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) 10 Apr 2023

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, New York District, 26 Federal Plaza New York, NY 10278-0090

SUBJECT: Request for Approval of the Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Study Review Plan

1. Reference Memorandum, CENAN-DE dated 28 March 2023, Subject: Transmittal of the Vertical Team Alignment Memorandum (VTAM) – Green Brook Upper Basin Flood Risk Management (FRM) Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Report (GRR) (P2#: 500105).

2. The Flood Risk Management Planning Center of Expertise of the South Pacific Division (SPD) is the lead office to execute the referenced Review Plan. The Review Plan includes Independent External Peer Review.

3. The enclosed Review Plan is approved for execution and is subject to change as study circumstances require, consistent with study development under the Project Delivery Business Process. Subsequent revisions to this Review Plan or its execution require new written approval from NAD.

4. The point of contact is Mr. Larry Cocchieri, NAD Planning Program Manager at 347-370-4571 or Lawrence.J.Cocchieri@usace.army.mil.

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

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW YORK
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, NY 10278-0090

CENAN-DE

MEMORANDUM FOR COMMANDER, U.S. Army Corps of Engineers North Atlantic Division, 301 General Lee Avenue, Fort Hamilton Community, Brooklyn, New York 11252 (ATTN: Ricciardi)

SUBJECT: Transmittal of the Vertical Team Alignment Memorandum (VTAM) - Green Brook Upper Basin Flood Risk Management (FRM) Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Report (GRR) (P2#: 500105)

1. Reference:

a. Engineer Regulation (ER) 1165-2-217, Civil Works Review Policy, 1 MAY 2021.

2. The New York District (NAN) is requesting review and approval of the enclosed Review Plan (enclosure 1) for the Green Brook Upper Basin FRM Project, Somerset, Middlesex and Union Counties, New Jersey GRR, prepared in accordance with ER 1165-2-217 (reference 1a).

3. The Green Brook Upper Basin FRM Project GRR may include life safety concerns from flood risk as well as complex challenges associated with the design of a detention basin as detailed in the Review Plan. The NAN Chief of Engineering has made a risk-informed 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 is detailed in the Review Plan (enclosure 1).

4. The Review Plan has been coordinated with the Flood Risk Management Planning Center of Expertise (FRM-PCX) as the review management organization and endorsed by the FRM-PCX in the enclosed memorandum (enclosure 2).

5. Please direct any questions or requests for information to Mr. Luis E. Santiago, Lead Planner at (410) 962-6691, luis.e.santiago@usace.army.mil.

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MATTHEW W. LUZZATTO
COL, EN
Commanding

Enclosures:

1. Green Brook Review Plan
2. FRM-PCX Endorsement Memorandum

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
SOUTH PACIFIC DIVISION
450 GOLDEN GATE AVENUE
SAN FRANCISCO CALIFORNIA 94102-3661

CESPD-PDP (FRM-PCX) 17 March 2023

MEMORANDUM FOR Commander, New York District, U.S. Army Corps of Engineers (CENAN-PP-C / Mr. Nathanael Wales)

SUBJECT: Review Plan Endorsement for the Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Study

1. The Flood Risk Management Planning Center of Expertise (FRM-PCX) endorses the subject review plan, dated March 2023, for approval by the North Atlantic Division (NAD).

2. The FRM-PCX, as the assigned Review Management Organization (RMO), coordinated with the New York District (NAN) in the development of the review plan and reviewed the enclosed plan for compliance with Engineer Regulation (ER) 1165-2-217, Civil Works Policy Review, 1 May 2021. The FRM-PCX coordination and review were led by Ms. Natalie McKinley, FRM-PCX Regional Manager for NAD. All review comments have been satisfactorily resolved.

3. The FRM-PCX concurs with the level and scope of review identified and supported in the review plan, including the decision to perform Independent External Peer Review (IEPR). The project does not currently meet any mandatory triggers for performing IEPR; however, a risk-informed decision to perform IEPR is provided in the review plan based on the scope and complexity of proposed FRM measures (detention basins, diversion tunnels), life safety concerns in the Upper Basin, and the potential for public controversy depending on the measures included in a recommended plan. Significant public controversy is a mandatory trigger for IEPR.

4. The FRM-PCX has reviewed the list of numerical modeling tools and software to be used in the study included in the review plan. All models are appropriate for the scope and purpose of the study and are certified or approved for use in planning studies by the appropriate Community of Practice.

5. Please include this memorandum when transmitting the review plan for approval by NAD. Upon approval of the review plan, please provide a copy of the approved plan, a copy of the approval memorandum, and the link to where the plan is posted on the District website to Ms. McKinley.

6. Thank you for the opportunity to assist in the preparation of the review plan. Please coordinate the Agency Technical Review (ATR) and IEPR efforts outlined in the review plan, and any future updates to the plan, with Ms. McKinley.

CESPD-PDP (FRM-PCX)
SUBJECT: Review Plan Endorsement for the Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Study

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ERIC THAUT
Deputy Director, Flood Risk Management
Planning Center of Expertise

CF:
CELRH-PMD-F (McKinley)
CESAM-PD-FP (Jester)
CENAB-PLP (Santiago)
CENAN-PL (Jones)
CEMVK-EC-P (Calla)
CELRH-MXG (Robinette)

PLANNING DECISION DOCUMENT REVIEW PLAN

March 2023

OVERVIEW

Project Name: Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Study
P2 Number: 500105

Decision Document Type: General Reevaluation Report

Project Business Line: Flood Risk Management (FRM)

District: New York District
District Contact: Project Manager, (917) 790-8731

Major Subordinate Command (MSC): North Atlantic Division
MSC Contact: Program Manager, (347) 370-4557

Review Management Organization (RMO): Flood Risk Management Planning Center of Expertise (FRM-PCX), South Pacific Division
RMO Contact: Deputy Director, FRM-PCX, (415) 503-6852

Key Review Plan Dates

Date of RMO Endorsement of Review Plan: 17 March 2023
Date of MSC Approval of Review Plan: Pending
Date of IEPR Exclusion Approval: N/A
Has the Review Plan changed since RMO Endorsement? No
Date of Last Review Plan Revision: None
Date of Review Plan Web Posting: Pending
Date of Congressional Notifications: Pending

Milestones and Other Key Dates

	Scheduled	Actual	Complete
FCSA Execution:	N/A	28 Sep 2022	Yes
Alternatives Milestone:	N/A	2 Feb 2023	No
Tentatively Selected Plan:	12 Dec 2023	N/A	No
Release Draft Report to Public:	7 Feb 2024	N/A	No
Agency Decision Milestone:	31 May 2024	N/A	No
Final Report Transmittal for Policy & Legal Compliance Review:	11 Oct 2024	N/A	No
Final Report Transmittal from MSC to HQ:	5 Feb 2025	N/A	No
Chief's Report:	12 Aug 2025	N/A	No

Project Fact Sheet
8 February 2023

Project Name: Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, New Jersey General Reevaluation Study

Location: Upper Basin of Green Brook Watershed in Somerset and Union Counties, including the City of Plainfield, Borough of North Plainfield, Borough of Watchung, Townships of Berkeley Heights, and Scotch Plains

Authority: Following completion of a Feasibility Study in 1980, construction of the Green Brook Project was authorized in the Water Resources Development Act (WRDA) of 1986 and directed implementation of FRM in the Lower Basin to the 0.2% annual chance exceedance event (500-year level) and to the 150-year level in the Stony Brook and Upper portions of the Green Brook Basin. Following is the authorization.

WRDA 1986
P.L. 99-662: SECTION 401. GREEN BROOK SUB-BASIN, RARITAN RIVER BASIN, NEW JERSEY
Report of the Chief of Engineers dated September 4, 1981 at a total cost of $203,000,000 with an estimated first Federal cost of $151,000,000 and an estimated first non-Federal cost of $52,000,000. Such project shall include flood protection in the upper Green Brook Sub-basin and the Stony Brook tributary, as described in Plan A in the report of the District Engineer, New York, dated August 1980.

1997 GRR
The Green Brook General Reevaluation Report (GRR), dated 1997, modified the Authorized Plan to provide FRM for the 0.67%, 4% and 5% annual chance exceedance (150, 25 and 20-year levels) for the Lower Basin, Stony Brook and Upper Basin portions of the Green Brook Basin, respectively. This is documented in a Post Authorization Change Analysis appended to the 1997 GRR. This plan is referred to as the Recommended Plan and is the plan currently under construction. The 1997 GRR also deferred implementation of the Upper Basin features. As the update was determined to be within the scope of the authorized project, the Chief's Report from 1981 was deemed still valid.

Upper Basin Prohibition
The passing of Energy and Water Development Appropriations Act (EWDAA) of 1998 placed a legislative prohibition on the use of funds for implementation of the detention basins at Oakway and Skytop. Following the authorization of the project in WRDA 1986 and the 1997 GRR, EWDAA 1998 stated the following:

EWDAA 1998
PL 105-62: SEC. 102. GREEN BROOK SUB-BASIN FLOOD CONTROL PROJECT, NEW JERSEY
"No funds made available under this Act or any other Act for any fiscal year may be used by the Secretary of the Army to construct the Oak Way detention structure or the Sky Top detention structure in Berkeley Heights, New Jersey, as part of the project for flood control, Green Brook

Sub-Basin, Raritan River Basin, New Jersey, authorized by section 401(a) of the Water Resources Development Act of 1986 (Public Law 99-662; 100 Stat. 4119)."

WRRDA 2014

The passing of WRRDA 2014 removed the legislative prohibitions on the use of funding for construction of the Oakway and Skytop detention basins:

WRRDA 2014 PL 113-121: SEC. 4013. Technical Corrections

(a) RARITAN RIVER. —Section 102 of the Energy and Water Development Appropriations Act, 1998 (Public Law 105–62; 111 Stat. 1327), is repealed.

In a letter dated April 6, 2015, the New Jersey Department of Environmental Protection (NJDEP) requested that the U.S. Army Corps of Engineers (USACE) initiate a reevaluation of the deferred Upper Basin of the Green Brook Authorized Project (Appendix A).

Green Brook Upper Basin Validation Report 2021

Prior to conducting a general reevaluation of FRM in the Upper Basin, CENAN and NJDEP agreed to conduct a validation study to determine if the recommended plan (the 1997 plan for detention basins at Oakway and Skytop and for channel modifications in Plainfield) remained engineeringly feasible, economically justified, and environmentally acceptable. The result of the validation study was a 2021 Validation Report that concluded that the recommended plan for Upper Basin was no longer economically justified and that a general reevaluation should, indeed, be conducted.

Sponsor: New Jersey Department of Environmental Protection (NJDEP)

Type of Study: General Reevaluation Report

SMART Planning Status: 3x3x3 Compliant Schedule and Budget

Project Area: The project is located in the Upper Basin of the Green Brook Watershed, a sub-basin of the Raritan River Basin within the State of New Jersey. The Upper Basin consists of the floodplain from the Green Brook, Blue Brook, and Mine Brook above the confluence with Stony Brook and lies within the municipalities of Plainfield, North Plainfield, Watchung, Berkeley Heights, and Scotch Plains in New Jersey. The Upper Basin of the Green Brook Watershed originates in the Watchung Mountains, exits the slopes of the First Watchung Mountain, and enters a mostly urbanized and industrialized broad, flat floodplain encompassing large portions of the Township of Scotch Plains and the City of Plainfield. The drainage area for Green Brook above its confluence with Stony Brook is approximately 10.3 square miles.

Problem Statement: For the greatest portion of this basin, the most damaging flood of record resulted from the August 1973 storm. Although the entire basin was affected by this storm, areas along Green Brook and Stony Brook experienced the most damages. Flooding was so extensive that the Governor requested and received a "Major Disaster" declaration from the President. In addition to the August 1973 flood of record, nine major floods had already occurred. September 1882, February 1896, July 1897, October 1903, July 1916, July 1938, May 1968, August 1971, and July 1975. The August 1971 flood was severe enough for the President to declare the entire State of New Jersey a disaster area. In fact, for reaches affected by the Raritan River backwater, the August 1971 flood was the largest recent flood. Prior to the installation of the Bound Brook gage on the Raritan

River in 1903, data on major flood events were based on record searches and recorded high water marks. Subsequent to 1973, significant floods occurred in July 1975, September 1979 and July 1984 but did not approach the magnitude of the August 1973 event.

Six deaths were attributed to the flood of August 1973 in the Stony Brook area of the project. These deaths occurred in North Plainfield and Plainfield. Thirty-four persons were also injured, and estimates indicate that more than 1,000 people were evacuated from their residences.

Flooding was less severe in the upper portion of the basin during the passage of Tropical Storm Floyd in September 1999, although record flood stages were recorded downstream in the Borough of Bound Brook. Hurricane Irene in August 2011 damaged parts of Bound Brook as Segment T was incomplete and did not provide FRM at the time. The Borough of Middlesex also suffered flooding damages. Additional damages occurred in the Upper Basin and Stony Brook during Tropical Depression Ida (August 31 – September 1, 2021).

The Green Brook Upper Basin has been subject to frequent severe flooding from storms ranging from local thunderstorms to more widespread tropical storms. Flood problems within the upper basin are primarily due to rapid runoff associated with the steep topography within the Watchung Mountains. In the upper basin, runoff from the steep slopes of the First and Second Watchung Mountains is funneled into the Green and Blue Brooks. At the confluence with Blue Brook, Green Brook flows through a diagonal gorge in the First Watchung Mountain. At the base of the gorge, the topography flattens dramatically. At this point, Green Brook normally continues to flow southwestward along the foot of the First Watchung Mountain. Under flood conditions, however, flow far exceeds the capacity of the Green Brook channel and overtops the divide between the Cedar Brook and Green Brook watersheds. This flow spreads southeastward across the flat topography of Township of Scotch Plains and the City of Plainfield, inundating homes, industries and commercial centers before eventually returning to Green Brook via the Cedar Brook and Bound Brook tributaries.

While much of the flooding associated with the diverted flow is relatively shallow, local depressions pond far deeper and pose a significant safety hazard, a condition particularly prevalent near railroad underpasses. Flood damages in the upper basin also tend to be relatively severe in comparison to depth due to numerous businesses with at-grade entrances.

Problems within the study area include:

- Damages to residential and commercial properties
- Deaths and injuries resulting from flood impacts
- Evacuation of socially vulnerable populations may be impacted by flooding of roads

Federal Interest: The Upper Green Brook Basin is densely populated with an estimated 4,000 structures at riverine flood risk from Greek Brook and its tributaries in the municipalities of Plainfield, North Plainfield, Watchung, Berkeley Heights, and Scotch Plains, New Jersey. Opportunities exist in the study area for federal participation in a FRM project to reduce flood risk to people and economic impacts from storms. Possible measures to be examined in the GRR include channel modification, diversion tunnels, detention basins, floodwalls and levees, a nonstructural plan, and any plan considering a combination of measures to reduce flood risk.

Goals and Objectives: The goal of the study is to reduce flood risk to vulnerable populations and reduce economic and social impacts from riverine flooding in the Upper Basin of the Green Brook Watershed. All objectives for this study apply to the 50-year period of analysis, beginning in 2030. Objectives for this study include:

- To reduce the flood vulnerability of communities in the study area, especially communities with environmental justice concerns, by reducing economic damages and life loss, and improving community resilience in the study area;
- To preserve, maintain and to, the extent possible, enhance the resources of the existing natural, cultural, and historic resources in the project area;
- To reduce flood risk to critical infrastructure (hospitals, municipal buildings, emergency response facilities and transportation corridors) in the study area by reducing disruption to the operation of public health and safety services;
- To preserve to the extent possible existing open space areas and associated recreational opportunities in the project area; and
- To provide a plan that is compatible with existing and planned USACE FRM projects within the basin.

Inventory and Forecast: Existing conditions for the Upper Basin are documented in the 2021 Validation Report and remain generally applicable to this GRR. A summary of these conditions is listed below:

- Land use in the Upper Basin is highly urbanized resulting in substantial runoff that exacerbates flooding in the study area.
- The topography in the urbanized areas is relatively flat, with some steeper topography present starting northeast of the City of Plainfield into the Watchung Mountains.
- Significant wetland habitats are present in some of the areas proposed for detention basins in the 2001 Screening Report and 2021 Validation Report.
- Federally-listed and state-listed threatened and endangered species and their critical habitats are present in the study area along Green Brook.
- Environmental Justice communities are present in the City of Plainfield and North Plainfield.
- Properties in the Green Acres Program are present in the study area along Green Brook. The Green Acres Program is a State of New Jersey Program used to acquire and operate properties to meet the recreation and conservation needs of state residents. Green Acres properties generally have protections in place that are incompatible with development for FRM purposes.

Future without project (FWOP) conditions for the Upper Basin are documented in the 2021 Validation Report and remain generally applicable to this GRR. A summary of FWOP conditions is listed below:

- Development is assumed to remain stable as few open areas remain available for new development. Future development in upland areas would increase future flood risk. Without FRM, significant developed areas will remain susceptible to severe flooding including future flood damages and impacts to the general wellbeing of the residents living and working in the Upper Basin.
- Hydrology and Hydraulic modeling are being revised to include the existing diversion tunnel from Milton Campbell Field to Cedar Brook and sheet flow between Green Brook and Cedar Brook.

- The authorized and funded portions of the Green Brook project in Lower Basin and Stony Brook are assumed to proceed as authorized, with minor design updates to account for the latest water year.
- Sea level change is not anticipated to impact residents of the Upper Basin due to its location in a non-tidally influenced portion of the state.
- The following are assumed to be unchanged in the FWOP condition: socioeconomic/demographic characteristics, topography, geology, soils, water resources, vegetation, fish and wildlife, HTRW sites, cultural resources, recreation, aesthetic and scenic resources.

Measures and Alternatives: The GRR will use the 2001 Screening Analysis of Flood Control Alternatives for the Upper Portion of Green Brook Sub-basin Raritan River Basin (January 2001) and the Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex, and Union Counties New Jersey Final Validation Report (2021) as a basis to initiate plan formulation. The PDT will focus on re-examining alternatives detailed in those studies including evaluating structural and nonstructural measures including:

Structural Measures
Structural FRM measures are man-made, constructed measures that counteract a flood event in order to reduce the hazard or to influence the course or probability of occurrence of the event. Structural FRM measures evaluated in this study include:

- Levees
- Floodwalls
- Channel modification
- Dams (new dry or wet detention basins)
- Channel Diversion – Surface Diversion
- Channel Diversion – Tunnels

Nonstructural Measures
Nonstructural FRM measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures in that they focus on reducing the consequences of flooding instead of focusing on reducing the probability of flooding. Nonstructural FRM measures evaluated in this study include:

- Acquisition
- Relocation
- Elevation
- Floodproofing (wet or dry)

Natural and Nature-Based Features (NNBF)
NNBF includes "the use of landscape features to produce FRM benefits. NNBF projects may also produce other economic, environmental, and social benefits known as NNBF co-benefits." NNBF features in fluvial systems include measures that reduce flood risk by integrating hydrology, hydraulic, morphological, and ecological principles (USACE 2021). NNBF measures considered in the Upper Basin include:

- Stream Restoration

- Smaller Detention Ponds
- Wetland Restoration
- Green Infrastructure
- Levee Setbacks
- Restoration after Nonstructural Measures

An initial array of alternatives has been developed by combining compatible FRM measures and will be revised as the PDT works through the formulation process, see Table 1.

Table 1: Initial Array of Alternatives

Alternative	Alternative Description
Alternative 0	No Action
Alternative 1 (a-b…)	Floodwalls and levees
Alternative 2 (a-b…)	Channel modification with bridge raising and Upstream Detention
Alternative 3 (a-b…)	Diversion Tunnels
Alternative 4 (a-b…)	Nonstructural Plan consisting of acquisition, relocation, elevation, and floodproofing
Alternative 5	Combination Plan (TBD)

Risk Identification: The PDT has identified the risks listed in Table 2 below that are associated with the scope, schedule, and budget of the GRR and represent important aspects of the reviews outlined in this Review Plan.

Table 2. Risks Identification and Impacts

Risk	Impacts	Risk Rating
Alternative 2 includes channel modification with detention basin. The alternative would require consideration of design and risk analysis required to meet USACE design standards for dams and detention basins, which is anticipated to affect the budget and schedule of the study beyond 3x3x3 requirements. This would require a policy waiver from the Assistant Secretary of the Army (Civil Works).	If Alternative 2 is identified as the Tentatively Selected Plan, the project would require $1 million and an additional year to examine dams and detention basins during the feasibility phase of the study. Detention basins are also controversial in the basin with many local stakeholders and residents opposed to the measure.	High
The January 2021 Comprehensive Benefits Directive requires consideration of all four accounts in plan formulation and selection. As there are communities with Environmental Justice concerns (Plainfield, North Plainfield) and significant life safety concerns in the Upper Basin, the PDT believes that comprehensive benefits would play a role in plan formulation and selection. If a plan is to be recommended on comprehensive benefits that is not the NED plan, then the PDT would require a waiver from the Assistant Secretary of the Army (Civil Works) for deviation from NED plan selection requirements.	If a plan is selected based on comprehensive benefits, a waiver is anticipated to take less than 6 months from the date of submittal.	Low
There are mapped areas with listed endangered and threatened species in the study area including in areas proposed for a detention basin. A survey of endangered and threatened species in the study area may be required if detention basins are being studied further.	There is moderate likelihood for significant and adverse impacts to listed endangered and threatened species in the study area that may require mitigation.	Medium
A traffic analysis may be required for the relocation of New Providence Road as part of Alternative 2 - channel modification with detention basin.	There is a moderate likelihood that a traffic analysis will be needed to examine potential impacts of the road relocation.	Medium
A detention basin at New Providence Road would result in challenges associated with road relocation of New Providence Road including real estate issues, engineering feasibility issues with the Wheldon Quarry embankment proximate to the detention basin location, and challenges with access to the various communities along the Watchung Mountains during construction.	There is a moderate likelihood that the PDT would encounter extensive design challenges related to foundation issues, embankment stability, potential real estate issues if road is proposed along Wheldon Quarry embankment.	Medium

Risk	Impacts	Risk Rating
The hydraulic flows resulting from the selected Upper Basin features affect the design of the levee/floodwalls (i.e. heights, widths, etc.) in the Lower Basin starting with Segments C & D along the Green Brook.	Upper Basin Study impacts design criteria of Lower Basin features due to potential changes of hydraulic flows in the Lower Basin from the Upper Basin.	Medium
Nonstructural analysis guidance related to real estate costs likely to change during feasibility study.	Real Estate's approach to nonstructural work is currently being discussed at USACE HQ. Depending upon guidance issued in future, RE approach and costs for nonstructural measures may change during the feasibility study.	Low
Alternative 1 - Floodwalls and levees was screened from consideration at the Alternative Milestone Meeting (AMM).	No further impacts anticipated from evaluation of this alternative.	Low
Alternative 3 - Diversion Tunnels was screened from consideration at the AMM.	No further impacts anticipated from evaluation of this alternative.	Low

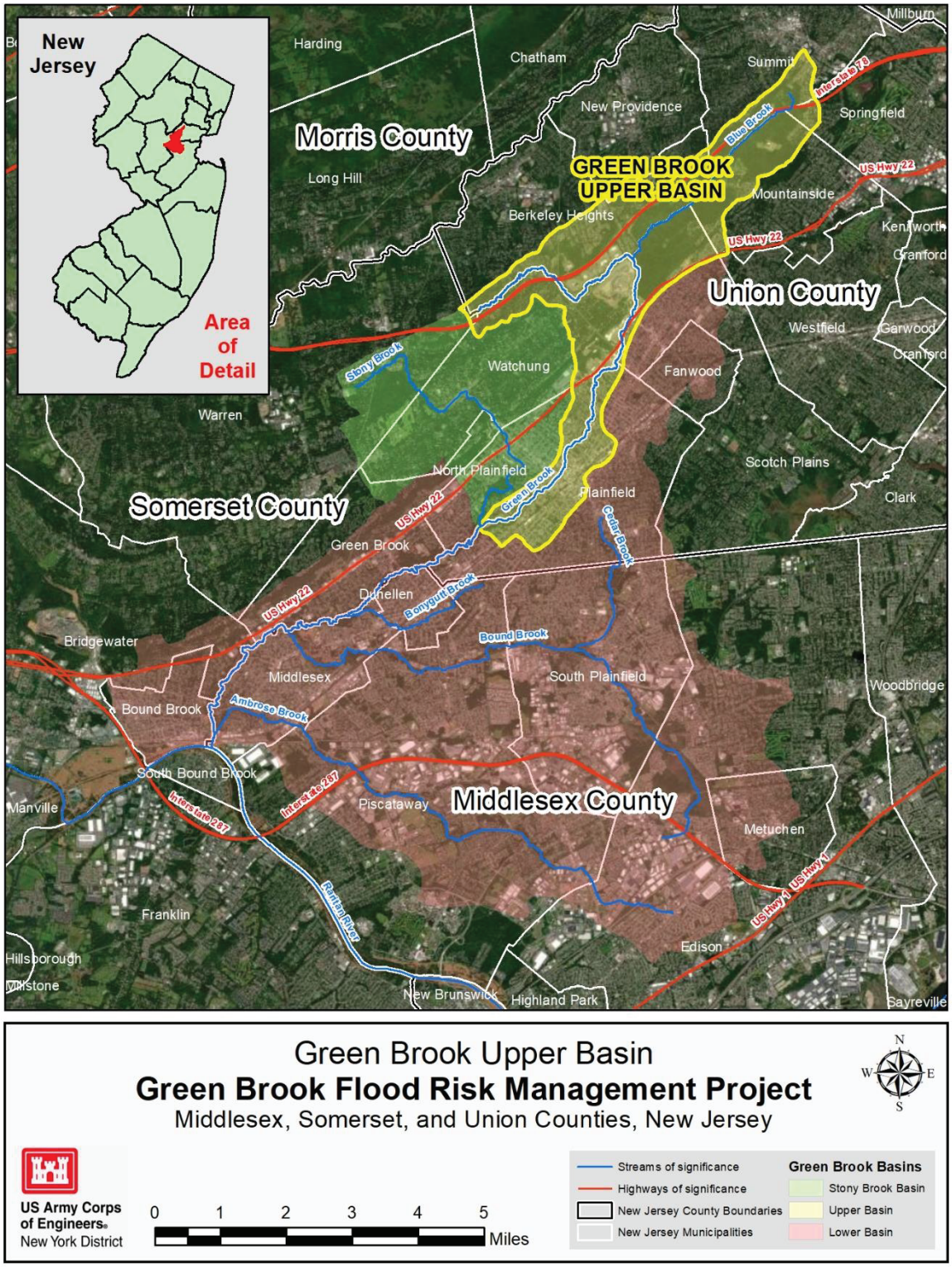

Figure 1. Green Brook FRM Project Area – Upper Basin shown in Yellow

DOCUMENTATION OF RISKS AND ISSUES

FACTORS AFFECTING THE LEVELS AND SCOPES OF REVIEWS

Mandatory IEPR Triggers.

- Is the estimated total project cost, including mitigation, greater than $200 million? No, the previous NED plan re-examined in the Final Validation Report (2021) had a total project cost of $200,555,000 and was determined to not be economically justified. Therefore, for a project to be economically justified to the same level of protection, project costs are likely to be less than the $200 million.
- Has the Governor of an affected state requested a peer review by independent experts? No, the Governor of New Jersey has not requested a peer review by independent experts.
- Has the Chief of Engineers determined the project study is controversial due to significant public dispute over the size, nature or effects of the project or the economic or environmental costs or benefits of the project (including but not limited to projects requiring an Environmental Impact Statement)? No, the Chief of Engineers has not determined that the project study is constroversial due to significant public dispute over the size, nature, or effects of the project or the economic or environmental costs or benefits of the project. However, it is possible that if detention basins or diversion tunnels proceed in the GRR, there may be environmental concerns that could be controversial.

Level and Scope of Review.

The Green Brook Upper Basin FRM Project, Somerset, Middlesex and Union Counties, New Jersey GRR study includes modeling of riverine flooding in HEC-RAS and economic analysis to evaluate and compare FRM alternatives. The scope of the review includes review of the Integrated Feasibility Report and National Environmental Policy Act (NEPA) documentation, any associated analyses generated for this study, and review of any read-ahead materials for major milestones. The Green Brook Upper Basin FRM Project is part of the Green Brook FRM Project, which includes federally-authorized segments in the lower basin and Stony Brook basin. In the lower basin, USACE has constructed Segments U, R, T, and N of the Green Brook FRM Project and construction is ongoing in Segments B and C. Congress has authorized funding for construction of a majority of the remaining FRM features in the Green Brook FRM Project in the lower basin. FRM alternatives examined in this GRR must evaluate the Green Brook FRM Project as a system and any impacts from proposed work in the Upper Basin would have to be factored into the hydraulic and economic evaluation in this GRR.

- <u>Will the study likely be challenging?</u> The study is likely to be moderately challenging from an engineering perspective. While the study is proposing conventional FRM measures, the PDT must examine the hydraulic interdependencies and potential impacts of proposed FRM measures on constructed and un-constructed (planned for construction) segments of the Green Brook FRM Project, which would require extensive hydrology and hydraulics modeling. Additionally, if detention basins are retained in the study, USACE design standards for detention basins would be applicable. Design of detention basins would require extensive engineering analyses beyond what is currently scoped in the study's project management plan (PMP) and would require additional policy waivers from 3x3x3 requirements for scope and budget.

- Provide a preliminary assessment of where the project risks are likely to occur and assess the magnitude of those risks. USACE has previously encountered opposition to proposed plans (detention basins and channelization) due to environmental concerns in this study area, so if a recommended plan is controversial or encounters opposition from the the public, the non-Federal sponsor, local municipalities, and/or stakeholders, there could be delays in project implementation.
- Is the project likely to be justified by life safety or is the study or project likely to involve significant life safety issues? The 2021 Validation Report details that the Flood of 1973 caused 6 deaths in the City of Plainfield in Stony Brook portion of the Green Brook Basin and resulted in 34 injuries in the Basin. Flooding caused by Tropical Storm Floyd in 1999 also resulted in 2 deaths in the lower basin portion of the watershed. While no deaths from flooding are documented in the Upper Basin, a substantial portion of the population in the Upper Basin still remains exposed to flooding. As recently as Hurricane Ida in 2021, flooding in the Upper Basin from Green Brook was documented by local stakeholders that resulted in damages to homes and businesses, inundation of roads, and flooding of vehicles. Additionally, the City of Plainfield and Borough of North Plainfield both contain significant and sizable Environmental Justice communities.
- 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?
  It is unlikely that information in the decision document or proposed project design will 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 conslusions 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?
  Due to the complexity of the Green Brook FRM Project, it is likely that the project design would require redundancy, resilience, and/or robustness, unique construction sequencing, or a reduced or overlapping design/construction schedule. Specifically, as segments in the Green Brook FRM Project in the lower and Stony Brook Basin are constructed, a proposed project design in the Upper Basin would have to factor those project segments and the potential interdependencies of project features in the Upper Basin with features in the rest of the Green Brook Basin. The extent of project features is likely to result in construction sequencing to initiate following completion of the segments in the lower and Stony Brook basins.
- Is the project expected to have more than negligible adverse impacts on scarce or unique tribal, cultural, or historic resources?
  This 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 to tribal, cultural, or historic resources.
- Is the project expected to have substantial adverse impacts on fish and wildlife species and their habitat prior to the implementation of mitigation measures?
  The project is not expected to have substantial adverse impacts on fish and wildlife species and their habitat prior the implementation of mitigation measures. The project will be formulated to minimize or avoid impacts to listed fish and wildlife species and their habitat.
- 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 neglibile adverse impacts on endangered and threatened species or their designated critical habitat before the implementation of mitigation measures. The project will be formulated to avoid impacts to federally-listed fish and wildlife species and their critical habitat and minimize impacts to state-listed fish and wildlife species and their critical habitat.

Assessment of the District Chief of Engineering.

In accordance with Engineer Regulation (ER) 1165-2-217 (1 May 2021), Civil Works Review Policy, the New York District Chief of Engineering has made a risk informed determination that there is a significant threat to human life from the FRM components (dams, floodwalls and levees) included in this project. The ER 1165-2-217, Civil Works Review Policy, states that a project may require a Safety Assurance Review (SAR) if there is a significant threat to human life. The Chief recommends that the District complete an Independent External Peer Review (IEPR) in the feasibility phase of the study and a Safety Assurance Review (SAR) during the Planning, Engineering, and Design (PED) phaseof this project as documented in the memorandum for the record with subject: Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, NJ General Reevaluation Report (Safety Assurance Review) Risk Informed Assessment of Significant Threat to Human Life (15 December 2022).

In accordance with ECB 2019-15 Interim Approach for Risk-Informed Designs for Dam and Levee Projects, the risk assessment will include an evaluation of the life and economic consequences, hazard curves, potential failure mode analysis, and determination of the annual probability of inundation.

REVIEW EXECUTION PLAN

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

District Quality Control (DQC). All decision documents and accompanying components (including supporting 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. The home district shall manage DQC. Documentation of DQC activities is required and should be in accordance with the Quality Manual of the District and the home MSC.

Agency Technical Review (ATR). ATR will be 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. The ATR team will ensure that proper and effective DQC has been performed (as assessment of which will be documented in the ATR report) and will ensure that the product is consistent with established criteria, guidance, procedures, and policy. If significant life safety issues are involved in a study or project, a safety assurance review should be conducted during ATR. At a minimum, ATR of the draft and final decision documents and supporting analyses is required (ER 1165-2-217, paragraph 5.3); however, targeted reviews may be scheduled as needed.

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

Cost Engineering Review. All decision documents will be coordinated with the Cost Engineering Mandatory of Expertise (MCX). The MCX assisted 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 occur as part of ATR.

Policy and Legal Review. All decision documents will be reviewed for compliance with law and policy. ER 1105-2-100, Appendix H, and Director's Policy Memorandum 2019-01, both provide 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.

Public Review. The district will post the Review Plan and approval memo on the district internet site. Public comment on the adequacy of the Review Plans will be accepted and considered. Additional public review will occur when the report and environmental compliance document(s) are released for public and agency comment.

Table 3 provides the schedules and costs for reviews. The specific expertise required for the teams are identified in later subsections of this plan covering each review. These subsections also identify requirements, special reporting provisions, and sources of more information.

Table 3 Schedule and Costs of Reviews

Product(s) to undergo Review	Review Level	Site Visit	Start Date	End Date	Cost	Complete
FWOP Hydrology and Hydraulics and Economic Modeling	Targeted District Quality Control	No	5/8/2023	5/26/2023	$2,400	No
FWOP Hydrology and Hydraulics and Economic Modeling	Targeted Agency Technical Review	No	5/29/2023	6/23/2023	$8,050	No
FWP Hydrology and Hydraulics and Economic Modeling	Targeted District Quality Control	No	9/18/2023	10/13/2023	$2,400	No
FWP Hydrology and Hydraulics and Economic Modeling	Targeted Agency Technical Review	No	10/16/2023	11/24/2023	$8,050	No
Draft Feasibility Report / EA or EIS	District Quality Control[1]	Yes	11/27/2023	1/8/2024	$35,200	No
Draft Feasibility Report / EA or EIS	Agency Technical Review[2]	No	2/7/2024	4/18/2024	$69,200	No
Draft Feasibility Report / EA or EIS	IEPR, Scoping (Corps costs)	N/A	10/6/2023	11/6/2023	$27,500	No
Draft Feasibility Report / EA or EIS	IEPR, Contractor Review	N/A	2/7/2024	5/8/2024	$200,000	No
Draft Feasibility Report / EA or EIS	Policy and Legal Review	Yes	2/7/2024	4/26/2024	n/a	No
Final Feasibility Report / EA or EIS	District Quality Control[1]	N/A	6/28/2024	7/26/2024	$24,000	No
Final Feasibility Report / EA or EIS	Agency Technical Review[2]	N/A	8/22/2024	10/10/2024	$39,800	No
Final Feasibility Report / EA or EIS	Policy and Legal Review	N/A	10/11/2024	1/7/2025	n/a	No

[1]DQC budget assumes 10 disciplines at the following rates:

- Targeted DQC of Hydrology & Hydraulics and Economics Modeling - includes 2 disciplines (Hydrology and Hydraulics Engineering and Economics) - $2,400 per discipline, $160 per hour for a total of 15 hours, split evenly between review of FWOP and Future with Project (FWP) modeling.
- Draft Integrated Integrated Feasibility Report/Environmental Assessment or Environmental Impact Statement (IFR/EA or EIS) - 8 disciplines at $4,000 per discipline, $160 per hour for a total of 25 hours; 2 disciplines with targeted ATR responsibilities funded at $1,600 per discipline, $160 per hour for a total of 10 hours.

- Final Integrated IFR/EA or EIS – 10 disciplines at $2,400 per discipline, $160 per hour for a total of 15 hours.

[2]ATR budget assumes 11 disciplines, 1 ATR Lead (assumed to be a member of the ATR Team), and 1 PCX review manager at the following rates:

- PCX Review Manager - $6,000; split $1,000 in the Targeted ATR, $3,000 in the Draft Report line item (which includes labor associated with review and endorsement of this review plan), and $2,000 in the Final Report line item.
- ATR Lead, funding for tasks as ATR Lead - $7,500; split $1,000 in the Targeted ATR, $3,900 in the Draft Report line item and $2,600 in the Final Report line item.
- Targeted ATR of Hydrology & Hydraulics and Economic Modeling - includes 3 disciplines (Hydrology and Hydraulics Engineering, Economics, and Climate Preparedness and Resilience Reviewer) - $4,500 per discipline, $180 per hour for a total of 25 hours – split evenly between review of FWOP and FWP modeling.
- Draft Integrated IFR/EA or EIS - 8 disciplines at $6,100 per discipline, $180 per hour for a total of 34 hours; 3 disciplines with targeted ATR responsibilities funded at $4,500 per discipline, $180 per hour for a total of 25 hours.
- Final Integrated IFR/EA or EIS - 11 disciplines at $3,200 per discipline, $180 per hour for a total of 18 hours.

a. DISTRICT QUALITY CONTROL

The home district will manage DQC and will appoint a DQC Lead to manage the local review (see ER 1165-2-217, Chapter 4). Table 4 identifies the required expertise for the DQC team. The DQC Team members should not be involved in the production of any of the products reviewed.

Table 4: Required DQC Expertise

DQC Team Disciplines	Expertise Required
DQC Lead	A senior professional with extensive experience preparing Civil Works decision documents and conducting DQC and is assumed to serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc.).
Planning	A senior water resources planner with extensive experience with formulation of flood risk management studies and general planning policy and guidance.
Economics	A senior economist familiar with the processes for evaluating structural and non-structural measures for flood risk management studies. The team member should have knowledge of the applicable models and software used in the economic analysis including HEC-FDA and LifeSim.
Environmental Resources	A senior environmental resources specialist with experience in environmental evaluation and compliance requirements pursuant to the 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 resources specialist with experience in environmental evaluation and compliance requirements pursuant to the the "Procedures for Implementing NEPA" (ER 200-2-2), National Historic Preservation Act (NHPA) Section 106 requirements, national environmental laws and statutes, New Jersey state historic and cultural preservation statutes, and other federal planning requirements for civil works projects.
Hydrology and Hydraulic Engineering	A senior hydrologic and hydraulic engineering specialist with extensive experience with riverine modeling in HEC-RAS and HEC-HMS.
Civil/Structural Engineering	A senior civil engineer with extensive experience in design and evaluation of flood risk management structures.
Geotechnical Engineering	The reviewer will have extensive experience reviewing boring samples, sediment samples, and geotechnical requirements related to FRM measures.
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 be familiar with designs and quantities associated with FRM measures.
Real Estate	A senior real estate specialist with experience in real estate planning and land acquisition for cost shared and full Federal water resources projects.

DQC Team Disciplines	Expertise Required
Nonstructural Formulation and Evaluation	The reviewer will have experience in formulation and evaluation of nonstructural plans and implementation/design of nonstructural measures.

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

Documentation of completed DQC will be provided to the MSC, RMO and ATR Team leader. Documentation available at the time of ATR will be made available to the ATR Team. The team will examine DQC records and comment in the ATR report on the adequacy of the DQC effort.

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. The RMO will manage the ATR. ATR will be performed by a qualified team from outside the home district that is not involved in the day-to-day production of the project/product. ATR will be performed by a team whose members are certified or approved by their respective Communities of Practice (CoPs) to perform reviews. The RMO will identify an ATR lead and ATR team members. Neither the home District nor the MSC will nominate review team members. The ATR team lead will be from outside the home MSC. The ATR team lead is expected to participate in the study's milestone meetings (PB 2018-01), the cost of which is not included in the estimates provided in Table 3. Targeted ATR or review of interim products is not anticipated at this time. Should such be needed, the RP will be updated, as appropriate. Lists of certified reviewers are maintained by the various technical Communities of Practice (see ER 1165-2-217, Chapter 5.5.3).

Table 5 identifies the disciplines and required expertise for this ATR Team (also see Attachment 1 - the ATR Team roster.

Table 5: Required ATR Team Expertise

ATR Team Disciplines	Expertise Required
ATR Lead (the ATR Lead should be from outside of the home MSC)	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	The Planning reviewer should be a senior water resources planner with experience in formulation of flood risk management studies especially in urban, highly developed areas.
Economics	The economics reviewer should have extensive experience in urban flood risk management studies and a thorough understanding of HEC-FDA and LifeSim. This team member will also be experienced with performing and presenting risk analyses in accordance with ER 1105-2-101 and other related guidance, including assessment of life risk consequences and familiarity with

ATR Team Disciplines	Expertise Required
	how information from the various disciplines involved in the analysis interact and affect the results.
Environmental Resources	Team member will have independently completed EA/EIS's and be well versed in the NEPA process, partnerships with other environmental resource agencies and environmental concerns and constraints within urban settings. The team member should also have knowledge of HTRW issues common to urban environments and developed areas.
Hydrology and Hydraulic Engineering	Team member should be an expert in the field of urban hydrology and hydraulics, have a thorough understanding of flash flooding and open channel systems, and have a thorough understanding of the use of HEC computer modeling systems. The member should also have the ability to perform H&H analyses in consideration of anticipated climate change. A certified professional engineer is required.
Civil Engineering	Team member should have experience in the design of plans for various flood risk management features including structural, non-structural, and nature-based. The reviewer should be well versed in the life safety risks associated with flood risk management projects.
Structural Engineering	Team member should be an expert structural engineer with extensive experience in the design and evaluation of flood risk management structures in highly urbanized environments. A certified professional engineer is required.
Geotechnical Engineering	Team member will be an expert at reviewing boring samples, sediment samples, and geotechnical requirements related to FRM measures. A certified professional engineer is required.
Cost Engineering	Team member will be familiar with cost estimating for similar projects in MII. Review includes construction schedules and contingencies for any document requiring Congressional authorization. The team member will be a registered Professional Engineer, Certified Cost Technician, a Certified Cost Consultant, or a Certified Cost Engineer. As the Cost Engineering Center of Expertise, Walla Walla District will assign this team member.
Real Estate	Team member will have at least 5 years of experience with flood risk management studies and be familiar with urban planning and acquisition strategies and preparation of Real Estate Plans. Team member should also extensive knowledge of USACE guidance related to nonstructural plan formulation and real estate plan development.
Climate Preparedness and Resilience CoP Reviewer	A member of the Climate Preparedness and Resiliency Community of Practice will participate in the ATR review.
Risk and Uncertainty Reviewer	As the decision document involves significant risk and uncertainty related to hydrologic and hydraulic modeling for inland FRM, this study would recommend a subject matter expert in multi-discipline flood risk analysis to ensure consistent and appropriate

ATR Team Disciplines	Expertise Required
	identification, analysis, and written communication of risk and uncertainty.

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. All members of the ATR team will use the four part comment structure (see ER 1165-2-217, Chapter 5). If a concern cannot be resolved by the ATR team and PDT, it will be elevated to the vertical team to resolve using the issue resolution process in ER 1165-2-217, chapter 5.9. Concerns will be closed in DrChecks by noting the concern has been elevated. The ATR Lead will prepare a Statement of Technical Review (see ER 1165-2-217, chapter 5.11 and Appendix D), for the draft and final reports, certifying that review issues have been resolved or elevated. ATR will be certified when all concerns are resolved or referred to the vertical team and the ATR documentation is complete.

c. INDEPENDENT EXTERNAL PEER REVIEW

IEPR is managed outside of the USACE and conducted on studies. The IEPR panel will 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.
The New York District Chief of Engineering has made the risk-informed recommendation to conduct an IEPR for the GRR based on the scope and complexity of proposed FRM measures (detention basins, diversion tunnels) and life safety concerns in the Upper Basin, but no mandatory triggers were exceeded. The scope and complexity of a proposed measures specifically detention basins and diversions tunnels would require extensive engineering analyses to meet current USACE design standards. Additionally, the PDT identified substantial concerns related to life safety in the Upper Basin and significant residual risk remaining with the failure or non-performance of proposed FRM measures, specifically detention basins. The decision is documented in the memorandum for the record with subject: Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, NJ General Reevaluation Report (Safety Assurance Review) Risk Informed Assessment of Significant Threat to Human Life (15 December 2022).

The general purpose of the IEPR is to consider the adequacy, appropriateness, and acceptability of the design in assuring public health, safety, and welfare.

Mandatory Triggers	Yes	No	To Be Determined
Exceeds $200 million (Sect 1044 of WRDA 2014)		**X**	
Request by Governor of New Jersey		**X**	
Controversial as determined by USACE Chief of Engineers			**X**

Products to Undergo IEPR. The full draft integrated feasibility report and NEPA documentation and associated 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 6 lists the required panel expertise.

Table 6: 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 demonstrated experience in public works planning. Direct experience working for or with USACE is preferred but not required. Panel Member must be very familiar flood risk management projects associated with tropical and extra-tropical storms.
Hydrology and Hydraulic Engineering	The Hydrologic and Hydraulic Engineering Panel Member should be a registered professional engineer in hydrologic and hydraulic engineering with an emphasis on large public works projects. 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, detention basins, and channel modification. 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 riverine hydraulics. The panel member should be familiar application of risk and uncertainty analyses in flood risk management studies. The panel member should also be familiar with standard hydrologic and hydraulic computer models such as HEC-1, HEC-HMS, HEC-2, and HEC-RAS.
Economics	The Economics Panel Member should be from academia, a public agency, a non-governmental entity, or an Architect- Engineer or Consulting Firm. Member must have experience directly related to water resource economic evaluation or review. Direct experience working for or with USACE is preferred but not required. Panel Member should be familiar with the USACE planning process, guidance, and economic evaluation techniques. Active participation in related professional societies is encouraged. Candidate should be familiar with the USACE flood risk management analysis and economic benefit calculations, including use of standard USACE computer programs including HEC-FDA.

IEPR Panel Member Disciplines	Expertise Required
Environmental	The panel member should be a scientist from academia, a public agency, a non-governmental entity, or an Architect- Engineer or Consulting Firm with 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 riverine and terrestrial ecology of the mid-Atlantic coast of North America. Active participation in related professional societies is encouraged.
Civil Engineering	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 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 projects. The panel member should also be familiar with and have demonstrated experience related to concrete floodwall, earthen levee foundation, channel modifications, diversion structures, and pumping station design and construction. Panel member should be familiar with the construction industry. Additionally, the panel member should be capable of addressing life safety 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 experience in civil or construction engineering. The panel member should have demonstrated experience in geotechnical engineering analyses for all phases of flood risk management 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 life risk aspects of all projects. Active participation in related professional engineering and scientific societies is encouraged.

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

d. SAFETY ASSURANCE REVIEW

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

Decision on Safety Assurance Review.

The New York District Chief of Engineering has made a risk-informed decision to recommend a Safety Assurance Review (SAR) for design and construction of the project as some of the alternative plans being proposed include significant threat to human life. However, since a plan has not been selected the decision on SAR may be revisited once the tentatively selected plan (TSP) has been identified and optimized. The decision is documented in the memorandum for the record with subject: Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, NJ General Reevaluation Report (Safety Assurance Review) Risk Informed Assessment of Significant Threat to Human Life (15 December 2022).

e. MODEL CERTIFICATION OR APPROVAL

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models are any models and analytical tools used to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making. The use of a certified/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 7: 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
HEC-FDA (Flood Damage Analysis) version 1.4.3	The Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA) program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating flood risk management plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans in Green Brook Upper Basin and to aid in the selection of a recommended plan to manage flood risk.	Certified
LifeSim version 2.0	LifeSim program is an agent-based estimation software that simulates population distribution during a flood to estimate life loss and direct damages. LifeSim may be used to estimate life loss during a flood event.	Certified
Regional Economic System (RECONS)	RECONS is a regional economic impact modeling tool that estimates jobs, income, and sales associated with Corps Civil Works spending and additional economic activities. The model will be used to estimate the regional economic impacts of project implementation.	Certified
Evaluation of Planned Wetlands (EPW)	The Evaluation of Planned Wetlands (EPW) model is a functional assessment model. It will be used to quantify the impacts to and benefits for wetlands	Approved for regional use
Northern New Jersey Fish Index of Biological Integrity (NNJ FIBI)	The NNJ FIBI is a functional assessment model that will be used to quantity impacts to and benefits for streams. The model utilizes the companion High Gradient Stream Habitat Assessment Worksheet developed as part of the EPA's Rapid Bioassessment Protocol. The Worksheet consists of a table comprised fo ten Habitat Parameters and four Condition Categories with a numerical scal that is used to evaluate and rate each Habitat Parameter.	Approved for regional use
High Gradient Macroinvertebrate Index (HGMI)	The HGMI is a functional assessment model that will be used to quantify impacts to and benefits for streams. The model utilizes the companion High Gradient Stream Habitat Assessment Worksheet developed as part of the EPA's Rapid Bioassessment Protocol. The Worksheet consists of a table comprised fo ten Habitat Parameters and four Condition Categories with a numerical scal that is used to evaluate and rate each Habitat Parameter.	Approved for regional 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 8: 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-RAS 6.3.1 (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/unsteady flow analysis to evaluate the future without- and with-project conditions along the streams of the Green Brook watershed and determine downstream impacts of proposed project features on authorized project features in the lower and Stony Brook basins of watershed.	HH&C CoP Preferred Model
HEC-HMS 4.10	This model will be used to define the watersheds' physical features; describe the metrological conditions; interior drainage analysis; estimate parameters; analyze simulations; and obtain GIS connectivity	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

f. POLICY AND LEGAL COMPLIANCE REVIEW

Policy and legal compliance reviews for draft and final planning decision documents have been delegated to the MSC (see Director's Policy Memorandum 2019-01).

(i) Policy Review.

The policy review team will be selected 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 may 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 will be documented in a Memorandum for the Record (MFR) produced for each engagement with the team. The MFR will 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 will 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 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.

DISCLAIMER: This information is distributed solely for the purpose of pre-dissemination review under applicable information quality guidelines. It does not represent and may not be construed to represent any agency determination or policy.

ATTACHMENT 1: TEAM ROSTERS

PROJECT DELIVERY TEAM		
Name	Office	Position
Nathanael Wales	CENAN-PP-C	Project Manager
Luis Santiago	CENAB-PLP	Lead Planner
Reegan Mccaulley	CENAN-PL-FW	Supporting Planner
Elena Manno	CENAN-EN-M	Technical Manager
Marko Nedzbala	CENAN-PL-S	Economist
Cheryl Alkemeyer	CENAN-PL-E	HTRW Specialist
Dag Madara	CENAN-PL-S	GIS Lead
Kailey Loughran	CENAN-PL-E	Cultural Resources Specialist
Kimberly Rightler	CENAN-PL-E	Biologist
Alexander Ring	CENAN-EN-C	Cost Engineer
Peyton Bethea	CENAN-RE-M	Real Estate Specialist
Thomas Jackson	CENAN-EN-H	Hydraulic Engineer
David Sleeper	CENAE-EDD	Structural Engineer
Shahid Shaikh	CENAN-EN-S	Civil Engineer
Laurie Gibeau	CENAE-EDW	Geotechnical Engineer
Tyra Lalor	CENAN-EN-C	Civil Engineer
Ruvini Perera	CENAN-EN-H	Hydraulic/Hydrologic Engineer

DISTRICT QUALITY CONTROL		
Name	Position	Experience
Karen Baumert	DQC Lead, CENAN-PL-FC	DQC Lead/Plan Formulation Reviewer
Andre Chauncey	CENAN-EN-H	Hydrology & Hydraulics Reviewer
Peter Weppler	CENAN-PL-E	Environmental Resources Reviewer
Thomas Hodson	CENAN-PL-S	Economics Reviewer
Carissa Scarpa	CENAN-PL-EW	Cultural Resources Reviewer
Jeff Gross	CENAN-EN-C	Cost Estimation Reviewer
Warren LaRiviere	CENAN-RE-M	Real Estate Reviewer
Stan Sedwick	CENAN-EN-DE	Civil & Structural Engineering Reviewer
Yousof Abdaljalil	CENAN-EN	Geotechnical Engineering Reviewer
TBD		Nonstructural Formulation and Evaluation

AGENCY TECHNICAL REVIEW		
Name	Position	Experience
Tom Jester	ATR Team Lead	Plan Formulation Reviewer/ATR Lead

POLICY AND LEGAL COMPLIANCE REVIEW TEAM		
Name	Office	Position
		Review Manager

ATTACHMENT 1: SAFETY ASSURANCE MEMORANDUM FOR NAN CHIEF OF ENGINEERING

CENAN-EN 15 December 2022

MEMORANDUM FOR RECORD

SUBJECT: Green Brook Upper Basin Flood Risk Management Project, Somerset, Middlesex and Union Counties, NJ General Reevaluation Report (Safety Assurance Review) Risk Informed Assessment of Significant Threat to Human Life

1. **Study/Project Information:** The project is located in the Upper Basin of the Green Brook Watershed, a sub-basin of the Raritan River Basin within the State of New Jersey. The Upper Basin consists of the floodplain from the Green Brook, Blue Brook, and Mine Brook above the confluence with Stony Brook and lies within the municipalities of Plainfield, North Plainfield, Watchung, Berkeley Heights, and Scotch Plains in New Jersey. The Upper Basin of the Green Brook Watershed originates in the Watchung Mountains, exits the slopes of the First Watchung Mountain, and enters a mostly urbanized and industrialized broad, flat floodplain encompassing large portions of the Township of Scotch Plains and the City of Plainfield. The drainage area for Green Brook above its confluence with Stony Brook is approximately 10.3 square miles.

   The Green Brook Upper Basin has been subject to frequent severe flooding from storms ranging from local thunderstorms to more widespread tropical storms. Flood problems within the upper basin are primarily due to rapid runoff associated with the steep topography within the Watchung Mountains. In the upper basin, runoff from the steep slopes of the First and Second Watchung Mountains is funneled into the Green and Blue Brooks. At the confluence with Blue Brook, Green Brook flows through a diagonal gorge in the First Watchung Mountain. At the base of the gorge, the topography flattens dramatically. At this point, Green Brook normally continues to flow southwestward along the foot of the First Watchung Mountain. Under flood conditions, however, flow far exceeds the capacity of the Green Brook channel and overtops the divide between the Cedar Brook and Green Brook watersheds. This flow spreads southeastward across the flat topography of Township of Scotch Plains and the City of Plainfield, inundating homes, industries and commercial centers before eventually returning to Green Brook via the Cedar Brook and Bound Brook tributaries. Six deaths were attributed to the flood of August 1973 in the Upper Basin area of the project. These deaths occurred in North Plainfield and Plainfield. Thirty-four persons were also injured, and estimates indicate that more than 1000 people were evacuated from their residences.

2. **Study/Project Description**: The General Reevaluation Report will use the 2001 Screening Analysis of Flood Control Alternatives for the Upper Portion of Green Brook Sub-basin Raritan River Basin (January 2001) and the Green Brook Upper Basin Flood

Risk Management Project, Somerset, Middlesex, and Union Counties New Jersey Final Validation Report (December 2019) as a basis to initiate plan formulation. The focus will be on re-examining alternatives detailed in those studies including evaluating structural and nonstructural measures including:

Structural Measures

Structural FRM measures are man-made, constructed measures that counteract a flood event in order to reduce the hazard or to influence the course or probability of occurrence of the event. Structural FRM measures evaluated in this study include:

- Levees
- Floodwalls
- Channel modification
- Dams (new dry or wet detention basins)
- Channel Diversion – Surface Diversion
- Channel Diversion – Tunnels

Nonstructural Measures

Nonstructural FRM measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures in that they focus on reducing the consequences of flooding instead of focusing on reducing the probability of flooding. Nonstructural FRM measures evaluated in this study include:

- Acquisition
- Relocation
- Elevation
- Floodproofing (wet or dry)

An initial array of alternatives has been developed by combining compatible FRM measures and will be revised as the reevaluation works through the formulation process, see Table 1.

Table 1: Initial Array of Alternatives

Alternative	Alternative Description
Alternative 1 (a-b…)	Floodwalls and levees
Alternative 2 (a-b…)	Channel modification with bridge raising and Upstream Detention
Alternative 3 (a-b…)	Diversion Tunnels
Alternative 4 (a-b…)	Nonstructural Plan consisting of acquisition, relocation, elevation, and floodproofing
Alternative 5	Combination Plan (TBD)

3. **Risk Informed Assessment**: Since dams, floodwalls and levees are included as possible structural solutions, a Safety Assurance Review (SAR) as part of the Type I IEPR is warranted due to the potential for risk to life safety involved in any FRM evaluation. However, it is too early in the evaluation process to accurately predict the level of risk involved to human life.

4. **Determination:** A SAR is required at this time; however, since a plan has not been selected, the risk informed assessment of the significant threat to human life maybe revisited once the tentatively selected plan is identified and optimized.

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