



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

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

11 July 2022

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 Coastal Storm Risk Management Feasibility Study Review Plan

1. Reference Memorandum, CENAB-PL-P, dated 21 April 2022, subject as above.
2. The Coastal Storm Risk Management Planning Center of Expertise of the North Atlantic Division (NAD) is the lead office to execute the referenced Review Plan. The Review Plan includes Independent External Peer Review.
3. The enclosed Review Plan is approved for execution and is subject to change as study circumstances require, consistent with study development under the Project Delivery Business Process. Subsequent revisions to this Review Plan or its execution require new written approval from NAD.
4. The point of contact is Mr. Larry Cocchieri, NAD Planning Program Manager at 347-370-4571 or Lawrence.J.Cocchieri@usace.army.mil.

Encl

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

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

CENAB-EX

21 APR 2022

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, North Atlantic Division (CENAD-PD-X/Ms. Karen Baker), 301 General Lee Avenue, Fort Hamilton Military Community, Brooklyn, NY 11252

SUBJECT: Request for Approval of the Metropolitan Washington District of Columbia Coastal Storm Risk Management Feasibility Study (DC Coastal) Review Plan

1. References:

- a. Director of Civil Works Memorandum, 5 APR 2019, Interim Guidance on Streamlining Independent External Peer Review (IEPR) for Improved Civil Works Product Delivery
- b. Engineer Regulation (ER)1165-2-217, Review Policy for Civil Works, 01 MAY 21
- c. EC 1105-2-412, Planning, Assuring Quality of Planning Models, 31 MAR 11
- d. Engineer Regulation (ER) 1110-2-12, Quality Management, 30 SEP 06

2. The Baltimore District (NAB) requests review and approval of the subject Review Plan (RP) (Enclosure 1), prepared in accordance with References 1a-d. The RP complies with all applicable policies and provides a satisfactory approach to District Quality Control and Agency Technical Review of the Integrated Feasibility Report and Environmental Assessment and associated plan formulation process, engineering and environmental analyses, and other planning considerations.

3. The DC Coastal study may include life safety concerns from flood risk as well as complex challenges as the team develops a design for deployable measures (including stop log closures and automatically deployed barriers). The project delivery team has made the determination that this study warrants an Independent External Peer Review (IEPR) which will be conducted after the draft report package is released for concurrent review. This decision has been explained in the Review Plan (Enclosure 1).

4. The RP was prepared in coordination with CENAD Planning Division Programs Directorate and the Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSRМ). Mr. Larry Cocchieri PCX-CSRМ, Review Manager, reviewed the RP and recommends the plan for approval (Enclosure 2).

CENAB-EX

SUBJECT: Request for Approval of the Metropolitan Washington District of Columbia Coastal Storm Risk Management Feasibility Study (DC Coastal) Review Plan

5. If you should require more information, the point of contact is Ms. Amber Metallo, Lead Planner, at amber.c.metallo@usace.army.mil or 410-962-2024.



- 2 Enclosures
- 1. Review Plan
- 2. PCX-CSRМ Endorsement

ESTHER S. PINCHASIN
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-CSRМ

25 Feb 2022

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

SUBJECT: Metropolitan Washington, District Of Columbia, 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 ER 1165-2-217, entitled "Civil Works Review Policy".
2. The review was performed by Mr. Donald Cresitello and Mr. Larry Cocchieri, 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 917-539-4174.

A handwritten signature in black ink, appearing to read "Larry Cocchieri".

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

REVIEW PLAN

March 2022

Project Name: METROPOLITAN WASHINGTON, DISTRICT OF COLUMBIA
COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY

P2 Number: 497631

Decision Document Type: Feasibility Study

Project Type: Coastal Storm Risk Management

District: Baltimore

District Contact: Amber Metallo, Study Manager (410) 962-2024

Major Subordinate Command (MSC): North Atlantic Division

MSC Contact: Megan Jadrosich, NAD Planning Program Manager (347) 370-4653

Review Management Organization (RMO): The National Planning Center of Expertise for Coastal Storm Risk Management (PCX-CSRМ) is the lead RMO. The Flood Risk Management Planning Center of Expertise (FRM-PCX) is a supporting RMO.

RMO Contact: PCX-CSRМ Deputy Director, (347) 370-4571
FRM-PCX Deputy Director, (415) 503-6852

Key Review Plan Dates

Date of RMO Endorsement of Review Plan: 25 Feb 2022

Date of MSC Approval of Review Plan: 25 Feb 2022

Date of IEPR Exclusion Approval: N/A

Has the Review Plan changed since PCX Endorsement? N/A

Date of Last Review Plan Revision: N/A

Date of Review Plan Web Posting: TBD

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 2019	22 Nov 2019	Yes
<u>Study Paused:</u>	N/A	15 July 2020	Yes
<u>FCSA Amendment:</u>	N/A	07 April 2021	Yes
<u>2nd Study Restart</u>	N/A	30 April 2021	Yes
<u>Tentatively Selected Plan:</u>	29 March 2022		
<u>Release Draft Report to Public:</u>	27 May 2022		
<u>Agency Decision Milestone:</u>	01 November 2022		
<u>Final Report Transmittal:</u>	05 September 2023		
<u>Chief's Report Signed:</u>	01 March 2024		

Project Fact Sheet
March 2022

Project Name: Metropolitan Washington, District of Columbia 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.

In the Metropolitan Washington, District of Columbia (DC, MD, and VA) Coastal Storm Risk Management Feasibility Study Vertical Team Charrette memorandum for record (MFR) dated 5 October 2017, the Middle Potomac River and Tributaries authority was confirmed for investigation of coastal storm risk management within the region. However, the authority includes areas upstream of the coastal influence, so the feasibility study will be limited to the extent of coastal storm surge inundation and focus solely on flood risk management (and not ecosystem restoration) noted in the Middle Potomac authorization. Mr. Vietri mentioned opinions from the Office of Counsel related to coastal storm risk management and/or flood risk management included within the “other allied purposes” clause in the authorization language that would corroborate the CENAB Office of Counsel opinion dated 22 April 2014, which noted that the DC focus area study would fit comfortably within the existing Middle Potomac authority (and that because CENAB can conduct the DC focus area study under the Middle Potomac authority, it is not necessary to consider the use of the PL 84-71 authority).

The study area will only include those areas of the Potomac and Anacostia Rivers that are tidally influenced and will not evaluate areas of inland riverine flooding. This is consistent with the coastal storm risk management focus of the Northern Atlantic Coast Comprehensive Study (NACCS). The tidal boundary of the Potomac River is the upper extent of the study area which includes a portion of Arlington County above Ronald Reagan Washington National Airport. The lower boundary of the study area based on the Authority is at Occoquan Bay.

Sponsor: Metropolitan Washington Council of Governments (MWCOG)

Type of Study: Feasibility

SMART Planning Status: A 3x3x3 Exemption was approved by the ASA(CW) on 05 February 2021. This exemption was approved for both time (additional 3 years added to the original study timeline due to a rescoping effort) and change in funding to 100% Federal funding under the Sandy supplemental. The new Chief's Report date is 01 March 2024.

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 significant archaeological resources and historic properties. 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 was constructed in the twentieth century to address flooding problems, including along Four Mile Run and Cameron Run. The feasibility study will incorporate new WSEL modeling (tide, surge and sea level rise) to evaluate the focus areas including areas of existing FRM infrastructure to determine a top of level protection for the year 2080 for structural alternatives (i.e. levees and floodwalls). Non-structural measures including floodproofing and elevation are being evaluated at the 20-year, 50-year, and 100-year level of protection to determine the level of protection. Relocations are not being considered because the depth of the water at the 100-year event can be addressed by raising or floodproofing structures.

Economic damages and life safety will be evaluated using Generation II Coastal Risk Model (G2CRM) 0.4.564 which is approved for use by USACE. The areas being evaluated under this study do not present substantial life threats from flooding and therefore, LifeSim is not being used to compute life loss. Parametric cost estimates will be completed and used to complete benefit-to-cost ratio computations leading to a tentatively selected plan. Information generated from the alternatives evaluation will be incorporated into the integrated feasibility report and environmental assessment (IFR/EA).

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 berms/levees, acquisition/buyouts and relocation of properties and/or critical infrastructure, elevating structures, building codes and zoning modifications, coastal zone management, wetlands, and maritime forests. 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 assume that 50-, 65-, and 80-percent risk reduction would be provided by flood risk management alternatives to reduce damages (i.e., damages prevented). The IFR/EA will also include a four accounts evaluation to evaluate regional economic development (RED), environmental quality (EQ), and other social effects (OSE) benefits in addition to NED.

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.

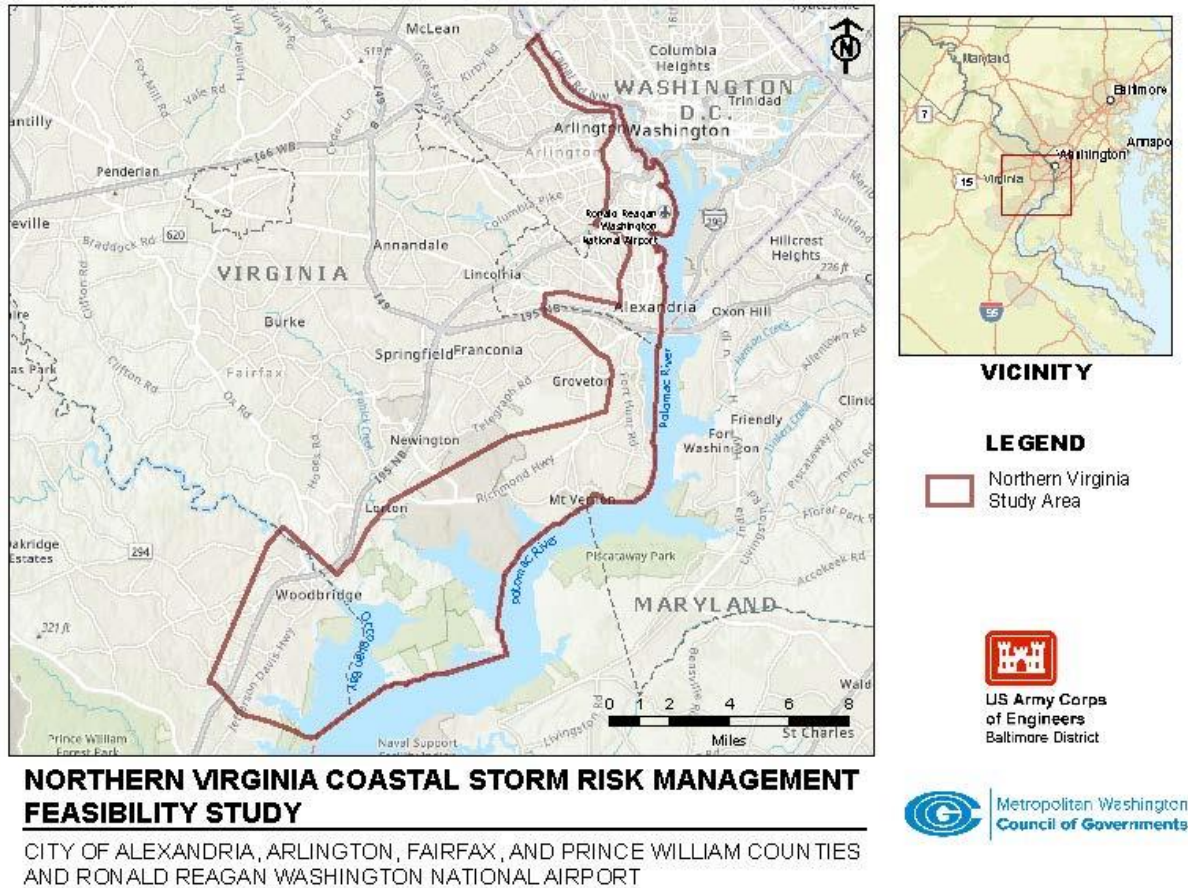


Figure 1: Study Area Map

1. FACTORS AFFECTING THE LEVELS OF REVIEW

Scope of Review.

The Metropolitan Washington, District of Columbia Coastal Storm Risk Management Feasibility Study includes coastal storm surge modeling and economics analyses to evaluate and compare flood risk management alternatives. Associated with these analyses are 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 the Arlington Water Pollution Control Plant 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 NED 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.

- 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 may present complex challenges as the team develops a design for deployable measures at Ronald Reagan Washington National Airport and Old Town Alexandria. These challenges will be worked through during the feasibility level design if either or both of these alternatives are chosen as the Tentatively Selected Plan.

- 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 rough order magnitude (ROM) costs of the alternatives range from \$7 million to \$114 million. If Alternative 8, the combination plan, is selected as the TSP with two or more alternatives or components of the alternatives carried forward, the total project cost could exceed \$200 million.

- Will an Environmental Impact Statement be prepared as part of the study?

- The National Environmental Policy Act (NEPA) decision document for the DC Coastal Study is an Environmental Assessment (EA). The study re-scope resulted in the removal of surge barriers which was driving the decision to potentially pursue an EIS. Additionally, limits of disturbance (LODs) were reevaluated at Four Mile Run and Belle Haven to avoid wetland impacts from structural measures. Therefore, an evaluation of environmental consequences and agency coordination show that the study alternatives are not likely to have a significant impact on the quality of the human environment. The study alternatives are expected to result in minor impacts to biological, cultural, and socioeconomic resources.

- 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 are 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.) will 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. Additionally, a Targeted ATR was conducted in November 2021 on the ADCIRC model and G2CRM results. These changes are being incorporated into the model and appendices prior to ATR of the draft IFR/EA package.

Independent External Peer Review. 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. IEPR will be conducted on this study concurrent with the release of the draft IFR/EA and appendices.

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
G2CRM and ADCIRC Model	Targeted ATR	11/29/21	01/14/22	\$8,000	Yes
Draft IFR/EA	District Quality Control	03/30/22	04/29/22	\$27,500	No
Draft IFR/EA	Agency Technical Review	05/27/22	06/24/22	\$55,000	No
Draft IFR/EA	IEPR	05/27/22	10/28/22	\$200,000	No
Draft IFR/EA	Policy and Legal Review	05/27/22	07/22/22	n/a	No
Final IFR/EA	District Quality Control	11/14/22	12/16/22	\$27,500	No
Final IFR/EA	Agency Technical Review	01/16/23	02/10/23	\$47,000	No
Final IFR/EA	Policy and Legal Review	01/16/23	03/03/23	n/a	No

a. DISTRICT QUALITY CONTROL

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

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 CSRM and 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.
Geotechnical Engineering	A geotechnical engineer with experience with geotechnical investigations and design necessary for FRM and coastal storm risk management projects.
Civil Engineering	A civil engineer with experience in design and evaluation of flood risk management and coastal storm risk management projects.
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	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 real estate planning and land acquisition for cost shared and full Federal water resource 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 ER 1165-2-217, Appendix D (page 81).

Documentation of completed DQC should be provided to the MSC, RMO and ATR Team leader prior to initiating an ATR. The ATR team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort. Missing or inadequate DQC documentation can result in delays to the start of other reviews (see ER 1165-2-217, Section 4).

b. AGENCY TECHNICAL REVIEW

The ATR will assess whether the analyses are technically correct and comply with guidance, and that documents explain the analyses and results in a clear manner. An RMO manages ATR. The review is conducted by an ATR Team whose members are certified to perform reviews. Lists of certified reviewers are maintained by the various technical Communities of Practice (see ER 1165-2-217, Section 5.5). 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 ArcGIS and geospatial analyses 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 real estate planning and land acquisition for cost shared and full Federal water resource 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 ER 1165-2-217 issue resolution process. Concerns can be closed in DrChecks by noting the concern has been elevated for resolution. The ATR Lead will prepare a Statement of Technical Review (see ER 1165-2-217, Section 5.11), 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) IEPR.

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

Decision on IEPR.

It is anticipated that the study would not meet all the IEPR exclusion criteria. Because of the scope, H&H, and economics analyses completed on the study, and based on the risk informed decision as prescribed in ER 1165-2-217, Section 6.2, IEPR is recommended. The following table summarizes these triggers and a discussion on the decision to pursue an IEPR is below.

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

In addition, the mandatory triggers listed above, risk-informed decision making (RIDM) was performed to determine if an IEPR would add value or significant benefit to the project. The PDT evaluated whether the project alternative(s) or study/design would include significant life safety concerns, novel methods utilized, complex challenges, precedent setting methods or models and/or are likely to change prevailing practices. A decision was made to recommend an IEPR based on life safety concerns and complex challenges. The study area includes a significant portion of coastline on the west bank of the Potomac River with areas of critical infrastructure and dense population centers which could result in significant life safety concerns. Additionally, the PDT is evaluating deployable measures for Ronald Reagan Washington National Airport and Old Town Alexandria which could lead to complex design challenges. The PDT recommends conducting an IEPR and believes it could add value to the study. 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 IEPR. The draft IFR/EA and appendices will undergo IEPR.

Required 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 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 experience 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	<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 appropriate field of study. Active participation in related professional societies is encouraged.</p>
Hydrologic and Hydraulic Engineering	<p>The Hydrologic and Hydraulic Engineering Panel Member should be a</p>

	<p>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 understand 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>
<p>Civil Engineering</p>	<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</p>

	<p>member should be familiar with the construction industry. Additionally, the panel member should be capable of addressing the USACE Safety Assurance Review (SAR) aspects of all projects. Active participation in related professional engineering and scientific societies is encouraged.</p>
<p>Geotechnical Engineering</p>	<p>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.</p>

Documentation of IEPR. The OEO will submit a final Review Report no later than 60 days after the end of the draft report public comment period. USACE shall consider all recommendations in the Review Report and prepare a written response for all recommendations. The final IFR/EA 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 0.4.564	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. The program will be used to evaluate and compare the existing, future without-, and future with-project alternative plans.	Approved for 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 4.8	The Hydrologic Modeling System (HEC-HMS) is designed to simulate the precipitation-runoff	HH&C CoP

(Hydrologic Modeling System)	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.	Preferred Model
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 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
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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
Amber Metallo	CENAB-PLP	Study Manager	410-962-4398
Catherine Perkins	CENAB-PPC	Project Manager	410-962-4283
Kristina May	CENAB-PLP	Biologist	410-962-6100
Komla Jackatey	CENAB-PLP	Economist	410-962-2910
Dan Lovette	CENAB-ENC-E	Civil Engineering	
Luis Santiago	CENAB-PLP	Geospatial Information Services	410-962-6691
Syed Qayum	CENAB-ENC-W	Hydraulic Engineering	410-962-2950
Luan Ngo	CENAB-END-T	Cost Engineering	410-962-3322
Michael Fritzges	CENAP-ECE-G	Geotechnical Engineering	215-656-6694
Ethan Bean	CENAB-PL	Cultural Resources	410-962-2173
La-Wanda Carter	CENAB-REC	Real Estate	443-386-1829
Constantine Ditsious	CENAB-ENE-T	HTRW	410-962-2427
Cynthia Mitchell	CENAB-CC	Public Affairs Specialist	410-962-7522
Steven Bieber	MWCOG	Water Resources Program Director	202-962-3219
Jeffrey King	MWCOG	Director, Climate, Air, and Energy Program	202-962-3238
Katherine Dyer	MWCOG	Environmental Planner	202-962-3324
Brian Rahal	City of Alexandria	Stormwater Program Section Lead	703-746-4057
Jesse Maines	City of Alexandria	Chief, Stormwater Management	703-746-6499
Dipmani Kumar	Fairfax County	Chief, Watershed Planning and Evaluation Branch	703-324-5500
Richard Dooley	Arlington County	Community Energy Coordinator	703-228-3532

Madan Mohan	Prince William County	Watershed Management Chief	703-792-7070
Raj Bidari	Prince William County	Engineer IV and Floodplain	703-792-7078
Gregg Wollard	Metropolitan Washington Airports Authority	Office of Engineering, Planning Department	703-572-0266
Thomas Wasaff	Metropolitan Washington Airports Authority	Environmental Planner	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

DISTRICT QUALITY CONTROL TEAM			
Name	Office	Position	Phone Number
Andrew Roach	CENAB-PLP	Plan Formulation Advisor/ DQC Lead	410-962-8156
Charles Leasure	CENAB-PLP	Environmental Team Lead	410-962-5157
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
Richard Kridler	CENAB-END-S	Structural Engineering	410-962-6718

AGENCY TECHNICAL REVIEW TEAM			
Name	Office	Position	Phone Number
Gregory Mausolf	CELRE-PLP	ATR Lead/Coastal Engineer	313-226-3389
Vongmony Var	CESAM-PD-FE	Economics/Risk Reviewer	251-694-3866
TBD		Plan Formulation	
		Environmental Resources	
		Cultural Resources	
		Geotechnical Engineering	
		Civil Engineering	
		Structural Engineering	
		Real Estate	
		Cost Engineering	
		Climate Preparedness and Resilience CoP Reviewer	

POLICY AND LEGAL REVIEW TEAM			
Name	Office	Position	Phone Number
Megan Jadrosich	CENAD-PD-PP	Review Manager/Plan Formulation Reviewer	347-370-4653
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Julie Alcon	CECW-PC	Senior Environmental Policy Reviewer	202-761-0523
Jason Shippy	CECC-NAD	Assistant Division Counsel	347-370-4526
Naomi Fraenkel Altschul	CENAD-PD-PP	Economics Reviewer	917-359-2819
Carlos Gonzalez	CENAD-PD-RE	Real Estate Reviewer	347-370-4529
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Jodi McDonald	CENAD-PD-OR	Operations and Regulatory Reviewer	

Javier Jimenez-Vargas	CENAD-RB-E	Engineering and Construction Reviewer	347-370-4599
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VERTICAL TEAM			
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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
Christopher Tolson	CENAD-PD-P	MSC District Support Team	347-370-4608
Donald Cresitello	CENAD-PD-P	Senior Coastal Planner/PCX-CSR	347-370-4591