-ENE-T | Chemist | 410-962-2842 |
| Eric Lamb | CENAB-REC | Civil Realty Specialist | |
| Sarah Lazo | CENAB-CC | Public Affairs Specialist | 410-962-9015 |
| Eddie Lukemire | MDOT | Environmental Program Manager | |
| Sandy Hertz | MDOT | Assistant Director, Office of the Environment | |
| Jim Joyner | MDOT | Assistant Director of Public Affairs | |

| DISTRICT QUALITY CONTROL TEAM | | | |
|---|---|---|---|
| Name | Office | Position | Phone Number |
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| AGENCY TECHNICAL REVIEW TEAM | | | |
|---|---|---|---|
| Name | Office | Position | Phone Number |

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| VERTICAL TEAM | | | |
|---|---|---|---|
| Name | Office | Position | Phone Number |
| Kim Gavigan | CECW-NAD | Regional Integration Team Planner | 602-230-6902 |
| Roselle Henn Stern | CENAD-PD-PP | North Atlantic Coast Focus Area Study Program Manager | 347-370-4562 |
| Joseph Vietri | CENAD-PD-P | MSC Chief, Planning & Policy | 347-370-4570 |
| Hank Gruber | CENAD-PD-P | MSC Deputy Chief, Planning & Policy | 347-370-4566 |
| Joseph Forcina | CENAD-PD-C | MSC Chief, Civil Works Integration Division | 347-370-4584 |
| Cynthia Fowler | CENAD-PD-C | MSC District Supoort Team Program Manager | 347-370-4561 |
| Larry Cocchieri | CENAD-PD-X | Deputy Director for National Operations, USACE National Planning Center for CSRM | 347-370-4571 |

| POLICY REVIEW TEAM | | | |
|---|---|---|---|
| Name | Office | Position | Phone Number |
| Megan Jadrosich | CENAD-PD-PP | Review Manager | 347-370-4653 |
| Donald Cresitello | CENAD-PD-P | Plan Formulation | 347-370-4591 |
| Julie Alcon | CECW-PC | Environmental | 202-761-0523 |
| Naomi Fraenkel | CENAD-PD-PP | Economics | 917-359-2819 |
| Pat Falcigno | CECC-NAD | Counsel | 347-370-4524 |
| Karen Kennedy | CENAD-PD-RE | Real Estate | 347-370-4516 |
| Ida Lafayette | CENAD-PD-RE | Real Estate | 347-370-4649 |
| John Winkelman | CEERD-HT | Engineering & Construction | 978-318-8615 |
| George Nieves | CENAD-PSD-O | Operations | 347-370-4556 |
| Heidi Moritz | CENWP-ENC-HD | Climate Preparedness and Reslience | 503-808-4893 |

| | | | |
|---|---|---|---|
| Patricia Bolton | CENAD-RB-T | Cost Engineering Reviewer | 347-370-4682 |