Programmatic Environmental Assessment
Stream and Shoreline Stabilization in New York and New Jersey

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U.S. Department of Homeland Security
Federal Emergency Management Agency Region II
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LIST OF ABBREVIATIONS

APE	Area of Potential Effect
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
CAFRA	Coastal Area Facility Review Act
CATEX	Categorical Exclusion
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resources System
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Plan
DLUR	Department of Land Use Regulation
EA	Environmental Assessment
EFH	Essential Fish Habitat
EHP	Environmental and Historic Preservation
EIS	Environmental Impact Statement
ES&C	Erosion and Sedimentation Control
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
HMA	Hazard Mitigation Assistance
HTL	High Tide Line
IPaC	Information for Planning and Consultation
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service

NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWP	Nationwide Permit
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
OHWM	Ordinary High Water Mark
OPA	Otherwise Protected Area
PA	Public Assistance
PEA	Programmatic Environmental Assessment
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter 2.5 micrometers
PM_{10}	Particulate Matter 10 micrometers
REC	Record of Environmental Consideration
RHA	Rivers and Harbors Act
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Office
SOW	Scope of Work
SPDES	State Pollutant Discharge Elimination System
SPGP-1	State Programmatic General Permit-1 for Emergency Response and Storm Recovery Activities in Regulated Waters in New York State
SSEA	Site-Specific Environmental Assessment
SSA	Sole Source Aquifer
THPO	Tribal Historic Preservation Office
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WRSA	Wild and Scenic Rivers Act

1.0 INTRODUCTION

The Federal Emergency Management Agency (FEMA) makes federal assistance available to state, local, tribal, and territorial governments and certain private nonprofit entities under the Public Assistance (PA) and Hazard Mitigation Assistance (HMA) Programs. These partners are FEMA's Recipients and Subrecipients. PA grants are used to repair or restore disaster-damaged facilities and may include mitigation measures along with repair in accordance with Section 406 of the Stafford Act (406 Mitigation). HMA encompasses several grant programs, including the Pre-Disaster Mitigation and Hazard Mitigation Programs, the latter known as 404 Mitigation. Stream work, shoreline stabilization, and stream bank stabilization are common components of response, recovery, mitigation, and resiliency projects in New York State and New Jersey.

FEMA is required during decision making to evaluate and consider the environmental consequences of its federal actions, in accordance with The National Environmental Policy Act (NEPA; 42 U.S.C. §§ 4321–4327); the Council on Environmental Quality (CEQ) regulations implementing NEPA (Title 40 Code of Federal Regulations [CFR] §§ 1500–1508); Department of Homeland Security (DHS) Instruction Manual 023-01-001-01, Revision 01, *Implementation of the National Environmental Policy Act* (DHS Directive); FEMA Directive 108-1: *Environmental and Historic Preservation Responsibilities and Program requirements* (Environmental Planning and Historic Preservation [EHP] Directive); and FEMA Instruction 108-1-1: Instruction on Implementation of the Environmental Planning and Historic Preservation Responsibilities and Program Requirements (EHP Instruction). The purpose of an Environmental Assessment (EA) is to analyze the potential environmental impacts of project alternatives including, a No Action alternative, and to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI). A Programmatic Environmental Assessment (PEA) assesses environmental impacts of proposed policies, plans, programs, and groups of actions. The CEQ issued guidance for Effective Use of Programmatic NEPA Reviews in 2014 (CEQ, 2014).

1.1. Use of this Programmatic Environmental Assessment

This PEA facilitates compliance with NEPA for FEMA-funded actions that include streambank and shoreline stabilization in the states of New Jersey and New York, regardless of FEMA funding program. It will be used to streamline review of proposed streambank and shoreline projects that exceed existing thresholds in FEMA's categorical exclusions (CATEX). It may be used in conjunction with other CATEXs for projects where other elements of the project scope meet CATEX thresholds, conditions, and requirements.

Regulations 40 CFR Part 1500.4(i), 1502.4 and 1502.20 encourage the development of program-level NEPA documents and tiering to eliminate repetitive discussions and to focus on the issues specific to the subsequent action. This analysis is programmatic in nature and does not address individual site-specific impacts, or impacts arising from other elements of a proposed scope of

work (SOW). FEMA will prepare a Record of Environmental of Consideration (REC) for each proposed action that may be tiered off this PEA. The REC will refer to the PEA in its analysis, address site-specific conditions, evaluate impacts relating to other project components, and document compliance with applicable environmental and historic preservation laws.

If the project is consistent with the scope, impacts, and mitigation described in the PEA, then FEMA will only prepare a REC. If the project is consistent with the scope described in this PEA, but creates impacts not described; create impacts greater in magnitude, extent, or duration than described; or require mitigation measures to minimize impacts that have not been described in this PEA; then FEMA will prepare a Site-Specific Environmental Assessment (SSEA) that is tiered from this PEA. The SSEA will contain an appropriate level of analysis to determine the significance of impacts that exceed those described in this PEA. After a public notice and 30-day comment period, FEMA will determine whether to issue a FONSI or to prepare an EIS for the specific action. For the purpose of this PEA, "FEMA" will mean FEMA Region II.

2.0 PURPOSE AND NEED

The purpose of FEMA's grant programs is to promote cost-effective mitigation measures that reduce or eliminate the risk of loss of life and property in response to and to recover from major disasters or emergencies. Streambank and shoreline repairs from storm damage and projects to stabilize embankments to protect infrastructure are common elements of FEMA projects. PA primarily supports communities in restoring pre-disaster functions with possible cost-effective mitigation to protect projects from future damages. HMA supports communities with projects that are intended to prevent future damage and reduce the costs associated with risks to life, property, and loss of function.

This PEA is needed to complete review of multiple current proposals to restore the function of embankments along roads, streams, and infrastructure to protect from further damage to those sites that will address safety and health; water quality; and land use. This PEA is also needed to systematically assess similar types of projects that FEMA anticipates in future incidents, to streamline review timelines, and increase predictability in the review process.

3.0 PROJECT BACKGROUND

November 2014, DHS published a Federal Register Notice[1] changing FEMA's implementation of NEPA to align with other DHS components which were fully implemented in August 2016. As a result of administrative changes in FEMA's implementation of NEPA, FEMA observed that multiple otherwise routine projects would now require EAs under more narrow definitions. FEMA

[1] Federal Register 79 FR 70538 Docket # DHS-2013-0052

considered current projects now subject to this more restrictive application and considered the potential of past projects to have had significant impacts. FEMA also considered NEPA implementation by agencies that fund, approve, or carry out similar actions and the scale and intensity of those projects for comparison. FEMA prepared this PEA to evaluate such actions and to streamline current and future project reviews. FEMA and DHS have categorically excluded from higher levels of NEPA, review actions that repair, protect, or upgrade existing facilities in upland and coastal areas: CATEX N2 (Federal Assistance for Facility Repair) and CATEX N7 (Federal Assistance for Structure and Facility Upgrades) apply to repairs and improvements to existing facilities but they exclude work affecting streams and coastal areas unless it incorporates bioengineering. CATEX N4 (Federal Assistance for Actions Involving Stream Work and Modification and Floodways) applies to actions in or affecting streams and streambanks that use bioengineering that disturb no more than one-half acre of ground and affect less than 300 feet of streambank. CATEX N5 (Federal Assistance for Actions in Coastal Areas Subject to Moderate Wave Action or V Zones) applies to similar work on coastal sites, and limits work to actions that disturb less than one half acre of ground seaward of the limit of moderate wave action or in coastal areas with velocity hazards due to wave action. Bioengineering is also encouraged in shoreline applications in accordance with CATEX N5.

FEMA sampled 215 PA and HMA projects incorporating stream restoration, stream bank stabilization, and shoreline stabilization from the last decade in New York and New Jersey. PA projects accounted for 196 of these, and the remaining 19 were HMA projects. This sampling provided an example of the range of project scopes, dimensions, and project locations in these states, but there is not a “typical” embankment project. Embankments are damaged and require repair in urban, rural, coastal, mountainous, flat, inland, and agricultural areas. Some repair pre-existing structures; others restore natural embankments using new materials. The majority of non-coastal projects are adjacent to roads.

FEMA surveyed the CATEXs of other Federal Agencies for comparison of thresholds associated with ground disturbance and streambank and coastal actions. FEMA also considered thresholds for levels of review in New York State’s State Environmental Quality Review Act and New Jersey’s State Executive Order 215.

4.0 ALTERNATIVES

NEPA guidance requires that federal agencies explore and objectively evaluate reasonable alternatives for proposed actions. NEPA guidance also requires evaluation of a No Action Alternative as a benchmark to evaluate other actions. A preferred alternative is not identified in this document because not all of the alternatives would meet a project’s purpose and need at all project locations. Subrecipients may determine that a specific project location requires an integrated, hybrid stabilization solution, consisting of a combination two or more of the alternatives that are evaluated in this PEA.

4.1 No Action Alternative

Under the No Action Alternative, FEMA would only fund projects disturbing no more than 300 feet of embankment and disturbing no more than one half acre of ground. Projects that exceed these thresholds would either not be funded or would require individual EAs. Bioengineering at the Subrecipient's cost of maintenance and monitoring would be required on all projects. FEMA reviewers would continue to interpret what constitutes bioengineering inconsistently. This would delay project implementation and increase risk of noncompliance if Subrecipients move ahead with work prior to completion of review, jeopardizing their funding. Damaged, unstable sites would pose an ongoing risk to the public and potentially other environmental resources until they can be restored or stabilized.

4.2 Action Alternatives Common Scope of Work

All action alternatives will require authorization by the United States Army Corps of Engineers (USACE), and projects may be authorized by USACE general permits for emergency response activities or activities affecting a specific geographic area. FEMA anticipates that Nationwide Permit (NWP) 3 Maintenance, NWP 13 Bank Stabilization, or NWP 54 Living Shorelines to be the most common. Other NWPs may be applicable to specific projects instead or in addition to these. Nationwide permits 13 and 54 apply to projects that are less than 500 feet in length, but USACE has authority to waive this limit. Pre-construction notification is required for NWP 13 when projects exceed 500 feet or when fill exceeds one cubic yard per running foot below the ordinary high-water mark (OHWM) or high tide line (HTL) and is required for all NWP 54 projects.

Embankment stabilization may take place in ground that is undergoing erosion or has been damaged by storm events, but otherwise has not been previously disturbed. Some methods may require excavation landward of the OHWM in order to anchor tiebacks, cribbing, stone, or other structure in stable ground. FEMA is limiting the scale considered in this PEA to no more than one linear mile and no more than five acres of ground disturbance; FEMA is limiting the scale of new bulkheads in this PEA to no more than 1,000 linear feet. This is based on past FEMA Region II EAs, other federal agency CATEXs, and a sampling of the New York and New Jersey review thresholds. Construction activities that may be associated with any of the alternatives discussed below include:

- Demolition or modification of existing facility or structure
- Tree and vegetation cutting, clearing, and removal
- Excavation in upland, embankment, and streambed areas
- Grading
- Staging areas and site access routes
- Erosion and sediment control (ES&C) measures

- Dewatering and temporary stream diversion
- Traffic disruptions, lane closures, possible detours for projects in sites adjacent to roadways
- Site closure and stabilization

4.2.1 Action Alternative 1: Return to Pre-Disaster Function

This alternative encompasses projects that repair or reconstruct stream embankments using different materials or in an expanded footprint without changing the function or capacity of pre-existing embankment. Examples of this type of work include the use of sheet pile to replace a damaged concrete bulkhead while maintaining pre-disaster geometry and dimensions; installation of large, properly sized, stone toe protection to replace washed out riprap or native stone, minor extension of embankment structures to tie into stable ground, or installation of drainage systems behind existing or restored retaining walls or revetments.

This alternative may apply to changes required to bring a previously permitted facility into compliance with new state or federal permit conditions or accepted codes and standards. Limited increases to length may be necessary to ensure that the ends of the embankment reconstruction are embedded in stable, non-eroded soils.

This type of work is typically authorized by USACE NWP 3 when its purpose is to repair, replace or rehabilitate previously authorized facilities, regardless of length. It may also be authorized by other NWPs, by state and federal emergency authorizations, or special permits issued for storm recovery work.

Typically, this work would be performed in previously disturbed ground, generally in the same footprint as the damaged facility. Best engineering practices may require increases in length or depth of excavation for footings. In addition to items listed in the discussion of the common SOW, specialized construction activities that may be associated with this alternative include but are not limited to:

- Specialized construction practices such as pile driving, cast-in-place concrete in water
- Installation of drainage systems behind retaining walls

4.2.2 Action Alternative 2: Bioengineering

This alternative encompasses projects that use plant materials alone or in combination with other practices to stabilize embankments adjacent to streams or shorelines. FEMA has adopted the following definitions of bioengineering as “the use of a combination of biological, mechanical, and ecological concepts to control erosion and stabilize soil through the sole use of vegetation or a combination of vegetation and construction materials” and “the use of living and non-living plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction, and vegetative establishment.” It may include practices such as fascines, coir logs and mats, root wads, tree revetments, vegetated banks, live stakes, spiling, wattles, live brush

mattress, large woody debris structures known as engineered log jams, and similar methods. Bioengineering can also include vegetating upland areas adjacent to bodies of water to minimize impacts from stormwater runoff. Living shorelines are considered in this alternative, as they incorporate bioengineering with other native material, including hard structural elements like rock sills or shellfish reefs.

In some low velocity situations, bioengineering alone can be used below OHWM, but under most conditions where erosion is actively taking place, plantings would be positioned higher on a streambank or anchored into stable ground to prevent washouts. Plant materials can be incorporated into traditional structural embankment armoring practices like riprap toe slope protection, retaining walls, geogrid or geocellular systems, and soil nailing techniques, depending on project specific needs. Bioengineering practices perform differently and should be selected to meet site- and project specific conditions including site hydrology and hydraulics and local land use. A site that can tolerate a dynamic streambank or coastline may lend itself to a more naturalistic plant-based design solution, while a site that requires a stable bank to protect infrastructure will be better served by a more structural approach. Vegetative measures can also be used above OHWM to stabilize soil above riprap or other toe slope armoring [NAS 2005, USACE & DEC 2017].

Projects in coastal areas can consist of bioengineering alone, traditional bioengineering and integrated structural practices, or they can be built as living shorelines. USACE notes that traditional bioengineering practices can be built close to a bank with minimal encroachment into the waterbody, making them useful in areas with limited space between the water and the OHWM or HTL [USACE 2016b]. In contrast, living shorelines are meant to have a substantial biological component that can include fringe wetlands or shellfish beds and can extend 30 feet seaward of the OHWM in the great lakes or the mean low water line in tidal waters.

This type of work is typically authorized by NWP 3, NWP 13 or NWP 54 or other USACE general permits or emergency authorizations. Projects in New Jersey that require pre-construction notification for NWP 13 and do not incorporate bioengineering must include an analysis to demonstrate that such measures are not practicable and/or appropriate [USACE 2017]. USACE and New York State Department of Environmental Conservation (NYSDEC) have developed a draft State Programmatic General Permit for Emergency Response and Storm Recovery Activities (SPGP-1) that would authorize embankment stabilization projects up to 500 feet in length that incorporate bioengineering practices with minimal project review. Projects that do not incorporate these elements will require prior authorization and approval [USACE & NYSDEC 2017]. State and federal permit conditions typically require use of native and non-invasive species when living plant material is used.

Specialized activities associated with this alternative include, but are not limited to:

- Excavation landward of embankment

- Bioengineering, including bare root planting, tree planting, hydroseeding
- Post-construction monitoring and maintenance

4.2.3 Action Alternative 3: In-Stream Structures

This alternative encompasses projects that use structures that extend into or fully cross a stream or river channel in an effort to limit bank erosion and stabilize channel gradients. These practices can be constructed of rock or woody plant material and are used in projects alone or in conjunction with other bank stabilization methods. This is considered an indirect method of embankment stabilization, meaning it functions by deflecting channel flows away from the bank or by reducing flow to non-erosive velocities [USEPA 2007]. In stream structures may emulate naturally occurring features found in stable stream beds. Depending on hydraulic and hydrologic characteristics of a site, they may reduce or eliminate the need for embankment armoring. They are used to control and direct the flow of dynamic stream channels from the outer bank of a river bend to the center of the stream or to the inner bank, reducing risk to parallel linear facilities like roads or utility lines or bridges and other stream crossings. These structures may be permanent or semi-permanent and are designed to permit the channel to approximate a state of dynamic equilibrium where stream bed and bank will continue to change but will be contained within a proscribed corridor [Miller and Kochel, 2013]. They also support reduction of erosion once vegetation either naturally recruits or is intentionally planted on adjacent banks. These structures can also be used for grade control on unstable streams that are aggrading, degrading, or undergoing head cutting.

Examples of this type of work includes stone structures like cross-vanes, J-hooks, rock vanes, bendway weirs, stream barbs and W-weirs. Woody structures include log weirs, or combinations of these practices with root wads, engineered log jams and other vegetative bioengineering methods. Cross-vanes and W-weirs are structures that span an entire channel and are keyed in to both stream banks, while rock vanes, J-hooks, and bendway weirs are single-arm structures that extend into channel flow and are keyed in to only one side of the stream bank [NAS 2014]. Some of these practices remain completely submerged under low-water conditions, while others have variable profiles that are not submerged under most conditions and key into banks.

USACE may authorize this kind of work alone or in conjunction with other activities under NWP 3, NWP 12 (Utility Line Activities), NWP 13, NWP 14 (Linear Transportation Projects), NWP 18 (Minor Discharges) or NWP 27 (Aquatic Habitat Restoration, Enhancement, and Establishment Activities). The draft USACE-NYSDEC SPGP-1 authorizes the use of J-hooks, log vanes, root wads, and cross vanes but requires project verification or prior authorization for their use.

This PEA does not cover construction of new coastal structures such as jetties, groins, breakwaters or other structures that are not placed parallel to a shoreline. The exception is unless they are part of a living shoreline project that has been authorized by NWP 54. FEMA will prepare a SSEA for

proposals that include construction of new perpendicular structures in coastal areas that exceed thresholds noted in CATEX N5.

Construction activities that may be associated with this type of work include but are not limited to:

- Placement of large rock, woody materials, and similar natural material in stream channel
- Use of geotextile or anchoring, such as pinning or grouting, in high-velocity conditions
- Excavation and placement of fill below the grade of existing streambed and banks as needed to place footers. Footers may be several feet deeper than what is typically encountered for embankment-only applications in similar conditions
- Post-construction monitoring to ensure structures are performing as planned

4.2.4 Action Alternative 4: Loose Stone/Riprap

This alternative encompasses projects that repair or replace damaged facilities using riprap or stone for toe protection and embankment stabilization without anchoring, grouting, interlocking, or other method of joining units together or to a substrate. Stone toe protection and riprap embankment stabilization are a common component of projects that are intended to mitigate damage or to restore pre-disaster function to washed out roads, utilities, and other facilities that are adjacent to or run parallel along streambanks and shorelines.

Alternative 4 includes a variety of stone-based practices, including longitudinal toe slope, riprap armoring [NAS 2005], stone fill trenching, and riprap blankets. Riprap can also be used to create benches on high banks that lack soil cohesiveness [NAS 2007b]. Like bioengineering, performance goals for these practices vary, and some are better suited than others to project- and site-specific needs. Typically, processed angular stone is used, and stone size and gradation is specified according to design objectives and site conditions. These factors include flow velocity and embankment side slopes. Native stone, broken concrete, bricks, other masonry rubble or precast units may be used in lieu of processed stone, depending on design considerations, permit conditions and availability of materials. Loose or random-placed stone is appropriate for embankments with no steeper than 50% slopes. Slopes that exceed 67% usually require structural treatments to achieve stabilization.

USACE typically authorizes this type of work with NWP 3, NWP 12, NWP 13, NWP 14, NWP 18. The draft SPGP-1 would authorize embankment stabilization projects that use only riprap if flow conditions preclude the use of bioengineering. In these cases, stone must be properly sized and toe stone must be anchored or keyed into the embankment.

Alternative 5 includes practices that run parallel to a stream or shoreline. On its own, this alternative does not apply to in-stream structures that are discussed in Alternative 4, although these measures may be used together. It also does not include rigid or semi-rigid riprap stone armoring

that is held in place by pinning or grouting, interlocking retaining wall systems, soil nail/sprayed concrete systems, stacked stone, or riprap gabions placed below OHWM.

Construction activities that may be associated with this alternative include but are not limited to:

- Machine placing riprap
- Keyed in toe stone

4.2.5 Action Alternative 5: Rigid and Semi-Rigid Armoring

This alternative encompasses projects that repair, replace or install embankment armoring using structural methods like stone, concrete or metal that is stacked, anchored, pinned, fastened, placed or driven to form a semi-rigid to rigid structure. It captures a range of coastal and streambank stabilization measures from sloping masonry stacked stone revetments built from cut stone to vertical bulkheads. These may be combined in other measures for an integrated approach to slope stabilization. In coastal environments with high-energy erosive wave action, hard armoring, whether sloped or vertical, this may be the only effective means to protect existing buildings and infrastructure [USACE 2017b].

This action alternative includes methods such as articulated concrete blocks, gabions and gabion mattresses, geocellular containment systems, pinned or grouted riprap, stacked stone, revetment mats, sheet pile, retaining walls, and bulkheads. These practices are almost always necessary in locations with side slopes exceeding 67% but may be used in areas with gentler slopes under certain conditions. They are suited to high-risk sites and areas where additional bank movement is unacceptable [NRCS 2008], such as improved sites where there is little room between a body of water and a facility like a road or building. Rigid structures have more structural strength than flexible structures, and often provide greater protection using less material. Rigid structures do not accommodate for uneven settlement of the underlying ground and are more difficult to repair than flexible placed riprap or modular structures. The entire embankment is susceptible to failure once part of a structural embankment is damaged.

This type of work may be authorized by NWPs, but bulkheads that exceed 1,000 feet may require individual permits from USACE. The draft SPGP-1 would allow repair and replacement to previously authorized structures with minimal project review; new or expanded use of semi-rigid embankment structures requires prior authorization by both NYSDEC and USACE. The draft SPGP-1 does not allow installation of new rigid structures. Bulkhead repairs, replacement and installation can take place landward of the OHWM, sometimes behind an existing damaged or failing bulkhead, and in this case, an action may not require USACE permits. State agencies may still require water, coastal, and other permits or compliance confirmation in these cases.

Specialized construction activities that may be associated with this type of work include but are not limited to:

- Installation of drainage systems behind revetments and bulkheads
- Soil nails
- Flowable or sprayed concrete
- Proprietary, patented systems
- Stacked rock masonry
- Sheet pile and micropile installation
- Installation of concrete forms in and near water
- Installation of cast-in-place concrete in and near water
- Installation of precast block in water

4.3 Summary of Alternatives

The alternatives considered in this PEA are:

1) No Action Alternative
2) Action Alternatives
    - Return to Pre-Disaster Function
    - Bioengineering
    - In-stream Structures
    - Loose Stone/Riprap
    - Rigid and Semi-Rigid Armoring

The impact analyses that follow in Section 5 evaluates the potential environmental impacts of the no action alternative, the environmental impacts all action alternatives. Alternative-specific conditions may exacerbate or mitigate impacts described in the common SOW.

5.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

This section discusses the potential impacts and mitigation measures of the No Action and the Action Alternatives. In accordance with NEPA, the affected environment includes the physical, biological, cultural, and human use contexts in which the activities will occur. “Thresholds for Preparing Tiered-SSEAs for Embankment Stabilization” in Section 9 of this PEA summarizes resource-specific thresholds and triggers for tiering. When possible, quantitative information is provided to establish potential impacts, otherwise the potential qualitative impacts are evaluated based on the criteria listed in Table 5.1.

Table 5.1: Impact Significance and Context Evaluation Criteria for Potential Impacts

Impact Scale	Criteria
No Effect	The resource area would not be affected and there would be no impact.

Impact Scale	Criteria
Negligible	Changes would either be non-detectable or, if detected, would have effects that would be slight and local. Impacts would be well below regulatory standards, as applicable.
Minor	Changes to the resource would be measurable, but the changes would be small and localized. Impacts would be within or below regulatory standards, as applicable. Mitigation measures would reduce any potential adverse effects.
Moderate	Changes to the resource would be measurable and have either localized or regional scale impacts. Impacts would be within or below regulatory standards, but historical conditions would be altered on a short-term basis. Mitigation measures would be necessary, and the measures would reduce any potential adverse effects.
Major	Changes to the resource would be readily measurable and would have substantial consequences on regional levels. Impacts would exceed regulatory standards. Mitigation measures to offset the adverse effects would be required to reduce impacts, though long-term changes to the resource would be expected.

5.1 Geology, Topography, and Soils

5.1.1 Existing Conditions

Geology, topography, and soils affect embankment stability at several spatial scales, descending in size from regional to local to site scale. At a regional scale, physiographic provinces have characteristic geology, topography, and soils that influence stream channel stability [FHWA 2006]. These in turn affect the frequency and nature of embankment erosion or embankment failure. This may drive preferences for and familiarity with embankment stabilization methods in a given region or locality. However, site-specific geomorphic conditions underly the physical composition of streams and shorelines themselves and ultimately contribute to hydraulics and water quality characteristics that will be discussed in Section 5.3.

The Farmland Protection Policy Act (FPPA) applies to soils classified as prime and unique farmlands and those that are of state and local importance. Soils subject to FPPA requirements do not have to be in use as cropland; it can be forest, pastureland, cropland, or other land that is not used for water storage or urban built-up land. Projects located in incorporated municipal areas are not subject to consultation under the FPPA; additional exemptions to consultation may also apply under Natural Resource Conservation Service's (NRCS) FPPA Manual.

- **Geology:** The substrate of a streambed or seabed is composed of mineral sediment ranging in size from clay particles to boulders and bedrock. It is the location where many natural processes occur, including the movement and deposition of sediment and the formation of bedforms [Valentine 2019]. Bank material may be dissimilar from bed material, which can contribute to the relative stability of the entire channel [NAS 2016]. A stream with bedrock-controlled channels or coarse aggregate material affects a

stream's ability to self-adjust in response to stream flow, while streams with smaller sediments tend to meander and change [Buffington 2013]. Shorelines are composed of mineral material deposited by waves or eroded material from adjacent sea cliffs, and sediment size can range from fine silt particles to boulders. As with streams, rocky shorelines are less susceptible to change than are those composed of sands and silts.

- **Topography:** The topography of an area affects the form a stable stream will take, just as it affects the nature of stream flow in an area and ultimately, any instability that results in damaging floods [Delaware Co SCWD 2014]. Steep terrain and steep channel slopes found in mountainous areas give rise to relatively straight streams with rocky substrates and banks, while meandering streams in flatter, low-lying areas have smaller sandy or silty sediments [Buffington 2013]. Streams in steep areas without a discernable floodplain may be subject to flash flooding, while streams in flatter areas may be subject to longer-lasting floods and often have well-defined floodplains or terracing. Embankment stabilization projects also must consider the slope and height of the embankment itself, both at the point of failure and at stable upstream and downstream locations. Naturally stable banks tend to have a slope of about 30% or less, and high banks are susceptible to slumping even at relatively stable grades. Natural vegetation grows more densely on flatter slopes, regardless of elevation in relation to the high-water mark. [NAS 2016].
- **Soil:** Soil is the unconsolidated loose covering of broken rock particles and decaying organic matter overlying the bedrock or parent material. In dynamically stable streams, sediments erode and are deposited in the stream without incident [NAS 2016], while unstable streams exhibit aggradation and degradation. Embankments may be damaged by erosion, or they may fail. Erosion is a hydrological process whereby soil particles are carried away individually by water or wind, while embankment failure is a geotechnical process that occurs when soil loses its cohesiveness and collapses suddenly [USACE 1997]. Erosion can occur gradually or suddenly, and can undercut a bank, leaving it vulnerable to failure. The most erosive soils are fine sands and silty sands, and the least erosive are clay and coarse gravels. Clayey soils are considered the most cohesive soils because they are held together by electrostatic forces, but they are absorbent and have low strength as a result of surface tension exerted by the water on soil particles. Therefore, they are prone to failure when saturated or undercut. In some conditions, site soils may not have the strength or cohesiveness to support all methods of embankment stabilization, especially in areas with steep topography. Sites that are in developed areas or transportation corridors are likely to have compacted soil and fill with reduced permeability.

Site specific design should be based on information like the size of sediment remaining at the damaged embankment site [USACE 1997] and analysis of stable stream banks or shorelines that are geomorphically similar and located near the damaged embankment [Delaware Co. SWCD 2014]. Erosion, sediment transport, and sediment deposition characterize both streambanks and shorelines, making them dynamic places with changing landforms. Aggradation and degradation lead to instability in stream systems, while alterations in sediment sources can lead to increased shoreline erosion and coastal land loss. Even in locations where embankment stabilization would reduce erosion, repairs to or new construction of embankment armoring may aggravate unstable conditions on stream banks or shorelines [USEPA 2007].

5.1.2 Potential Impacts and Proposed Mitigation

5.1.2.1 No Action Alternative

The no-action alternative would not alter naturally occurring geological processes in the vicinity of a project site. In the absence of a project, FEMA expects that embankment erosion would continue unabated. These processes may result in minor to moderate impacts from sediment deposition downstream of an eroding or failed embankment that may in time evolve into significant instability. Soil instability may present increasing risk to nearby infrastructure such as roads and utilities. FEMA anticipates negligible to no impacts to geology and minor impacts to moderate impacts to topography relative to site characteristics.

5.1.2.2 Action Alternatives Common Scope of Work

All action alternatives would require grading and excavation; therefore, any alternative would result in localized minor to moderate impacts to soils and topography. All stream and shoreline embankment projects are subject to state and federal permit conditions. Many include standards for ES&C Best Management Practices (BMPs) to mitigate impacts from sediment-laden runoff during construction. Long term, FEMA expects embankment stabilization projects would prevent slope failure and continued erosion as they reduce risk to improved land and nearby facilities, resulting in beneficial impacts to the community.

FPPA: All action alternatives may have the potential to have negligible to no impacts to designated soils, depending on the project location. There are no alternative-specific impacts or mitigation that would affect farmland or consistency with the FPPA.

Most embankment stabilization projects undertaken by FEMA occur within or near existing road rights-of-way and do not irreversibly convert farmland to other uses, so FPPA review is unlikely. If NRCS requires further review, FEMA will complete a Farmland Conversion Impact Rating form AD-1006 and make a determination as to consistency with FPPA.

5.1.3 Alternative-Specific Impacts and Mitigation

In addition to impacts common to all action alternatives, each action alternative has alternative-specific impacts and mitigation that warrant additional discussion.

Action Alternative 1: Return to Pre-Disaster Function

This alternative maintains and restores the function and capacity of damaged embankment but may include additional excavation or additional materials to tie into stable soils. FEMA anticipates minor to moderate local impacts to geology, soils, and topography. Washed-out native stone may be replaced by processed stone; site soils may be replaced with granular fill to promote drainage, and topography may be altered during grading. FEMA expects that stabilization measures replacing damaged features suited to site conditions will have long-term minor to moderate beneficial impacts on soil retention and erosion control.

Action Alternative 2: Bioengineering

This alternative comprises a variety of practices that require a wide range of ground disturbance and will result in minor to moderate impacts to existing soils, topography, and geology. Flatter slopes are easier to treat using plant materials alone, while steep slopes may require terracing or benching alone or in combination with stone or structural armoring. In small areas with gentle slopes, disturbance may be limited to hand digging to place coir rolls, stakes, and planting on natural grades. Steep and highly eroded sites may require extensive excavation to bench or terrace the bank before planting.

Plant roots reinforce soil and can increase shear strength, decreasing both erosion and embankment failure risk. Plants at the water's edge dissipate wave and current energy, reducing erosion. Established vegetation in the riparian corridor and adjacent upland areas roughens the ground surface, promotes uptake of water, reduces overland flow, and encourages sediment capture before runoff can enter a waterway. One of the objectives of bioengineering is to emulate this effect. When bioengineering is used in combination with stone-based or structural methods, use of plants can help mitigate impacts to site soils and topography. FEMA expects that bioengineering measures will have long-term minor to moderate beneficial impacts on soil retention and erosion control.

Action Alternative 3: In-Stream Structures

In-stream structures would have moderate, localized impacts to geology, topography, and soils at a project site because their purpose is to change in-stream geomorphic characteristics. Occasionally, in-stream structures can increase erosion opposite the bank they are intended to protect, so they must be monitored after installation to ensure they are working as designed [NAS 2014]. In-stream structures can be used for grade control and as a measure to stop channel instability. FEMA anticipates long-term minor to moderate beneficial impacts to geology, topography, and soils.

Action Alternative 4: Loose Stone/Riprap

If properly sized and placed, riprap will result in negligible to minor impacts to local geology, topography and soils. Some riprap embankment measures can be placed with minimal disturbance to existing side slopes [USEPA 2007] and can replicate natural stone armoring or imbrication that is found in naturally stable channels [Buffington 2013]. Embankment stabilization using only riprap or stone must be based on analysis of site soils and erosive forces of waves or current; improperly sized and placed rock may contribute to additional scour of banks, which can increase debris and sediment deposition in future storms. FEMA anticipates long-term minor to moderate beneficial impacts to geology, soils, and topography.

Action Alternative 5: Rigid and Semi-Rigid Armoring

Hard armoring practices decrease the ability of stream channel to self-adjust, which in turn can increase erosion along the embankment footer and contribute to sediment load downstream. In coastal and estuarine areas, bulkheads reflect wave energy, which contributes to erosion, changes in sediment transport, and inhibited migration of the shoreline in response to sea level change [USACE 2017b]. At the same time, these structures are the most effective at holding back steep grades and preventing erosion in areas with steep slopes or high-energy wave flow conditions. For some sites, this may be the only practicable measure to protect infrastructure. FEMA anticipates that this alternative would result in moderate impacts to local geology, topography, and soils.

5.2 Air Quality

The Clean Air Act of 1970 (42 USC 7401–7661 [2009]) is a comprehensive federal law that regulates air emissions from area, stationary, and mobile sources. The act authorized the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The NAAQS include standards for six criteria air pollutants: lead, nitrogen dioxide, ozone, carbon monoxide, sulfur dioxide, and particulate matter (PM). Particulate matter is further divided into less than 10 micrometers in diameter (PM_{10}) and fine PM less than 2.5 micrometers in diameter ($PM_{2.5}$). Areas where the monitored concentration of a criteria pollutant exceeds the applicable NAAQS are designated as being in non-attainment of the standards. Non-attainment areas can be re-designated as a maintenance area if monitoring data demonstrate that the area meets the NAAQS and a 10-year plan for continuing to meet and maintain such standards is implemented.

Federally funded actions in nonattainment and maintenance areas are subject to USEPA conformity regulations [40 CFR Parts 51 and 93]. Section 176(c) of the Clean Air Act requires that federally funded projects conform to the purpose of the State Implementation Plan. Conformity determinations for federal actions other than those related to transportation plans, programs, and projects that are developed, funded, or approved under title 23 United States Code (USC) or the Federal Transit Act [49 USC 1601 et seq.] must be made according to the federal general conformity regulations [40 CFR 93 Subpart B]. FEMA's Subrecipients are required to conduct a general conformity applicability analysis in nonattainment areas. If applicable, the Subrecipient must prepare the general conformity analysis and obtain approval and any required permits prior to construction.

5.2.1 Existing Conditions

USEPA, NYSDEC, and New Jersey Department of Environmental Protection (NJDEP) provide information at a site-specific level regarding nonattainment or maintenance status. Nonattainment and maintenance areas are periodically updated and available through USEPA's Green Book. As of April 2020, there are nonattainment areas in all or part of 10 of New York's counties and in all

or part of New Jersey's 21 counties. Most counties are maintenance areas for ozone, followed by sulfur dioxide and PM_{10}.

5.2.2 Potential Impacts and proposed Mitigation

5.2.2.1 No Action Alternative

The No Action Alternative would not result in emissions due to construction activity. If embankment failures lead to road closures, there may be short-term decreases in localized vehicular emissions at the project site, but emissions may increase in other areas where traffic is re-routed. There may be an overall increase in vehicular emissions if the detour routes are longer than the original route. If the embankment is severely damaged and results in long-term road closures, the short-term changes to localized air quality may become long-term. FEMA anticipates negligible to minor air quality impacts due to traffic diversion.

5.2.2.2 Action Alternatives Common Scope of Work

FEMA anticipates negligible to minor impacts to air quality for all action alternatives during construction and no long-term impacts on air quality. All action alternatives would result in temporary emissions due to construction activity. Local $PM_{2.5}$ and PM_{10} levels can increase during excavation of soils, demolition of concrete structures and movement of vehicles on unpaved surfaces. The Subrecipients will use BMP measures to minimize fugitive dust. Such measures may include covering spoil piles, covering truck beds containing fill or cut materials, tire washing prior to leaving the site, and watering exposed soils.

Construction activities for all action alternatives may require the use of backhoes, loaders, cranes, trucks, and other large equipment. Temporary electric power may be supplied by portable diesel generators. Emissions from construction vehicles and equipment could temporarily increase the levels of some of the criteria pollutants, including carbon monoxide, nitrogen dioxide, ozone, PM_{10}, and non-criteria pollutants such as volatile organic compounds [USEPA 2003]. The Subrecipients will use construction BMPs such as minimizing running time for engines and use of properly maintained equipment. Ultra-low sulfur diesel fuel is required by the Clean Air Nonroad Diesel Rule [USEPA 2012]. Any asphalt paving and concrete pouring would emit negligible amounts of volatile organic compounds as the compounds cure.

5.3 Water Quality and Water Resources

Clean Water Act: Congress enacted the Federal Water Pollution Control Act in 1948 which was later reorganized and expanded in 1972 and became known as the Clean Water Act (CWA) in 1977. The CWA regulates discharge of pollutants into water with sections falling under the jurisdiction of the USACE and the USEPA.

Under section 303(d) of the CWA, states are required to compile a list of impaired waters that fail to meet any of their applicable water quality standards. States develop a Total Maximum Daily

Load plan to identify the maximum pollutant load that a listed water body can receive each day and still maintain water quality standards.

The USEPA has delegated authority to state agencies to issue National Pollution Discharge Elimination System permits in both New York (SPDES) and New Jersey (NJPDES). NYSDEC and NJDEP issue permits for point source discharges. These include permanent industrial, agricultural, or municipal facility discharges, as well as construction activity permits for projects that disturb more than one acre of ground. Non-point source pollutants consist of substances such as nutrients, including phosphorus and nitrogen, pathogens, sediments, oil and grease, salt, and pesticides that can be carried by diffuse stormwater. Streambank instability contributes to downstream water quality impacts increasing turbidity and non-point source contamination.

Section 404 of the CWA establishes the USACE permit requirements for discharging dredged or fill materials into Waters of the United States and traditional navigable waterways. USACE regulation of activities within navigable waters is also authorized under the 1899 Rivers and Harbors Act (RHA). In New York and New Jersey, USACE-issued NWPs are used to authorize the great majority of construction projects subject to compliance with Section 404 of the CWA and Section 10 of the RHA. USACE may also issue emergency authorizations or emergency general permits that streamline repairs following a storm or flooding event. Section 401 of the CWA allows delegated states to set standards for water quality certification that may exceed USACE's permit conditions; these become state-specific regional conditions for projects authorized by USACE in a given state.

Section 1424(e) of the **Safe Drinking Water Act** (SDWA) of 1974 [Public Law 93–523] authorizes USEPA to designate an aquifer for special protection under the sole source aquifer (SSA) program. These aquifers are principal drinking water resource for an area supplying 50 percent or more of the drinking water for the area. No commitment for federal financial assistance may be provided for any project that USEPA determines may contaminate a sole source aquifer that might create a significant hazard to public health.

The **Wild and Scenic Rivers Act** (WSRA) of 1968 (Public Law 90-542) was created to permanently protect free-flowing rivers and their riverbanks from impacts due to hydro-electric dams and oil, gas, and mineral mining. It prohibits federal support for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or outstanding resource values. The US Congress or the US Department of the Interior can designate rivers or segments of rivers. Designated wild and scenic rivers may also include a portion of land, including existing riparian buffers, typically 0.25 mile on either side in the lower 48 states.

5.3.1 Existing Conditions

Channel width, depth, and slope may vary over time, but stable stream channels and shorelines exhibit natural resiliency to changes caused by storms or human interventions. However, unstable streams and shorelines contribute to water quality degradation made worse by storms. Stream banks and shorelines can be made unstable as a result of surrounding development or other human influence [USEPA 2007]. These sites provide hydrologic, biological, and habitat functions. Riparian corridors and estuarine areas adjacent to streams and shorelines are critical to supporting their function and stability [USACE 2017a].

Seven SSAs are located entirely within New York State; three are located entirely within New Jersey; three are located within both states, and one is located within New Jersey, Pennsylvania and Delaware. The majority of New Jersey and all of Long Island are mapped as SSAs; maps and additional information are available on USEPA's website [USEPA 2014b].

New York has approximately 51,790 miles of river, of which 73.4 miles are federally designated as wild and scenic, slightly more than 1/10th of 1% of the state's river miles. NYSDEC has jurisdiction over approximately 1,300 miles of state-designated wild, scenic, and recreational rivers. New Jersey has approximately 6,450 miles of river, of which 262.9 miles are designated as wild and scenic by both federal and state entities making up about 4% of the state's rivers (USFWS 2020).

5.3.2 Potential Impacts and Proposed Mitigation

5.3.2.1 No Action Alternative

CWA: In the short-term, no-action alternative would result in minor to moderate impacts to surface water with increasing turbidity of the water in downstream areas. In undeveloped natural areas, a damaged stream or shoreline embankment may stabilize through natural revegetation. In developed areas, FEMA anticipates moderate long-term impacts to water quality, physical structure of the stream or shoreline, hydrology, and embankment stability.

SDWA & WSRA: The No-Action Alternative would have no effect on sole source aquifers or additional impacts on wild, scenic, or recreational rivers.

5.3.2.2 Action Alternatives Common Scope of Work

CWA: All action alternatives have the potential to affect water quality in the short-term during construction, site preparation, excavation, and work in the water. In addition to ES&C BMPs installed on land, in-stream mitigation measures to manage turbidity within the work area may include cofferdams, turbidity curtains, and dewatering. The Subrecipient will use BMPs and incorporate conditions from applicable permits which will minimize impacts.

All action alternatives have the potential to affect surface water resources and alter channel or shoreline geometry, structure, and alignment. Armoring, straightening, or other stream bank

treatments that increase smoothness of channel will increase velocity and flow in a stream. This in turn can increase the moving water's erosive force and sediment load, while increasing the risk of flooding downstream. These impacts can be mitigated by design measures that increase channel roughness, resulting in increased deposition and vegetative growth and decreased velocity and flow along the length of a channel. In developed areas, bank stabilization reduces non-point source contamination from erosion and sedimentation, thus improving water quality downstream [USACE 2017b].

SDWA: All action alternatives described in this EA are expected to have negligible, if any, impact on federally regulated ground water resources. None of the action alternatives involve storage, transport of hazardous, toxic, or pathogenic materials such as solvents, road salt, manure, petroleum products or sewage. If excavation, pile driving or other construction may intersect the seasonal high water table of an SSA, FEMA will consult with USEPA to determine if the action is consistent with SDWA.

WSRA: FEMA will consult with the appropriate managing agency for any projects located within a designated wild, scenic, or recreational river or buffer. FEMA anticipates that any projects that incorporate the managing agency's conditions, BMPs, and are consistent with State and USACE permitting would have negligible to minor impacts.

There are no alternative-specific impacts relating to compliance with SDWA or WSRA.

5.3.2.3 Alternative-Specific Impacts and Mitigation

In addition to impacts common to all action alternatives, each action alternative has alternative-specific impacts and mitigation that warrant additional discussion.

Action Alternative 1: Return to Pre-Disaster Function

FEMA anticipates negligible to minor impacts to water resources for projects during construction, but negligible to no impacts long term as a result of restoring pre-disaster function. Some increase in size or incorporation of mitigation measures may change the profile of an embankment but will integrate with the surrounding stable areas.

Action Alternative 2: Bioengineering

FEMA anticipates negligible to minor impacts to restoring embankments with bioengineering during construction. In addition to erosion control as a result of roots binding the soil, vegetation can offer pollutant filtering capability, and can reduce runoff volumes and rates through transpiration, improved soil permeability, and surface roughness. Bioengineering reduces flow velocities, causing flows during flooding to dissipate energy against the vegetation and other bioengineered features [USEPA 2007]. FEMA anticipates minor to moderate beneficial impacts as a result of bioengineered embankments.

Action Alternative 3: In-Stream Structures

FEMA anticipates in-stream structures, designed to change hydrology and hydraulics in a stream, to have minor to moderate impacts to surface water. Such measures reduce flow velocity, which in turn reduces erosion, sedimentation, and deposition. These measures are most effective and suitable in locations where there is space to allow for a dynamic stream channel. Stream barbs can be effective at reducing bank erosion and can have fewer adverse effects to streams and their banks than armoring the stream bank [USACE 2017b].

Action Alternative 4: Loose Stone/Riprap

For steeper slopes and where there is not room to grade for a gentler slope and areas subject to high velocity flow, riprap may be the most practicable option. FEMA anticipates minor to moderate impacts for installing new riprap to stabilize a slope and shorelines to protect infrastructure. Riprap can affect riverine processes including sediment transport, hydrodynamics, water levels, sediment input, and sediment characteristics of the river or stream bed. Properly sized and installed, it can reduce sediment loads and erosive velocities, thus improve water quality compared to pre-existing site conditions in developed locations. [USACE 2017b].

Action Alternative 5: Rigid and Semi-Rigid Armoring

FEMA anticipates that rigid and semi-rigid armoring to have moderate impacts when used in developed areas that require a fixed embankment. These practices are often used in coastal and riparian environments that are subject to high energy erosive forces from waves and current. These are primarily structural measures that are required to control erosion adjacent to existing buildings and infrastructure.

5.4 Floodplain and Wetlands

Executive Order (EO) 11988, Floodplain Management, applies to federal actions that take place in floodplains. EO 11990 Wetlands Management applies to federal actions that take place in or adjacent to wetlands. The EOs require federal agencies to avoid funding activities that directly or indirectly support occupancy, modification, or development of floodplains or wetlands whenever there are practicable alternatives. FEMA uses an eight-step decision-making process to evaluate potential effects on, and mitigate impacts to, wetlands and floodplains. This process, like NEPA, requires the evaluation of alternatives prior to funding the action. FEMA's regulations on conducting the eight-step decision-making process is contained in 44 CFR Part 9.

During day to day operations, floodplain management is primarily the responsibility of state and local government. USACE permits include a condition that projects must be compliant with state and local requirements. Wetlands are protected by the CWA, and wetland fills or disturbances

require USACE permit authorization. New York and New Jersey each have additional wetland regulations and permit requirements for freshwater and tidal wetlands.

5.4.1 Existing Conditions

Floodplains: FEMA produces Flood Insurance Rate Maps (FIRMs) that map floodplains and are used to determine if an action is located in the floodplain. FIRMs depict calculated locations of the 1 percent (100-year) and the 0.2 percent (500-year) floodplains, coastal high hazard areas, and base flood elevation levels. FEMA also produces Advisory Base Flood Elevation maps as an interim product to assist flood impacted communities in their rebuilding efforts while the Agency completes the new FIRMs. FIRMs may not map floodplains for all streams, especially in remote areas with minimal development.

Wetlands: The Cowardin wetland classification system includes five types of wetland, and New York and New Jersey include examples of all five. Marine wetlands consist of open ocean and high-energy coastlines. Estuarine wetlands consist of tidal areas that often are partially enclosed by land; riverine wetlands include areas within a river channel. Lacustrine wetlands are large freshwater, non-tidal wetlands associated with lakes, dammed rivers, and topographical depressions. Palustrine wetlands encompass smaller wetlands adjacent to other types of wetlands or surrounded by upland areas.

FEMA uses the US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), state-specific mapping tools and on-site surveys to identify wetlands. The NWI is the only national-level wetland inventory. USFWS and USACE use different criteria to identify wetlands, and there is no national inventory of wetland acreage based on the USACE definition [33 CFR 328.3(c)(4)]. The USACE may require delineation of wetlands to issue a jurisdictional determination or permits.

Wetlands and floodplains may or may not overlap in location, but they have similar, and often mutually dependent natural functions that provide similar benefits. They possess characteristics that are both aquatic and terrestrial, stemming from hydrological connections between floodplain or wetland and surface water. They provide stormwater storage and conveyance, groundwater recharge, soil development and transport, water quality improvement, nutrient regulation, and habitat support for plants and animals.

5.4.2 Potential Impacts and Proposed Mitigation

5.4.2.1 No Action Alternative

The no-action alternative would have no direct impact to floodplains or wetlands but may leave facilities vulnerable to flood risk in the absence of repair or mitigation. Unstable embankments would be more vulnerable to further erosion or failure during subsequent storms. Sedimentation may build up in downstream structures such as culverts and may increase flood risk by impeding

flow. Sedimentation may also impact downstream wetlands through fill depositing in them. FEMA anticipates that this alternative would have minor to moderate long-term impacts.

5.4.2.2 Action Alternatives – Common Scope of Work

All action alternatives have the potential to cause minor to moderate impacts to floodplains and wetlands in the short-term during construction with the potential release of sediments and with temporary fills. The Subrecipients will use ES&C BMPs and follow permit requirements to minimize these impacts. Activities authorized by NWPs must comply with general conditions 9 and 10, which relate to fills within 100-year floodplains.

Actions that change the height, length, or permeability of an embankment have the greatest potential to affect hydrology. At the site scale, embankment stabilization projects can cut off the hydrological connection between a body of water and the surrounding land. This effectively reduces or eliminates floodplain and wetland functions adjacent to a project site. At a larger scale, embankment hardening, and channel smoothing may lead to an increase in flood risk, change erosion and deposition patterns, and alter wetland composition downstream of a site. Subrecipients may need to prepare hydrology and hydraulics studies to demonstrate impacts on flood levels. FEMA will apply the eight-step decision-making process to consider site-specific impacts of proposed projects to prior to approving in order to consider alternatives and mitigation measures.

5.4.2.3 Alternative-Specific Impacts and Mitigation

In addition to impacts common to all action alternatives, three have alternative-specific impacts and mitigation that warrant additional discussion.

Action Alternative 2: Bioengineering

The methodology, impact, and regulatory requirements can vary widely for a bioengineering project. In addition to short-term impacts, FEMA anticipates minor to moderate beneficial long-term impacts to floodplains and wetlands using bioengineering techniques. Use of 100% wooden structures can provide similar functional benefits to soil or riprap placement without being considered fill and requiring USACE permitting. Placement of wooden and similarly composed structures could still potentially cause the negative impacts discussed above. Depending on design, they can also provide improved wildlife habitat and access, soil development, nutrient cycling, and water quality. Use of vegetative bank stabilization tends to not have the negative impacts of hardened structures, and can result in increased soil stability, pollutant filtering, increased wildlife habitat, while reducing water runoff and velocity.

Action Alternative 3: In-Stream Structures

FEMA anticipates in-stream structures, designed to alter hydrology and hydraulics in a stream, to have minor to moderate negative impacts to floodplains and wetlands. These structures typically are designed to change the course or velocity of water flow which affects sedimentation,

deposition, and nutrient distribution which can affect downstream wetlands and floodplain ecosystems. Such projects may also affect upstream wetlands and floodplains through slowing velocity and flow of water. There may be minor to moderate beneficial impacts as well.

The Subrecipients may be required to prepare studies to demonstrate that new in stream structures do not increase flood risk to adjacent properties before FEMA considers eligibility of the action. Activities in or adversely affecting wetlands may require an Individual Permit from USACE, CWA 401 water quality certification, and a NYSDEC Freshwater or Tidal Wetlands Permit, or NJDEP general or individual permit.

Action Alternative 5: Rigid and Semi-Rigid Armoring

Projects that limit hydrologic connectivity between open water and floodplains or wetlands have the potential for direct adverse effects to these resources. Actions that use sheet pile to repair or construct bulkheads do not always require USACE permits, despite the potential for impacts to floodplains and flood elevations. Adherence to federal permit conditions will mitigate impacts from projects occurring in open waterways and wetlands. This may not be the same for projects in floodplains. The Subrecipients may be required to prepare studies to demonstrate that new rigid or semi-rigid armoring does not increase flood risk to adjacent properties before FEMA considers eligibility of the action. Construction of new or expanded sheet piling or bulkheads has the greatest potential for moderate impacts among the alternatives.

5.5 Coastal Resources

The Coastal Zone Management Act (CZMA), administered by states with shorelines in coastal zones requiring those states to have a Coastal Zone Management Plan (CZMP) to manage coastal development. Projects falling within designated coastal zones must be evaluated to ensure they are consistent with the CZMP. Projects receiving federal assistance must follow the procedures outlined in 15 CFR 930.90 – 930.101 for federal coastal zone consistency determinations. In New York, the Department of State (NYSDOS) oversees consistency review. NJDEP incorporates CZMA consistency reviews via permits through their NJDEP Division of Land Use Regulation (DLUR) permitting programs. NJDEP has a second path to address CZMA where federal agencies may consult directly with them for certain types of projects.

The Coastal Barrier Resources Act (CBRA) of 1982 and the Coastal Barrier Improvement Act of 1990 are administered through the USFWS. They are a US Department of the Interior initiative to preserve the ecological integrity of areas that buffer the mainland from storms and provide important habitats for fish and wildlife. The CBRA designated two types of units: Coastal Barrier Resources System (CBRS) and Otherwise Protected Areas (OPA). CBRSs consist of areas that were relatively undeveloped at the time of their designation. OPAs are generally lands held by a qualified organization primarily for wildlife refuge, sanctuary, recreational or natural resource

conservation purposes. Most new federal expenditures and financial assistance, including federal flood insurance, are prohibited within CBRSs. Exceptions exist for some actions that repair or maintain portion of existing public facilities or infrastructure that are part of larger systems or networks; only federal flood insurance is prohibited within OPAs [USFWS 2014c].

Both New York and New Jersey promote non-structural erosion control techniques in coastal areas, for instance as policy in the New York State Coastal Management Plan [NYSDOS 2017] and as a state-wide permit condition for USACE permits issued in New Jersey. In New York, the Coastal Erosion Hazard Law (Environmental Conservation Law 34) empowers NYSDEC to identify and map coastal erosion hazard areas and to adopt regulations [6 NYCRR Part 505]. The Coastal Erosion Hazard Area Permit Program manages regulated activities or land disturbance to properties within the coastal erosion hazard areas. In New Jersey, the Coastal Area Facility Review Act (CAFRA) enables DLUR to regulate development and issue permits for certain activities within the designated CAFRA zone. Both states have additional regulations and issue permits for work affecting tidal wetlands.

5.5.1 Existing Conditions

New York State has approximately 700 miles of shoreline along Lake Ontario and Lake Erie, approximately 300 miles of shoreline on Long Island Sound and another 120 miles of shoreline on the Atlantic Ocean. New Jersey has approximately 130 miles of Atlantic coastline between Sandy Hook and Cape May. Shoreline mileage increases when the measurement is taken from large scale maps and includes the outlines offshore islands, sounds, bays, rivers, and tidal creeks – using this methodology, New York has 2,625 linear miles of shoreline, and New Jersey has 1,792.

New York and New Jersey are highly developed states, and many coastal sites that are eligible for FEMA-funded repairs or mitigation are already hardened to some degree. New Jersey's Atlantic coast is one of the most developed and highly populated shorelines in the country with 76% of its length developed. Erosion protection structures have hardened nearly half of the Long Island Sound shoreline bordering Westchester, Bronx, Queens, Nassau, and Suffolk counties. Long Island's south shore is more complex, with barrier islands facing the Atlantic Ocean and shallow tidal bays and tributaries between the barrier islands and Long Island itself. The South Shore Estuary Reserve consists of 326 square miles in Suffolk and Nassau Counties with 1.5 million residents. Lake Erie and Lake Ontario shoreline have expanses of undeveloped and low-density development, but have dense urban development near Buffalo, Niagara, Rochester, and Oswego.

CZMA: The NYSDOS Division of Coastal Resources oversees all regulated activities in New York's coastal waterways. This includes the Hudson River as far north as the Federal Dam in Troy and the Great Lakes, in addition to the Atlantic Ocean and Long Island Sound. In New Jersey, NJDEP's Coastal Management Program manages the state's coastal resources, while DLUR conducts federal consistency reviews. New Jersey's coastal zone includes the Atlantic Ocean coast and tidal areas of the Delaware Bay, Delaware River, and their tributaries.

CBRA: New Jersey has nine CBRSs and 15 OPAs, protecting a total of 87,476 acres along 49 miles of Atlantic Ocean and Delaware Bay shorelines. New York has 80 CBRSs and 21 OPAs, protecting 104,671 acres along 156 miles of Atlantic Ocean, Long Island Sound and Great Lakes shoreline.

5.5.2 Potential Impacts and Proposed Mitigation

5.5.2.1 Alternative 1: No Action Alternative

The no action alternative would have minor to moderate impacts to coastal resources. Depending on site conditions, eroding or failing shorelines may affect water quality and habitat locally. The no action alternative may not meet CZMA consistency goals that aim to balance land use, economic development, and natural resource management in coastal areas.

5.5.2.2 Action Alternatives – Common SOW

All action alternatives have the potential to affect coastal resources; favorable consistency determinations for CZMA and CBRA and compliance with state and federal permits will ensure that impacts to coastal resources are minor to moderate.

CZMA: All projects located in designated coastal zones require consultation to determine consistency. In New York, FEMA assists the Recipients who are responsible for consulting with NYSDOS to determine consistency with the state's CZMA goals. In New Jersey, CZMA consistency is incorporated into the NJDEP permit process; DLUR will not issue a permit for a project that is not consistent with the state's coastal programs. For certain types of projects, FEMA may consult with NJDEP for consistency review.

CBRA: All projects located in CBRS units require consultation with USFWS, even for proposals that appear to meet exceptions and would be eligible for federal funding. USFWS opinion is advisory, and FEMA may elect to proceed with funding a project even if USFWS does not concur with FEMA's evaluation. Privately funded projects are not prohibited from construction in CBRSs at their own risk.

State Coastal Permits: Subrecipients are responsible for obtaining all necessary permits, such as Coastal Erosion Hazard Area and CAFRA, and for complying with all permit conditions.

5.5.2.3 Alternative-Specific Impacts and Mitigation

In addition to impacts common to all action alternatives, Bioengineering and Rigid and Semi-Rigid Armoring have alternative-specific impacts and mitigation that warrant additional discussion.

Alternative 2: Bioengineering

FEMA anticipates stabilization projects using bioengineering and living shorelines would have impacts similar to the common SOW during construction. USACE notes that these practices, which are authorized by NWP 13, can be built close to a bank with minimal encroachment into the

waterbody, making them useful in areas with limited space between upland areas and the OHWM or HTL [USACE 2016 NWP 13 DD]. Living shorelines are authorized by NWP 54 and incorporate hard elements such as shellfish beds and rock sills to stabilize shoreline sites with gentler slopes. Living shorelines also are intended restore or enhance biological functions of coastal areas. [USACE 2016 NWP 13 DD]. FEMA anticipates that living shorelines and bioengineering would have minor to moderate beneficial impacts to coastal resources in the long term.

Alternative 5: Rigid and Semi-Rigid Armoring

In coastal environments with high-energy erosive wave action, hard armoring, whether sloped or vertical, may be the only effective means to protect existing buildings and infrastructure. Bulkheads are known to have more potential for adverse environmental impacts than sloped revetments, but bulkheads can be used where there can be no encroachment into a waterway, while other measures require a larger footprint in the water [NWP 13 DD]. FEMA anticipates that there would be moderate adverse impacts to coastal resources from bulkheads, but impacts will be limited by permitting conditions.

5.6 Vegetation, Habitat, Wildlife, and Fisheries

Executive Order 13112 Invasive Species requires federal agencies, to the extent practicable, to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. Invasive plant species prefer disturbed habitats and generally possess high dispersal abilities, enabling them to out-compete native species. Invasive insects, mussels, fish, and other animal species can destroy existing vegetation and habitat in aquatic and terrestrial environments. Regulations in both New York and New Jersey aim to control the spread of invasive plants and animals. Each state's environmental and agricultural agencies coordinate their efforts: NYSDEC and NJDEP focus on the spread of invasive species in the wild, while New York State Department of Agriculture and Markets and New Jersey Department of Agriculture focus on the spread of endangered species in agricultural, silvicultural and horticultural trade.

Both NYSDEC and NJDEP classify streams to indicate suitability for freshwater fisheries, including standards for trout habitat and spawning. Permit conditions often include seasonal restrictions on in-water work to avoid impacts to spawning fish.

5.6.1 Existing Conditions

Both New York and New Jersey have diverse landscapes, including major centers of dense urban development, moderately dense suburban, highway-dominated landscapes, and low density rural, small town, and agricultural areas. Approximately 15% of New York State is urbanized or developed; 25% has agricultural cover and 60% is forest or wildland. In New Jersey, approximately 40% of the land is urbanized or developed, 15% is used for agriculture and 45% is undeveloped forest or open land [NYSDEC 2005, NJDEP2010, NASS 2018]. Varied terrestrial,

marine and freshwater aquatic systems overlap areas of both states with equally varied development intensity. In a natural setting, stream banks and shorelines provide physically dynamic and complex habitats that host diverse species. Human influence makes these sites physically more uniform and reduces species diversity. FEMA streambank and shoreline embankment stabilization projects are likely to occur in improved areas that have already been altered to some degree by human intervention. The intensity of human influence will range from rigid bulkheads in densely settled urban areas to natural unarmored streambanks adjacent to unpaved roads or residential lots in rural areas.

Riparian areas and shorelines have characteristics that make them especially attractive to both transient and resident wildlife, even along roads and in developed areas. Wildlife use aquatic ecosystems and adjacent terrestrial corridors for habitat, for breeding and nesting areas, escape cover, travel corridors, and preferred food sources. Aquatic and terrestrial animals can travel parallel to the shore or river edge to move between similar habitat patches in fragmented landscapes with otherwise sparse natural cover. Wildlife moves perpendicular to the riparian or coastal edge, to and from aquatic and terrestrial habitats, to forage, lay eggs, or hibernate. Movement in either direction exposes wildlife to threats such as vehicle strike and predation, especially in degraded landscapes with minimum natural cover. Site-specific information regarding habitat, vegetation, and wildlife is available from each state's Natural Heritage Program.

5.6.2 Potential Impacts and Proposed Mitigation

5.6.2.1 Alternative 1: No Action Alternative

In the short-term, the no-action alternative will have minor to moderate localized effects on aquatic vegetation, habitat and wildlife. If erosion continues unabated, sedimentation in river, estuarine and coastal areas may result in impacts to vegetation and aquatic habitats at the project site and in downstream areas. Sedimentation and siltation as a result of eroding stream and road banks and coastal soils contributes to aquatic habitat loss and restricts fish migration. Deposition of silt downstream can result in loss of wetlands, and invasive plant species readily colonize disturbed sites [NYSDEC 2005]. Exposed soils at the embankment and where sedimentation accumulate may provide strata for invasive species to spread.

5.6.2.2 Action Alternatives – Common Scope of Work

Action alternatives that require vegetation clearing during site preparation, staging, and construction will have impacts to terrestrial vegetation and habitats. Projects involving new construction require permanent displacement of vegetation and habitat within a facility's footprint. Those that require dewatering, temporary placement of fill in wetlands or bodies of water have the potential to impact resident and transient terrestrial wildlife that use shorelines and riparian areas. Permit conditions and design considerations may include site restoration, seasonal restrictions, compensatory mitigation, habitat enhancements, and ES&C BMPs. Such measures, including seeding or vegetative stabilization using native species, will mitigate long-term impacts to

terrestrial and aquatic wildlife and habitats as a result of construction activity but will not reduce impacts entirely.

Bank stabilization projects can inhibit animal movements between habitats, cause the loss or reduction of established habitat, and can alter physical habitats, resulting in reduced species richness or diversity [USACE 2016, NWP 13 DD, NAS 2016]. The level of impact at a given site depends on the level of development and human disturbance present at a site. Most project sites will take place in improved areas that have already been influenced by development. FEMA anticipates that each alternative would have minor to moderate impacts during construction.

5.6.2.3 Alternative-Specific Impacts and Mitigation

In addition to impacts common to all action alternatives, four action alternatives have alternative-specific impacts and mitigation that warrant additional discussion.

Action Alternative 2: Bioengineering

USACE permits require the use of native plants that are appropriate for site conditions, reducing the likelihood of colonization by invasive species and improving opportunity for successful establishment of ground cover. Well-established vegetation improves habitat in the long-term as it provides shelter, shade, food, cover, and other benefits for terrestrial and aquatic species [NAS 2016]. Living shorelines have minor to moderate adverse impacts to established habitats in coastal areas because they can result in localized habitat conversion [USACE 2016b] but can also provide benefits to degraded sites. FEMA anticipates minor to moderate beneficial impacts to habitat through incorporation of bioengineering measures.

Alternative 3: In-Stream Structures

In-stream structures are sometimes installed with a secondary goal of improving aquatic habitat by creating flow diversity through the formation of scour pools and deep holes. They may also provide refuge for fish and aquatic invertebrates during high-flow events [NAS 2014, NAS 2016]. In-stream structures that slow stream velocities allow plants to establish naturally along banks and in the voids between stones, aiding in stabilization and contributing to habitat benefits [NRCS 2013]. FEMA anticipates minor beneficial impacts from the secondary services in-stream structures provide.

Alternative 4: Loose Stone/Riprap

Riprap's effect on aquatic habitats and organisms depends on site-specific conditions. FEMA anticipates that riprap toe protection will have minor localized impacts to aquatic habitat in areas adjacent to roads, infrastructure, and buildings, and moderate localized impacts in less developed areas. In sites that are already degraded by intensive land uses and previous embankment hardening, riprap can improve habitat by providing cover for animals and substrate for aquatic

plants and immobile animals. Some studies have found that in shorelines that are protected by riprap revetment, there was little or no difference in biodiversity and organism abundance compared to natural shorelines. Other studies have found that locations with these conditions have markedly low species diversity and vegetative cover [USACE 2016 NWP 13 DD; NYSDEC 2014]. Stream habitats were found to improve when riprap stone toe protection included spurs [NAS 2005]. Habitat potential improves when riprap features are built to increase irregularity and complexity of the land/water interface. Riprap used above the OHWM can be vegetated and may allow some vegetation to establish naturally in the long term, but it will inhibit vegetation in the short-term.

Alternative 5: Rigid and Semi-Rigid Armoring

Semi-rigid and rigid armoring would have minor to moderate impacts to habitat depending on site conditions and methods employed. While some sessile animals and algae can inhabit bulkheads, meta-analysis of bulkhead habitat studies revealed a 23 percent decline in biodiversity and a 45 percent decline in organism abundance near bulkheads and seawalls compared to natural shorelines [USACE 2016 NWP 13 DD]. Actions that use sheet pile, rigid grouted or interlocking revetment or wall systems have fewer voids between stones or masonry units than stacked stone, pinned toe stone, timbers, and other materials and therefore have fewer surfaces for aquatic vegetation or immobile animals to take hold. Some wall and geogrid systems allow for planting; others are designed to also provide habitat improvements. Temporary noise and vibration from pile driving during bulkhead construction can be detrimental to aquatic habitats and shorebird nesting and may be subject to permit conditions such as seasonal restrictions.

5.7 Protected Species and Habitat

The Endangered Species Act (ESA) of 1973 provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing the ESA are the USFWS and National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service (NMFS). The law requires Federal agencies to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a “taking” of any listed species of endangered fish or wildlife.

The Migratory Bird Treaty Act (MBTA) of 1918 provides a program for the conservation of migratory birds that fly through the United States. The lead federal agency for implementing the MBTA is USFWS. The law requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any migratory birds or result in the destruction or adverse modification of designated critical habitat of such species. The law makes it illegal for anyone to “take,” possess, import, export, transport, sell, purchase, barter or

offer for sale, purchase, or barter, any migratory bird, or their parts, feathers, nests or eggs. “Take” is defined as “to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities.”

The Bald and Golden Eagle Protection Act (BGEPA), enacted in 1940, prohibits anyone without a permit issued by the Secretary of the Interior, from "taking” bald and golden eagles, including their parts, nests, or eggs. Like the MBTA, the law makes it illegal for anyone to “take,” possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any bald or golden eagle, or their parts, feathers, nests, or eggs.

The Magnuson–Stevens Fishery Conservation and Management Act (MSA) provides a critical role in sustaining life stages of fisheries and the persistence of fish and shellfish species. It places a high priority on the aesthetic, recreational and commercial value of fishery resources that are dependent on Essential Fish Habitat (EFH). Federal agencies are required to assess the potential impacts that proposed actions and alternatives may have on EFH. Federal agencies that fund, permit or carry out activities that may adversely impact EFH are required to consult with NMFS regarding potentially adverse effects of their actions and respond in writing to NMFS and Fishery Management Council recommendations. NMFS is further directed to comment on any state agency activities that may potentially impact EFH.

The Marine Mammal Protection Act (MMPA) extends protections to marine mammals. No person shall take, import, transport, purchase, sell or offer to purchase or sell any marine mammal or marine mammal product unless exempted by USFWS or NMFS.

5.7.1 Existing Conditions

ESA: Both New York and New Jersey have diverse wildlife habitats so, despite high levels of development in both states, a project site may be host to unusual, rare, or protected species. As of December 2019, New York has 13 federally protected animal species, eight federally protected plant species, and one critical habitat. New Jersey has eight federally protected animal species, six federally protected plant species, and no critical habitat. Both states have protection and management regulations for additional state-listed species and habitats: New York categorizes nearly 150 species of animals as endangered, threatened, or of special concern, and New Jersey lists nearly 90 species of animals as endangered or threatened.

MBTA, MMA and BGEPA: Both states are completely within the Atlantic Flyway and thus provide potential habitat for hundreds of species of migratory birds, seasonally and year-round. Golden eagles are considered eradicated as a breeding bird east of the Mississippi River but can be sighted in the eastern US during spring and fall migration [NYSDEC website, accessed 1/31/20]. Bald eagles are found year-round in both states and are often seen during the winter when they are nesting near rivers and estuarine areas. Marine mammals, including whales, seals, and dolphins inhabit coastal and estuarine areas in both states.

MSA: Coastal and estuarine areas off both states include mapped EFH. The NMFS manages the EFH Mapper website that shows EFH locations nationwide that have been mapped using geographic information system data. The maps are a generalized interpretation of the textual definition of EFH; they do not fully represent the complexity of the habitats described in the designation. The textual description of EFH within the EFH Mapper is always determinative of the presence or absence of EFH for the species.

5.7.2 Potential Impacts and Proposed Mitigation

5.7.2.1 Alternative 1: No Action Alternative

The no action alternative would have negligible to minor impacts on protected species, wildlife and fisheries. Ongoing, unstable erosion may contribute to turbidity that would be detrimental to fish and aquatic invertebrates, including protected freshwater mollusks.

5.7.2.2 Action Alternatives – Common Scope of Work

All action alternatives have the potential to affect protected species and habitats. FEMA expects impacts to be minor and limited by permitting conditions and any recommendations resulting from consultation. Protected species are subject to the same effects from habitat loss and alteration discussed in section 5.6 of this PEA, and generally, similar mitigation measures are employed to reduce short and long-term impacts. Regardless of the alternative, FEMA will analyze the project location, site characteristics, USFWS's Information for Planning and Consultation (IPaC), and available Natural Heritage Database data. FEMA will use this to consult with USFWS or NMFS, as appropriate, for any project that may have an impact on a protected species or resource.

ESA: FEMA will consult with USFWS for all actions that do not result in a "no effect" determination. FEMA may make a determination of "may affect, not likely to adversely affect" a threatened or endangered species or critical habitat with one or more project-specific conditions. For projects taking place in an area with potential northern long eared bat habitat, FEMA will follow USFWS's final 4(d) rule. If USFWS concur with FEMA's determination, agency concurrence and project conditions are recorded in the REC. FEMA will consult with NMFS for projects that adversely impact species unless guidance from NMFS directs otherwise. Projects designed to meet NWP conditions and state permitting requirements will minimize potential impacts to species. Consultation with USFWS or NMFS will continue until project impacts are mitigated satisfactorily.

MBTA, MMA and BGEPA: FEMA will consult with USFWS or NMFS for projects that have the potential to take species protected by these laws. Consultation may result in a finding that no take is likely to occur with or without project conditions, and in this case, FEMA documents its determination, agency concurrence and any project conditions in a REC.

MSA: If a project area is within or adjacent to EFH, FEMA would determine whether the action would cause physical, chemical, or biological changes to the waters. FEMA will follow the same process for EFH as ESA for coordination with NMFS.

5.7.2.3 Alternative-Specific Impacts and Mitigation

In addition to impacts common to all action alternatives, two action alternatives have alternative-specific impacts that warrant additional discussion.

Action Alternative 2: Bioengineering

Section 5.6 of this PEA discusses some habitat benefits that bioengineering and living shorelines can result in post-construction. As a result, FEMA anticipates negligible to minor beneficial impacts to habitat through incorporation of bioengineering measures.

Alternative 3: In-Stream Structures

Section 5.6 of this PEA discusses benefits to species from reduced velocities and potential habitat enhancements for some species. As a result, FEMA anticipates negligible to minor beneficial impacts from the secondary services in-stream structures provide.

5.8 Cultural Resources

Cultural resources include historic properties, sacred sites, archaeological sites, and other resources of cultural significance to a community. Section 106 of the National Historic Preservation Act (NHPA), as amended, and implemented by 36 CFR Part 800 requires federal agencies to consider the effects of their actions on historic properties. It provides the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on federal projects that may have an effect on historic properties. Historic properties include districts, buildings, structures, objects, landscapes, archaeological sites, and traditional cultural properties that are listed on or eligible for listing on the National Register of Historic Places (NRHP). Eligibility criteria can be found at 36 CFR Part 60. Section 106 consultation as detailed in 36 CFR Part 800 must take place prior to the approval of the expenditure of federal funds on an action, known as an 'undertaking' under NHPA. FEMA consults with the State Historic Preservation Office (SHPO), Tribal Historic Preservation Offices (THPOs), the public, and other consulting parties throughout the Section 106 process. Under 36 CFR 800.4(a)(1), the Area of Potential Effects (APE) is defined as the geographic area(s) within which the undertaking may directly or indirectly affect cultural resources. The APE may also include a site's viewshed within a historic district or landscape, or visible between a project site and a historic structure or district.

5.8.1 Existing Conditions

In accordance with 36 CFR Part 800.14, FEMA has executed Programmatic Agreements that are applicable to projects in New York and New Jersey. These Programmatic Agreements stipulate roles and responsibilities, exempt certain undertakings from Section 106 review, establish

protocols for consultation, facilitate identification and evaluation of historic properties, and streamline the assessment and resolution of adverse effects.

The statewide Programmatic Agreements include the New York and New Jersey SHPOs, the Landmark Preservation Commission in New York City, and the Advisory Council on Historic Preservation. Other parties include New Jersey Office of Emergency Management, New York State Division of Homeland Security and Emergency Services, and the Tribal Nations with an interest in the two states. FEMA recently updated the New York State Programmatic Agreement in November 2019 and is in the process of updating the New Jersey Programmatic Agreement as of the writing of this PEA.

Streams and rivers are often associated with historic and prehistoric settlements, estates, mills, mining, transportation, and other human activities. Infrastructure features like canals, ornamental masonry retaining walls, canals, bridges, and dams may be NRHP-eligible individually or can contribute to a historic district or landscape. Coastlines and lakeshores may be associated with Native American settlements, military, trade, and navigation activities. NRHP-eligible or contributing resources may include shipwrecks, seawalls, and lighthouses. Shorelines and stream banks and the upland areas around them are often archeologically sensitive, with a high likelihood of prehistoric resources in undisturbed soil.

5.8.2 Potential Impacts and Proposed Mitigation

5.8.2.1 Alternative 1: No Action Alternative

FEMA anticipates that the no action alternative could result in minor to major impacts. Ongoing embankment erosion or failure may cause damage to historic structures or lead to the permanent loss of archeological resources.

5.8.2.2 Action Alternatives – Common SOW

All action alternatives have the potential to disturb archeological resources as a result of excavation, construction staging, and site access that disturbs previously undisturbed soils. Projects that include demolition, repair and replacement of bulkheads, retaining walls, revetments or other structures may affect character-defining elements of a historic property. Projects for construction of new structures within or visible from a historic property may affect the aesthetic character and viewshed of a site. If archaeological sites are present, Phase I or Phase II archaeological testing, may be warranted to determine the site boundaries and assess the NHRP eligibility.

Embankment projects have the potential to affect historic and cultural resources. Surviving infrastructure of cultural significance or archeological resources may be present within the project area. FEMA would seek to identify historic properties that may be affected by the undertaking and if a culturally significant site exists within the APE, FEMA Historic Preservation staff will determine if a project SOW has the potential to affect the resource. If the scope meets allowances outlined in

the Programmatic Agreements, FEMA will determine if the project is within compliance with Section 106 of NHPA and the review process will be complete. If the proposed SOW does not fall within an allowance, FEMA will follow the standard Section 106 review process and initiate consultation with the respective SHPO and any appropriate consulting parties. These consultations will be included in the individual RECs for each project. Through consultation and mitigation, FEMA anticipates that this alternative will have a negligible to moderate impact to cultural resources.

5.9 Environmental Justice

Executive Order 12898 Federal Actions to the address the Environmental Justice in Minority Populations and Low-Income Populations requires agencies to identify and address disproportionately high and adverse human health or environmental effects its actions on minority or low-income populations.

5.9.1 Existing Conditions

FEMA follows USEPA's guidelines to assess disproportionate impacts and uses resources such as USEPA's EJScreen website to identify potential communities of concern. Where there is a potential for disproportionately high or adverse impacts, FEMA consults with USEPA and incorporates recommendations for mitigating those impacts.

5.9.2 Potential Impacts and Proposed Mitigation

5.9.2.1 Alternative 1: No Action Alternative

Under the no action alternative, FEMA would either not fund repairs to embankment failures or for mitigation to improve the resiliency of infrastructure or funding would be delayed. Infrastructure may be disrupted ranging from utility services to roads, bridges, and culverts. Failures that result in closed roads may isolate populations in remote areas or increase travel time, increasing vehicle emissions and exacerbate barriers to accessing services. Accumulation of sedimentation downstream of a failure has to potential to increase flood risk to surrounding areas. In areas subject to wave action, the failure of a bulkhead in a community of concern could expose people to increased risk of flooding. The potential for disproportional adverse impacts will vary widely by the location. FEMA anticipates impacts ranging from no to moderate and will evaluate on a project-by-project basis.

5.9.2.2 Action Alternatives – Common SOW

FEMA anticipates that none of the action alternatives would have disproportionately high or adverse long-term impacts on low-income or minority populations. For each project location, FEMA will consider the SOW and location to identify potential impacts to communities of concern. If the project has a potential to impact one, FEMA will consult with USEPA and incorporate recommendations into the project to minimize impacts. Short term impacts would primarily include temporary increase of traffic for construction activities and increase of emissions associated with vehicles and heavy equipment. Rerouting of traffic is possible during construction

as well. FEMA anticipates negligible to minor impacts for projects located in communities of concern during construction because of the beneficial intent of correcting damages and addition of mitigation measures to improve resiliency.

5.10 Hazardous Materials

Hazardous materials and wastes are also regulated under a variety of federal and state laws, including 40 CFR Part 260, the Resource Conservation and Recovery Act of 1976 [42 USC 6901 et seq.] and Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 USC 9601 et seq.]. Standards under the Occupational Safety and Health Act (OSHA) seek to minimize adverse impacts on worker health and safety. Evaluations of hazardous substances and wastes consider whether any hazardous material would be generated by the proposed activity and/or already exists at or in the general vicinity of the site [40 CFR 312.10].

5.10.1 Existing Conditions

Site or facility history, previous land use, or location relative to known hazardous waste sites can be an indicator of whether hazardous wastes are likely to be present. Materials such as creosote- and pressure-treated lumber and asbestos-containing concrete may be found in existing structures such as retaining walls, bulkheads, underground piping, and lined channels. There are 114 sites in New Jersey on USEPA's National Priority List, also known as Superfund sites. In New York there are 85 sites on the National Priorities List.

5.10.2 Potential Impacts and Proposed Mitigation

5.10.2.1 Alternative 1: No Action Alternative

Under the No Action Alternative, there would be no impacts involving handling and disposal of solid waste or hazardous wastes. Damage to facilities containing hazardous materials or that expose previously buried materials may contaminate water sources. Depending on site characteristics, FEMA anticipates that this alternative may have no to moderate impacts.

5.10.2.2 Action Alternatives – Common SOW

Each of the action alternatives has the potential to generate substantive quantities of solid waste during work such as removal of debris from adjacent streambeds and demolition of existing structures. To minimize impacts to human health and safety, Subrecipients will use personnel trained in the proper use of personal protective equipment and the job specific duties according to OSHA standards. FEMA requires that Subrecipients properly handle and dispose of debris and hazardous wastes in accordance with local, state, and federal laws. FEMA requires that materials used in construction also meet local, state, and federal requirements. Contractors performing the work may be required to have a license or permit from local or state governments as well. If contractors discover unanticipated site contamination, FEMA expects them to stop work and report it in accordance with local and state procedures. Likewise reporting, if there are accidental releases of fuel, oil, or similar contaminants during construction. For sites that are in or adjacent to

identified Superfund sites, FEMA will consult with USEPA to determine any additional conditions or measures to carry out the project. FEMA anticipates that by following these requirements, there will be no to minor impacts related to hazardous materials.

5.11 Cumulative Impacts

In accordance with NEPA, this PEA considers the overall cumulative impact of the Action Alternatives and other actions that are related in terms of time or proximity. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time [40 CFR 1508.7]. Cumulative impacts are those impacts "…which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions…" [40 CFR 1508.7]. In addition to NEPA, other statutes require federal agencies to consider cumulative impacts as well. These include the Clean Water Act section 404(b)(1) guidelines, the conformity provisions of the Clean Air Act, Section 106 of the NHPA, and Section 7 of the ESA.

5.11.1 Summary of Cumulative Impacts

A large storm or flood may affect stretches of stream or coastline that result in projects that may not be especially close to one another and occur in different jurisdictions, by different Subrecipients. In other situations, small sections of a stream or coastline may erode or fail over several years, resulting in a patchwork of repairs undertaken by the same entity each time. Multiple projects taking place along the same stream or coastline concurrently or over several years have the potential for cumulative impacts that are difficult to quantify.

FEMA anticipates all actions covered by this PEA to have less than major adverse impacts to resources; mitigation and compliance with permits and conditions resulting from consultations will limit potential impacts. Project proposals with major impacts or impacts that cannot be mitigated will require an SSEA. However, this PEA does not consider specific project locations or Subrecipients, and it cannot predict the frequency or proximity of projects that it will cover. For projects that meet the scale threshold considered in this PEA, but that would otherwise be unusual at its location, FEMA may prepare an SSEA to evaluate any extraordinary circumstances. For multiple projects happening in similar time and location with impacts, FEMA may prepare SSEA to consider cumulative impacts of those projects. By considering the thresholds considered in their respective CATEXs which other agencies that fund, approve, or conduct for similar actions, FEMA anticipates that actions in this PEA will remain below the threshold of significance.

6.0 PERMITS AND PROJECT CONDITIONS

The Subrecipients are responsible for obtaining all applicable federal, state, and local permits and other authorizations and adhering to permit conditions for project implementation prior to construction. Subrecipients are responsible for providing copies of permits to the Recipients and

FEMA prior to project closeout and should do so upon obtaining them. Any substantive change to the approved SOW will require reevaluation by FEMA for compliance with NEPA, other laws, and EOs. The Subrecipients must not exceed the thresholds described in Section 9 of this PEA during project implementation without first notifying FEMA in advance.

The Subrecipients must also adhere to project-specific conditions as documented on the REC during project implementation and observe the below conservation recommendations. FEMA expects the following conditions are applicable to all project scopes of work covered by this PEA. Failure to comply with grant conditions may jeopardize federal funds:

1. The Subrecipients area responsible for completing state and local environmental and land-use reviews in accordance with state and local regulations.

2. Excavated soil and waste materials must be managed and disposed of in accordance with applicable federal, state, and local regulations. In the event of discovery of soil or water contaminants exceeding reportable levels, the Subrecipient and its construction contractor(s) will follow applicable federal, state, and local protocol to report and respond to the contaminants.

3. The work may be authorized by USACE permits. The Subrecipient is responsible for obtaining all necessary permits and complying with all conditions of the permit including but not limited to notification and signature requirements to insure validation of permits.

4. The Subrecipients may be required to obtain a New York SPDES or NJPDES permit prior to construction.

5. Subrecipients must comply with any requirements and avoidance measures pursuant to Section 7 of the ESA. If protected species are observed during construction, activities that could result in harm or disturbance must stop immediately and the Subrecipient must notify the Recipient and FEMA. USFWS or NOAA may require FEMA to conduct additional consultation.

6. The Subrecipients must follow the conditions resulting from consultation with the SHPO and Tribal Nations. If unexpected archaeological resources are encountered during construction, the Subrecipient must stop work and notify the Recipient and FEMA. FEMA will determine what additional consultation with the SHPO and the Tribal Nations are required, and what additional conditions or avoidance measures may apply.

7. FEMA recommends that the Subrecipients restore disturbed construction areas of the site with native seed and/or plant species to minimize soil erosion and sedimentation, as well as enhance environmental habitat quality of project area. FEMA also recommends that disturbed soil areas be planted as soon as practicable after exposure to avoid or minimize

growth of undesired and potentially invasive plant species. Local landscape plant nurseries and soil conservation offices can assist with identification of suitable native plants for site location and type.

7.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

This PEA will be made available for agency and public review and comment for a period of 30 days. The public process will include information about the actions in a public notice distributed electronically by FEMA to counties throughout both states. Additionally, the public notice and this PEA will be posted on the New Jersey Office of Emergency Management website at https://njemgrants.org/; and linked to on the New York Department of Environmental Conservation Shoreline Stabilization website at https://www.dec.ny.gov/permits/50534.html; and will also be available for download at https://www.fema.gov/resource-document-library.

This PEA reflects the evaluation and assessment of the federal government, the decision maker for the federal actions; however, FEMA will take into consideration any substantive comments received during the public review period to inform the final decision regarding grant approval and project implementation. The public is invited to submit written comments by emailing FEMAR2COMMENT@fema.dhs.gov or by mail to Department of Homeland Security, FEMA Region II, Attn: Environmental Planning and Historic Preservation, 26 Federal Plaza, New York, NY, 10278.

If no substantive comments are received, the PEA will be adopted as final, and FEMA will issue a FONSI. If FEMA receives substantive comments, they will be evaluated, and FEMA will address them as part of the FONSI documentation or in a final PEA.

8.0 LIST OF PREPARERS

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9.0 THRESHOLDS FOR PREPARING TIERED SSEA

Area of Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Geology, Topography, and Soils	The proposed action would have no, negligible, or minor impacts to geology, topography, and soils. or The proposed action results in moderate impacts that are mitigated by regulatory permit conditions and resource agency consultations to reduce the impacts below the level of significance. and The proposed action is consistent with the FPPA and NRCS policies.	The proposed action results in major impacts to geology, topography and soils that cannot be mitigated. or The proposed action includes work that exceeds the thresholds for scale established in this PEA. or FPPA consultation indicates that the proposed action may cause significant impacts to prime and unique farmland. or The proposed action includes more than 1,000 linear feet of new bulkheading.
Air Quality	Emissions from the proposed action for NAAQS in nonattainment and maintenance areas would be below the de minimis levels. Emissions in attainment areas would not cause air quality to go out of attainment for any NAAQS. or Mitigation measures are used to reduce the level of impacts below the level of significance.	Emissions from the proposed action for NAAQS would be greater than the exceedance levels for nonattainment and maintenance areas. Emissions in attainment areas would cause an area to be out of attainment for any NAAQS after a conformity determination.

Area of Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Water Quality	The proposed action would have no, negligible or minor impacts to water resources and would be at or below water quality standards or criteria. Localized and short-term alterations in water quality and hydrologic conditions relative to historical baseline may occur. or The proposed action results in moderate impacts that are mitigated by regulatory permit conditions and resource agency consultations to reduce the impacts below the level of significance. and The proposed action does not require an individual permit from USACE. and The proposed action is in compliance with all permit conditions, notification and reporting requirements for applicable NWPs, regional general permits, emergency authorizations, programmatic general permits or other USACE-issued general permit. and The Subrecipient has received a written waiver from USACE for projects that exceed permit thresholds. and The proposed action does not have the potential to contaminate a sole source aquifer and FEMA has determined it is consistent with the SDWA. and Proposed action is consistent with the goals of the WSRA. This determination requires coordination with National Park Service, USFWS and/or USACE.	The proposed action would cause or contribute to existing exceedances of water quality standards resulting in violation of state water quality criteria. or The proposed action requires an individual permit from USACE. or Subrecipient has not demonstrated compliance with applicable permit conditions, notifications or application procedures. or Proposed action has the potential to contaminate a sole source aquifer and is not consistent with SDWA. or After consultation with National Park Service, and coordination with USACE and USFWS, FEMA determines that the proposed action has the potential to result in adverse impacts to designated river in the National Wild and Scenic River program.

Area of Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Floodplains and Wetlands	Proposed action is not located in or does not adversely affect floodplains or wetlands. or Subrecipient has complied with all state, federal and local permit conditions, regulations and authorizations, including CWA, state floodplain and wetland laws and local floodplain codes. and The proposed action will not increase levels, frequency or duration of floods and will not alter hydrological connectivity. and FEMA has completed an eight-step decision-making process and has determined that the proposed action is the most practicable alternative.	Proposed action requires an individual permit from USACE because of impacts to a wetland. or The proposed action would result in adverse effects to the floodplain or wetlands, including an increase in flood levels, significant changes to flood frequency, conveyance and duration that increase flood risk at locations upstream, downstream or adjacent to the project site.
Coastal Resources	Proposed action in a coastal zone has received consistency determination or complied with state-issued permits, and the proposed action would have no, negligible or minor impacts to coastal resources. or The proposed action is located within a Coastal Barrier Resources System and FEMA receives concurrence from USFWS that it qualifies as an exception under Section 3505.a.6 of the CBRA and is consistent with CBRA. or The proposed action results in moderate impacts that are mitigated by regulatory permit conditions and resource agency consultations to reduce the impacts below the level of significance.	Proposed action is located within a Coastal Barrier Resources System and USFWS does not concur that it qualifies as an exception under Section 3505.a.6 of the CBRA. or For work subject to CZMA consistency review, proposed Action has not received concurrence for the 44 coastal management policies from NYSDOS or permit authorization from NJDEP. or Proposed action includes work in addition to shoreline stabilization actions included in this PEA that would exceed dimensional thresholds and conditions for FEMA CATEXs. or Proposed is for beach renourishment and does not meet conditions for FEMA CATEX.

Area of Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Vegetation, Habitat, Wildlife and Fisheries	The proposed action would have no, negligible or minor impacts to native vegetation and animal species, their habitats, or the natural processes sustaining them. Population levels of native species would not be affected. Sufficient habitat would remain functional to maintain viability of all species. or The proposed action would have temporary, localized adverse effects on vegetation that would be mitigated by using vegetative measures to implement the action and stabilize project site. or Proposed action discourages spread of invasive species by implementing BMPs according to state and federal guidance.	Proposed action specifies use of exclusively non-native plants for bioengineering. or Proposed action does not implement BMPs consistent with state and federal guidance to reduce the spread of invasive species EO 13112 Invasive Species. or Proposed action includes permanent removal of vegetation or measures that prevent re-establishment of vegetation in excess of what is required to implement the project. or Proposed action includes removal of vegetation that irreparably fragments established habitat or wildlife corridors adjacent to the project site and loss of habitat would affect the long-term viability of native species.
Protected Species	The proposed action would not affect any threatened, endangered or otherwise protected species or habitats. or The proposed action results in potential moderate impacts that are mitigated via resource agency consultations. FEMA makes a "May affect, Not Likely to Adversely Affect" determination and USFWS or NMFS concurs. or Proposed action includes mitigation measures to reduce the level of impacts to species and habitats protected by MBTA, BGEPA MSA, and MMPA below the level of significance.	Projects that exceed a "May affect, Not Likely to Adversely Affect" determination to a species listed as federally threatened or endangered. or Projects that are determined to likely result in the take of birds protected under the MBTA or BGEPA or marine mammals protected under the MMPA. or Projects that result in the loss or adverse modification of designated critical habitat for a listed species. or Projects having major impacts to Essential Fish Habitat that cannot be mitigated through consultation with the NOAA.

Area of Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Cultural Resources	The effects of the action can be resolved through the Programmatic Agreement or standard consultation.	FEMA makes an "Adverse Effect" determination with concurrence from SHPO/THPO that cannot be resolved using measures outlined in state programmatic agreements or negotiated through a standard project-specific Memorandum of Agreement. or Projects that that result an "Adverse Effect" determination on a National Historic Landmark.
Environmental Justice	There would be no disproportionately high and adverse environmental or health effects to low-income and/or minority populations. or Mitigation measures are used to reduce the level of impacts below the level of significance.	There would be unmitigated disproportionately high and adverse environmental and health impacts to low-income or minority populations.
Hazardous Materials and Waste Management	Any hazardous materials exposed, generated, or used during construction would be handled and disposed of in accordance with applicable local, state, and federal regulations. and To minimize risks to human health and safety, all construction activities would be performed using qualified personnel trained in the proper use of appropriate equipment and applicable safety measures.	Projects within an area designated by USEPA as a superfund site on the National Priorities List. or Projects on a site with extensive and unremediated contamination.

10.0 IMPACT SUMMARY

Resource Section	No Action	Alternative 1: Return to Pre-Disaster Function	Alternative 2: Bioengineering	Alternative 3: In-Stream Structures	Alternative 4: Loose Stone/Riprap	Alternative 5: Rigid and Semi-Rigid Armoring
5.1 Geology, Topography, Soils	Geology: negligible to none Soils & Topography: minor impacts to moderate	Minor to moderate Beneficial Impact: long-term minor to moderate	Minor to moderate Beneficial Impact: long-term minor to moderate	Moderate	Minor to moderate Beneficial: long-term minor to moderate	Moderate
5.2 Air Quality	Negligible to minor	Negligible to minor	Negligible to minor	Negligible to minor	Negligible to minor	Negligible to minor
5.3 Water Quality	CWA: minor to moderate SDWA & WSRA: no impact	CWA: minor to moderate SDWA: negligible WSRA: negligible to minor	CWA: negligible to minor SDWA: negligible WSRA: negligible to minor Beneficial: minor to moderate	CWA: minor to moderate SDWA: negligible WSRA: negligible to minor	CWA: minor to moderate SDWA: negligible WSRA: negligible to minor	CWA: moderate SDWA: negligible WSRA: negligible to minor
5.4 Floodplains and Wetlands	Minor to moderate	Minor to moderate	Minor to moderate Beneficial: Minor to moderate	Minor to moderate Beneficial: Minor to moderate	Minor to moderate	Minor to moderate Beneficial Living Shorelines: Minor to moderate

Resource Section	No Action	Alternative 1: Return to Pre-Disaster Function	Alternative 2: Bioengineering	Alternative 3: In-Stream Structures	Alternative 4: Loose Stone/Riprap	Alternative 5: Rigid and Semi-Rigid Armoring
5.5 Coastal Resources	Minor to moderate	Minor to moderate	Minor to moderate Beneficial: Minor to moderate	Minor to moderate	Minor to moderate	Moderate
5.6 Vegetation, Habitat, Wildlife, and Fisheries	Minor to moderate	Minor to moderate	Minor to moderate Beneficial: Minor to moderate	Minor to moderate Beneficial: Minor	Minor to moderate	Minor to moderate
5.7 Protected Species and Habitat	Negligible to minor	Minor	Minor Beneficial: negligible to minor	Minor Beneficial: negligible to minor	Minor	Minor
5.8 Cultural Resources	Minor to major	Negligible to moderate	Negligible to moderate	Negligible to moderate	Negligible to moderate	Negligible to moderate
5.9 Environmental Justice	None to moderate	Negligible to minor	Negligible to minor	Negligible to minor	Negligible to minor	Negligible to minor
5.10 Hazardous Materials	None to moderate	None to minor	None to minor	None to minor	None to minor	None to minor

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APPENDIX A: CATEX LANGUAGE

N2 Federal Assistance for Facility Repair. Federal assistance for the repair of structures and facilities in a manner that conforms to pre-existing, design, function, location, and land use. This CATEX does not apply to work within or affecting the following: streams; stream banks; seaward of the limit of moderate wave action (LiMWA) (a line mapped to delineate the inland extent of wave heights of 1.5 feet); or the V zone (areas expected to be affected by wave impact of 3 feet or more in height, in a 100-year flood event) if the LiMWA has not been identified. This CATEX covers temporary staging and the use of equipment and vehicles to carry out the proposed repair actions as long as best management practices are put in place to control noise, water, and air pollution.

N4 Federal Assistance for Actions Involving Stream Work and Modification and Floodways. Federal assistance for repair and restoration actions, hazard mitigation actions other than flood control, or the new construction of facilities that are functionally dependent of facilitate open space use, when the actions are within or affect regulatory floodways, streams, and stream banks and that

(a) Involve ground disturbance of less than ½ acre,
(b) Involve stream bank work or alteration of less than 300 linear feet,
(c) Do not involve hardening or armoring of the stream banks unless the project uses stream bank bioengineering techniques and improve fish passage or habitat,
(d) Do not result in adverse flood risk effects to downstream communities,
(e) Do not result in any increase of flood levels within the community during the occurrence of the base flood discharge if the action takes place within the regulatory floodway, and
(f) Where the effect of the proposed project when combined with other existing or reasonably foreseeable development will not increase water surface elevation of the base flood more than one foot at any point within the community if the action takes place in a floodplain with no regulatory floodway.

N5 Federal Assistance for Actions in Coastal Areas Subject to Moderate Wave Action or V Zones. Federal assistance for repair, hazard mitigation, new construction, or restoration actions of less than one-half acre within the following areas: areas seaward of the limit of moderate wave action (LiMWA) (a line mapped to delineate the inland extent of wave heights of 1.5 feet) during the base flood (an area that has at least a one-percent chance of being flooded in any given year); or areas within the V zone (a coastal area where there is a velocity hazard due to wave action) if the LiMWA has not been established. The actions must meet the following criteria:

(a) They are consistent with the State or Tribe enforceable policies of approved coastal management programs,
(b) They are not within or affect a Coastal Barrier Resource System unit,
(c) They do not result in man-made alterations of sand dunes,

(d) They do not result in the permanent removal of vegetation (including mangrove stands, wetlands, and dune vegetation), and
(e) Applicable Federal requirements and local codes and standards are followed.

If the actions involve substantial improvement or new construction of structures, the following criteria also apply:

1. The structure must be elevated upon open works (e.g. piles and columns), as opposed to fill, in a manner that the bottom lowest horizontal structural member is at or above the base flood level,
2. The foundation must be anchored to resist floatation, collapse, and lateral movement due to the effects of wind and water loads, and
3. The siting of the project must conform to applicable State, Tribe, or local setback requirements.

Examples of activities covered by this CATEX include but are not limited to: the repair and elevation of structures; repair and new construction of jetties and groins; the repair, hazard mitigation, and new construction of functionally dependent facilities such as piers, marinas, boat ramps, bathrooms, and port facility structures; and beach restoration projects except projects that result in the man-made alteration of dunes and wetlands such as beach nourishment projects.

N7 Federal Assistance for Structure and Facility Upgrades. Federal assistance for the reconstruction, elevation, retrofitting, upgrading to current codes and standards, and improvements of pre-existing facilities in existing developed areas with substantially completed infrastructure, when the immediate project area has already been disturbed, and when those actions do not alter basic functions, do not exceed capacity of other system components, or modify intended land use. This category does not include actions within or affecting streams or stream banks or actions seaward of the limit of moderate wave action (or V zone when the limit of moderate wave action has not been identified).

APPENDIX B: FIGURES

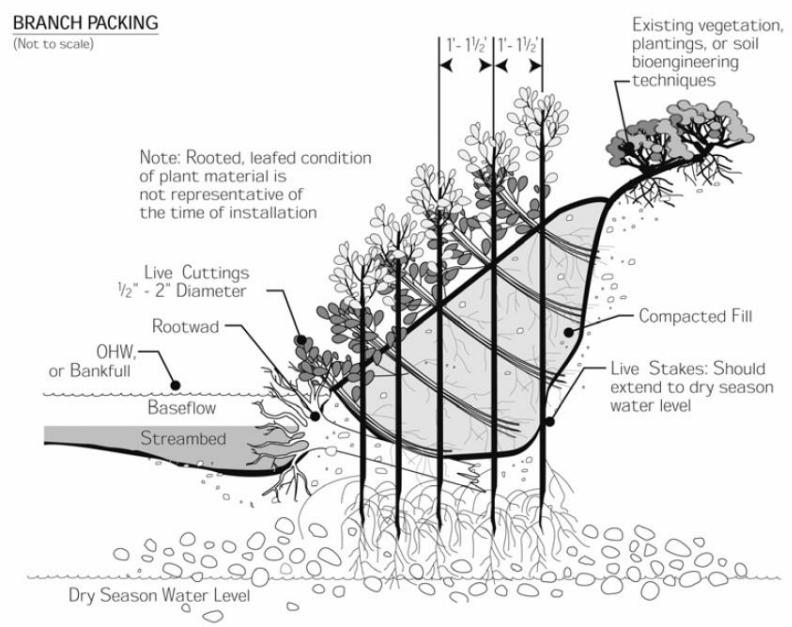


Figure 1: Cross section of an embankment showing multiple stabilization techniques including root wads and live stakes, also known as spiling or branch packing. USEPA 2007.

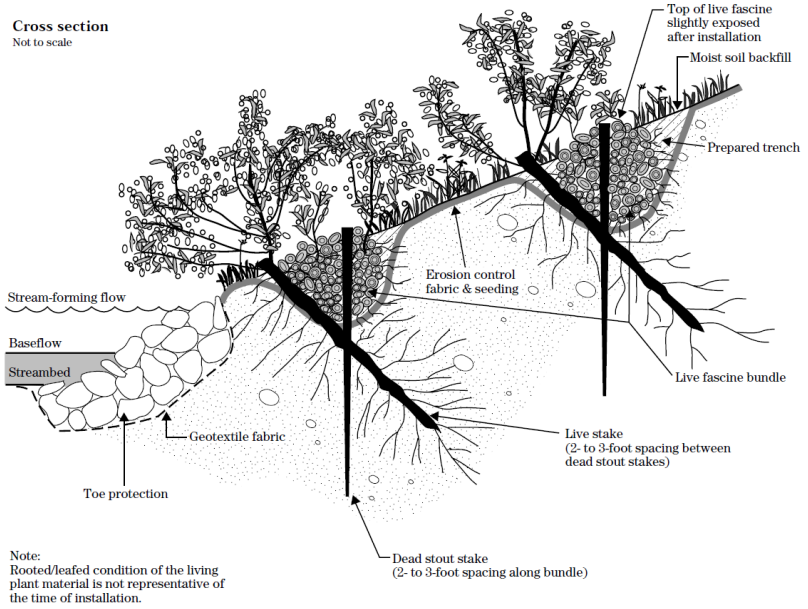


Figure 2: Cross section of an embankment showing multiple stabilization techniques including toe slope rip rap, geotextile fabric, live stakes, erosion control seeding, and live fascine bundles, sometimes called wattles. USDA NRCS 1996.

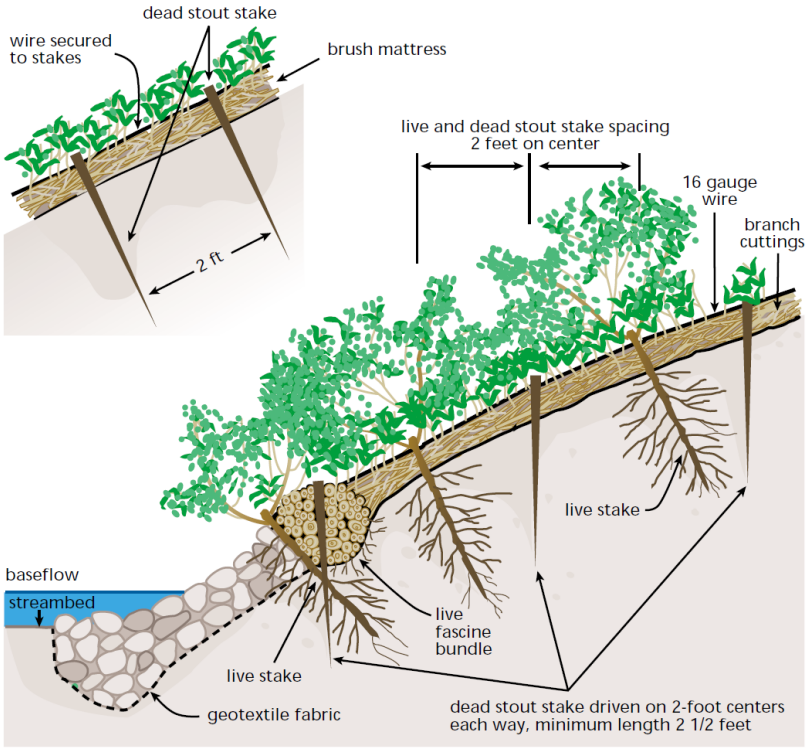


Figure 3: Cross section of an embankment showing multiple stabilization techniques including toe slope rip rap, geotextile fabric, live fascines, live stakes, and brush mattress consisting of a layer of branch cuttings providing soil cover and pinned with stakes. USDA NRCS 2001.

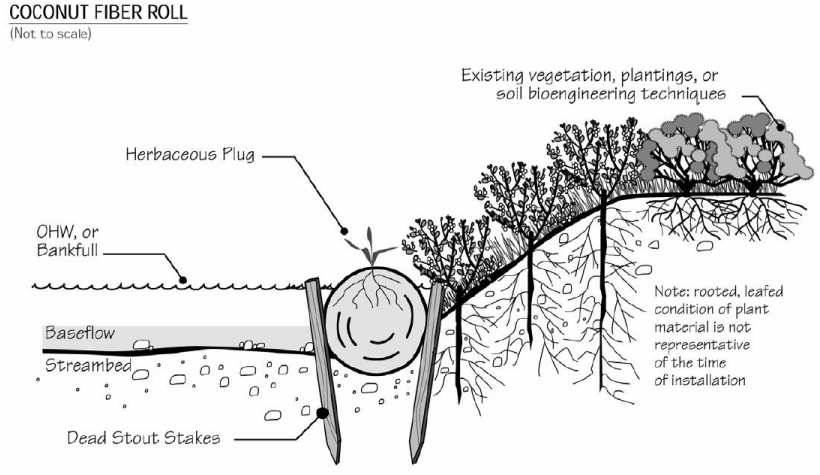


Figure 4: Cross section of an embankment showing a coconut fiber roll, sometimes called choir log, at the toe of an embankment, held in place with stakes, and live planting. USEPA 2007.

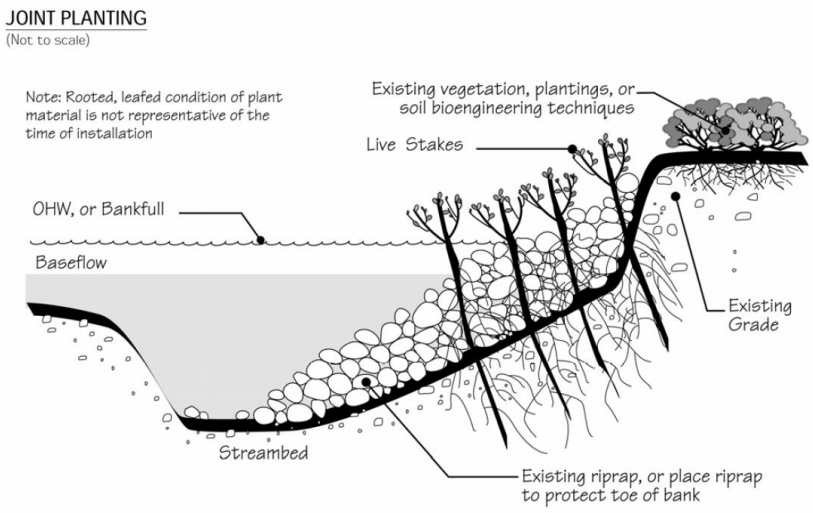


Figure 5: Cross section of embankment showing joint planting technique consisting of live planting interspersed with rip rap. USEPA 2007.

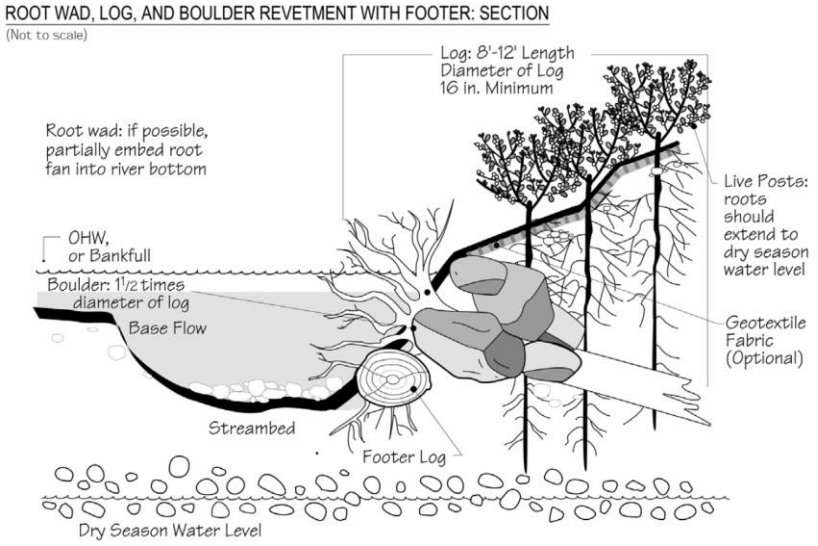


Figure 6: Cross section of embankment showing root wads and boulders with live planting. USEPA 2007.

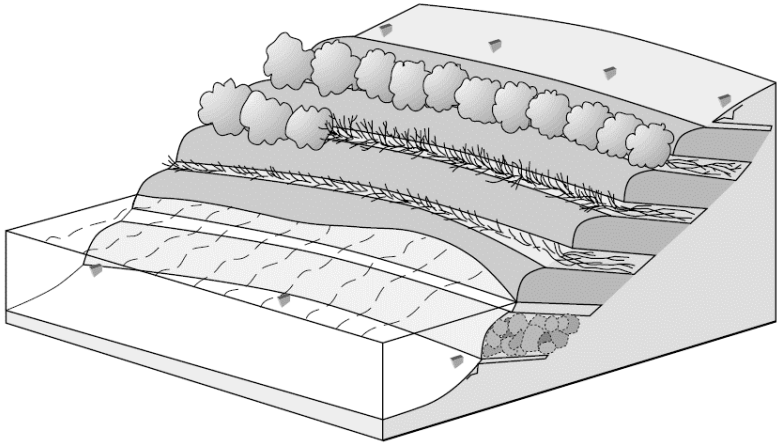


Figure 7: Diagram of embankment showing vegetated geogrids consisting of a base of rock wrapped in geotextile fabric with layers of soil above the water line similarly wrapped and interspersed with layers of live plantings. USDA NRCS 2001.

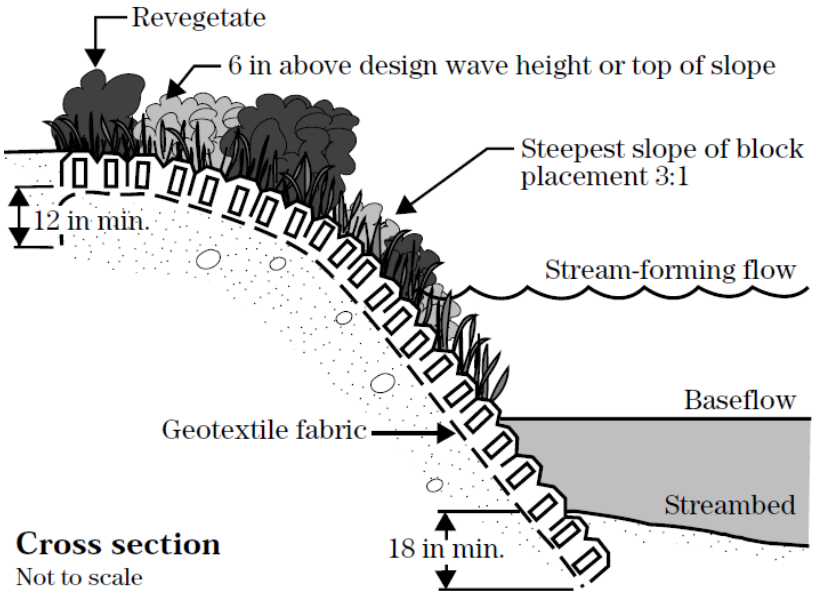


Figure 8: Cross section of embankment showing geocellular mat consisting of semi-rigid mat with open grids allowing planting within the voids. USDA NRCS 1996.

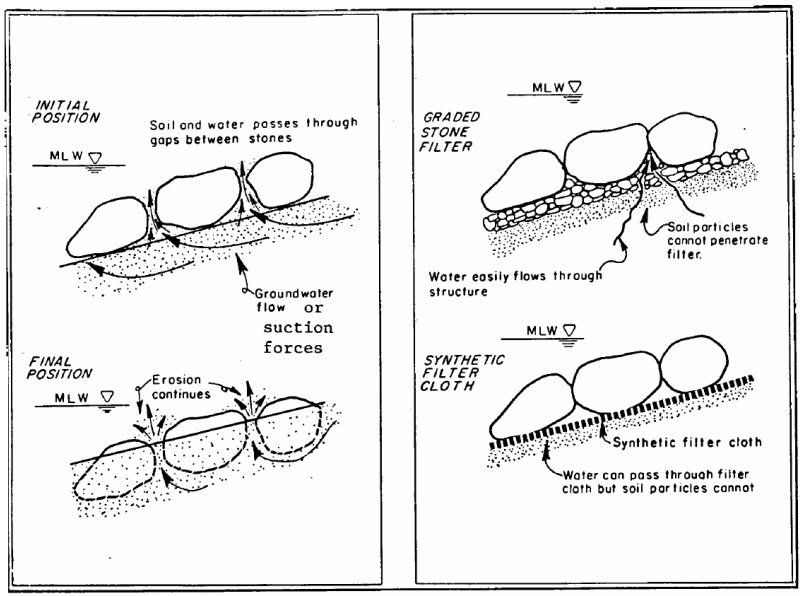
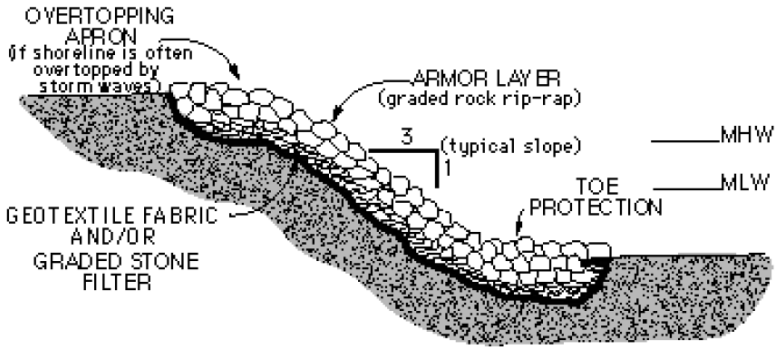


Figure 9: Diagram of proper versus improper rip rap placement for managing erosion. USDA Soil Conservation Service 1989.



Proper riprap placement (MHW=mean high water, MLW=mean low water).

Figure 10: Cross section of embankment showing rip rap with toe protection using proper placement for managing erosion. USEPA 2007.

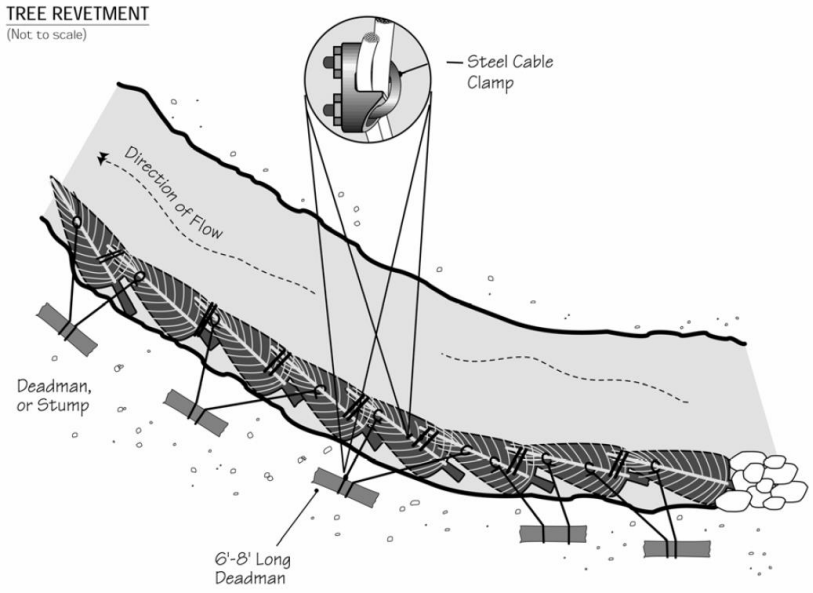


Figure 11: Plan view of a bend in a stream channel using tree revetment anchored by a log or other weight buried into the embankment with rip rap protecting the first tree on the upstream side. USEPA 2007.

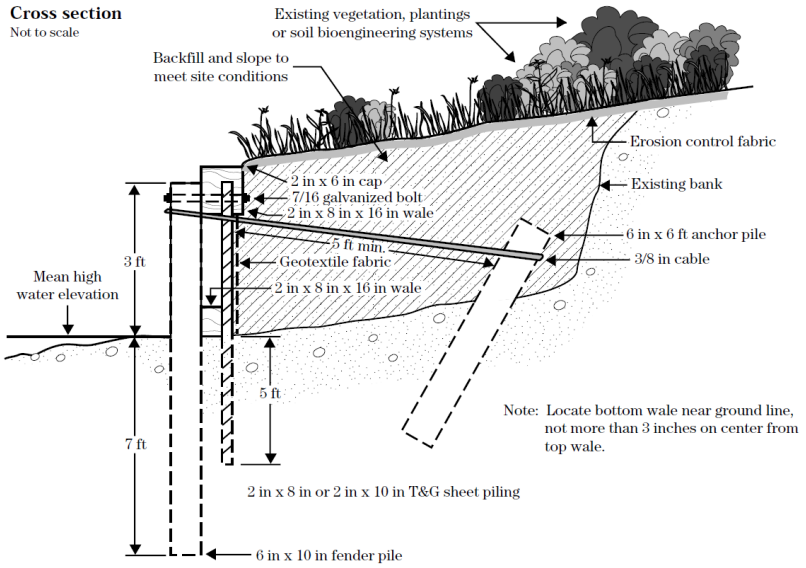


Figure 12: Cross section of bulkhead landward of mean high water level using either logs or sheet piling anchored to a pile or other weight buried in the embankment with geotextile fabric to manage soil erosion. USDA NRCS 1996.

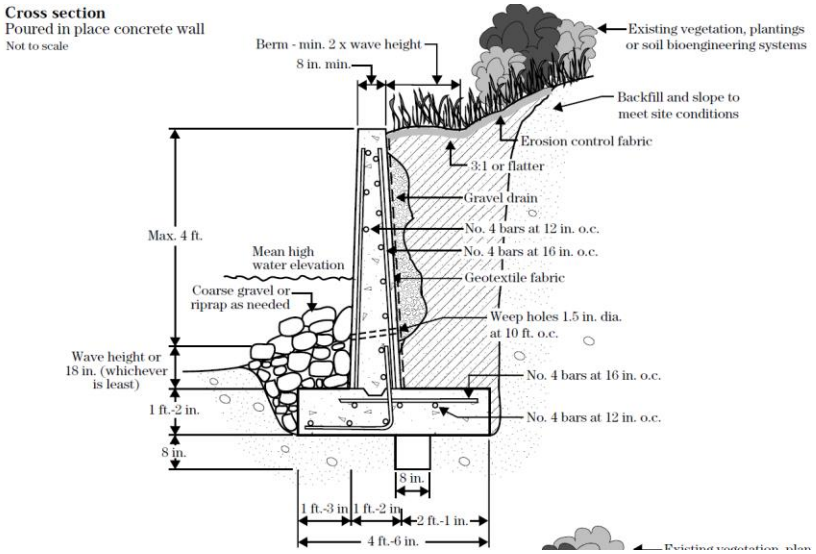


Figure 13: Cross section of a concrete retaining wall separating the embankment from mean high water with gravel or rip rap on the water side. USDA NRCS 1996.

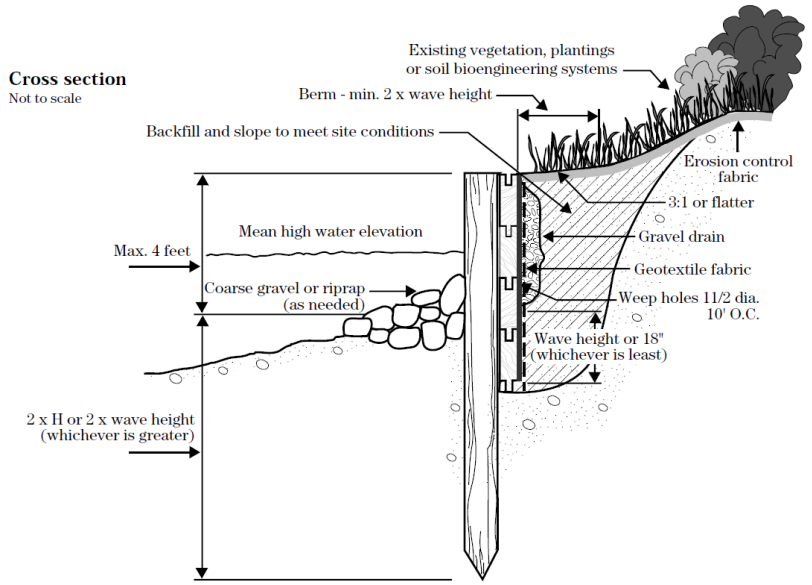


Figure 14: Cross section of a system of piles supporting horizontal tongue-in-groove planks separating the embankment from mean high water with gravel or rip rap on the water side. USDA NRCS 1996.

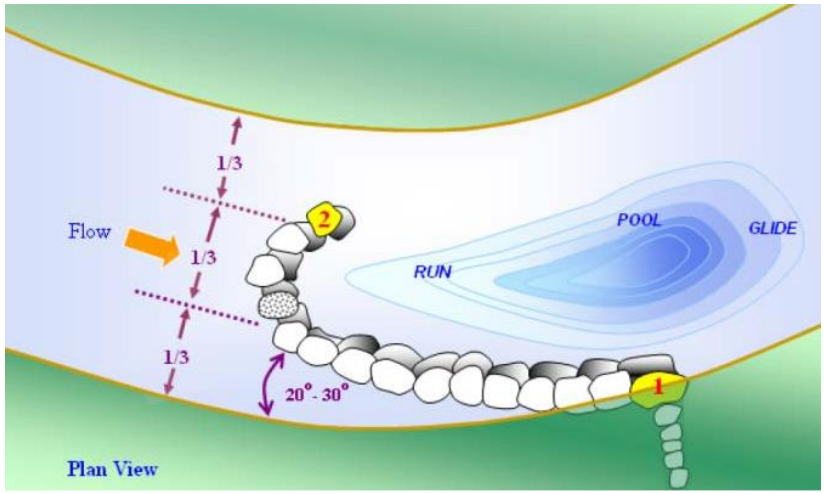


Figure 15: Plan diagram of a J-hook rock vane in a stream channel. USDA NRCS 2013.

Figure 16: Photograph of bendway weirs. USDA NRCS 2013.

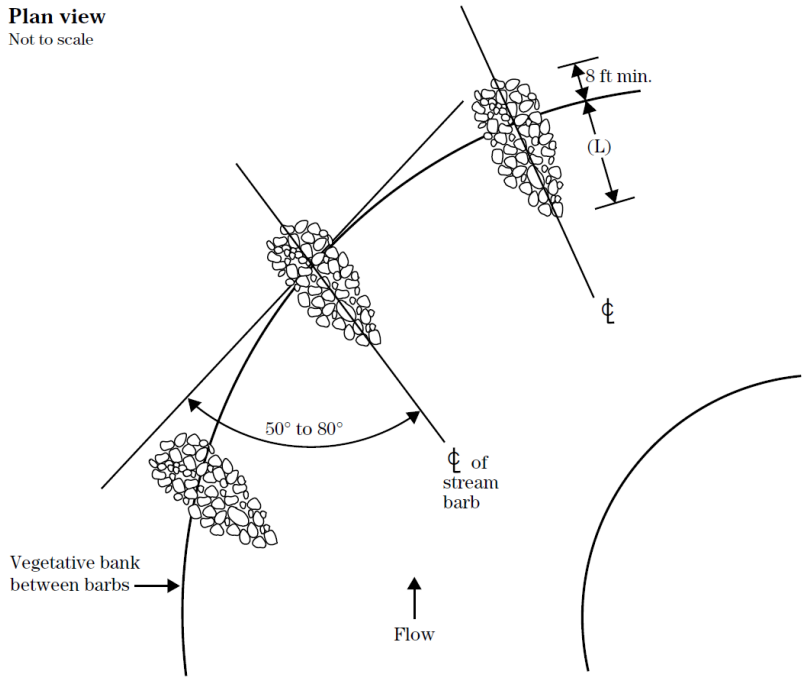


Figure 17: Plan diagram of stone stream barbs, also called bendway weirs. USDA NRCS 1996.

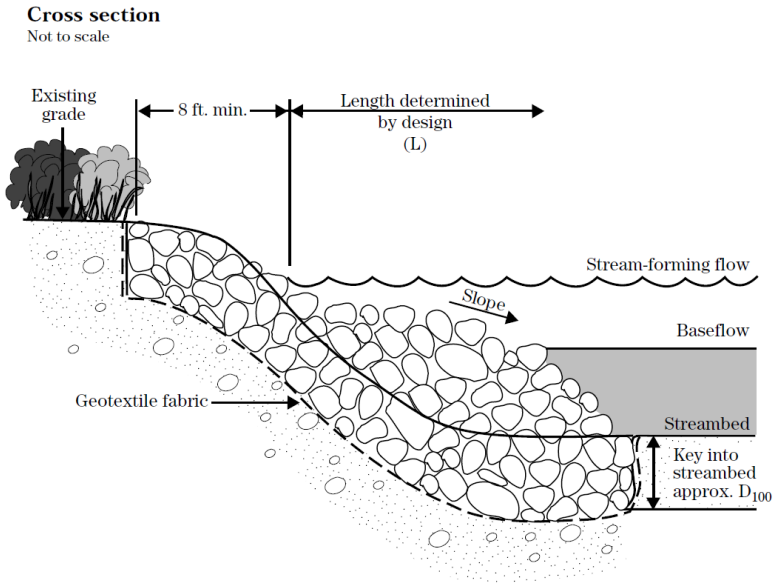


Figure 18: Cross section of stream barb showing stone keyed into the soil. USDA NRCS 1996.

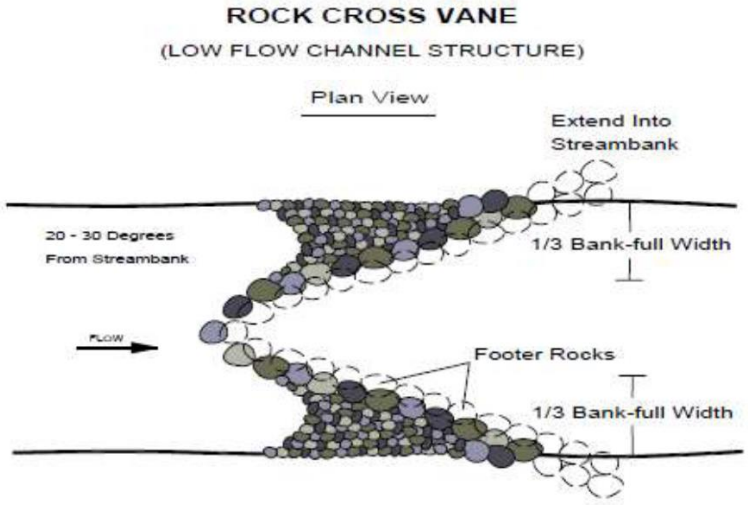


Figure 19: Plan view of rock cross vane. Cronauer 2016.

Figure 20: Photograph of rock cross vane. USDA NRCS 2013.

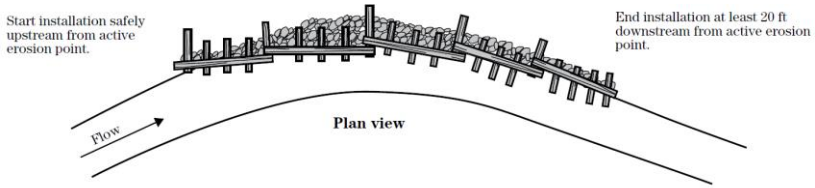


Figure 21: Plan view of log cribbing interspersed with stone. NRCS 2007b.

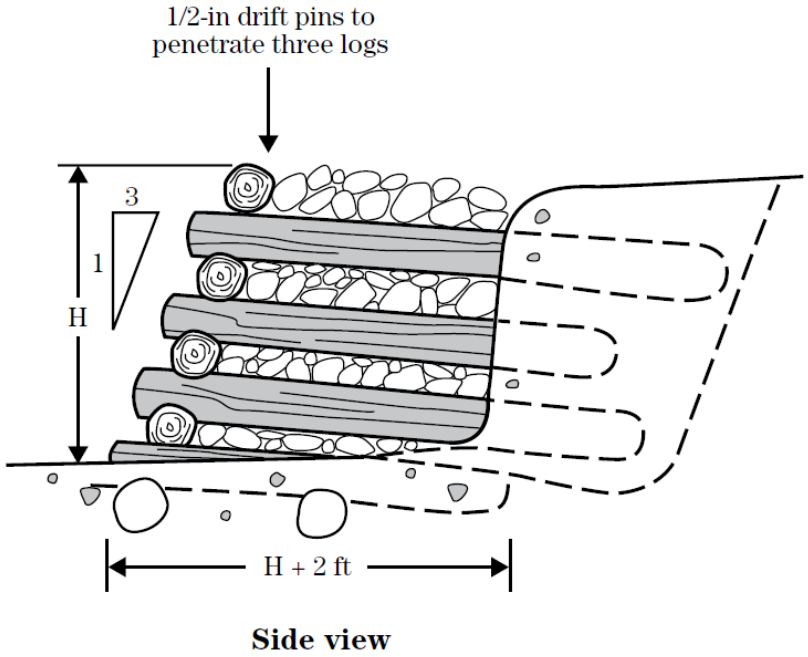


Figure 22: Cross section diagram of log cribbing with stone; engineered log jams also resemble cribbing. NRCS 2007b.

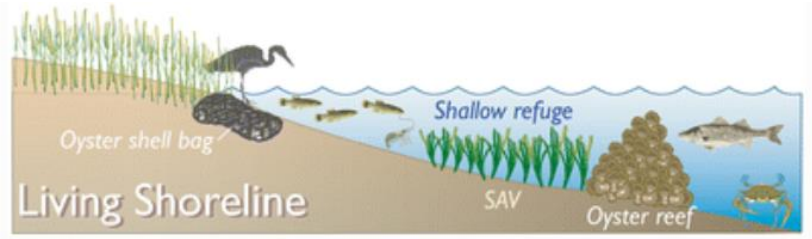


Figure 23: Cross section diagram of a living shoreline. Prosser 2018.

Figure 24: Photograph of rock gabion wall. NRCS 2007b.