



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 Metropolitan Washington, District of Columbia (DC, MD, and VA) 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

10/10/10



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 Metropolitan Washington, District of Columbia (DC, MD, and VA), Coastal Storm Risk Management Feasibility Study (P2 No. 404563) Project Review Plan

1. References:

- a. EC 1165-2-217, Review Policy for Civil Works, 20 FEB 2018.
- b. Memorandum, CEPCX-CSR, 4 Oct 2019, subject: Metropolitan Washington, District of Columbia (DC, MD, and VA), 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. FITZ
COL, EN
Commanding

CF:
CAMPBELL/6704/CENAB-PL-P
ROACH/8156/CENAB-PL-P
BIERLY/6139/CENAB-PL-P
CHALECKI/4710/CENAB-PL
GUISE/6138/CENAB-PL
PHELPS/4568/CENAB-EX
KUHLMANN/4546/CENAB-EX



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CEPCX-CSRМ

4 Oct 2019

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

SUBJECT: Metropolitan Washington, District Of Columbia (DC, MD, and VA), Coastal
Storm Risk Management Feasibility Study

1. The National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSRМ) 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-CSRМ.
3. PCX-CSRМ 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-CSRМ 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.

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

September 2019

Project Name: METROPOLITAN WASHINGTON, DISTRICT OF COLUMBIA (DC, MD, AND VA), COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY

P2 Number: 404563

Decision Document Type: Feasibility Study

Project Type: Coastal Storm Risk Management

District: Baltimore

District Contact: Jacqueline Seiple, (410) 962-4398

Major Subordinate Command (MSC): North Atlantic Division

MSC Contact: Larry Cocchieri, NAD Planning Program Manager (347) 370-4550

Review Management Organization (RMO): The National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSR) and the Flood Risk Management Planning Center of Expertise (FRM-PCX)

RMO Contact: PCX-CSR Deputy Director, (347) 370-4550
FRM-PCX Deputy Director, (415) 503-6852

Key Review Plan Dates

Date of RMO Endorsement of Review Plan: 14 November 2017

Date of MSC Approval of Review Plan: 20 December 2017

Date of IEPR Exclusion Approval: N/A

Has the Review Plan changed since PCX Endorsement? Yes (transferred to new template)

Date of Last Review Plan Revision: August 2019

Date of Review Plan Web Posting: 20 December 2017

Date of Congressional Notifications (IEPR): N/A

Milestone Schedule

	<u>Scheduled</u>	<u>Actual</u>	<u>Complete</u>
<u>FCSA Execution Date:</u>	18-July-2017	18-July-2017	Yes

<u>Study Restart Date:</u>	N/A	15-July 2019	Yes
<u>Alternatives Milestone:</u>	22-Nov-19	-	No
<u>Tentatively Selected Plan:</u>	24-Jul-20	-	No
<u>Release Draft Report to Public:</u>	21-Sep-20	-	No
<u>Agency Decision Milestone:</u>	26-Feb-21	-	No
<u>Final Report Transmittal:</u>	07-Feb-22	-	No
<u>Chief's Report Signed:</u>	13-Jul-22	-	No

Project Fact Sheet

September 2019

Project Name: Northern Virginia Coastal Storm Risk Management Feasibility Study

Location: Middle Potomac River watershed, Northern Virginia

Authority: Resolution of the Committee on Environment and Public Works in the United States Senate, dated May 23, 2001:

That the Secretary of the Army is requested to review the Report of the chief of Engineers on the Potomac River and Tributaries in Maryland, Virginia, and Pennsylvania published in House Document 343, 91st Congress, Second Session, and other pertinent reports, with a view to conducting a study, in cooperation with the States of Maryland and West Virginia, the Commonwealths of Pennsylvania and Virginia, and the District of Columbia, their political subdivisions and agencies and instrumentalities thereof, other Federal agencies and entities, for improvements in the interest of the ecosystem restoration and protection, flood plain management, and other allied purposes for the middle Potomac River watershed.

Sponsor: Metropolitan Washington Council of Governments (MWCOCG)

Type of Study: Feasibility

SMART Planning Status: 3x3x3 Exemption for budget (study cost is estimated at \$3.5 million) and schedule (schedule will exceed 3 years) will be requested following the Alternatives Milestone Meeting but before the Tentatively Selected Plan meeting.

Project Area: Middle Potomac River watershed

Problem Statement: The study area encompasses northern Virginia located within the Middle Potomac watershed boundary (Figure 1). Jurisdictions within the study area include Arlington County, Fairfax County, the City of Alexandria, Reagan National Airport, and a portion of Prince William County. The study area is limited to those areas along rivers and other waterways that are subject to tidal flooding, coastal storm flooding, and interior drainage damages within areas of coastal flooding. The goal of the study is to support resilient communities by recommending actions to manage flood risk to vulnerable populations, properties, infrastructure, and environmental and cultural resources. The study will investigate solutions that will manage coastal flood risk considering future climate and sea level change scenarios in ways that support the long-term resilience and sustainability of the D. C. metropolitan region in northern Virginia. Recommended solutions including structural, non-structural, and natural and nature-based flood risk management measures will include actions by USACE as well as other federal and non-federal entities.

The problem is defined as coastal flooding that has caused extensive property damage and disruption to critical services supporting communities, including the continuity of operations for the Federal Government (i.e., national security implications). Storms, such as Hurricane Isabel in 2003, have resulted in approximately 10 feet (mean low low water) extreme water (8 feet surge) and may occur more frequently in the future; however, less intense but more frequent events may cause similar damages in the future, due to the potential impacts of sea level change (1-6 feet of forecasted change in mean sea level over 50 years).

Flood Risk Management (FRM) infrastructure has been constructed in the twentieth century to address flooding problems, including along Four Mile Run and Cameron Run. The feasibility study will evaluate the performance of existing FRM infrastructure, and will include a top of protection evaluation based on future condition surge scenarios.

Following the initial problem identification, the focused array of alternatives consisting of the combination of structural, non-structural, and/or natural and nature-based features flood risk management measures will be evaluated and compared. The universe of management measures from large regional storm surge barriers to more localized structural or non-structural solutions like levees, floodwalls, floodproofing, and elevation would be evaluated and compared. Economic damages will be approximated using GIS analyses, though certified planning models will be required for the final report presentation of cost-benefit analyses. Additionally, parametric cost estimates will be completed and used to complete benefit to cost ratio computations leading to a tentatively selected plan. NACCS information will be used to the furthest extent practicable, supplemented with local or regional information.

Information generated from the alternatives evaluation would be incorporated in the feasibility study report and corresponding floodplain management plan. Using existing recommendations from local jurisdictions, information derived from the feasibility study analyses and further collaboration with stakeholders, the floodplain management plan is intended to identify actions of stakeholders to complement the USACE tentatively selected plan to address the shared responsibility to manage flood risk within the DC metropolitan region.

Federal Interest: Opportunities exist in the study area for federal participation in projects that reduce economic impacts from coastal storm damage. Coastal storm risk management is needed to reduce 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, 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 estimated costs will depend on the magnitude of the alternative recommended.

General conceptual analyses using existing information will be used to identify scenarios to forecast a range of possible future conditions, such as current water surface elevation inundation plus bathtub increases to account for sea level change impacts. The conceptual analyses will be used to evaluate which infrastructure systems would be affected by flooding damages, including electricity, water and wastewater, communications, and transportation systems. Considering the Nation's government relies on its staff commuting from across the metropolitan region, it is important to understand the resulting impacts that direct damages may have on the continuity of operations and other emergency management functions. A vulnerability assessment will be conducted for critical infrastructure to identify priorities for protection and to inform decision making. This, along with traditional National Economic Development (NED) plan benefits of structural and content damages associated with residential, commercial/industrial, and governmental facilities would be evaluated to consider federal interest along with regional resilience. Initial economic analyses will be based on an assumption that 50-, 65-, and 80-percent risk reduction would be provided by flood risk management alternatives to reduce damages (i.e., damages prevented).

Risk Identification: Implementation of a flood risk management project could potentially reduce flood-related risk to human life/safety as well as damages to property and infrastructure. Conversely, failure of existing infrastructure or a project resulting from this study could pose a risk to life safety. Protection provided by existing FRM infrastructure will be evaluated under this study. Design considerations for recommended solutions would consider depth and velocities and how impacts from failure of a recommended plan could affect the study area and those people residing therein. 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.

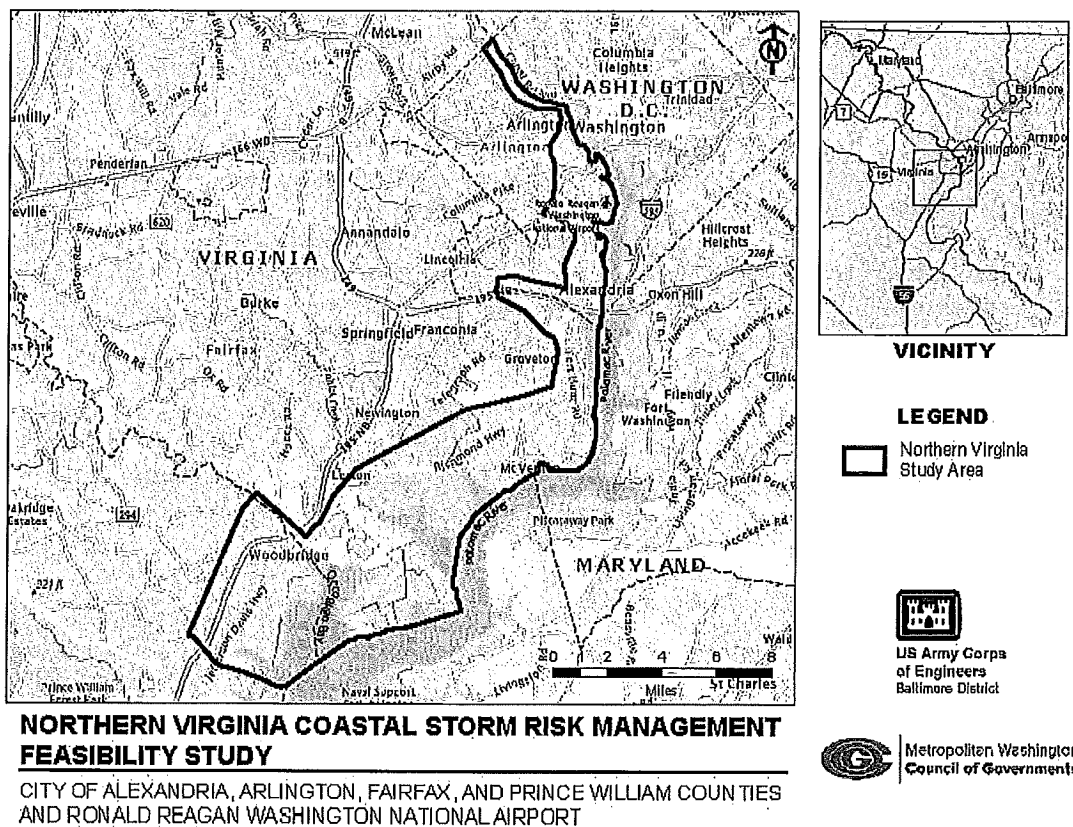


Figure 1: Study Area Map

1. FACTORS AFFECTING THE LEVELS OF REVIEW

Scope of Review.

The Northern Virginia 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?
The study area consists of multiple jurisdictions, which contain significant critical infrastructure elements, including those that feed National Security hubs and Reagan National Airport. Within the study area, coastal flooding can be exacerbated by riverine flooding. Additionally, 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.
- 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. For any recommended project, an evaluation of residual risk and uncertainty will be performed.
- 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 Commonwealth of Virginia.
- 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 process used to evaluate net economic benefits leading to the National Economic Development plan or a locally preferred plan, per USACE policy, may require specific public outreach activities. Environmental impacts will be coordinated with the appropriate resource agencies. Aesthetic features associated with any structural recommendation may be required to be incorporated into project designs. The National Capital Planning Commission, the regional permitting board in the National Capital Region, has noted that structural features within its jurisdiction may face stringent permitting requirements associated with potential aesthetic impacts for any recommended structures.

- 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 be confirmed 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; however, should an alternative such as a storm surge barrier be recommended, this will need to be explored further.

- 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; however, should an alternative such as a storm surge barrier be recommended, this will need to be explored further.

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	08/21/20	09/04/20	\$27,500	No
Draft Feasibility Report and EIS	Agency Technical Review	09/21/20	10/05/20	\$35,000	No
Draft Feasibility Report and EIS	Type I IEPR	09/21/20	10/21/20	\$200,000	No
Draft Feasibility Report and EIS	Policy and Legal Review	09/21/20	10/21/20	n/a	No
Final Feasibility Report and EIS	District Quality Control	10/08/21	10/22/21	\$27,500	No
Final Feasibility Report and EIS	Agency Technical Review	11/08/21	12/08/21	\$35,000	No
Final Feasibility Report and EIS	Policy and Legal Review	04/08/22	05/08/22	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 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.

DQC will be conducted by senior level USACE, Baltimore District staff and supervisors of the respective functional organizations. Comments and responses will be formally documented for both the project delivery team and the DQC review. A DQC lead will be identified for each product that undergoes DQC.

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 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 FRM projects and have recent experience in preparing economic analysis plans for FRM 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.
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 (Riverine)	The reviewer should be a senior hydrologic and hydraulic engineering specialist with extensive experience associated with riverine H&H modeling. The reviewer should have experience with HEC-HMS and HEC-RAS.
Hydrology and Hydraulic Engineering (Coastal)	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.
Engineering - Civil	A civil engineer with experience in design and evaluation of flood risk management and coastal storm risk management projects.
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).
Planning	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 FRM projects and have recent experience in preparing economic analysis plans for FRM 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.
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 (Riverine)	The reviewer should be a senior hydrologic and hydraulic engineering specialist with extensive experience associated with riverine H&H modeling. The reviewer should have experience with HEC-HMS and HEC-RAS.
Hydrology and Hydraulic Engineering (Coastal)	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.

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.
Geotechnical 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.
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.
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.
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.
Climate Preparedness and Resilience CoP Reviewer	The reviewer should be 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.

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, and based on the risk informed decision as prescribed in EC 1165-2-217, Section 11.d(1), Type I IEPR is recommended. The following table summarizes these trigger and a discussion on each point is below. Note that significant threat to human life is no longer an IEPR trigger, but has been included for completeness:

Mandatory Triggers	Yes	No	To be Determined
Significant threat to human life	X		
Exceeds \$200 million (Sect 1044 of WRDA 14)			X
Governor's Request		X	
Controversial by USACE Director of Civil Works		X	

The study will be subject to Type I IEPR on the basis of potential life safety risks. 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

	<p>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.</p>
Economics	<p>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 G2CRM.</p>
Environmental	<p>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. The panel member should also be familiar with all NEPA Environmental Assessment requirements as well as have experience with the Endangered Species Act, essential fish habitat, and the Marine Mammals Protection Act. 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</p>

	appropriate field of study. Active participation in related professional societies is encouraged.
Hydrologic and Hydraulic Engineering	<p>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 river control structures, including levees and floodwalls. The panel member should have experience modeling large 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 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, STWAVE, and G2CRM.</p>
Civil Engineering	<p>The Civil Engineering Panel Member should be a registered professional engineer from academia, a public agency whose mission includes flood damage prevention, or an Architect-Engineer or consulting firm, having a minimum of 10 years' experience in civil or construction engineering. The panel member should have demonstrated experience in performing civil engineering design for all phases of flood risk management related projects. The panel member should also be familiar with and have demonstrated experience related to concrete floodwall, earthen levee foundation, and pumping station design and construction. Panel member should be familiar with the construction industry. Additionally, the panel member should be capable of addressing</p>

	the USACE Safety Assurance Review (SAR) aspects of all projects. Active participation in related professional engineering and scientific societies is encouraged.
Geotechnical Engineering	The Geotechnical Engineering Panel Member should be a registered professional engineer from academia, a public agency whose mission includes flood risk management, or an Architect-Engineer or consulting firm, having a minimum of 10 years' experience in civil or construction engineering. The panel member should have demonstrated experience in geotechnical engineering analyses for all phases of flood risk management related projects. Additional experience and familiarity of geotechnical practices associated with concrete floodwalls, earthen levee foundations and dams, and line of protection under seepage concerns. Additionally, this Panel Member should be capable of addressing the USACE SAR aspects of all projects. Active participation in related professional engineering and scientific societies is encouraged.

Documentation of Type I 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. 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	Generation II Coastal Risk Model (G2CRM) is a desktop computer model oriented specifically toward analysis of nonsacrificial coastal protection systems in 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. The program will be used to evaluate and compare the existing, future without-, and future with-project alternative plans.	Certified for one-time use

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
HEC-HMS 3.5 (Hydrologic Modeling System)	The Hydrologic Modeling System (HEC-HMS) is designed to simulate the precipitation-runoff processes of dendritic watershed systems. It is designed to be applicable in a wide range of geographic areas for solving the widest possible range of problems. This includes large river basin water supply and flood hydrology, and small urban or natural watershed runoff. Hydrographs produced by the program are used directly or in conjunction with other software (e.g., HEC-RAS) for studies of water availability, urban drainage, flow forecasting, future urbanization impact, reservoir	

	spillway design, flood risk management (including interior drainage analyses), floodplain regulation, and systems operation.	
HEC-RAS 4.0 and 4.1 (River Analysis System)	The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program provides the capability to perform one-dimensional steady and unsteady flow river hydraulics calculations. The program will be used for steady flow analysis to evaluate the future without- and with-project conditions along the Wild River and its tributaries. The models will be used for both steady and unsteady flow analysis.	HH&C CoP Preferred Model
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 are used 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
Jacqui Seiple	CENAB-PLP	Study Manager	410-962-4398
Tanveer Chowdhury	CENAB-ENC-W	Project Manager	410-962-8126
Andrew Roach	CENAB-PLP	Plan Formulation Advisor	410-962-8156
Christopher Spaur	CENAB-PLP	Environmental Team lead	410-962-6134
Kristina May	CENAB-PLP	Biologist	410-962-6100
Robertas Simonavicius (NAO)	CENAO-PL	Economist	(757) 201-7704
Komla Jackatey	CENAB-PLP	Economist	410-962-2910
Andrew Orlovsky	CENAB-ENC-E	Civil Engineering	
Luis Santiago	CENAB-PLP	GIS	410-962-6691
Lori Bank	CENAB-ENC-W	Hydraulic Engineering	410-962-5127/410-962-4842
Luan Ngo	CENAB-END-T	Cost Engineering	410-962-3322
Jane Bolton (NAO)	CENAO-ECE-G	Geotechnical Engineering	757-201-7123
Ethan Bean	CENAB-PL	Cultural Resources	410-962-2173
Craig Homesley	CENAB-REC	Real State	410-962-4944
Sarah Lazo	CENAB-CC	Public Affairs Specialist	410-962-9015
Steve Walz	MWCOG	Director, Department of Environmental Programs	202-962-3205
Brian Rahal	City of Alexandria	Stormwater Program Section Lead	703-746-4057
Dipmani Kumar	Fairfax County	Chief, Watershed Planning and Evaluation Branch	703-324-5500
Richard Dooley	Arlington County	Community Energy Coordinator	703-228-3532
Erik Schwenke	Metropolitan Washington Airports Authority	Lead Environmental Planner, Office of Engineering	703-572-0268
Ann Phillips	Commonwealth of Virginia	Special Assistant for Coastal Adaptation and Protection	804-786-0226
Julia Koster	National Capital Planning Commission	Director, Office of Public Engagement	202-482-7211

Corey Miles	Northern Virginia Regional Commission	Coastal Program Manager	703-642-4625
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DISTRICT QUALITY CONTROL TEAM			
Name	Office	Position	Phone Number
Andrew Roach	CENAB-PLP	Plan Formulation Advisor/ DQC Lead	(410) 962-8156
TBD	CENAB-PLP	Environmental Team Lead	
Eva Falls	CENAB-PL	Cultural Resources	(410) 962-4458
TBD	TBD	Economics	
Dan Risley	CENAB-EN	H&H Engineering	(410) 962-5127
Andrew Orlovsky	CENAB-EN	Civil Engineering	(410) 962-3100
Chuck Frey	CENAB-EN	Geotechnical Engineering	(410) 962-5663
Craig Homesly	CENAB-REC	Real Estate	(410) 962-4944
Parris McGhee-Bey	CENAB-CDV-C	Cost Engineering	(410) 962-9596

AGENCY TECHNICAL REVIEW TEAM			
Name	Office	Position	Phone Number
TBD			

POLICY AND LEGAL REVIEW TEAM			
Name	Office	Position	Phone Number
Megan Jadrosich	CENAD-PD-PP	Review Manager	347-370-4653
Patricia Bolton	CENAD-RB-T	Cost Engineering	347-370-4682
Julie Alcon	CECW-PC	Environmental	202-761-0523
Donald Cresitello	CENAD-PD-P	Plan Formulation	347-370-4591
Pat Falcigno	CECC-NAD	Legal	347-370-4524
Naomi Fraenkel Altschul	CENAD-PD-PP	Economics	917-359-2819
Karen Kennedy	CENAD-PD-RE	Real Estate	347-370-4516
Heidi Moritz	CENWP-ENC-HD	Climate Preparedness and Resilience	503-808-4893
George Nieves	CENAD-PSD-O	Operations	347-370-4556
John Winkelman	CEERD-HT	Engineering & Construction	978-318-8615

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 Support 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

