

DRAFT

RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT

FOR THE

CORNELL-DUBILIER ELECTRONICS, INC. SUPERFUND SITE

SOUTH PLAINFIELD, MIDDLESEX COUNTY, NEW JERSEY

FEBRUARY 2021

Prepared by:

Cornell-Dubilier Electronics, Inc. Trustee Council

U.S. Fish and Wildlife Service on behalf of the U.S. Department of Interior

National Oceanic and Atmospheric Administration on behalf of the U.S. Department of
Commerce

New Jersey Department of Environmental Protection on behalf of the State of New Jersey

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CHAPTER 1 INTRODUCTION AND SUMMARY

1.1 Overview

The U.S. Department of Interior (DOI) acting through the U.S. Fish and Wildlife Service (Service), the U.S. Department of Commerce acting through the National Oceanic and Atmospheric Administration (NOAA), and the State of New Jersey acting through the New Jersey Department of Environmental Protection (NJDEP; collectively referred to as Trustees) initiated a natural resource damage assessment and restoration (NRDAR) process under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; 42 U.S.C. § 9601 *et seq.*) for the Cornell-Dubilier Electronics, Inc. Superfund Site (Cornell-Dubilier Site or Site), located in South Plainfield, Middlesex County, New Jersey. As part of the NRDAR process, the Trustees developed and jointly filed natural resources damages claims with potentially responsible parties seeking monetary compensation for injuries to natural resources caused by the release of hazardous substances and pollutants at or from the Cornell-Dubilier Site, as summarized in Section 1.7. Recovered damages are intended to restore, replace, rehabilitate and/or acquire the equivalent of injured natural resources, including their supporting habitats, to compensate the public for injuries to natural resources. The Trustees developed this Draft Restoration Plan and Environmental Assessment (Draft RP/EA) in accordance with 43 C.F.R. § 11.93 to identify and evaluate proposed restoration alternatives and to inform the public of the proposed restoration actions to be undertaken towards compensating the public for injuries to natural resources.

1.2 Purpose and Need for Restoration

The Trustees prepared this Draft RP/EA to address natural resources injured or lost due to releases of hazardous substances at and from the Cornell-Dubilier Site. Pursuant to Section 111(i) of CERCLA (42 U.S.C. § 9611(i)), and the CERCLA NRDAR regulations (43 C.F.R § 11.93), the Trustees have developed this Draft RP/EA to identify and evaluate proposed restoration alternatives to restore, replace, rehabilitate and/or acquire the equivalent of injured natural resources, including their supporting habitats, to compensate the public for natural resource injuries caused by the release of hazardous substances at the Site. Consistent with NRDAR regulations, this Draft RP/EA includes a reasonable number of restoration alternatives and identifies “preferred

alternatives” for funding and implementation. Public comments are being sought on this Draft RP/EA and will be considered and incorporated in the Final RP/EA as appropriate.

1.3 Natural Resource Trustees and Authorities

Pursuant to Section 107(f) of CERCLA, 42 U.S.C. § 9607(f); the Federal Water Pollution Control Act (Clean Water Act or CWA), 33 U.S.C. § 1321(f)(4) and (5); Subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. §§ 300.600, 300.605; and other applicable federal and state laws, designated federal and state authorities may act on behalf of the public as natural resource Trustees to pursue natural resource damages for injury to, destruction of, or loss of natural resources resulting from the release of hazardous substances to the environment. The State Trustee (*i.e.*, NJDEP) also acts pursuant to the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 *et seq.*; the Water Pollution Control Act, N.J.S.A. 58:10A-1 *et seq.*; and the authority vested in the Commissioner of the Department by N.J.S.A 13:1D-1 *et seq.*

This Draft RP/EA was prepared jointly by the Trustees in accordance with Section 111(i) of CERCLA (42 U.S.C. § 9611(i)) and the NRDAR implementing regulations (43 C.F.R. § 11.93).

1.3.1 CERCLA Compliance

In compliance with CERCLA, this Draft RP/EA evaluates a reasonable number of proposed restoration alternatives, including a No Action alternative (*i.e.*, natural recovery; 43 C.F.R. § 11.82). In this document, the Trustees select from among the possible alternatives the alternative(s) most appropriate to restore, rehabilitate, replace, or acquire the equivalent of those natural resources injured or lost due to the release of hazardous substances, in part by considering factors outlined in 43 C.F.R. § 11.82(d). Consistent with federal law, the Trustees also evaluated the proposed restoration alternatives for compliance with other applicable laws and regulations, as documented in Chapter 6.

1.3.2 NEPA Compliance

The Trustees must comply with the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. § 4321 *et seq.*, and its regulations, 40 C.F.R. § 1500 *et seq.*, when planning restoration projects. NEPA is generally applicable to any project that involves federal funding, work performed by the federal government, or permits issued by a federal agency. NEPA and its implementing regulations

outline the responsibilities of federal agencies under NEPA, including preparing environmental documentation. In general, federal agencies contemplating implementation of a major federal action must produce an Environmental Impact Statement (EIS) if the action is expected to have significant impacts on the quality of the human environment. When it is uncertain whether a contemplated action is likely to have significant impacts, federal agencies prepare an Environmental Assessment (EA) to evaluate the need for an EIS. If the EA demonstrates that the Preferred Alternative(s) will not significantly impact the quality of the human environment, the agency issues a Finding of No Significant Impact (FONSI), which satisfies the requirements of NEPA, and no EIS is required. For a proposed restoration plan, if a FONSI determination is made, the Trustees may then issue a final restoration plan describing the selected restoration action(s).

In compliance with NEPA, this Draft RP/EA summarizes the current environmental setting where the proposed restoration actions may take place, describes the purpose and need for restoration actions, identifies a reasonable range of alternatives, and assesses the potential environmental consequences of those alternatives, including cumulative impacts. Actions undertaken by the Trustees to restore natural resources under CERCLA must also comply with other applicable laws and regulations, as documented in Chapter 6.

The Service is acting as the lead federal agency for NEPA compliance for this Draft RP/EA, and NOAA is participating as a cooperating federal agency pursuant to NEPA (40 C.F.R. § 1508.5). NOAA may adopt the Final RP/EA, as appropriate, in accordance with 40 C.F.R. § 1506.3 and agency-specific NEPA procedures.

1.4 Site Background

The Cornell-Dubilier Site is a 26-acre industrial facility (Facility) and adjacent areas that were contaminated as a result of releases of hazardous substances at and from the Facility, located in South Plainfield, Middlesex County, New Jersey (Figure 1). Cornell-Dubilier Electronics, Inc. (CDE) manufactured electronic parts and components, including capacitors, from 1936 to 1962 at the Facility. CDE allegedly released and buried materials contaminated with polychlorinated biphenyls (PCBs) which contaminated Site soils; groundwater in the aquifer beneath the Site; soils and groundwater of nearby residential and commercial properties; and the surface water, soils, and sediments of an unnamed tributary, the Bound Brook, and adjacent wetlands. The contaminant of

greatest concern at the Site is PCBs, however, elevated concentrations of heavy metals, chlorinated volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), dichlorodiphenyltrichloroethane (DDT), dioxins, and furans have also been identified at levels of ecological concern.

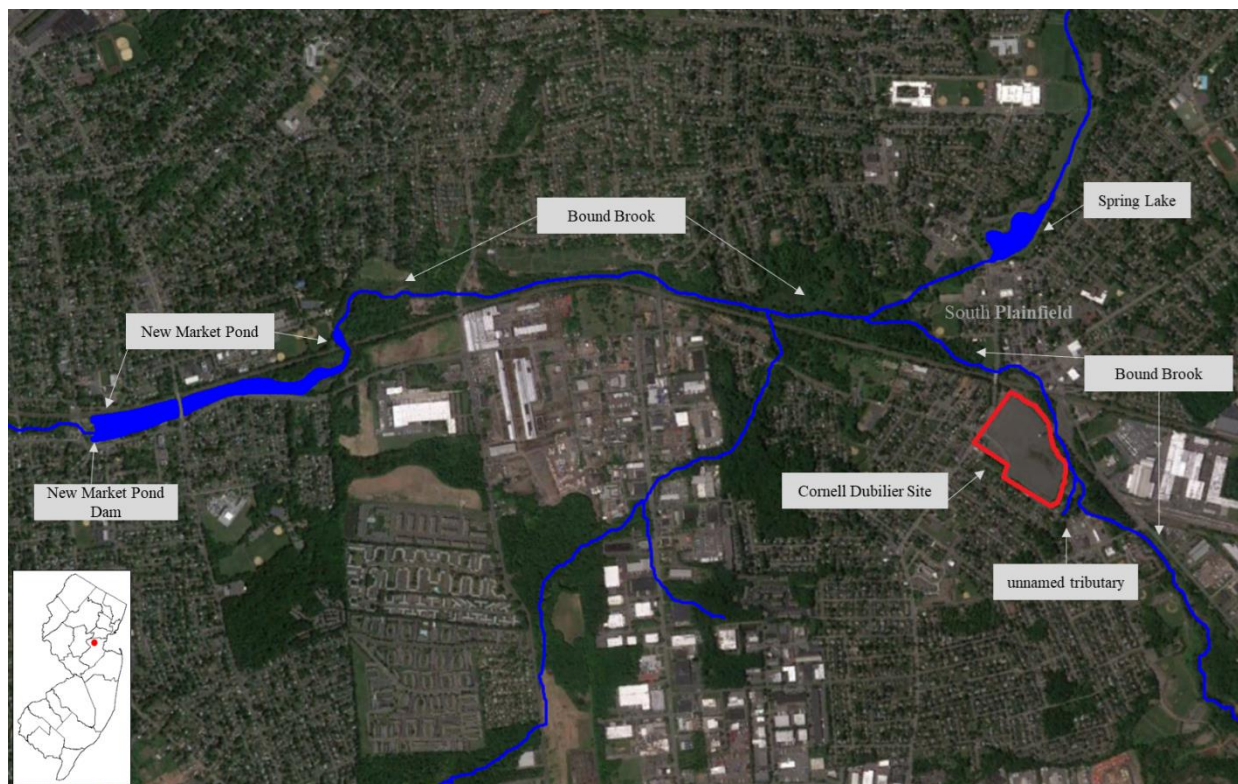


Figure 1. Map of Cornell-Dubilier Site and environs.

Of particular ecological concern is contamination that migrated to or was released into the surface water and sediments of the unnamed tributary, Bound Brook, and adjacent wetlands. The unnamed tributary flows approximately 0.5 mile along the southeast corner of the Facility to its confluence with Bound Brook. Bound Brook flows approximately 3.3 miles to the New Market Pond Dam, then continues for an additional 6 miles to the confluence with the Raritan River. Contaminated material was historically disposed of directly into the unnamed tributary, adjacent wetlands, and Bound Brook, and analytical results indicated the presence of elevated PCB contamination extending downstream of the Site to the New Market Pond Dam in Piscataway, New Jersey.

The Facility was owned by the Dana Corporation (Dana) from about 1913 until 1956. Dana leased the Facility to CDE from 1936 until 1956, when Dana sold the property to CDE. CDE occupied

the Facility from 1936 to 1962, manufacturing electronic components, primarily capacitors. In 1961, CDE sold the Facility to two companies that jointly held title, Lamitex, Inc. and C.R.D. Realty Corporation, but remained at the property as a tenant until 1962. Sometime prior to 1976, Lamitex, Inc. and C.R.D. Realty Corporation merged into the Marco Investing Corporation, which later merged into DSC Enterprises, Inc., now known as D.S.C. of Newark, Inc., the most recent property owner. The Facility was operated as a rental property for commercial and light industrial tenants after 1962 until the Facility was closed in the late 1990s.

1.5 Summary of Response Actions

The U.S. Environmental Protection Agency (EPA) added the Cornell-Dubilier Site to the National Priorities List (NPL) on July 28, 1998. The NPL is a list of hazardous waste sites in the United States that are eligible for long-term remedial action (*i.e.*, clean up) under the Federal Superfund Program. The EPA divided the Site into four operable units (OUs) to address remedial actions, where Operable Unit 1 (OU1) addressed nearby residential and commercial properties; Operable Unit 2 (OU2) addressed Facility soils; Operable Unit 3 (OU3) addressed contaminated groundwater; and Operable Unit 4 (OU4) addressed contamination found in adjacent stream channels (*i.e.*, unnamed tributary and 10 miles of Bound Brook) and floodplain sediments.

The selected remedial action for OU1 was addressed first, and required the excavation, off-site transportation, and disposal of PCB-contaminated soils, property restoration, and cleaning of interior dust at residential and commercial properties in the vicinity of the former Facility. EPA began remediating OU1 in 2005, and work was substantially complete by 2014. The selected remedial action for OU2 included the demolition of Facility buildings; excavation of the most highly contaminated soil; on-site treatment of excavated soils using low temperature thermal desorption or off-site disposal if warranted; backfilling of excavated areas with clean fill or treated soil; and installation of a multi-layer cap or hardscape. Remediation of OU2 began in 2006, and was substantially complete by 2012. The selected remedial action for OU3 included institutional controls and long-term monitoring of groundwater and vapor intrusion, and incorporated a waiver for groundwater treatment due to technical infeasibility. The remedial action associated with OU3 was initiated in 2012 and continues to be implemented. The selected remedial action for OU4 includes excavation and off-site disposal of capacitor debris located along the portion of Bound Brook that is adjacent to the former Facility property; the relocation of a waterline that transects

the former Facility property; capping and treatment of groundwater along the boundary of the former Facility property and Bound Brook; and excavation and removal of contaminated sediment and floodplain soils along a three-mile stretch of Bound Brook. The complete remedial design for OU4 is pending, and no remedial actions have been implemented to date.

Generally, “clean-up” actions address risks to human health and the environment from contamination, while the focus of NRDAR (and this Draft RP/EA) is to restore, replace, rehabilitate, and/or acquire the equivalent of natural resources injured or lost as a result of the release of hazardous substances to “make the public whole”. Additional information on the EPA’s clean-up activities can be found at: <https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0201112>.

1.6 Summary of Natural Resource Injuries

For the purposes of developing natural resource damages claims for the Dana Corporation bankruptcy settlement, the Cornell-Dubilier Electronics, Inc. settlement, and the D.S.C of Newark settlement (discussed in Section 1.7), the Trustees quantified ecological injuries in Bound Brook, the unnamed tributary, and the wetlands located within the 100-year floodplain and within 25 feet of the brook and tributary. Evidence used to determine injury to natural resources from Site-related releases included concentrations of Site-related contaminants (*i.e.*, PCBs) in sediments in excess of guidelines developed for the protection of ecological receptors, and concentrations of Site-related contaminants (*i.e.*, PCBs) in fish tissue in excess of values known to cause adverse effects to fish. The Trustees determined that Site-related contamination resulted in injury to at least 252 acres of forest wetland and 132 acres of emergent freshwater wetland, including open water areas of the Bound Brook corridor extending from the Site downstream to the New Market Pond Dam.

In addition to injuries to ecological resources, Site-related contamination resulted in injuries to recreational fishing. NJDEP issued a fish consumption ban in 1997 for all species in Bound Brook due to PCB contamination, and this fish consumption advisory currently remains in effect. Damages associated with the potential losses to recreational fishing associated with the fish consumption ban were estimated using information from studies of recreational fishing at other similar sites and information derived from NOAA’s Marine Recreation Fishing Statistics Survey, since Site-specific information regarding recreational fishing was not available. The recreational

fishing injury was calculated on a per-mile basis and applied to Bound Brook based on a calculation of the total number of miles affected. The value per mile accounted for past and future damages from 1997 to 2030, where 2030 represented the year that the Trustees assumed the Bound Brook corridor would be fully remediated and restored. The Trustees determined that between 1997 and 2030, at least 260 recreational fishing trips were lost per stream mile per year along 9.13 miles of Bound Brook and its tributaries.

1.7 Summary of Settlements

To date, there have been three NRDAR settlements associated with the Cornell-Dubilier Site.

Dana Corporation Bankruptcy Settlement: In June 2008, the Federal Trustees settled environmental claims against Chapter 11 debtors Dana Corporation and 40 affiliated companies (DANA) under CERCLA. The Federal Government claimed that DANA was liable at the CDE Site based on its prior ownership of the real property and buildings at the CDE Site from 1936 to 1956. According to the Federal Government's Proof of Claim, during that time, DANA leased the property and buildings to CDE. The Government alleged that PCB contamination from CDE's operations during DANA's ownership caused injury to natural resources at the Cornell-Dubilier Site, including injuries to migratory birds and fish. Under the DANA settlement for the Cornell-Dubilier Site, the Departments of Commerce and Interior recovered DANA stock for natural resource damages, with a 2008-cashed value of \$88,900.

Cornell-Dubilier Electronics, Inc. (ability to pay) Settlement: In October 2014, the Federal Trustees settled environmental claims against CDE under CERCLA, and the State additionally found CDE liable under the New Jersey Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 *et seq.*; the Industrial Site Recovery Act, N.J.S.A. 13:1K6, *et seq.*; and the common law of nuisance, negligence and strict liability. The U.S. Department of Justice (DOJ) entered a judgment against CDE for \$75,040,000. However, the DOJ examined the company's financial and insurance information and determined that CDE had limited financial ability to pay for response costs and natural resource damages. Therefore, the DOJ ordered CDE to pay \$75,040,000 using their best effort to maximize insurance proceeds from companies against which CDE has asserted a claim. To date, natural resource damages collections from CDE total \$20,030,783.

D.S.C. of Newark Enterprises, Inc. Settlement: In February 2015, the Federal and State Trustees settled environmental claims against D.S.C. of Newark Enterprises, Inc. under CERCLA, and the State additionally found D.S.C. of Newark Enterprises, Inc. liable under the New Jersey Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 *et seq.*, and the Industrial Site Recovery Act, N.J.S.A 13:1K-6, *et seq.* The Federal Government and State of New Jersey charged that D.S.C. of Newark Enterprises, Inc. was liable based on its current ownership of real property and buildings at the Site, having owned and operated the Site since 1976 as an industrial park, and having owned and operated the Site at a time at which hazardous substances were disposed of. The Trustees recovered \$4,821,005 in natural resource damages in the D.S.C. of Newark Enterprises, Inc. settlement.

1.8 Administrative Record

The Trustees have maintained records documenting the information considered and actions taken by the Trustees during the NRDAR process. These records collectively comprise the Trustees' administrative record supporting this Draft RP/EA. These electronic records are available at: <https://www.diver.orr.noaa.gov/web/guest/diver-admin-record?diverWorkspaceSiteId=6229>. For additional information, contact:

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Arrangements must be made in advance to review or obtain hard copies of these records by contacting the office listed above. Access to and copying of these records is subject to all applicable laws and policies including, but not limited to, copying fees and the reproduction or use of any material that is copyrighted.

1.9 Public Involvement

Public review of this Draft RP/EA is an integral and important part of the restoration planning process and is consistent with all applicable state and federal laws and regulations, including the guidance for restoration planning found within 43 C.F.R. Part 11. Through the public review

process, the Trustees seek public comment on the restoration alternatives and the Trustees' preferred restoration alternatives to restore injured natural resources.

The Draft RP/EA will be open for review and comment by the public for a period of 30 days. The document can be found at: https://www.cerc.usgs.gov/orda_docs/DocHandler.ashx?task=get&ID=6394. Interested individuals, organizations, and agencies may submit written (email or letter) comments to:

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U.S. Fish and Wildlife Service
New Jersey Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, New Jersey 08205
609-569-5770
Cathy_Marion@fws.gov

The Trustees will consider all written comments received during the public comment period prior to preparing the Final RP/EA. Based on the public's comments, or other information, the Trustees may amend the Draft RP/EA if significant changes are made to the type, scope, or impact of the projects. Written comments received and the Trustees' responses to those comments, whether in the form of project revisions or written explanations, will be summarized in the Final RP/EA.

CHAPTER 2

CERCLA RESTORATION PLANNING PROCESS

2.1 Restoration Objective

Restoration of resources injured or lost due to the release of hazardous substances is the goal of the Cornell-Dubilier Site NRDAR process. The purpose of the actions identified in this Draft RP/EA is to restore, rehabilitate, replace, or acquire the equivalent of natural resources that were injured or destroyed, and recreational use that was lost as a result of releases of hazardous substances and pollutants, pursuant to the requirements of applicable federal and state laws and regulations.

2.2 Restoration Strategy

In accordance with NRDAR regulations, the Trustees identified and evaluated multiple restoration project alternatives to compensate for natural resource injuries, including a “No Action” alternative. The Trustees identified restoration alternatives through a variety of approaches, including: 1) reviewing information on potential projects from existing reports and datasets; 2) consulting individuals and/or local groups with knowledge of specific projects or restoration opportunities; and 3) soliciting input on potential ecological and recreational restoration opportunities from the public as part of a Restoration Scoping effort (https://pub-data.diver.orr.noaa.gov/admin-record/6229/CornellDubilier_RestorationScopingReport.pdf).

Project opportunities very near the Site boundaries are limited due to dense urban development in this area, persistent contamination in the surrounding Bound Brook watershed, and pending remedial actions at both the Site and other nearby contaminated areas that are managed by the EPA (*e.g.*, Woodbrook Road Dump Superfund Site). However, since injured resources included similar habitats, species assemblages, and recreational opportunities as found in the larger Raritan River watershed, the Trustees determined that natural resource injury restoration completed within the Raritan River watershed would be appropriate to compensate for natural resource injuries.

The Trustees consider the ecological and recreational restoration categories listed below as potentially appropriate for the purpose of restoring, rehabilitating, replacing, or acquiring the equivalent of the natural resources and recreational opportunities that were injured or lost as a result of the release of hazardous substances at and from the Cornell-Dubilier Site.

Ecological Restoration Project Categories

- Tidal Wetland Restoration
- Freshwater Wetland Restoration
- Technical Fish Passage (*e.g.*, fish ladders, rock ramps, bypass channels)
- Dam Removal
- Submerged Aquatic Vegetation Restoration
- Oyster Restoration
- Riparian Restoration
- Floodplain Restoration
- Land Acquisition (parcels under imminent risk of development)
- Aquatic Connectivity (including culvert replacement)
- Freshwater Mussel Conservation and Enhancement
- Native Fish Conservation and Enhancement
- Instream Enhancement

Recreational Use Restoration Project Categories

- Boat Launches
- River Trails
- Land Trails
- Interpretive Signage
- Docks and Piers
- Americans with Disabilities Act Accessibility

2.3 Primary Evaluation Criteria

To ensure the appropriateness and acceptability of restoration options addressing ecological and recreational loss, the Trustees first evaluated each restoration alternative using “primary” evaluation criteria. Primary evaluation criteria incorporate the “factors to consider when selecting the alternative to pursue” as described in the NRDAR regulations found at 43 C.F.R. § 11.82(d)(1-10).

Consistent with the NRDAR regulations, the following primary evaluation criteria were used to evaluate restoration project alternatives and identify projects preferred for implementation.

RELATIONSHIP TO INJURY

Criteria	Description
Nexus to Injury	Project restores natural resources similar to those injured.
Location	Project is located within the Raritan River watershed.
Scale of Benefits	Quality/quantity of benefits provided by project (increase in acres, species, etc.) per dollar spent.

LIKELIHOOD OF SUCCESS

Criteria	Description
Proven Technology	Can the project be accomplished with available technology? Is the technology well documented / studied? Are there biological, chemical, physical limitations and uncertainties that may require actions beyond technical capabilities?
Documented Success	Have similar projects succeeded in the past? Is success well documented / studied? Is success measurable?
Self-Sustaining	Are benefits expected to be long-lived? Will maintenance and/or supplemental (future) action be required?
Cost Effective	Are costs reasonable related to expected benefits? Are costs reasonable in comparison to alternative projects?

REGULATORY/POLICY CONSIDERATIONS

Criteria	Description
Compliant with Applicable Federal/State Law	Project complies with applicable federal, state, local laws and regulations. Based on current regulatory framework, policies, rules, and requirements is this potentially permissible work?
Site Ownership/Availability	Project site is available, ownership is clear, and owner is willing to consent to restoration action. Are there physical, legal, or technical limitations to site access? Is site access safe?
Consistent with Trustee Policy, Management Goals, Objectives	Project meets stated goals (objectives) of Trustee council.

2.4 Secondary Evaluation Criteria and Project Tiers

The NRDAR regulations allow the Trustees discretion to use additional (secondary) evaluation criteria, as appropriate. In developing this Draft RP/EA, the Trustees gave primary evaluation criteria (Section 2.3, above) initial consideration since these factors are paramount to ensuring that restoration actions will compensate the public for natural resource injuries. The Trustees

additionally developed secondary evaluation criteria supplemental to the NRDAR primary (*i.e.*, regulatory) criteria for which to evaluate potential restoration projects for the Cornell-Dubilier Site.

The use of primary and secondary evaluation criteria allowed the Trustees to rank and categorize preferred restoration alternatives into three tiers for the purpose of prioritizing projects for implementation. Tier I alternatives are projects that the Trustees view as providing the most appropriate restoration of natural resources injured, and can be funded using the existing settlement funds to complete the project. Tier II alternatives are projects that would also result in appropriate restoration of the injured natural resources, but would only be funded if settlement monies remain after funding the higher priority Tier I projects. Tier III alternatives are projects that, as proposed, are not preferred to compensate the public for injuries to natural resources resulting from the release of hazardous substances at and from the Cornell-Dubilier Site.

The Trustees anticipate sufficient funding available for Tier I projects at the current estimated funding levels. The Trustees acknowledge, however, that uncertainties may arise as the preferred projects are implemented. For some projects, the Trustees may be able to modify the scale of the project, increasing or decreasing the scope of the project to accommodate financial limitations, or make the most cost effective use of funds relative to the environmental gains to be realized by a project. Thus, final funding levels will be based, in part, on the final cost of each selected project and Trustee judgments regarding what actions are most pertinent to compensate for natural resource injuries associated with the Cornell-Dubilier Site. The Trustees may choose to increase funding levels of one or more Tier I preferred projects, if determined necessary to complete the project in a manner that best compensates the public for natural resource injuries. Conversely, if a preferred project is not progressing in a timely manner that the Trustees deem suitable to compensate for natural resource injuries in a reasonable timeframe, the Trustees may withdraw funds from the project and reallocate the funds to another Tier I or Tier II preferred project. The Trustees also reserve the right to consider future projects not currently identified or included in this Draft RP/EA; such actions must be justified under the criteria stated in this document and will warrant additional documentation under CERCLA, NEPA, and other applicable law.

Consistent with the NRDAR regulations, the following secondary evaluation criteria were used to evaluate restoration project alternatives and identify the projects preferred for implementation.

SECONDARY EVALUATION CRITERIA

Criteria	Description
Consistent with Local, Regional, National Restoration Goals / Initiatives	Will the project be consistent with / contribute to existing local, regional, national initiatives?
Timeframe of Potential Benefits	What is the timeframe to expected benefits?
Integration with Existing Management Programs / Leverage Potential	Will the project integrate with existing programs and leverage external funds?
Aquatic / Terrestrial Connectivity	Will the project increase/enhance aquatic and/or terrestrial connectivity?
Proximity to Areas with Protected Status	Will the project provide access to / connectivity with protected areas? Will the project increase the size of protected areas?
Benefits to Species of Concern / Sensitive Habitats	Will the project benefit federal and/or state SOC or their identified habitats?
Potential for Public Outreach / Education / Recreation / Public Access	Will the project provide benefit to the public in the form of outreach, education, recreation, and/or public access?
Benefits More than One Natural Resource	Will the project benefit multiple types of natural resources?
Monitoring / Measurable Results	Will the project include monitoring? Will there be measureable results? Is monitoring cost-effective?
Climate Change	Will the project provide resilience to anticipated environmental changes due to climate change? Will the project withstand anticipated environmental changes due to climate change?

2.5 Restoration Alternative Identification and Screening

The Trustees compiled a list of potential restoration alternatives in the Raritan River watershed that were informed by the restoration strategy outlined in Section 2.2. The Trustees narrowed this list of potential restoration alternatives to reflect those potential alternatives that met some or all of the Trustees primary evaluation criteria (43 C.F.R. § 11.82(d), Section 2.3). Projects meeting some or all of the primary criteria requirements were further screened using the Trustees secondary evaluation criteria (Section 2.4). Tier I and Tier II projects ranked highest among primary and secondary criteria, and Tier III projects ranked lowest among criteria.

CERCLA requires the Trustees to evaluate a “No Action” restoration alternative. Under this alternative, the Trustees would take No Action to restore injured resources. In addition to the No Action alternative, the following alternatives were retained for detailed evaluation in this Draft RP/EA.

- Island Farm Weir Fish Passage
- Headgates Dam Removal
- Califon Dam Removal
- Blackwells Mills Dam Removal
- Nunn's Mill Dam Removal
- Pond Removal on Tributary to Rockaway Creek
- County Boat Launch and Fishing Platform at Lincoln Avenue Park
- Lost Valley Nature Park
- North Branch Raritan River Corridor Riparian Buffer Restoration
- East Brunswick Swamp Pink Restoration
- Stony Brook Green Infrastructure Demonstration Project
- Rockafellows Mills Dam Removal
- Klines Mill Dam Fish Passage
- Beisler Lake Dam Removal
- Mill Street Dam Removal
- Lake Manalapan Riparian Restoration
- North Branch Raritan River, Lamington River, and Stony Brook Mussel Restoration
- Trash Trap Installation in the Lower Raritan River Watershed
- Rutgers Ecological Preserve Accessible Trail
- Bridge Over the Delaware and Raritan Canal Spillway
- Cherry Brook Preserve Constructed Wetland
- Raritan Bay Oyster Restoration
- South River Tidal Marsh Restoration
- Edison Landfill Capping and Wetland Restoration

CHAPTER 3

EVALUATION OF RESTORATION ALTERNATIVES

In this section, the Trustees evaluate the restoration alternatives using the primary and secondary evaluation criteria described in Sections 2.3 and 2.4. Each of the restoration alternatives identified by the Trustees in Section 2.5 are described in greater detail in the following sections. Figure 2 shows the locations of restoration alternatives within the Raritan River watershed. Table 1 provides a tabular summary of the Trustees' criteria-based screening process and preferred alternative restoration projects that will accomplish the goal of restoring, replacing, rehabilitating, and/or acquiring the equivalent of injured natural resources, including their supporting habitats, to compensate the public for injuries resulting from the release of hazardous substances at and from the Cornell-Dubilier Site. Table 3 provides preliminary cost estimates for Tier I and II preferred alternatives.

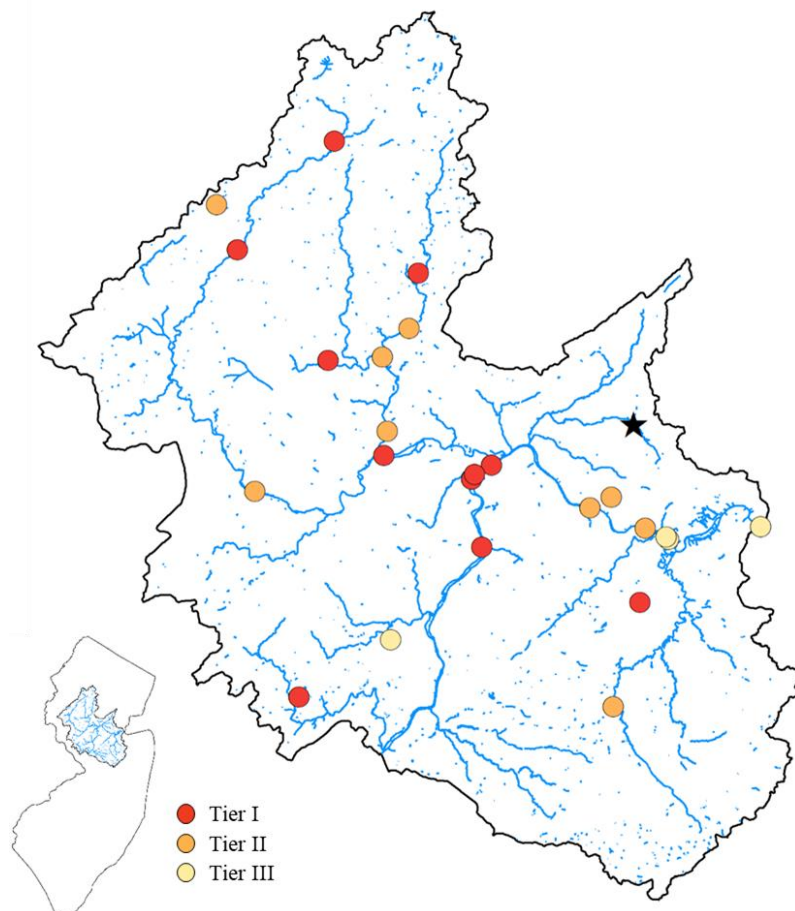


Figure 2. Location of Cornell-Dubilier Site (black star) and locations of restoration alternatives (circles). All restoration alternatives are located within the Raritan River watershed, New Jersey.

Table 1. Restoration alternatives tiered by primary and secondary criteria.

Restoration Alternative	Tier	Nexus to Injury	Location	Scale of Benefits	Proven Technology	Documented Success	Self-Sustaining	Cost Effective	Compliant with Applicable Federal / State Law	Site Ownership / Availability	Consistent with Trustee Policy, Management Goals, Objectives	Consistent with Local, Regional, National Restoration Goals / Initiatives	Timeframe of Potential Benefits	Integration with Existing Management Programs / Leverage Potential	Aquatic / Terrestrial Connectivity	Proximity to Areas with Protected Status	Benefits to Species of Concern / Sensitive Habitats	Potential for Public Outreach / Education / Recreation / Public Access	Benefits More than One Natural Resource	Monitoring / Measureable Results	Climate Change
Island Farm Weir Fish Passage	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
Headgates Dam Removal	1	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Califon Dam Removal	1	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X
Blackwells Mills Dam Removal	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nunn's Mill Dam Removal	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Pond Removal on Tributary to Rockaway Creek	1	X	X		X	X	X	X	X	X	X	X	X	X	X		X		X	X	X
County Boat Launch and Fishing Platform at Lincoln Avenue Park	1	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	
Lost Valley Nature Park	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
North Branch Raritan River Corridor Riparian Buffer Restoration	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
East Brunswick Swamp Pink Restoration	1	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Stony Brook Green Infrastructure Demonstration Project	1	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rockafellows Mills Dam Removal	2	X	X	X	X	X	X	X	X		X	X		X	X		X	X	X	X	X
Klines Mill Dam Fish Passage	2	X	X	X	X	X	X	X	X		X	X		X	X		X		X	X	
Beisler Lake Dam Removal	2	X	X		X	X	X	X	X	X	X	X	X	X	X				X	X	X
Mill Street Dam Removal	2	X	X	X	X	X	X	X	X		X	X		X	X		X	X	X	X	X
Lake Manalapan Riparian Restoration	2	X	X		X	X		X	X	X	X	X	X	X				X	X	X	
North Branch Raritan River, Lamington River, and Stony Brook Mussel Restoration	2	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	
Trash Trap Installation in the Lower Raritan River Watershed	2	X	X		X	X			X		X	X					X	X	X	X	
Rutgers Ecological Preserve Accessible Trail	2	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X		X	
Bridge over the Delaware and Raritan Canal Spillway	2	X	X		X	X			X		X	X				X		X		X	
Cherry Brook Preserve Constructed Wetland	3	X	X						X	X	X		X	X		X		X		X	
Raritan Bay Oyster Restoration	3		X	X	X	X			X		X	X	X	X			X	X	X	X	X
South River Tidal Marsh Restoration	3		X						X											X	
Edison Landfill Capping and Wetland Restoration	3		X						X											X	

Table 2. Preliminary cost estimates for Tier I and Tier II preferred alternatives.

Restoration Alternative	\$0 - \$100,000	\$100,000 - \$1,000,000	\$1,000,000 -\$3,500,00	\$3,500,000 -\$8,000,000
Tier I Alternatives				
Island Farm Weir Fish Passage				X
Headgates Dam Removal				X
Califon Dam Removal			X	
Blackwells Mills Dam Removal		X		
Nunn's Mill Dam Removal		X		
Pond Removal on Tributary to Rockaway Creek	X			
County Boat Launch and Fishing Platform at Lincoln Avenue Park		X		
Lost Valley Nature Park				X
North Branch Raritan River Corridor Riparian Buffer Restoration		X		
East Brunswick Swamp Pink Restoration	X			
Stony Brook Green Infrastructure Demonstration Project		X		
Tier II Alternatives				
Rockafellows Mills Dam Removal			X	
Klines Mill Dam Fish Passage			X	
Beisler Lake Dam Removal		X		
Mill Street Dam Removal		X		
Lake Manalapan Riparian Restoration		X		
North Branch Raritan River, Lamington River, and Stony Brook Mussel Restoration		X		
Trash Trap Installation in the Lower Raritan River Watershed		X		
Rutgers Ecological Preserve Accessible Trail	X			
Bridge over the Delaware and Raritan Canal Spillway			X	

3.1 No Action

Under the No Action (*i.e.*, natural recovery) alternative, the Trustees would take No Action to restore, rehabilitate, replace, and/or acquire the equivalent of injured natural resources, including their supporting habitats and the services they provide. Natural resources at the Site were injured due to the release of hazardous substances, including PCBs. While consideration of the No Action (*i.e.*, natural recovery) alternative is required by CERCLA, given the long-term environmental persistence of PCBs and the other hazardous substances at the Site, natural recovery would not meet the requirements of CERCLA and the NRDAR process under CERCLA to restore injured natural resources and services. In addition, restoration funds must be spent on restoration, rehabilitation, replacement, or acquisition of the equivalent of injured natural resources (42 U.S.C. § 111(i)), and the No Action alternative would preclude the appropriate use of funds under federal law and in accordance with the Site's relevant Consent Decrees. The No Action alternative is not

appropriate for the Cornell-Dubilier Site given that injured natural resources cannot be addressed through natural recovery.

3.2 Preferred Tier I Alternative: Island Farm Weir Fish Passage

The Island Farm Weir (IFW) is located just downstream of the confluence of the Raritan and Millstone Rivers, in Franklin and Bridgewater Townships, Somerset County, New Jersey. The proposed restoration project includes the installation of a rock ramp fishway at the IFW to enhance fish passage. This Alternative meets the Trustees identified project categories of technical fish passage, aquatic connectivity, and native fish conservation and enhancement.

The IFW is currently the downstream-most barrier on the Raritan River, since the removal of the Calco Dam in 2011. The IFW is only a partial barrier to fish passage, since the current weir includes a concrete vertical slot fishway and supplemental flow chamber that supplies attraction water (Figure 3). However, an ongoing fish passage study conducted by the NJDEP Office of Natural Resource Restoration and Rutgers University indicates that overall fish passage at the IFW is relatively poor for all species, but particularly for anadromous species (NJDEP 2013, Jensen 2017). Such findings are not uncommon; Brown *et al.* 2012 reported that the mean passage efficiencies of conventional fishways (*i.e.*, fish ladders) on three major Atlantic coast rivers was less than three percent for American shad (*Alosa sapidissima*).

The initial configuration of the IFW was completed by the New Jersey Water Supply Authority (NJWSA) in 1994. The IFW was built to supplement the State's public water supply system; extraction varies daily, but the IFW impoundment can supply upwards of 225 million gallons of water per day in summer months, and the facility is considered critical to New Jersey American Water's (NJAW) operations. As such, the IFW cannot be removed, and the headpond elevation of the impoundment cannot be altered. A reasonable alternative that will preserve NJAW's water withdrawal operations and provide enhanced fish passage involves retrofitting the weir with a rock arch rapids fishway.

Dam removal is the preferred solution for instream barriers, since dam removal provides immediate and permanent improvements to fish passage and benefits water quality and sediment transport. However, for sites such as the IFW where barriers cannot be removed, nature-like fishways (*e.g.*, rock ramps, stream-like bypass channels) offer an alternative to previous

conventional fishway designs (*e.g.*, fish ladders, fish lifts). Historically, conventional fishways were built from conventional materials such as metals and concrete, and often did not reflect natural stream conditions (*e.g.*, contain right angles, high walls, chutes). Conventional fishways are generally unsuccessful for fish passage on Atlantic Coast rivers (Brown *et al.* 2012). In contrast, nature-like fishways simulate natural stream materials and environmental conditions, and provide suitable passage conditions and habitat for a wide variety of fish species and sizes (Katopodis *et al.* 2001). Emerging research indicates that nature-like fishways have greater passage success than conventional fishways (Franklin *et al.* 2012). However, very few studies have been conducted on rock ramps in larger rivers, and recent studies have found that fish passage success varies widely among species, sizes, and years (Landsman *et al.* 2018; Raabe *et al.* 2019). As such, rock-ramp fishways should be carefully designed for a particular location and for a particular target species, rather than assuming that all species will pass successfully.



Figure 3. Island Farm Weir aerial view showing layout of major structures.

The original IFW and vertical slot fishway were built in 1994. The original weir was approximately 200-feet-long, 8-feet-high, and 24-feet-wide, including a 15-foot-long section extending from the weir crest to the downstream apron. Following a series of boater fatalities in 1996, the downstream

weir geometry was redesigned as a stepped spillway in 1997. The revision consisted of installing a series of steps of varying widths (1 to 2 feet), and extending the downstream apron by an additional 10 feet. The existing vertical slot fishway remains in the same configuration as constructed in 1994. The fishway is located in a 20-foot-wide bay, with a labyrinth configuration and pool dimensions of 8 feet by 12 feet. An adjacent chamber (approximately 8-foot-wide) provides supplemental attraction flow. Downstream fish passage is provided by a single 4-feet-long by 1.2-feet-deep weir notch that directly abuts the fishway. Additional infrastructure associated with NJAW's water withdrawal operation is present on the north bank, including water intakes and a sediment bypass channel (Figure 4).

Rock ramps are a sloped watercourse that link two pools of different elevations (*e.g.*, headwater and tailwater of dam). Design plans for a rock ramp (*i.e.*, nature-like fishway) at the IFW are being prepared as part of a partial NRDAR settlement agreement for the American Cyanamid Company Superfund Site (Bridgewater Township, New Jersey). The proposed design includes a rock arch rapids fishway that spans the full length of the weir, although a portion of flow will be diverted for the sediment bypass channel and the water intake system. The design includes at least 8 rock (boulder) arches, spaced and positioned appropriately to provide adequately sized zones of passage, resting pools, water depths, and velocities to facilitate passage of 'target' anadromous species (*i.e.*, American shad, blueback herring, alewife), and possibly other 'non-target' resident and diadromous species. The design will not impact water withdrawal operations nor the headpond elevation of the impoundment. The 2016 Federal Interagency Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes and the Service's 2019 Region 5 Fish Passage Engineering Design Criteria guided the fish passage design elements (Turek *et al.* 2016; USFWS 2019).

The IFW is owned by the NJWSA and downstream adjacent properties are owned by Pfizer. The Pfizer properties house the now defunct American Cyanamid facility, a partially remediated EPA Superfund Site. The southern edge of the IFW meets the Delaware and Raritan (D&R) Canal State Park and towpath, owned and managed by the State of New Jersey Division of Parks and Forestry. Visitors can view and access the IFW from the D&R Canal State Park towpath.

Restoration of fish passage at the IFW will benefit diadromous species such as American shad (*Alosa sapidissima*), alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*). The

proposed nature-like fishway is specifically designed to pass the clupeid species mentioned above, but may also benefit American eel (*Anguilla rostrata*), hickory shad (*Alosa mediocris*), sea lamprey (*Petromyzon marinus*), and striped bass (*Morone saxatilis*).



Figure 4. Island Farm Weir spillway and associated infrastructure shown from downstream facing north bank.

Long-term fish passage monitoring at the IFW is critical to demonstrate the efficacy of the rock ramp in comparison to the existing conventional vertical slot fishway, and to track the recovery of several anadromous populations. Telemetry is the most useful tool for assessing fishways, especially for determining fish passage efficiency and fish passage duration (Lucas and Baras 2001; Bunt *et al.* 2012; Raabe *et al.* 2019). The Trustees recommend the use of boat electrofishing to capture and tag adult fishes downstream of the IFW as part of a robust monitoring program. The Trustees recommend the use of stationary (*e.g.*, acoustic) telemetry stations placed strategically at multiple stations upstream and downstream of the IFW. The Trustees additionally recommend developing methods to quantify juvenile anadromous populations in the Raritan River, and

utilizing novel techniques to sample and quantify both adults and juvenile populations, as feasible (*e.g.*, sonar imaging, eDNA).

The installation of a rock-ramp at the IFW may be accomplished by leveraging additional funds through other federal and state sources. Alternative 3.2 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Restoration of fish passage at the IFW will reestablish fish movement in the mainstem Raritan River, expand critical spawning habitat for diadromous fishes, and enhance recreational boating and fishing opportunities.

3.3 Preferred Tier I Alternative: Headgates Dam Removal

The Headgates Dam is located on the mainstem Raritan River in Bridgewater and Hillsborough Township, Somerset County, New Jersey. The proposed restoration project involves the removal of the Headgates Dam; appropriate relocation or reconfiguration of the Bridgewater North Branch Trunk sewer line located approximately 90 feet upstream; appropriate adjustment or modification of the Raritan Water Power Canal located approximately 0.15 mile upstream; appropriate restoration and stabilization of the adjacent stream reaches and impoundment area; revegetation of exposed and newly formed banks; and scour protection measures, as warranted (Figure 5). This Alternative meets the Trustees identified project categories of dam removal, riparian restoration, aquatic connectivity, freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail recreation.

The Headgates Dam is a 235-feet-wide, 14-feet-tall, concrete, run-of-river, gravity dam that provides no water storage or flood attenuation function (Figure 6). The original timber crib dam was built in the 1930s; its original purpose was likely to deliver flow into the Raritan Water Power Canal. Various repairs, modifications, and upgrades took place prior to 1959, when the spillway failed and was reconstructed that same year. The current training walls were reconstructed sometime between 1964 and 1965, and the retaining walls were replaced on both the north and south banks in the 1960s.

An intake culvert that siphons flow from the Raritan River into the Raritan Water Power Canal is located approximately 0.15 mile upstream of Headgates Dam. The culvert has a reinforced concrete pipe inlet structure that is approximately 120-feet-long and 24 inches in diameter. The

Raritan Water Power Canal is a 3-mile-long canal built in the early 1840s to supply water power for nearby mills. By the mid-1900s, the mills had closed, and the canal was used to provide drinking water to neighboring towns. In the 1970s, the canal and adjacent parcels were purchased by Somerset County and transformed into a recreational park. The canal is now part of the Raritan Water Power Canal Historic District, and cannot be removed or modified. However, it may be necessary to adjust the canal intake structure to ensure a consistent water supply after dam removal if hydrologic and hydraulic modeling indicates that the dam supplies water to the canal.

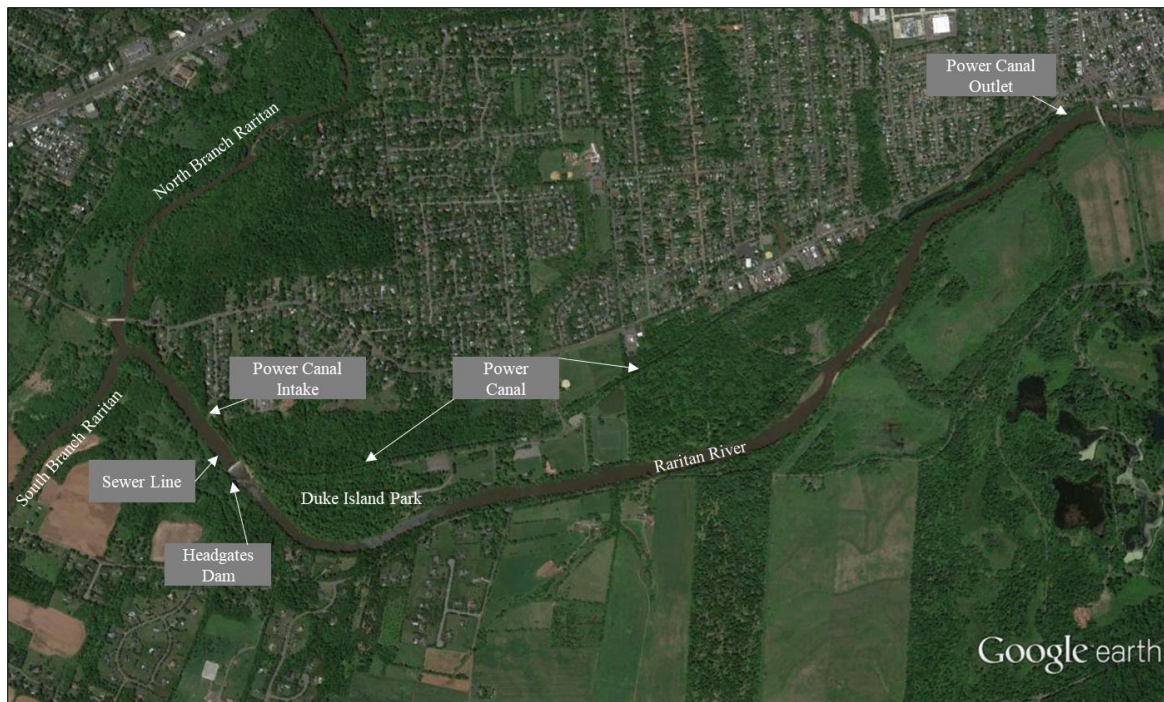


Figure 5. Headgates Dam aerial view showing layout of major structures.

A submerged active sewer line (Bridgewater North Branch Trunk Sewer) is located approximately 90 feet upstream of the Headgates Dam, and crosses the river perpendicular to its flow. The sewer pipe is composed of a 54-inch reinforced concrete pipe fully encased in a minimum of 6 inches of concrete, and serves as the main sewer line for both Bridgewater and Branchburg Townships. Manholes are located on both sides of the river. The sewer line will be exposed after dam removal, putting the section at risk of degradation and failure. The exposed line would also likely become a barrier for fish passage. Therefore, the sewer line will either be relocated under the riverbed or rerouted, as determined in the design phase.

Dam removal will consist of demolishing, removing, and disposing of approximately 3,000 cubic yards of dam material. Approximately 400 cubic yards of sediment that have accumulated immediately upstream of the dam would be resuspended and transported downstream following dam removal. This sediment will redistribute to downstream reaches, but is unlikely to have a measurable impact on benthic habitat quality. The removal design may include minor grading of the riverbed and banks, revegetation of exposed areas, and scour protection measures, as warranted.



Figure 6. Headgates Dam shown from downstream facing west bank.

The Headgates Dam is currently the only complete fish passage barrier on the mainstem Raritan River. The downstream Island Farm Weir, in its current configuration, houses a fish ladder that has provided fish passage to tens of thousands of fish since installation in 1994. The installation of a rock ramp at Island Farm Weir is proposed as a Tier I project in this Draft RP/EA, which will dramatically increase fish passage success at the Island Farm Weir structure. After fish passage issues are addressed at the Island Farm Weir, the removal of the Headgates Dam would restore fish passage for approximately 13.5 miles to the next two upstream dams (*i.e.*, Mill Street

Dam on the North Branch Raritan, and Rockafellows Mills Dam on the South Branch Raritan), and would provide fish passage for an additional 27.8 miles downstream to the Raritan Bay.

Somerset County owns the Headgates Dam, and adjacent upstream and downstream land parcels are owned by the NJDEP, Somerset County, private landowners, and the Dukes Farms Foundation. Somerset County's Duke Island Park is located along the northern side of the dam. Duke Island Park is a 343-acre county-managed park that flanks the Raritan Power Canal and provides a variety of recreational opportunities and special events, including but not limited to: picnicking, playgrounds, athletic fields, ice skating and cross country skiing, biking, running, and fishing. A 127-acre protected parcel owned by the Somerset County and the NJDEP is located along the southern side of the dam. Duke Farms, a 2,740-acre protected property is located approximately 1 mile downstream on the southern side of the Raritan River. Approximately 1,000 acres of Duke Farms is open to the public for recreational and educational opportunities.

Restoration of fish passage at the Headgates Dam will benefit diadromous species such as: American eel (*Anguilla rostrata*), American shad (*Alosa sapidissima*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), hickory shad (*Alosa mediocris*), sea lamprey (*Petromyzon marinus*), and striped bass (*Morone saxatilis*). Habitat improvements may improve conditions for several species identified by the State of New Jersey as having Greatest Conservation Need, including: American brook lamprey (*Lethenteron appendix*), bluespotted sunfish (*Enneacanthus gloriosus*), bridle shiner (*Notropis bifrenatus*), comely shiner (*Notropis amoenus*), cutlips minnow (*Exoglossum maxillingua*), eastern mudminnow (*Umbra pygmaea*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfin shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), swallowtail shiner (*Notropis procne*), white catfish (*Ameiurus catus*), and yellow bullhead (*Ameiurus natalis*). Habitat and fish passage improvements may also improve conditions for several mussel species, including: eastern elliptio (*Elliptio complanata*), eastern pondmussel (*Ligumia nasuta*), and eastern floater (*Pyganodon cataracta*).

Removal of the Headgates Dam will enhance the safety and experience of recreational paddling on the mainstem Raritan River. The 6.6-mile reach extending between the Old York Road (Somerville, New Jersey) and Duke Park launches brings boaters by the scenic areas of the Duke Island Park and Duke Farms, but is currently interrupted by a dangerous, but necessary portage at

the Headgates Dam. The dam is also a safety hazard for boaters unaware of the upwelling and drowning hazards associated with small low-head dams.

The removal of the Headgates Dam may be accomplished by leveraging additional funds through other federal and state sources. Alternative 3.3 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Removing the Headgates Dam restores river habitat, improves water quality, reestablishes fish and mussel movement, and enhances fishing and recreational boating opportunities.

3.4 Preferred Tier I Alternative: Califon Dam Removal

The Califon Dam (also known as Coles Mill Dam) is located on the South Branch Raritan River, in Califon, Hunterdon County, New Jersey. The proposed restoration project involves the removal of the Califon Dam; appropriate restoration, stabilization, and revegetation of adjacent stream reaches and the impoundment area; appropriate characterization, dredging, removal, and storage/disposal of upstream sediments, as warranted; and scour protection measures at the Highway 512 Bridge and other areas, as warranted. This Alternative meets the Trustees identified project categories of dam removal, riparian restoration, aquatic connectivity, freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail recreation.

The Califon Dam is an approximately 210-foot-long concrete and rock-fill run-of-river gravity dam that creates an approximate 7-acre impoundment on the South Branch Raritan River (Figure 7). The dam and former mill were originally constructed sometime between 1830 and 1840 by Aaron Sutton, and sometime prior to 1950, Benjamin Cole purchased the property and operated the facility as a flour mill. At this time, the dam became known as Cole's Mill Dam. The mill operation became defunct by the end of the 1800s, and the dam is now obsolete. In January of 2018, approximately 30 feet of the dam was damaged by ice, resulting in a breach. The breach caused the water level in the impoundment to drop 8 to 10 inches over a 24-hour period. Due to this incident, the NJDEP Bureau of Dam Safety notified the current dam owner in writing that the dam must be repaired or removed. The breach and associated debris accumulation has accentuated

a bifurcated flow pattern just downstream of the dam that threatens to erode and undermine a small local road (Raritan River Road).



Figure 7. Califon Dam shown facing north. Photo depicts approximate 30-foot breach.

The dam is currently in private ownership, and the impoundment is flanked by parcels of both private and public ownership. The Borough's Califon Island Park, and the County's South Branch River Reservation are located approximately 0.25 mile upstream of the dam along the upper impoundment, and the Ken Lockwood Gorge Wildlife Management Area (WMA) is located approximately 0.85 miles downstream. The Ken Lockwood Gorge WMA is a 533-acre state-owned and managed protected parcel that flanks the South Branch Raritan River along a 2.5-mile stretch, and is valued as a trout fishing destination. The Columbia Trail, a 15.1-mile rails-to-trails conversion, runs along the South Branch Raritan and passes by the Califon Dam at approximately 0.1 mile to the southeast.

Removal of the Califon Dam would restore fish passage for approximately 11 miles to Nunn's Dam, the next dam upstream. The removal of the Nunn's Mill Dam is also proposed as a Tier I

restoration project in this Draft RP/EA. Removal of the Califon Dam would additionally provide resident fish passage for five miles downstream, through Ken Lockwood Gorge to the Lake Solitude Dam. Summertime fish kills are not uncommon at the Ken Lockwood Gorge due to water quality issues, particularly increased water temperature. Removal of the Califon Dam would help to conserve cold water habitat in the South Branch Raritan and improve recreational fishing in the Ken Lockwood Gorge.

Dam removal will improve fish passage for resident and diadromous species such as American eel (*Anguilla rostrata*), and will reduce stream temperatures for coldwater species such as brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*). Water quality and habitat improvements will improve conditions for all species, including several species identified by the State of New Jersey as having Greatest Conservation Need, including: American brook lamprey (*Lethenteron appendix*), bluespotted sunfish (*Enneacanthus gloriosus*), cutlips minnow (*Exoglossum maxilligua*), eastern mudminnow (*Umbra pygmaea*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfin shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), swallowtail shiner (*Notropis procne*), and yellow bullhead (*Amerius natalis*). Water quality and habitat improvements will also benefit several mussel species, including: alewife floater (*Anodonta implicata*), eastern elliptio (*Elliptio complanata*), and eastern floater (*Anodonta cataracta*).

Sediments that have accumulated upstream of the Califon Dam would need to be characterized and quantified as part of the dam removal feasibility process, and construction actions may require dredging, removal, or storage/disposal of sediments. The dam removal design may include minor grading of the riverbed and banks, revegetation of exposed areas, and scour protection measures, as warranted.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements¹ indicate that South Branch Raritan waters upstream of the Califon Dam attain the

¹ Section 303(d) of the Clean Water Act, 33 U.S.C. § 1313(d), requires states to identify and develop a list of impaired waters (waters that do not meet water quality standards) and develop Total Maximum Daily Loads (TMDLs) for every pollutant / waterbody combination on the list. This process ensures that polluted waters are monitored and assessed until applicable water quality standards are met. See <https://www.epa.gov/tmdl/overview-identifying-and-restoring-impaired-waters-under-section-303d-cwa>

following designated uses: aquatic life general; and aquatic life-trout (NJDEP 2019). However, waters upstream of Califon do not attain the following designated uses: public water supply (due to arsenic); and recreation (due to *Escherichia coli*). Data is insufficient to determine if waters upstream of Califon meet their designated use for fish consumption. In contrast, South Branch Raritan waters downstream of the Califon Dam do not attain any designated uses, including: aquatic life general (due to pH); aquatic life-trout (due to temperature); fish consumption (due to mercury in fish tissue); public water supply (due to arsenic); and recreation (due to *Escherichia coli*).

The removal of the Califon Dam and restoration of its associated impoundment will likely improve water quality conditions in the impoundment reach and downstream of Califon, namely by reducing pH, temperature, and *Escherichia coli* levels. The impoundment created by the Califon Dam is very shallow with predominant sand and clay substrates. Shallow, slow moving, unshaded waters are highly susceptible to thermal impacts at all times of year, but particularly during summer months. In addition, shallow and slow waters tend to host intense aquatic plant growth. Excessive photosynthesis in slackwater impoundments can cause pH to rise to high, basic levels that are intolerable to some fish and macroinvertebrate species. Small, shallow impoundments are also attractive to numerous wildlife species such as Canada goose (*Branta canadensis*), which can contribute to increased *Escherichia coli* levels.

The removal of the Califon Dam may be accomplished with technical assistance and leveraging additional funds from the Raritan Headwaters Association and other state and federal sources. Alternative 3.4 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Removing the Califon Dam restores river habitat, improves water quality, reestablishes fish and mussel movement, and enhances recreational fishing and boating opportunities.

3.5 Preferred Tier I Alternative: Blackwells Mills Dam Removal

The Blackwells Mills Dam is located on the Millstone River in Franklin Township, Somerset County, New Jersey. The proposed restoration project involves the removal of the Blackwells Mills Dam; appropriate restoration and stabilization of the adjacent stream reaches; native

plantings to stabilize banks; installation, relocation and/or recalibration of U.S. Geological Survey (USGS) stream gaging equipment; and scour protection measures at the Blackwells Mills Road bridge and other areas, as warranted. This Alternative meets the Trustees identified project categories of dam removal, riparian restoration, floodplain restoration, aquatic connectivity, freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail recreation.

The Blackwells Mills Dam is an approximately 90-feet-long and 3-feet-high, concrete, run-of-river, gravity dam (Figure 8). The current dam structure was built in 1933, and it is unknown whether the current structure incorporated the remnants of the original dam at this location, built in 1747. A remnant millrace and associated spillway is located approximately 280 feet upstream.



Figure 8. Blackwells Mills Dam shown from upstream facing west.

The current 1933 Blackwells Mills Dam was likely constructed by the USGS, when it was reconfigured as the control weir for the USGS gage 01402000 Millstone River at Blackwells Mills,

New Jersey. This USGS gage measures stage and discharge, and has been in continuous use at its current location since 1921, with water quality measurements taken in 1962-1969, 1973, 1976-1980, and 1991 to present (USGS 2019). The gage's stage measurements are currently used to inform local water supply operations, therefore dam removal must preserve this capability along this stretch of the Millstone River. A 2018 report found that the USGS gage only provides accurate readings at low flows, primarily due to the fact that there is bifurcated flow between the main channel and the former millrace entrance located just upstream (Princeton Hydro 2018). The remnant millrace is prone to debris jams and the abutments of the dam itself may create accuracy issues at higher flows as well (Princeton Hydro 2018). As such, project proponents have proposed to relocate the USGS gage at Blackwells Mills Dam to an alternate location, or update existing equipment and recalibrate the gage at its current position or relocate to a new position. Such actions would preserve the capability of stage measurements in this stretch of the Millstone River, while also facilitating dam removal. Depending on the new configuration of the USGS gage, this restoration project may include closing the millrace channel to prevent flows less than bankfull from entering. Stakeholder discussions regarding how to deal with the gage appropriately are ongoing; further feasibility investigations may be warranted to determine the best approach to balancing the dual needs of dam removal and stream gaging.

The Blackwells Mills Dam is currently the downstream-most barrier on the Millstone River since the removal of the Weston Mills Dam in 2017. Multiple formal reports by the USGS, the Service, and Princeton Hydro, LLC, have determined that the Blackwells Mills Dam is a barrier to anadromous fish passage. The NJDEP has classified the dam as a Significant Hazard Structure (Class II), as several structural deficiencies exist that require maintenance. Dam removal is the most parsimonious solution to achieve fish passage and eliminate ageing infrastructure that poses a public safety hazard.

The NJDEP owns the Blackwells Mills Dam and adjacent land parcels. Parcels located to the east of the Blackwells Mills Dam are managed by the NJDEP Division of Parks and Forestry as part of the Delaware and Raritan Canal (D&R Canal) State Park and towpath. The D&R Canal was built in the 1830s and connects the Delaware River to the Raritan River. Most of the canal system was declared a state park in 1974, and is currently used for boating, fishing, biking, hiking, running, and wildlife viewing.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicate that Millstone River waters above and below the Blackwells Mills Dam do not attain the following designated uses: aquatic life general (due to total phosphorus); fish consumption (due to mercury in fish tissue); and public water supply (due to arsenic; NJDEP 2019). Both upstream and downstream waters do attain the use of recreation. TMDL regulations are in place for total suspended solids. The removal of the Blackwells Mills Dam will likely improve water quality conditions in the impounded reach and downstream, namely by restoring natural sediment transport and contributing to the reduction of total suspended solids.

Removal of the Blackwells Mills Dam would restore fish passage for approximately 9.7 miles to the Kingston Mill Dam, the next dam upstream. Dam removal would also provide fish passage for 6.25 miles downstream, to the Island Farm Weir. Restoration of fish passage at the Island Farm Weir is proposed as a Tier I project in this Draft RP/EA. Once fish passage issues at the Island Farm Weir are addressed, the removal of the Blackwells Mills Dam would restore a total of approximately 35.7 miles of fish passage connectivity along the Millstone River and Raritan River mainstem extending to the Raritan Bay.

Restoration of fish passage at Blackwells Mills will benefit diadromous species such as American eel (*Anguilla rostrata*), sea lamprey (*Petromyzon marinus*), blueback herring (*Alosa aestivalis*), and American shad (*Alosa sapidissima*). After the removal of the lowermost dam on the Millstone River in the fall of 2017 (Weston Mill Dam), juvenile American shad were documented as far upstream as the base of the Blackwells Mill Dam by the fall of 2018, confirming that shad are migrating and spawning in the Millstone River for the first time in approximately 278 years. A 2017 report determined that the Blackwells Mills Dam is a hydrological barrier to upstream fish passage for American shad for approximately seventy percent of the migration season during the period of record (Haro *et al.* 2017). Dam removal is the best method to further improve fish passage in the Millstone River.

Water quality and habitat improvements will improve conditions for several species identified by the State of New Jersey as having Greatest Conservation Need, including: bluespotted sunfish (*Enneacanthus gloriosus*), comely shiner (*Notropis amoenus*), and satinfin shiner (*Cyprinella analostana*). Habitat and water quality improvements may also benefit several mussel species, including: alewife floater (*Anodonta imbecilis*), eastern elliptio (*Elliptio complanata*), eastern

floaters (*Pyganodon cataracta*), eastern lampmussel (*Lampsilis radiata*), and triangle floater (*Alasmidonta undulata*).

Removal of the Blackwells Mills Dam will enhance recreational paddling on the Millstone River. Boaters will be able to paddle the reach extending from the Kingston Mill Dam near Kingston, New Jersey to the County Boat Launch in Manville, New Jersey. Restoration of the County Boat Launch is proposed as a Tier I project in this Draft RP/EA. The reach between Kingston and Manville is currently interrupted by a necessary portage at the Blackwells Mills Dam. The dam is a safety hazard for boaters unaware of the upwelling hazards associated with small low-head dams.

The removal of the Blackwells Mills Dam will be accomplished through funding and technical assistance from The Watershed Institute based in Pennington, New Jersey, and may be accomplished by leveraging additional funds through private, state, and/or federal sources. Alternative 3.5 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Removing the Blackwells Mills Dam restores river habitat, improves water quality, reestablishes fish and mussel movement, and enhances recreational fishing and boating opportunities.

3.6 Preferred Tier I Alternative: Nunn's Mill Dam Removal

The Nunn's Mill Dam is located on the South Branch Raritan River in Washington Township, Morris County, New Jersey. The proposed restoration project involves the removal of the Nunn's Mill Dam; appropriate characterization, dredging, removal, and storage/disposal of upstream sediments, as warranted; appropriate restoration, stabilization, and revegetation of adjacent stream reaches and the impoundment area; and scour protection measures at the Four Bridges Road bridge and other areas, as warranted. This Alternative meets the Trustees identified project categories of freshwater wetland restoration, dam removal, riparian restoration, floodplain restoration, aquatic connectivity, freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail recreation.

Nunn's Mill Dam is approximately 150-feet-long and the spillway is approximately 6-feet-tall (Figure 9). Approximately 40 feet of the dam's width is a concrete gravity dam spillway, and the remaining 110 feet is an earthen embankment. The earthen embankment consists of two concrete

walls with a rock rubble interior fill. There is a 7.5-foot-wide double gate sluice on the north end of the dam and a 5-foot-wide single gate sluice on the south end. The single sluice gate drains two 48-inch diameter reinforced concrete pipes that run beneath Four Bridges Road. The dam retains an approximate 2.5-acre impoundment. The dam owner reported that sediment has recently collected at a rapid rate just upstream of the dam.



Figure 9. Nunn's Mill Dam shown from downstream facing northeast.

The dam was constructed at least 100 years ago to provide power for a small mill located on the north bank of the river. It is unknown whether the current dam structure incorporates the remnants of any type of historic structure. After an inspection in August of 2019, the NJDEP Division of Dam Safety and Flood Engineering determined that Nunn's Mill Dam was damaged and not maintaining normal pool. As a result, the NJDEP directed the dam owner to conduct an official engineering inspection, including recommendations for permanent decommissioning or repair, to bring the dam into compliance with the New Jersey Safe Dam Act (N.J.S.A. 58-4.1 *et seq.*).

The dam is currently in private ownership, and the impoundment is flanked by parcels of both private and public ownership. The State of New Jersey, including the State's Green Acres Program, owns several large parcels of land on the western side of the impoundment and upstream reaches of the South Branch Raritan. The Columbia Trail, a 15.1-mile rails-to-trail conversion, runs along the South Branch Raritan and passes by the dam and impoundment on their eastern side.

Sediments that have accumulated upstream of the Nunn's Mill Dam would need to be characterized and quantified as part of the dam removal feasibility process, and the removal may require dredging, removal, and storage/disposal of sediments. The dam removal design may include minor grading of the riverbed and banks, revegetation of exposed areas, and scour protection measures, as warranted.

Removal of the Nunn's Mill Dam would restore fish passage for approximately 1 mile to the next upstream dam, and would provide fish passage for approximately 11 miles downstream to the Califon Dam. The removal of the Califon Dam is proposed as a Tier I project in this Draft RP/EA. Once fish passage is restored at the Califon Dam, an additional five miles would be gained to the Lake Solitude Dam.

Dam removal will improve fish passage for resident and diadromous species such as American eel (*Anguilla rostrata*), and will reduce stream temperatures for coldwater species such as brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*). Water quality and habitat improvements will improve conditions for all species, including several species identified by the State of New Jersey as having Greatest Conservation Need, including: American brook lamprey (*Lethenteron appendix*), bluespotted sunfish (*Enneacanthus gloriosus*), cutlips minnow (*Exoglossum maxilllingua*), eastern mudminnow (*Umbra pygmaea*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfish shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), swallowtail shiner (*Notropis procne*), and yellow bullhead (*Amerius natalis*). Water quality and habitat improvements will also benefit several mussel species, including: alewife floater (*Anodonta imbecilis*), eastern elliptio (*Elliptio complanata*), and eastern floater (*Anodonta cataracta*).

Recreational trout fishing is popular along the upper South Branch Raritan River. Cold water is released from Budd Lake (located 6 miles upstream) during most of the year, which allows for

stocked rainbow and brown trout to holdover well. The section of the river in proximity to the Nunn's Mill Dam ranges from 20 to 40 feet in width, has ample public fishing access, and has appropriate habitat heterogeneity to support trout.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicate that South Branch Raritan waters do not attain the following uses: aquatic life general (due to biological - cause unknown); aquatic life – trout (due to temperature); fish consumption (due to mercury in fish tissue); public water supply (due to arsenic); and recreation (due to *Escherichia coli*; NJDEP 2019). TMDL regulations are in place for total phosphorus and total suspended solids.

The removal of Nunn's Mill Dam will likely improve water quality conditions in the impounded reach and downstream, namely by reducing temperature, total phosphorus, total suspended solids, and *Escherichia coli* levels. The impoundment created by Nunn's Mill Dam is shallow with predominant sand and clay substrates. Shallow, slow moving, unshaded waters are highly susceptible to thermal impacts at all times of year, but particularly during summer months. In addition, shallow and slow waters tend to host intense plant growth that can negatively affect dissolved oxygen and pH. Small, shallow impoundments attract numerous wildlife species such as Canada goose (*Branta canadensis*), which can contribute to high *Escherichia coli* levels. The removal and revegetation of the impoundment will also help trap nutrients and sediments that may runoff and increase total phosphorus and total suspended solid loads.

The removal of the Nunn's Mill Dam may be accomplished by leveraging additional funds through other state and/or federal sources. Alternative 3.6 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Removing Nunn's Mill Dam restores river habitat, improves water quality, reestablishes fish and mussel movement, and enhances recreational fishing and boating opportunities.

3.7 Preferred Tier I Alternative: Pond Removal on Tributary to Rockaway Creek

This project will remove a small inline farm pond on a private property. The pond is located on an unnamed tributary to Rockaway Creek, in Readington Township, Hunterdon County, New Jersey. The proposed restoration project includes: the removal of a small pond weir structure; the

restoration of the stream corridor within and adjacent to the small pond; the removal of exotic invasive plant species; the revegetation and stabilization of stream banks; and the creation/restoration of floodplain topography to restore floodplain hydrology and improve connectivity between the stream and its floodplain. This Alternative meets the Trustees identified project categories of freshwater wetland restoration, dam removal, aquatic connectivity, and instream enhancement.



Figure 10. Inline farm pond on an unnamed tributary to Rockaway Creek.

The farm pond is situated on an unnamed tributary located approximately 0.7 mile upstream of Rockaway Creek; Rockaway Creek flows for 2.5 miles to the Lamington River, and the Lamington River flows another 2.5 miles to the confluence with the North Branch Raritan River. The farm pond weir is approximately 12 to 15 feet long, and retains an approximate 0.25-acre impoundment (Figure 10). The pond is located on private property, and the landowner wishes to remove the pond and restore the stream and floodplain to their natural state. The surrounding watershed of the

unnamed tributary is comprised mostly of forest and fallow agricultural fields, although a private golf course is located near the headwaters.

The Rockaway Creek watershed exhibits healthy biological communities, and recent improvements have been attained in water quality (NJDEP 2019). However, the section of Rockaway Creek that the unnamed tributary flows to does not attain the following uses: aquatic life general (due to pH and total phosphorus); aquatic life – trout (due to temperature); public water supply (due to arsenic); and recreation (due to *Escherichia coli*). Data is insufficient to determine the use of fish consumption. TMDL regulations are in place for total phosphorus and total suspended solids.

The farm pond removal will likely contribute to the improvement of water quality conditions in Rockaway Creek, by helping to reduce pH and total suspended solids. The shallow, sediment-laden pond hosts excessive plant growth. Excessive photosynthesis in slackwater ponds can cause pH to rise to high, basic levels that are intolerable to fish and macroinvertebrate species. The removal and revegetation of the impoundment will help reduce pH and the removal design is tailored to help to trap nutrients and sediments that may runoff and increase total suspended solid loads.

The farm pond removal will be accomplished with the assistance of the Natural Resources Conservation Service (NRCS). NRCS has prepared engineering design plans, will assist the landowner with construction contracting, will provide technical assistance and project management assistance, and will provide partial funds for the project. Alternative 3.7 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Removing the Rockaway Creek tributary farm pond is cost-effective, increases floodplain habitat, and improves water quality.

3.8 Preferred Tier I Alternative: County Boat Launch and Fishing Platform at Lincoln Avenue Park

The County Boat Launch is located on the lower Millstone River in Lincoln Avenue Park, Manville, Somerset County, New Jersey. The proposed recreational restoration project includes: the restoration of an existing dirt and gravel boat launch at the Lincoln Avenue Park; the

installation of an accessible fishing platform, as feasible, in the vicinity of the boat launch; the installation of appropriate safety and informational signage associated with the boat launch and platform; and the creation or expansion of unpaved parking, as warranted. This Alternative meets the Trustees identified project categories of boat launch recreation, river trail recreation, docks and piers, and ADA accessibility.

The existing boat launch is located in the southwest corner of Lincoln Avenue Park, on the western edge of the Millstone River, approximately 1.5 miles upstream of the confluence with the Raritan River (Figure 11). The boat launch is located immediately downstream of the Royce Brook tributary, and approximately 450 feet downstream of the former Weston Mill Dam, which was removed in 2017. The existing boat launch is composed of hard-packed gravel to approximately the water line, then is gravel and riprap into the river. New riprap and gravel were added to the in-river portion of the launch in 2017, as part of the equipment access route for the Weston Mill Dam removal. The new slope of the in-water portion of the ramp precludes easy trailer launching at low water levels.



Figure 11. County Boat Launch in Lincoln Avenue Park, Manville, New Jersey.

The existing parking area is an extension of the gravel and dirt drive that provides vehicle access to the Lincoln Avenue Park. No signage is visible to instruct visitors as to the types of boats permitted to be launched, where visitors should park their vehicles, or the hours of operation. There is currently no river or fishing access to visitors with disabilities.

This recreational restoration project involves enhancing public access to the Millstone and Raritan Rivers, in part, by upgrading the existing boat launch at Lincoln Avenue Park. Boat launch upgrades may include regrading the launch to a greater slope and resurfacing the launch with appropriately sized gravel and riprap, or regrading the launch to an appropriate slope and replacing the existing gravel/rip-rap with pre-cast concrete slabs. The launch should be able to handle both non-motorized and small motorized boats. Boaters that launch at the County Boat Launch can currently travel to the mainstem Raritan River as well as travel 4.7 miles upstream the Millstone River to the Blackwells Mills Dam.

Fishing access will be enhanced by installing an accessible fishing platform, as feasible. Figure 12 provides an example of the type of fishing platform that could be installed at or near the County Boat Launch. The fishing platform should provide access, given the provisions of the Americans with Disabilities Act of 1990 (ADA; 42 U.S.C. § 12101 *et seq.*), and should incorporate appropriate signage. The fishing platform should be designed in a manner as to not exacerbate erosion of the Millstone River and Royce Brook banks.



Figure 12. Example of accessible fishing platform along a small river in Virginia. Photo credit: Hawksbill Greenway Foundation.

This restoration project may additionally include the creation or expansion of the existing parking area associated with the boat launch. Parking materials will consist of gravel or parking pavers. Appropriate signage will be installed to provide instruction on the safe use of the launch, and other general information about the park, as warranted.

The proposed restoration project may be accomplished through leveraging additional funding and/or technical assistance from the Borough of Manville, the Manville Green Team, the Somerset County Planning Division, and other private, state, and federal partners. Alternative 3.8 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the recreational injuries caused by the release of hazardous substances. Repairing the County Boat Launch and installing an accessible fishing platform, as feasible, will enhance recreational fishing and boating opportunities on both the Millstone and Raritan Rivers.

3.9 Preferred Tier I Alternative: Lost Valley Nature Park

The Lost Valley is an area of Manville, Somerset County, New Jersey that is situated along the western side of the Millstone River, just upstream of the confluence with the mainstem Raritan River. The Borough of Manville, Somerset County, The Nature Conservancy, and other partners have proposed to transform the Lost Valley Area into a multi-use Nature Park. The proposed restoration project includes a mix of recreational and ecological improvements, that may include but are not limited to: the removal of existing impervious surfaces; trail and path development; planting pollinator garden areas; installing rain gardens; expansion and revegetation of wetland areas; tree plantings; upland meadow plantings; improvements to a gravel driving path; installation of a new gravel parking area; and installation of educational and wayfinding signage. This Alternative meets the Trustees identified project categories of freshwater wetland restoration, riparian restoration, floodplain restoration, land trail recreation, interpretive signage, and ADA accessibility.

The 65-acre Lost Valley Nature Park will include portions of the Lost Valley neighborhood and Lincoln Avenue Park. The Lost Valley neighborhood was comprised of roughly 500 homes and businesses, but after unprecedented flooding following Hurricane Floyd in 1999, the State's Blue Acres buyout program has reduced the community to only 377 homes and 4 remaining commercial

properties. The Lost Valley Nature Park will be situated along the southeastern portion of the Lost Valley neighborhood, and will completely incorporate the Lincoln Avenue Park. Somerset County owns and maintains the Lincoln Avenue Park, and the Manville Borough owns the reclaimed portion of the Lost Valley neighborhood.

The Nature Park will be located within the 100-year floodplain of the lower Millstone River, approximately 1 mile upstream of the confluence with the Raritan River. Royce Brook flows along the southwestern edge of the park, and portions of the proposed park are wetlands. The existing Lincoln Avenue Park has ball fields, a playground, and a boat ramp, but the site is underutilized by visitors.

The Nature Conservancy produced a recommendations report (TNC 2017) and the Borough of Manville produced a draft Master Plan report for the site in 2017 (Mott MacDonald 2017). The draft Master Plan for the Lost Valley Nature Park includes a conceptual design, as well as information regarding the existing natural and anthropogenic characteristics of the park. The Master Plan conceptual design is depicted in Figure 13.

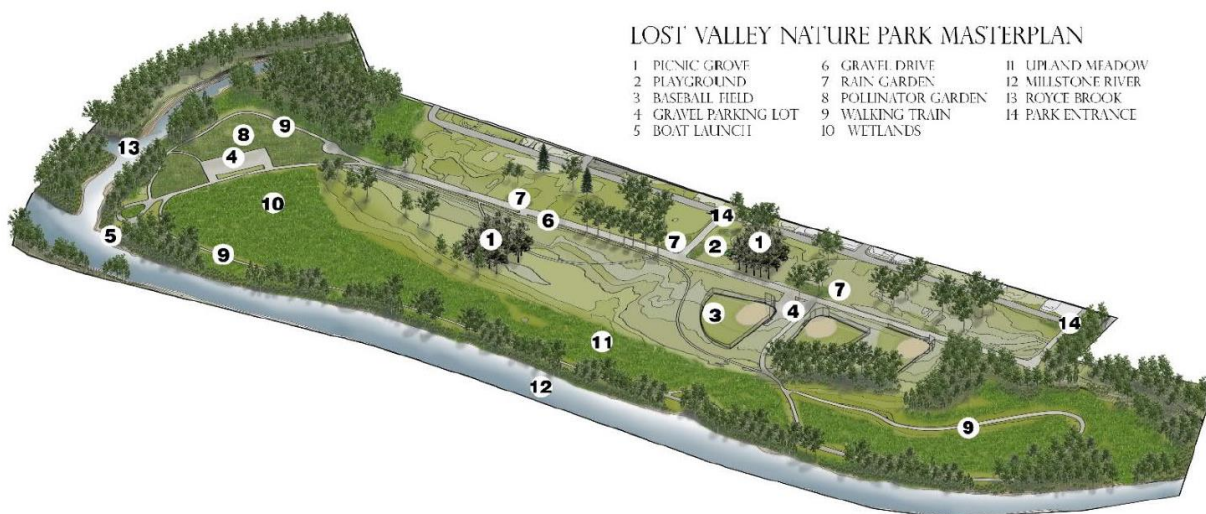


Figure 13. Conceptual design for the Lost Valley Nature Park, Mott MacDonald 2017.

The Lost Valley Nature Park has the potential to transform an area considered a community impediment into a community asset. Draft and final designs will be produced as part of this project. The available conceptual design indicates that the park may include: floodplain habitat, forested riparian buffer zones, pollinator gardens, rain gardens, tree plantings, picnic areas, impervious

surface removal, vegetated wetlands, upland meadow, and lawn. The conceptual design indicates that the park may provide human recreational areas, including active recreation (*e.g.*, basketball court, baseball field, playground) and passive recreation (*e.g.*, trails, roads, lawn). The Trustees will work with project partners to create a design that meets the goals and objectives of both the local community and the Trustee Council.

The proposed Lost Valley Nature Park restoration project may be accomplished through partnerships, additional funding, and technical assistance from the Borough of Manville, Somerset County, The Nature Conservancy, Manville's Green Team, and other state and federal sources. Alternative 3.9 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the ecological and recreational injuries caused by the release of hazardous substances. Creation of the Lost Valley Nature Park will increase and enhance public recreation and environmental education opportunities; will remove impervious surfaces and enhance water retention and storage capacity; and will improve pollinator habitat and habitat for small mammals and birds.

3.10 Preferred Tier I Alternative: North Branch Raritan River Corridor Riparian Buffer Restoration

The headwaters of the North Branch Raritan River are located in Mendham Borough, Morris County, New Jersey and the river flows generally southward through Somerset County, joining the South Branch Raritan River in Bridgewater and Branchburg Townships to form the mainstem Raritan River. The North Branch Raritan River watershed has a drainage area of approximately 187 square miles. The proposed restoration project includes the establishment and restoration of riparian buffers on publicly-owned open space properties along the North Branch Raritan River corridor (Figure 14). This Alternative meets the Trustees identified project categories of riparian restoration, floodplain restoration, land freshwater mussel conservation and enhancement, native fish conservation and enhancement, and instream enhancement.

The Raritan Headwaters Association (RHA) will identify, prioritize, and implement riparian buffer restoration in the North Branch Raritan River watershed. The RHA is a non-profit conservation organization based in Bedminster, Somerset County, New Jersey. RHA operates under the guidance of a Board of Trustees, and has 20 staff members, an AmeriCorps Watershed

ambassador, nature educators, interns, and over 180 volunteers. RHA's mission is to protect clean water in the rivers, streams, and homes of the North and South Branch Raritan watersheds, a region covering 38 municipalities in Hunterdon, Somerset, and Morris counties.

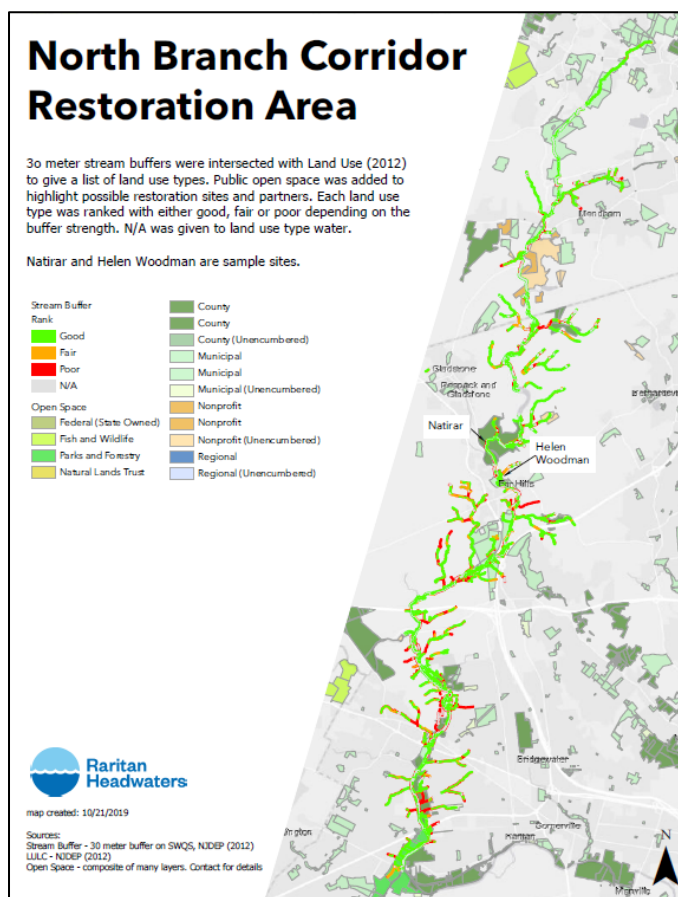


Figure 14. Map of potential areas for riparian buffer restoration in the North Branch Raritan watershed.

The RHA analyzed land cover and water quality data collected from the North Branch Raritan River and tributaries, including the Lamington/Black River, Chambers Brook, Mine Brook, Peapack Brook, and Rockaway Creek, and found that there has been a decline in water quality over time. The primary causes of impairment include non-point source pollution, impervious cover associated with increased development, and the decline of forested stream riparian buffers. RHA encourages green infrastructure and reducing nonpoint source pollution through their programming, and the State requires a 50-foot, 150-foot, or 300-foot riparian buffer depending on how the State classifies the adjacent stream or waterbody. However, RHA recently conducted a

GIS analysis of riparian buffers on the North Branch Raritan River and its tributaries, and found that long segments of riparian areas had inadequate or no riparian buffer, even when located on publicly-owned parcels.

The proposed project will establish or restore riparian buffers to at least their State-required length at select municipal, county, and state properties along the North Branch Raritan River and its tributaries. The RHA has a minimum goal of establishing 10,000 native trees and shrubs in partnership with municipalities and other public landowners. As part of the project, RHA will monitor water quality parameters including benthic macroinvertebrate and fish communities before and after restoration as part of their robust stream monitoring program. This will provide data on the effectiveness of stream buffer plantings on restoring water quality.

Streams of this region provide drinking water to 1.5 million people in New Jersey; therefore, water quality improvements are of utmost importance to the health of citizens, the local economy, and the natural ecology of the area. Healthy riparian buffers contain trees and other vegetation that help protect water quality. Riparian buffers intercept non-point source pollutants carried by rainwater runoff and help to trap excess nutrients and other chemical pollutants that degrade waterbodies. Riparian buffers help to stabilize stream banks and minimize erosion and sedimentation. Riparian buffers help to flatten the hydrograph by infiltrating and slowing down runoff from rain events prior to entering the stream; this capability helps to decrease the frequency and intensity (*i.e.*, flashiness) of flood events. Riparian buffers provide shade over waterbodies, which helps to reduce stream temperatures and reduce large fluctuations in stream temperatures over time. Streams and their riparian buffers also play an important role in water storage and groundwater recharge. During high water events, riparian buffers can help to store subsurface water, allowing it to slowly percolate to the stream over time and also percolate vertically to groundwater reserves. As a result, riparian buffers help to maintain stream flow in the late summer when rain is minimal and help to maintain groundwater resources. Riparian buffers contribute towards aquatic habitat heterogeneity by providing large wood and other organic inputs that help provide a diversity of habitats (and food sources) for a variety of different species.

Improvements to water quality and aquatic/riparian habitat would benefit a number of sensitive wildlife species, including several species identified by the State of New Jersey as having Greatest Conservation Need, including: longtail salamander (*Eurycea longicauda*), wood turtle (*Glyptemys*

insculpta), American brook lamprey (*Lethenteron appendix*), comely shiner (*Notropis amoenus*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfin shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), spotfin shiner (*Cyprinella spiloptera*), swallowtail shiner (*Notropis procne*), and yellow bullhead (*Amerius natalis*). Water quality and habitat improvements may also benefit several mussel species, including: brook floater (*Alasmidonta varicosa*), triangle floater (*Alasmidonta undulata*), alewife floater (*Anodonta implicata*), eastern elliptio (*Elliptio complanata*), and eastern floater (*Pyganodon cataracta*).

The North Branch Raritan River riparian restoration project may be accomplished by leveraging additional funds and technical assistance from RHA, and other state, federal, or local sources. Alternative 3.10 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Creating and restoring riparian buffers along the North Branch Raritan River and its tributaries will benefit water quality and aquatic habitat for sensitive aquatic taxa, will benefit species that use stream edge as habitat, and will also provide a high potential for public outreach and education.

3.11 Preferred Tier I Alternative: East Brunswick Swamp Pink Restoration

The proposed restoration project involves the protection of an extant swamp pink (*Helonias bullata*) population and the restoration and protection of adjacent Atlantic white cedar (*Chamaecyparis thyoides*) habitat in East Brunswick, New Jersey. This Alternative meets the Trustees identified project categories of freshwater wetland restoration and floodplain restoration.

Swamp pink is a perennial herb in the lily family, characterized by smooth evergreen oblong-spatulate leaves that lay flat on the ground in a basal rosette, and a stocky, hollow flower stem (one to three feet) that is topped by a cluster of unique pink flowers in the spring. Swamp pink is only found in wetlands along streams and seepage areas in freshwater swamps. It often grows on hummocks formed by trees, shrubs, and sphagnum moss. The hummocks keep the roots moist but not submerged in the standing water and hydric soil characteristic of the plant's habitat. In New Jersey, the plant is often found in Atlantic white cedar or red maple (*Acer rubrum*) dominated swamps.

Swamp pink was listed as threatened under the Endangered Species Act of 1973 (ESA; 16 U.S.C. § 1531 *et seq.*) in 1988. The species once inhabited wetland areas from New York to Georgia, but now only ranges from New Jersey to Virginia and a few isolated areas in the Southern Appalachian Mountains. The East Brunswick swamp pink population, located in East Brunswick, New Jersey, represents the northernmost occurrence of the species within its extant range. The protection of this remnant population is important for maintaining the distribution and genetic diversity of the species.



Figure 15. Swamp Pink plant from the East Brunswick, New Jersey population.

The East Brunswick swamp pink population is currently comprised of less than 20 individual plants (Figure 15). The population is negatively impacted by deer browse; only a small number of swamp pink plants flower each spring and their flowers are preferentially consumed by deer. In addition, the adjacent Atlantic white cedar stand is aging, and at risk of windfall. As a result, canopy gaps and other changes that may alter the specialized wetland habitat required by swamp pink. Recently germinated Atlantic white cedar seedlings are present in the understory, but their growth is suppressed by the high level of deer browse at the site. Because of inadequate canopy cover, the invasive plant Japanese stilt grass (*Microstegium vimineum*) is encroaching on the project site, causing further risk. Appropriate restoration at the site involves the protection of

swamp pink using deer exclusion fencing, and the enhancement and protection of its adjacent Atlantic white cedar habitat.

The proposed restoration project is comprised of three general phases: 1) conduct a current swamp pink survey (last survey conducted in 2018) to determine the appropriate footprint for deer exclusion fencing, and conduct a survey of the adjacent white cedar stand to determine appropriate habitat enhancement actions; 2) install 6- to 8-foot-high deer exclusion fence around the swamp pink area, install anti-herbivory cages around individual plants, and implement appropriate habitat suitability actions (*e.g.*, thin the adjacent white cedar stand to promote new growth; plant white cedar saplings an house with browse tubes, and/or provide additional fencing around the white cedar stand; remove invasive species within fenced area); and 3) monitor swamp pink plants and the Atlantic white cedar stand for a minimum 5-year period, and monitor and repair the fencing, as warranted.

The protection of the East Brunswick swamp pink population may be accomplished by leveraging additional funds and technical assistance through other federal sources. Alternative 3.11 is a Tier I preferred alternative because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances. Protection of the East Brunswick swamp pink population benefits a federally endangered species and protects critical wetland habitat in New Jersey.

3.12 Preferred Tier I Alternative: Stony Brook Green Infrastructure Demonstration Project

The Watershed Reserve is a property owned and operated by The Watershed Institute, and is located in Pennington, Mercer County, New Jersey. The proposed recreational and ecological restoration project involves the removal of impervious driving surfaces and the 14,000 square feet impervious parking area located on The Watershed Reserve property; the installation of multiple demonstration porous paving alternatives; the installation of bioswales to capture and treat stormwater along the entry drive; the removal of invasive species along the entry drive and adjacent tributary stream; and native plantings along the entry drive and adjacent tributary stream. This project will serve as a green infrastructure demonstration project to educate Watershed Reserve visitors on alternative green infrastructure practices and will also serve as a research site

for local academic groups. This Alternative meets the Trustees identified project categories of riparian restoration, floodplain restoration, instream enhancement, interpretive signage, and ADA accessibility.

The Watershed Reserve is owned and managed by The Watershed Institute (a nonprofit formerly known as the Stony Brook Millstone Watershed Institute). The Watershed Reserve spans nearly 1,000 acres of forest, wetlands, meadows, and farmland; houses a 15,256 square foot LEED-Platinum certified educational center (*i.e.*, The Watershed Center); and attracts tens of thousands of visitors each year who attend more than 300 programs including summer camps, educational classes, school field trips, conferences, and environmental festivals. The Watershed Reserve hosts over 10 miles of hiking trails for general recreation (*e.g.*, hiking, wildlife viewing, educational center).

The current parking lots, entry drive, and exit roads used to access The Watershed Reserve are comprised of asphalt and gravel and do not infiltrate stormwater. Runoff and sediments, especially from the gravel parking lot, drain directly into an unnamed tributary to Stony Brook and also drain indirectly into the tributary through various storm sewer drains. Invasive plants that perform poorly at stormwater infiltration and retention dominate riparian areas along the entry drive and the parking lot. Cumulatively, there is concern that the existing road and parking infrastructure at the Watershed Reserve is promoting the degradation of water quality in the Stony Brook.

The proposed recreational and ecological restoration project will play a significant role in educating tens of thousands of people that visit The Watershed Reserve each year about stormwater runoff and the role that runoff plays in degrading our local waterways. Though signage, brochures, presentations, and educational programs, this project will demonstrate and explain the principals of stormwater mitigation and green infrastructure. Watershed Center staff will incorporate monitoring of water quality changes associated with project installation, and will work with local academic groups to monitor other aspects of the efficacy of the multiple types of impervious surfaces installed onsite.

Approximately 0.73 mile of tributary stream leading to the Stony Brook will be immediately enhanced with the implementation of this green infrastructure project, and water quality uplift will have a lasting impact for miles downstream. At least 3 acres of wetland, 9 acres of riparian buffer,

and 12 acres of upland habitat will be improved through the riparian planting program, and 11 acres of upland will be protected through the implementation of green infrastructure that will reduce the negative effects of stormwater runoff and erosion.

Aquatic species that may benefit from the reduction of stormwater runoff in Stony Brook include diadromous species such as American eel (*Anguilla rostrata*), and several coldwater species (brook trout – *Salvelinus fontinalis*, rainbow trout – *Oncorhynchus mykiss*). The project may also benefit species identified by the State of New Jersey as having Greatest Conservation Need, including: comely shiner (*Notropis amoenus*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfish shiner (*Cyprinella analostana*), and swallowtail shiner (*Notropis procne*). Water quality improvements may additionally benefit several mussel species, including: alewife floater (*Anodonta implicata*), brook floater (*Alasmidonta varicosa*), creeper (*Strophitus undulatus*), eastern elliptio (*Elliptio complanata*), eastern floater (*Pyganodon cataracta*), eastern pondmussel (*Ligumia nasuta*), green floater (*Lasmigona subviridis*), and triangle floater (*Alasmidonta undulata*).

The installation of green infrastructure at The Watershed Reserve may be accomplished with funding and technical assistance from The Watershed Institute, and may leverage additional funds through private and/or federal sources. Alternative 3.12 is a Tier I preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the recreational and ecological injuries caused by the release of hazardous substances. Creating a green infrastructure demonstration project at The Watershed Reserve will provide a high potential for public outreach and education, and will also provide ecological benefits by improving water quality and benefitting species of concern.

3.13 Preferred Tier II Alternative: Rockafellows Mills Dam Removal

The Rockafellows Mills Dam is located on the South Branch Raritan River, in Readington and Raritan Townships, Hunterdon County, New Jersey. The proposed restoration project involves the removal of the Rockafellows Mills Dam; appropriate stabilization, restoration and vegetation of the adjacent stream reaches and impoundment area; appropriate characterization, dredging, removal, and storage/disposal of upstream sediments, as warranted; and scour protection measures for the Black River & Western Railroad Flemington through truss bridge, the Rockafellows Mill

Road bridge, and other areas, as warranted. This Alternative meets the Trustees identified project categories of dam removal, riparian restoration, aquatic connectivity freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail recreation.

The Rockafellows Mills Dam is the downstream-most barrier on the South Branch Raritan River. The dam is an approximately 290-feet-long, 14-feet-high (maximum height) concrete and rock-fill run-of-river gravity dam that creates an approximate 12.5-acre impoundment on the South Branch Raritan River (Figure 16). The concrete overflow spillway is connected to an undershot water wheel structure at the southern end of the dam, but the low-level outlet valves that supply water to the wheel, as well as the wheel, are no longer operable.



Figure 16. Rockafellows Mills Dam shown from downstream facing southwest.

The original construction date for Rockafellows Mills Dam is unknown. The dam was rebuilt in 1919 to supply power for a small mill located along the southern edge of the dam. In 1930 and 1978, dam failures were recorded. The cause and extent of the failure in 1930 and/or resulting

damage is unknown. The 1978 failure consisted of a 30-foot breach at the southern end of the main spillway (USACE 1981). All damage has been since been repaired. The dam and most of the land flanking the impoundment is currently in private ownership. The state-owned South Branch WMA is situated along the northern bank of the river just downstream of the dam.

Removal of the Rockafellows Mills Dam would restore fish passage for approximately 9.4 miles upstream to the Hamden Pump Dam, which is mostly permeable to migratory fish, and an additional 3 miles upstream to the next impermeable dam, the Clinton Mills Dam. Dam removal would also provide- fish passage for approximately 12 miles downstream to the Headgates Dam located on the mainstem Raritan River. The Headgates Dam removal is proposed as a Tier I project in this Draft RP/EA. The Headgates Dam is the last remaining complete barrier on the mainstem Raritan; as such, the removal of both the Headgates and Rockafellows Mills Dam could allow for approximately 55 miles of fish passage connectivity along the South Branch and mainstem Raritan Rivers extending to the Raritan Bay.

Sediments that have accumulated upstream of the Rockafellows Mills Dam would need to be characterized and quantified as part of the dam removal feasibility process, and the removal may require dredging, removal, and storage/disposal of sediments. The dam removal design may include minor grading of the riverbed and banks, revegetation of exposed areas, and scour protection measures, as warranted.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicate that South Branch Raritan waters in the vicinity of the Rockafellows Mills Dam do not attain any of the following uses: aquatic life general (due to total phosphorus); aquatic life – trout (due to temperature); fish consumption (due to mercury in fish tissue); public water supply (due to arsenic); and recreation (due to *Escherichia coli*; NJDEP 2019). Total Maximum Daily Load (TMDL) regulations are in place for total phosphorus and total suspended solids.

The removal of the Rockafellows Mills Dam and restoration of its associated impoundment will likely improve water quality conditions in the impounded reach and downstream of the dam, namely by reducing temperature, total phosphorus, and total suspended solids. Shallow, slow moving, unshaded waters are highly susceptible to thermal impacts, particularly during summer months. Altered flow regimes also modify nutrient and chemical cycling, and sediment transport.

The impoundment created by the Rockafellows Mills Dam is very shallow with predominant sand and clay substrates, very little physical and hydrological habitat heterogeneity, and very little cover. The reintroduction of the river's natural flow regime will provide more suitable habitat conditions for aquatic biota.

Dam removal will improve fish passage for resident and diadromous species such as American eel (*Anguilla rostrata*), blueback herring (*Alosa aestivalis*), sea lamprey (*Petromyzon marinus*), and striped bass (*Morone saxatilis*) after fish passage issues are addressed at the Island Farm Weir and Headgates Dam. Water quality and habitat improvements will improve conditions for all species, including several species identified by the State of New Jersey as having Greatest Conservation Need, including: American brook lamprey (*Lethenteron appendix*), bluespotted sunfish (*Enneacanthus gloriosus*), cutlips minnow (*Exoglossum maxillingua*), eastern mudminnow (*Umbra pygmaea*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfish shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), swallowtail shiner (*Notropis procne*), and yellow bullhead (*Amerius natalis*). Water quality and habitat improvements will also benefit several mussel species, including: brook floater (*Alasmidonta varicosa*), eastern elliptio (*Elliptio complanata*), eastern floater (*Anodonta cataracta*), and triangle floater (*Alasmidonta undulata*).

Removal of the Rockafellows Mills Dam will enhance recreational paddling on the South Branch River. The reach extending from Clinton, New Jersey to the confluence with the mainstem Raritan River is currently interrupted by a necessary portage at the Rockafellows Mills Dam, which is not recommended due to the fact that the dam is located on private property. The dam is also a safety hazard for boaters unaware of the upwelling hazards associated with small low-head dams.

The removal of the Rockafellows Mills Dam may be accomplished with technical assistance and leveraging additional funds from the Raritan Headwaters Association and other state and federal sources. Alternative 3.13 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances, but project access and permissions are uncertain at this time. Removing the Rockafellows Mills Dam restores river habitat, improves water quality, reestablishes fish and mussel movement, and enhances recreational fishing and boating opportunities.

3.14 Preferred Tier II Alternative: Klines Mill Dam Fish Passage

The Klines Mill Dam is located on the North Branch Raritan River in Bedminster Township, Somerset County, New Jersey. The proposed restoration project involves the restoration of fish passage at the Klines Mill Dam through dam removal, partial dam removal, or the installation of a nature like fishway. The project may also include appropriate restoration, stabilization, and revegetation of the adjacent stream and millrace reaches; and scour protection measures at the Klines Mill Road and bridge, as warranted. This Alternative meets the Trustees identified project categories of dam removal or technical fish passage, riparian restoration, floodplain restoration, aquatic connectivity, freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail recreation.

The Kline's Mill Dam is an approximately 145-foot-long, v-shaped, concrete, run-of-river gravity dam (Figure 17). The northern arm of the v-shaped dam is approximately 90-foot-long, and contains a small notch toward its southern end that is approximately 15 feet in length and 1 foot in depth; this arm passes the river's thalweg. The southern arm of the v-shaped dam is approximately 55-foot-long and contains a small, vertical-rising sluice gate that opens to a historic millrace. The millrace runs approximately 780 feet to a fork where a portion of flow can be diverted back to the North Branch Raritan, and remaining water runs in a smaller, more constricted millrace for an additional 800 feet past the historic McDonalds-Klines Mill before rejoining the North Branch Raritan.

The Klines Mill Dam is associated with the historic McDonalds-Klines Mill, originally constructed as an up-and-down sawmill mill built in 1744 by William McDonald. The mill was converted to a grist mill and willed to the wife of Jacob Kline in 1836, and the property remained in the Kline family until 1899. While the dam and mill are now obsolete, the mill building has been refurbished in modern times and retains functional sawmill machinery inside. The McDonalds-Klines Mill as well as the Klines Mill Road located 0.2 mile downstream are listed on the National and New Jersey Registers of Historic Places. The dam is currently privately owned; land to the south is privately held (preserved farmland), and land to the north is owned by Bedminster Township.

Restoration of fish passage at the Klines Mill Dam will benefit diadromous species such as American eel (*Anguilla rostrata*) and sea lamprey (*Petromyzon marinus*), and after fish passage is

addressed at the Island Farm Weir and Headgates Dam will additionally benefit American shad (*Alosa sapidissima*) and blueback herring (*Alosa aestivalis*). Water quality and habitat improvements will improve conditions for all species, including several species identified by the State of New Jersey as having Greatest Conservation Need, including: American brook lamprey (*Lethenteron appendix*), comely shiner (*Notropis amoenus*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfin shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), spotfin shiner (*Cyprinella spiloptera*), swallowtail shiner (*Notropis procne*), and yellow bullhead (*Amerius natalis*). Restoration of fish passage at the Kline Mill Dam may also benefit several mussel species, including: triangle floater (*Alasmidonta undulata*), alewife floater (*Anodonta implicata*), eastern elliptio (*Elliptio complanata*), and eastern floater (*Pyganodon cataracta*).



Figure 17. Klines Mill Dam shown from downstream facing southeast.

Removal of the Klines Mill Dam would restore fish passage for approximately 5.6 miles to the next upstream dam (Ravine Lake Dam), and would provide fish passage for approximately 8.1 miles downstream to the Mill Street Dam. Once fish passage is addressed at the Mill Street Dam and remaining mainstem Raritan River Dams, the removal of the Klines Mill Dam would provide approximately 43.6 miles of fish passage connectivity along the North Branch and mainstem Raritan Rivers extending to the Raritan Bay.

Restoration of fish passage at the Klines Mill Dam may be accomplished by leveraging additional funds through other state and federal sources. Alternative 3.14 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances, but project access and permissions are uncertain at this time. Removing the Klines Mills Dam restores river habitat, improves water quality, and reestablishes fish and mussel movement.

3.15 Preferred Tier II Alternative: Beisler Lake Dam Removal

Beisler Lake is located in Lebanon Township, Hunterdon County, New Jersey. This restoration project includes the partial removal of the earthen dam at Beisler Lake; stream channel restoration and stabilization in the former impounded area and downstream; revegetation of the former impounded area and other disturbed areas; and the creation of vernal pools in and around the former impoundment footprint. This Alternative meets the Trustees identified project categories of dam removal, riparian restoration, floodplain restoration, aquatic connectivity, native fish conservation and enhancement, and instream enhancement.

Beisler Lake is created by the impoundment of Spruce Run Creek, and is situated approximately 9.4 miles upstream of the Spruce Run Reservoir. Spruce Run Reservoir meets the South Branch Raritan River just downstream of the reservoir's dam. The Beisler Lake Dam is a 630-foot-long and 17.1-foot-high earthen dam that retains a 6.8-acre impoundment (Figure 18). In 2015, the NJDEP requested that the dam owner perform a dam failure analysis. The analysis resulted in the recommendation to designate the earthen dam as a Class I – High Hazard Potential, indicating that its failure would likely cause the loss of life or extensive property damage. Due to the Class I designation, the property owner was required to either reconstruct the dam to meet minimum hazard requirements or remove the dam. After determining the reconstruction option to be cost-prohibitive, the dam owner chose to remove the dam, reclaim the former impoundment, and restore the section of Spruce Run Creek that flows through the impoundment.

To date, the dam owner has taken several actions towards removing the Beisler Lake Dam. In fall of 2017, there was a permanent drawdown of the lake and a complete fish removal and relocation effort. The drawdown was facilitated by permanently opening an existing outflow structure and conveyance pipe that is embedded in the earthen dam. Immediately following the drawdown, the

lakebed was hydroseeded with native rye grass to minimize sediment transport. In summer of 2018, a total station survey was conducted to assist in the development of dam removal and impoundment restoration design plans. In fall of 2018, approximately 750 native trees and shrubs were planted in the former impounded area.



Figure 18. Beisler Lake in fall of 2019. The impoundment was permanently drained through the outflow structure embedded in the earthen dam in 2017, and the impoundment was partially revegetated in 2018.

Conceptual project designs include dam removal, stream reconstruction, and native plant reclamation. The dam removal design calls for the removal of the existing spillway structure, and excavation of a breach through the dam. The embankment breach will be excavated to a slope of at least 5:1, taking into consideration ease of access as well as constriction during high water events. Excavated soils will be relocated to adjacent areas within the former impoundment. The streambed will be graded to match the existing upstream bed elevation through the breach, and rock cross vanes will be installed for gradient control. The designed channel dimensions through

the dam will allow for minimal retention of floodwaters within the impoundment. The breach will be stabilized with riprap, non-woven geotextiles, and erosion control matting.

Once dam removal is complete, the reach of Spruce Run Creek that flows through the impoundment will be stabilized by the revegetation of stream banks and modifications to the channel dimensions to reflect those upstream and downstream of the Beisler Lake impoundment. Meanders and pools will be excavated to create fish and macroinvertebrate habitat. Riffles will be created with excavated gravels and imported gravels, as needed. The flow line will be relocated within the upstream reach of the impoundment to the creek's assumed historic streambed. A channel block may be installed to direct the stream's flow into its historic channel. Vernal pools will be established at appropriate locations within and adjacent to the former impoundment footprint.

The Beisler Lake Dam was built in 1973 to support a local summer camp, and is currently in private ownership. There are no significant historic resources in the general area. Beisler Lake is situated at the headwaters of Spruce Run Creek, although five, small (two to three acre), off-channel impoundments are located within 0.5 to 0.75 mile upstream. Most of the upstream ponds are located within a Hunterdon County open space preserved land parcel. There are no impoundments for 9.4 miles downstream to the Spruce Run Reservoir.

Beisler Lake was built for swimming and boating recreation by a local summer camp. The restored impoundment area will be used for environmental education and alternate recreational purposes (e.g., nature-hikes, wildlife viewing). The section of Spruce Run Creek running from Beisler Lake to the Spruce Run Reservoir is a popular trout-fishing destination, and the removal of the Beisler Lake Dam and the revegetation of the former impoundment will help keep downstream waters sufficiently cool to support trout.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicate that Spruce Run Creek waters in the vicinity of Beisler Lake do not attain the following uses: aquatic life – trout (due to temperature); and recreation (due to *Escherichia coli*), but do attain the uses of aquatic life general and public water supply (NJDEP 2019). There is insufficient data to determine the use of fish consumption. Spruce Run Creek in the vicinity of Beisler Lake is listed on the Raritan Water Region Restoration Priority Watershed List (NJDEP

2019), indicating high potential in achieving water quality improvements to restore designated uses. The removal of the Beisler Lake Dam and the revegetation of the former impoundment will help to reduce stream temperature, and will help reduce *Escherichia coli* by dissuading use by Canada goose and by infiltrating and capturing other *Escherichia coli* sources before entering the creek.

Restoration of fish passage and other water quality and habitat improvements at Beisler Lake will improve conditions for all fish species, including several cold water recreational game species (brook trout - *Salvelinus fontinalis*, brown trout - *Salmo trutta*, and rainbow trout - *Oncorhynchus mykiss*), and diadromous species such as American eel (*Anguilla rostrata*). Water quality and habitat improvements may also benefit several mussel species, including: brook floater (*Alasmidonta varicosa*), eastern elliptio (*Elliptio complanata*), eastern floater (*Pyganodon cataracta*), and triangle floater (*Alasmidonta undulata*).

The Beisler Lake Dam removal may be accomplished by leveraging additional funds and technical assistance from other non-profit, state, and/or federal sources. Alternative 3.15 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances, but the project may not yield ecological benefits of the magnitude of other Tier I preferred projects. Removing the Beisler Lake Dam restores headwater aquatic habitat, improves water quality, and enhances recreational opportunities at the adjacent summer camp.

3.16 Preferred Tier II Alternative: Mill Street Dam Removal

The Mill Street Dam is located on the North Branch Raritan River in Branchburg and Bridgewater, Somerset County, New Jersey. The proposed restoration project involves the removal of the Mill Street Dam; relocation and/or recalibration of an adjacent USGS stream gage; appropriate restoration and stabilization of the adjacent stream reaches and impoundment area; revegetation of exposed and newly formed banks; and scour protection measures at the U.S. Route 202 bridge and other areas, as warranted. This Alternative meets the Trustees identified project categories of dam removal, riparian restoration, aquatic connectivity, freshwater mussel conservation and enhancement, native fish conservation and enhancement, instream enhancement, and river trail restoration.

The Mill Street Dam is an approximately 180-foot-long, less than 5-feet-high, concrete, run-of-river gravity dam (Figure 19). The dam slows the water of the North Branch Raritan River, but does not produce an apparent impoundment, and does not noticeably trap sediments upstream. The dam is owned by NJDEP, and is flanked by land owned by the NJDEP to the west and by Somerset County Park Commission on the east. Land downstream is owned by the NJDEP and is part of the Chipman Tract, a 109-acre undeveloped preserved parcel.



Figure 19. Mill Street Dam shown facing northeast. Water has eroded the stream bank along the northeastern edge of the dam, and visibly flows around the weir.

The Mill Street Dam acts as the control weir for USGS gage 01400000 North Branch Raritan River near Raritan, New Jersey. This USGS gage measures stage and discharge, and has been at use in its current location since 1923. The USGS reports that records are generally good except for estimated discharges, which are fair due to variable-stage backwater from the confluence with the South Branch Raritan River. The riverbank at the northeastern edge of the weir is currently eroded, and water actively circumvents the weir, which may also reduce the accuracy of the USGS gage at this location.

Removal of the Mill Street Dam would restore fish passage for approximately 8.1 miles to Klines Mill Dam, the next upstream dam. Restoration of fish passage Klines Mill Dam is proposed as a Tier II project in this Draft RP/EA. Removal of the Mill Street Dam would also provide fish passage for 2.1 miles downstream, to the Headgates Dam on the mainstem Raritan River. Fish passage projects at the two remaining Raritan River mainstem dams, the Headgates Dam and the Island Farm Weir, are proposed as Tier I projects in this Draft RP/EA. Once fish passage issues at these remaining mainstem dams are addressed, the removal of the Mill Street Dam would restore approximately 38 miles of fish passage connectivity along the North Branch Raritan and mainstem Raritan Rivers extending to the Raritan Bay.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicate that North Branch Raritan waters in the vicinity of the Mill Street Dam do not attain the following uses: aquatic life general (due to pH and turbidity); public water supply (due to arsenic); and recreation (due to *Escherichia coli*); and there is insufficient data to determine if waters in the vicinity of the Mill Street Dam meet their designated use for fish consumption (NJDEP 2019). TMDL regulations are in place for total phosphorus and total suspended solids. The removal of the Mill Street Dam will likely improve water quality conditions in the impounded reach and downstream, namely by restoring natural sediment transport and contributing to the reduction of turbidity and total suspended solids.

Restoration of fish passage at the Mill Street Dam will benefit diadromous species such as American eel (*Anguilla rostrata*) and sea lamprey (*Petromyzon marinus*), and will additionally benefit American shad (*Alosa sapidissima*) and blueback herring (*Alosa aestivalis*) after fish passage is addressed at the remaining mainstem Raritan River dams. Water quality and habitat improvements will improve conditions for all species, including several species identified by the State of New Jersey as having Greatest Conservation Need, including: American brook lamprey (*Lethenteron appendix*), comely shiner (*Notropis amoenus*), fallfish (*Semotilus corporalis*), margined madtom (*Noturus insignis*), redbreast sunfish (*Lepomis auritus*), satinfish shiner (*Cyprinella analostana*), shield darter (*Percina peltata*), spotfin shiner (*Cyprinella spiloptera*), swallowtail shiner (*Notropis procne*), and yellow bullhead (*Amerius natalis*). Restoration of fish passage at the Mill Street Dam may also benefit several mussel species, including: triangle floater

(*Alasmidonta undulata*), alewife floater (*Anodonta implicata*), eastern elliptio (*Elliptio complanata*), and eastern floater (*Pyganodon cataracta*).

Removal of the Mill Street Dam will enhance recreational paddling on the South Branch Raritan River. The commonly paddled reach extending from the Lamington River confluence to the mainstem Raritan River is currently interrupted by a necessary portage at the Mill Street Dam. The dam is a safety hazard for boaters unaware of the upwelling hazards associated with small low-head dams.

The removal of the Mill Street Dam may be accomplished by leveraging additional funds through other state and federal sources. Alternative 3.16 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances, but project access and permissions are uncertain at this time. Removing the Mill Street Dam restores river habitat, improves water quality, reestablishes fish and mussel movement, and enhances fishing and recreational boating opportunities.

3.17 Preferred Tier II Alternative: Lake Manalapan Riparian Restoration

Lake Manalapan is located in Monroe Township, Middlesex County, New Jersey. The 30-acre lake is situated within Thompson Park, a 616-acre county park that is a popular spot for fishing, boating, and general recreation. The proposed restoration project would create 600 feet of riparian buffer along the western shoreline of Lake Manalapan to stabilize banks and reduce erosion, reduce sediment and nutrient loading from runoff, and deter Canada geese. This Alternative meets the Trustees identified project categories of riparian restoration and floodplain restoration.

Specific project components would include: re-grading and installing erosion control blankets, coir logs, and native vegetation; creation of a vegetated buffer to dissipate and resist wind-driven wave action along the shoreline and deter Canada goose (approximately 600-feet-long and 20-feet-wide); and planting of aquatic vegetation to reduce wind-driven wave energy associated with the long fetch of Lake Manalapan. The primary objective of these design measures is to improve water quality in Lake Manalapan and downstream by reducing total suspended solids originating from the continued erosion and degradation of Lake Manalapan's shoreline.

Lake Manalapan is an impoundment of Manalapan Brook, a tributary to the South River and situated 14.5 miles upstream of the Raritan River mainstem. The western shoreline is currently bare, and the current landscaping regime dictates mowing up to the shoreline banks. Shoreline erosion is exacerbated by upland runoff, foot traffic, and wave action from recreational users and by Canada goose who congregate in the area and eat shoreline vegetation. Excess sediment increases turbidity and total suspended solids, and can carry pollutants that further degrade water quality.



Figure 20. Riparian Restoration on Lake Manalapan’s southern shoreline; this project is very similar to the proposed project.

The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicates that Manalapan Branch waters at Lake Manalapan attain the designated use of public water supply (NJDEP 2019), but do not attain the following designated uses: aquatic life general (due to total phosphorus); fish consumption (due to chlordane, DDT, PCBs in fish tissue); and recreation (due to *Escherichia coli*). Waters downstream of Lake Manalapan attain the use of

aquatic life general, but do not attain the following uses: fish consumption (due to mercury in fish tissue); public water supply (due to arsenic); and recreation (due to *Escherichia coli*). In general, biological communities in the Manalapan Brook are healthy and fully supporting (NJDEP 2019), and the Manalapan Brook watershed is one of seven Raritan sub-watersheds that has a nine-element watershed-based plan (WBP). WBPs can be an effective alternative to a formal TMDL to characterize pollutant sources, the reductions needed to attain EPA 303d surface water quality standards, and the means to achieve those reductions (*e.g.*, EPA 319(h) grants).

In 2016, the Freehold Soil Conservation District received a 319(h) grant to install a 600-foot-long and 20-foot-wide riparian buffer along the southern shoreline of Lake Manalapan (Figure 20). The project was completed by the District in partnership with Princeton Hydro, Middlesex County, and the Rutgers Cooperative Extension of Middlesex County. The buffer incorporated native plants and biodegradable erosion control materials to stabilize the soil and reduce erosion. The project was part of an ongoing effort within the Manalapan Brook watershed to implement restoration projects that benefit water quality (as outlined in the WBP). Additional past projects include the installation of floating wetland islands at Lake Manalapan and naturalized detention ponds to reduce stormwater runoff. The proposed restoration project will add to these ongoing conservation efforts.

A total of 0.52 acre of wetland and riparian habitat would be enhanced from the proposed riparian restoration. Plant species that will benefit include wetland plants that typically populate the littoral zone of lakes, floodplains, and emergent wetland habitats, including but not limited to: pickerel weed (*Pontederia cordata*), broadleaf arrowhead (*Sagittaria latifolia*), northern blue flag (*Iris versicolor*), green bulrush (*Scirpus atrovirens*), softstem bulrush (*Schoenoplectus tabernaemontani*), crimsoneyed rosemallow (*Hibiscus moscheutos*), river birch (*Betula nigra*), silky dogwood (*Cornus amomum*), and red chokeberry (*Aronia arbutifolia*). The restoration of the riparian area would improve habitat for many native birds, mammals, reptiles, and amphibians. Along with stabilizing the shoreline and providing benefits to local biota, the restoration will also provide recreational aesthetic benefits to Thompson Park.

Thompson Park staff will engage community volunteers to help plant native species once the buffer surface is prepared. Volunteer engagement will help to educate the local population and help to reduce overall project costs. Additional potential project partners include the Rutgers

Cooperative Extension of Middlesex County and the Middlesex County Office of Parks and Recreation, Princeton Hydro, and the Middlesex County Office of Planning. Princeton Hydro has completed the initial engineering design plans.

The Lake Manalapan riparian restoration project may be accomplished by leveraging additional funds and technical assistance from other state, federal, or local partners. Alternative 3.17 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration criteria and objectives to address the injuries caused by the release of hazardous substances, but the project may not yield ecological benefits of the magnitude of other Tier I preferred projects. Installing a riparian buffer at Lake Manalapan will improve water quality, restore habitat, and serve as a community demonstration project for stormwater runoff and erosion prevention practices.

3.18 Preferred Tier II Alternative: North Branch Raritan River, Lamington River, and Stony Brook Mussel Restoration

The North Branch Raritan River, the Lamington River, and the Stony Brook are home to several state-listed mussel species, including the brook floater (*Alasmidonta varicosa*), green floater (*Lasmigona subviridis*), triangle floater (*Alasmidonta undulata*), and eastern lampmussel (*Lampsilis radiata*). The green floater is an at-risk species that is currently under candidate review for listing under the Federal ESA, and in New Jersey is only known to potentially occur in two river systems, including the Stony Brook. The brook floater was recently determined to not warrant listing under the ESA, although the species is only found in four to five known locations in New Jersey, including locations in the North Branch Raritan River and the Lamington River.

The proposed project involves: expanding current mussel surveys within the North Branch Raritan River, the Lamington River, and the Stony Brook; determining environmental correlates to mussel decline in those waterways; and determining and potentially implementing appropriate restoration actions that may benefit imperiled mussel species. The identification of survey areas may include a review of historic and current distribution information, identification of locations that have never been surveyed or are under-surveyed, and the use of eDNA as a survey location screening tool. Determination of environmental correlates may involve habitat surveys, habitat modeling, and GIS modeling. Determination and implementation of appropriate restoration actions may include: genetic and genomic studies; relocation of non-reproducing mussels to areas with suitable stable

habitat; and propagation and stocking of mussels as a long-term conservation strategy. Special focus will be given to the brook floater and green floater, since they are both state-listed endangered and have both been considered for federal listing. This Alternative meets the Trustees identified project categories of freshwater mussel conservation and enhancement.

The brook floater is a small freshwater mussel that ranges from the Savannah River Basin in South Carolina, to the St. Lawrence River Basin in Canada, and west to the Ohio River Basin in West Virginia (Figure 21). In New Jersey, low numbers of brook floater have been historically reported in Stony Brook, Lamington River, North Branch of the Raritan River, Musconetcong River, and the upper Delaware River. The brook floater requires clean flowing water over stable cobble, sand, and gravel substrates of small streams and rivers, little to no siltation, high dissolved oxygen, appropriate spawning temperatures, and adequate food availability. Reported host fishes include, but are not limited to, the slimy sculpin (*Cottus cognatus*), longnose dace (*Rhinichthys cataractae*), blacknose dace (*Rhinichthys atratulus*), golden shiner (*Notemigonus crysoleucas*), pumpkinseed (*Lepomis gibbosus*), yellow perch (*Perca flavescens*), and margined madtom (*Noturus insignis*).



Figure 21. Green floater and brook floater shells. Photo credit: Allan Barlow.

The brook floater was listed as state endangered in 2002. Low population numbers of brook floater reported in occupied habitats indicate that little new reproduction is occurring. However, brook floater populations are under-surveyed in New Jersey. In 2010, the Service received a petition to list the brook floater as threatened or endangered under the ESA. As of 2019, the Service determined that the species did not warrant listing under the ESA.

The green floater is a small, rare mussel with an ovate trapezoid bivalve shell (Figure 21). The green floater ranges from the Cape Fear River Basin in North Carolina to the St. Lawrence River Basin in New York. The species is often found in small streams with pools, eddies, and sand-gravel substrates. The host fish are unknown, and there is some evidence that host fish are not obligatory for the green floater to complete its life cycle.

The green floater was listed as state endangered in 2002. There is currently only one known live record of the green floater in the Raritan River watershed, located in the Stony Brook. However, green floater populations are likely under-surveyed in New Jersey. The Service is currently reviewing the status of green floater under the ESA.

Freshwater mussels are an important component of freshwater systems. Adult mussels filter-feed and consume phytoplankton, diatoms, and other microorganisms, as well as detritus and bacteria. The fact that mussels filter-feed makes them highly beneficial to water quality. Some mussels can filter up to 15 gallons of water per day. Mussels are also food sources for fish, aquatic birds, mammals, and humans. Mussels are commonly used as indicators of water quality; for example, a sudden increase in mortality of mussels is a reliable indicator of contamination.

Although mussels are critical to freshwater systems, their populations are too often in decline due to habitat loss and degradation; water flow alterations; loss of host fish; and contamination. Frequent and increasingly intense flood events are a major threat to mussel populations in New Jersey and the Mid-Atlantic region. In addition, mussels are frequently under-surveyed, since it requires a high level of expertise and resources to locate and identify mussels. The purpose of this restoration project is, in part, to expand mussels surveys to increase our knowledge where mussels are found, what species are abundant (or rare), and what anthropogenic correlates are related to their decline. Expansion of mussel surveys may lead to more robust efforts to protect New Jersey mussel populations and identify areas where practitioners can target appropriate restoration efforts that will benefit mussels, including but not limited to relocation of existing populations to suitable habitat as well as propagation and stocking.

Implementing mussel surveys, determining environmental correlates, and determining and implementing restoration actions in the North Branch Raritan River, the Lamington River, and the Stony Brook may be accomplished by leveraging additional funds and technical assistance from

other state and/or federal sources. Alternative 3.18 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances, but project access and permissions are uncertain at this time. Implementing mussel surveys will benefit species of concern and sensitive habitats, and has a high potential for public outreach.

3.19 Preferred Tier II Alternative: Trash Trap Installation in the Lower Raritan River Watershed

This restoration project involves the installation and maintenance of a trash trap device at an easily accessible trash 'hotspot' location on a tributary to the Raritan River between Cuckels Brook at State Route 287 and the mouth of the Raritan River at Perth Amboy. The project area may include portions of South Bound Brook Borough, Highland Park Borough, Sayreville Borough, Perth Amboy, and South Amboy. This Alternative meets the Trustees identified project categories of freshwater mussel conservation and enhancement, native fish conservation and enhancement, and instream enhancement.

Trash that is improperly disposed of can enter freshwater and coastal systems, and can eventually make its way to the ocean. Aquatic trash decreases water quality and degrades habitat, in addition to causing aesthetic blight, ecological effects, economic impacts, and possible human health risks. Of particular concern is that plastics tend to break down to tiny pieces called microplastics (five millimeters or smaller). Microplastics both absorb and give off harmful pollutants and can be harmful to wildlife and humans via direct ingestion or trophic transfer.

Trash is the most visible form of pollution in the Raritan River and many of its urban tributaries, including Green Brook, Mile Run Brook, Mill Brook, and the South River. The proposed restoration project involves the installation of a trash reduction technology at an appropriate trash 'hotspot' location in a tributary to the lower Raritan River. An appropriate trash 'hotspot' should be located in a highly urbanized area that tends to accumulate trash originating from a population-dense area. The location should be easily accessible for trash trap installation and routine maintenance.

An existing trash reduction technology that may be appropriate in the lower Raritan River system is the Bandalong Litter Trap™ (Bandalong). The Bandalong is a floating device that uses passive

downstream currents to direct and trap floating trash items. The Bandalong can operate year-round at a variety of different flow conditions without any mechanical assistance, but the trash will need to be emptied at appropriate intervals. Bandalongs can capture tens of thousands of pounds of trash each year, but the actual success will be highly dependent on where it is installed. An example of a Bandalong device in the Anacostia River is featured in Figure 22.



Figure 22. Example of Bandalong Litter Trap™, installed on a tributary to the Anacostia River, Washington, DC. Photo credit: United Nations Information Center, Washington DC.

The Lower Raritan Watershed Partnership and partners currently host more than 12 stream cleanup events each year to remove trash and other floatables within the Raritan River tributaries and floodplain. The installation of a trash reduction device would help to alleviate the manpower associated with riverine cleanup, and would also engage the public as an education and outreach tool. The Lower Raritan Watershed Partnership may engage a partial-volunteer trash removal program that includes training on how to measure and remove trash from the trash traps, which will help to further strengthen community ties and current environmental education outreach efforts. Reduction of plastic debris would also benefit aquatic and semi-aquatic wildlife by reducing microplastic ingestion and potential exposure to contaminants.

In addition to the positive benefits to water quality and aquatic taxa, the implementation of a trash trap would benefit the aesthetics of the area and enhance public perception and usability of recreational areas along the lower Raritan River.

The installation of a trash trap device in the lower Raritan River watershed may be accomplished by leveraging additional funds and technical assistance from other non-profit, private, state and/or federal sources. Alternative 3.19 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the recreational and ecological injuries caused by the release of hazardous substances, but project access and permissions are uncertain at this time. Installing a trash trap at an appropriate location in the lower Raritan watershed will help improve water quality, restore habitat, and serve as a community demonstration and educational project for the local populace.

3.20 Preferred Tier II Alternative: Rutgers Ecological Preserve Accessible Trail

The Rutgers Ecological Preserve is located adjacent to the Rutgers University's Livingston Campus in New Brunswick, Middlesex County, New Jersey. The proposed recreational restoration project would create a 0.4-mile ADA accessible trail through the Rutgers Ecological Preserve, create a small pullout area for direct access to the Buell Brook, and install educational signage (Figure 23). This Alternative meets the Trustees identified project categories of land trail recreation, interpretive signage, and ADA accessibility.

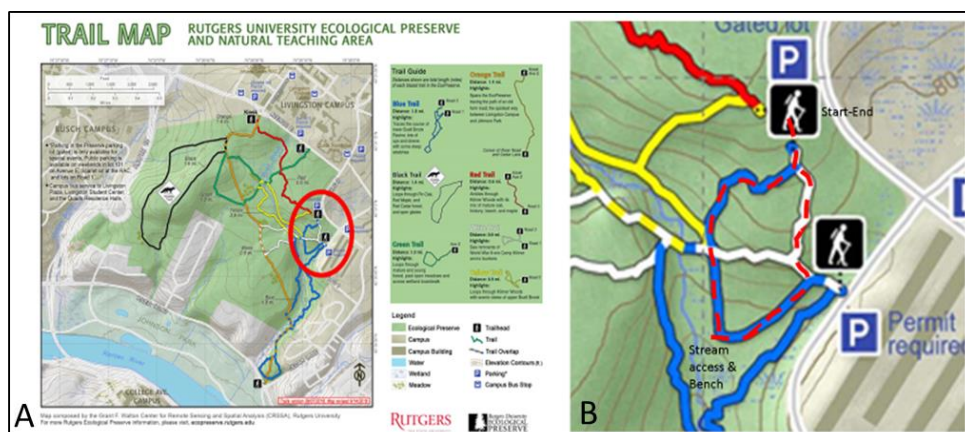


Figure 23. Proposed location of Rutgers Ecological Preserve ADA Trail. Frame A shows general location of trail within the Preserve, denoted by the red circle. Frame B shows a close-up of the trail, denoted by dashed red lines.

The 316-acre Rutgers Ecological Preserve was established in 1976 by the Rutgers Board of Governors to preserve the natural ecological characteristics of the site and serve as an outdoor teaching area. Today, the Ecological Preserve maintains this balance between preserving and restoring the area's ecological system and natural values while continuing to expand its role as an educational, recreational, and aesthetic resource for University students, faculty and staff, as well as local citizens. The Ecological Preserve has approximately eight miles of multiuse trails for hiking, running, and mountain biking, but no trails are ADA-accessible.



Figure 24. Existing trail along Buell Brook that will be modified for ADA compliance.

The proposed recreational restoration project includes: the construction of a 0.4-mile ADA-accessible loop trail (approximately 3.5-foot-wide) at the Rutgers Ecological Preserve that runs through mature forest and provides close-up views of Buell Brook; resurfacing the trail loop with fine, compacted red shale; and the construction of a level pullout and bench near Buell Brook (Figure 24). The pullout would allow access to a shallow section of Buell Brook so visitors have the opportunity to explore the stream in a safe manner. Rutgers University students will develop a series of educational signage to install along the trail and highlight the area's natural and cultural

history. The trail would be open to Rutgers University's students, faculty and staff, as well as the broader community.

Final project designs will be produced and implemented as part of this project. The project designs will ensure that the trail and pullout do not exacerbate runoff and contribute negatively to erosion and sediment loads introduced to Buell Brook.

The construction of an ADA-accessible trail and pullout at the Rutgers Ecological Preserve may be accomplished by leveraging additional funds and technical assistance from Rutgers University. Alternative 3.20 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the recreational injuries caused by the release of hazardous substances, but may not yield recreational benefits of the magnitude of other Tier I preferred projects. Creation of the ADA trail and pullout area will enhance public recreational and educational opportunities in the Raritan River watershed.

3.21 Preferred Tier II Alternative: Bridge over the Delaware and Raritan Canal Spillway

The Delaware and Raritan Canal State Park (D&R Canal Park) is a 70-mile park and towpath that follows the Delaware River from Frenchtown to Trenton, then follows the Delaware and Raritan Canal from Trenton to New Brunswick. In New Brunswick, the D&R Canal Park terminates just past where the towpath intersects with Landing Lane, northwest of Buccleuch Park. At this location, the towpath is interrupted by an impassible 200-foot spillway where the D&R Canal drains to the Raritan River. The proposed recreational restoration project involves constructing a bridge over the 200-foot spillway to provide connectivity between the D&R Canal Park towpath and a 2.2-mile section of riverside trail that runs from the spillway east towards Boyd Park in New Brunswick (Figure 25).

The D&R Canal State Park is one of New Jersey's most significant historic and recreational resources as it provides over 70 miles of hiking and biking trails as well as opportunities for canoe and kayak access to the Raritan River. However, a 200-foot spillway separates residents of the City of New Brunswick from direct access to the recreational offerings of this greenway. Likewise, the spillway separates users of the D&R Canal towpath from easy access to the riverside Boyd Park, historic D&R Canal locks, and New Brunswick Landing. The existing disconnected riverside

trail on the eastern side of the spillway is approximately 2.2 miles long and runs from the spillway to Boyd Park in New Brunswick. The first 1.3 miles of the disconnected trail are referred to locally as “the trench”, since the trail runs along a narrow corridor flanked by the Raritan River to the north, and New Jersey Route 18 to the south.

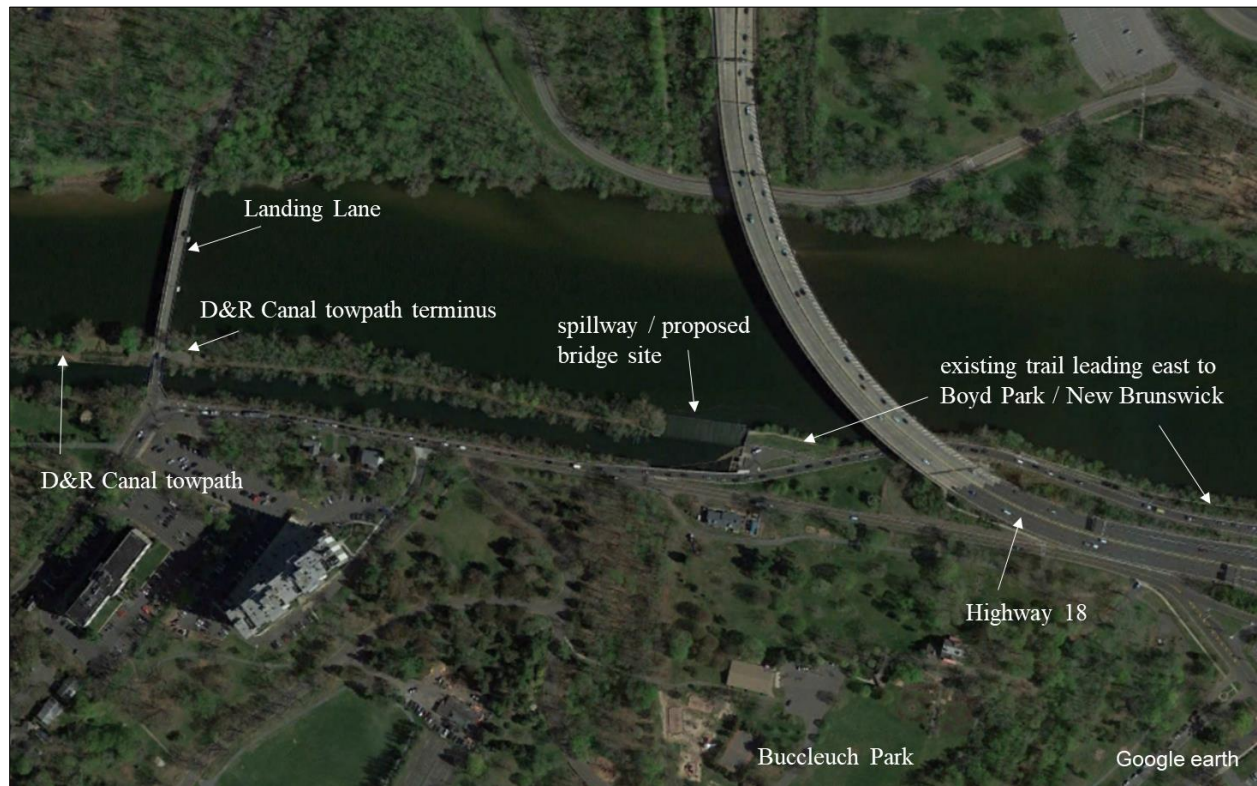


Figure 25. Map showing D&R Canal spillway and proposed location of bridge site.

The proposed action is a recreational project that would increase public access through construction of a prefabricated steel bridge over the 200-foot spillway and water intake. The spillway is owned and operated by the NJDEP. The proposed bridge would be at least 200-feet-long and approximately 10-feet-wide and would likely be installed by crane onto concrete pilings and abutments. The pilings and abutments would be constructed so that flow of water across the spillway is not impeded. The proposed action would ensure that the bridge installation would not cause erosion along the riverbanks that flank the spillway.

The construction of a pedestrian and biking bridge would improve access to the Raritan River waterfront in the most densely populated area of the Raritan River watershed. The bridge is an important missing link to a regional network of trails, including the Rutgers University bicycle

trail network and the East Coast Greenway. The bridge would extend access from the 70-mile-long D&R Canal State Park into the City of New Brunswick, effectively restoring the historic extent of the original towpath which was severed with the construction of the Route 18 highway and other infrastructure improvements. The proposed project complements other Raritan River initiatives being considered by other agencies and institutions in the area, including waterfront access projects proposed in the Rutgers University 2030 Physical Master Plan (Rutgers 2015). Improved access to the Raritan River waterfront afforded by this project will increase recreational, educational, and research opportunities for the community. In addition, this project may provide positive public health and recreation benefits to the predominantly low socioeconomic status population of New Brunswick.

The construction of a bridge over the D&R Canal Park spillway may be accomplished by leveraging additional funds and technical assistance from other state, federal, private, and non-governmental sources. Alternative 3.21 is a Tier II preferred alternative for this restoration plan because it meets the Trustees' identified restoration objectives and criteria to address the recreational injuries caused by the release of hazardous substances, but project access and permissions are uncertain at this time. Construction of a bridge over the D&R Canal Park spillway will improve connectivity between the D&R Canal Park and New Brunswick, and would increase and enhance recreational opportunities for a heavily urbanized population.

3.22 Non-Preferred Tier III Alternative: Cherry Brook Preserve Constructed Wetland

The Cherry Brook Preserve is located in Montgomery Township, Somerset County, New Jersey. The proposed restoration project is to convert an aging farm pond (*i.e.*, Cherry Brook Pond) into a constructed freshwater wetland. Project components may include: dredging approximately 780 cubic yards of accumulated sediment and silt; regrading of the dredged pond area to create a constructed wetland with varying water depths; reconstruction and/or repair of portions of the existing pond retaining wall; reconstruction of the pond's outlet control structure; replacement of the outlet pipe to a larger box culvert; reconstruction of the downstream outlet headwall; and revegetation (Kleinfelder and Omni Environmental 2012). This Alternative meets the Trustees identified project categories of wetland restoration and floodplain restoration.

Cherry Brook Pond is located on the Cherry Brook Preserve, a Montgomery Township Open Space property, and is situated adjacent to a preserved farmland parcel (Figure 26). The 0.75-acre Cherry Brook Pond is created by the impoundment of a small unnamed tributary to Cherry Brook. The pond is located approximately 0.6 mile upstream of the confluence with Cherry Brook, and the unnamed tributary is likely intermittent along most or all of its length. The Cherry Brook Pond watershed is approximately 150 acres, comprised of forest, active row crop agriculture, and residential urban land cover. The pond is formed by a concrete and stone retaining wall that is in poor condition; water exits the pond by flowing over an 18-inch-wide weir in the retaining wall and through a 30-inch-diameter reinforced concrete pipe that discharges into to the unnamed tributary to Cherry Brook.



Figure 26. Cherry Brook Pond, Montgomery Township, New Jersey. Photo Credit: Kleinfelder and Omni Environmental 2012.

During summer months, pond depths are less than one foot, with patches of exposed sediment throughout. The upstream and downstream reaches surrounding the pond are classified as freshwater forested/shrub wetland. The pond is thought to be a source of phosphorus and sediment to Cherry Brook, although no formal sampling has confirmed this hypothesis. Once the unnamed

tributary meets Cherry Brook, Cherry Brook flows approximately 0.5 mile to the confluence with Beden Brook. The most recent New Jersey Integrated Water Quality Assessment Report for EPA 303d requirements indicates that TMDL regulations are in place for total phosphorus and total suspended solids in the portion of Beden Brook that receives flow from Cherry Brook (NJDEP 2019).

The proposed restoration project involves converting the Cherry Brook Pond into a constructed wetland, wherein the accumulated sediment will be dredged and regraded to create three water depth zones: deep pool, shallow, and mid-elevation in order to accommodate the different water height requirements of emergent wetland plant species. A shallow “bench” would be located around the periphery of the existing pond, with depths of less than 6 inches during normal conditions. The mid elevation bench would be located further out from the shoreline, with depths of 6 to 18 inches. The deep pool would be located in the center of the existing pond, with water depths of approximately 4 feet. Appropriate native plant species would be planted at these depths and at the upland edge of the constructed wetland.

Recent research on small headwater ponds indicates that in general, small ponds may be beneficial in that they are collectively responsible for trapping a substantial amount of nutrients and sediments that are exported annually from headwaters (Schmadel *et al.* 2019). The Cherry Brook Pond may serve as a nutrient and sediment sink, rather than source; further investigation of water quality conditions over a variety of annual flow conditions should be performed prior to pond removal or modification. In addition, there may be technical uncertainties in the project’s ability to provide hydrological conditions necessary to support freshwater wetlands and unknown water quality issues from runoff from active row crop and residential urban land cover within the projects drainage area.

Alternative 3.22 is a Tier III non-preferred restoration project. Technical uncertainties, in addition to uncertainty regarding the project’s cost-benefit ratio indicate that this project, as proposed, does not meet the Trustees’ identified restoration objectives and criteria to address injuries caused by the release of hazardous substances.

3.23 Non-Preferred Tier III Alternative: Raritan Bay Oyster Restoration

This restoration project involves the establishment of oyster reefs within the Raritan Bay. The Raritan Bay is located between the southern portion of Staten Island and the northern edge of New Jersey from Perth Amboy to Sandy Hook. This project would include performing environmental condition indexing, site survival, and growth rate testing to determine appropriate restoration sites; culturing seed oysters in an aquaculture facility; constructing appropriate structures (*e.g.*, reefs, Figure 27) to support oysters; and oyster monitoring. This Alternative meets the Trustees identified project categories of oyster restoration.



Figure 27. Example of oyster castle reefs at Nantuxent Creek, New Jersey. Photo credit: Steve Jacobus.

Human development during the past several centuries led to the extirpation of Raritan Bay oysters; overharvest, habitat degradation by sedimentation, changes in salinity, and industrial pollution precipitated their decline (MacKenzie 1984). However, with the passage of environmental laws, water quality within the New York-New Jersey Harbor has greatly improved and it may be possible to restore aquatic species that have suffered declines in the past to areas of historic presence (Ravit

et al. 2012; Rutgers CUES 2013). Reintroduction of the Eastern Oyster (*Crassostrea virginica*), could potentially support further improvements in water quality, contribute to the stabilization of coastal shorelines, and accelerate ecosystem-level restoration processes. Oyster reef creation is a technique to support continued water quality improvement and to reestablish habitat utilized by other aquatic species, as well as serve as a natural method to reduce shoreline erosion.

There would be many ecological and human use benefits from restoring oysters within Raritan Bay. Oyster beds are an important component of the ecosystem, as they provide structurally complex habitat for aquatic organisms at many trophic levels. Oysters clean the surrounding waters and can filter sediment and excess nutrients from up to 50 gallons of water per day, contributing to both water column and benthic productivity. Reef restoration also directly benefits waterfront communities by providing storm surge protection for waterfront structures and serves to protect and fortify existing wetlands, which improves their function as protective barriers to storm surge as well.

Alternative 3.23 is a Tier III non-preferred restoration project. The Trustees agree that oyster restoration in the Raritan Bay will offer many ecological and human use benefits. However, this Draft RP/EA presents numerous feasible projects that restore freshwater environments that contain natural resources more similar to those injured by hazardous substances at the Cornell-Dubilier Site than those proposed by this restoration alternative. Therefore, in comparison to other higher-ranked feasible projects, this project does not meet the Trustees' identified restoration goals and objectives criteria to address injuries caused by the release of hazardous substances.

3.24 Non-Preferred Tier III Alternative: South River Tidal Marsh Restoration

The South River Tidal Marsh Restoration Project is a proposed marsh restoration project on the lower South River, in South River and Sayreville, New Jersey. The proposed restoration project includes: creation of improved tidal marsh habitat; expansion of high marsh habitat; reduction and control of *Phragmites australis*; implementation of shoreline erosion control measures; creation of living shoreline areas; protection of restored vegetation areas with a goose exclusion fence; and if warranted, the excavation and relocation of contaminated soils and sediments and backfilling with clean material. This Alternative meets the Trustees identified project categories of tidal wetland restoration and floodplain restoration.

The South River Tidal Marsh Restoration is a proposed marsh restoration of approximately 258 acres of existing marsh situated between the lower South River and the Washington Canal and adjacent to the mainstem Raritan River (Figure 28). The site is part of a larger 650-acre tidal salt marsh that spans between the lower South River and Washington Canal. The site is dominated by *Phragmites australis*, and most of the wetlands within the project area have been altered by anthropogenic activity including soil removal, dredge material deposition, brick/asphalt/concrete waste fill, and ditching for mosquito control (USACE 2002). There are approximately 38,836 feet of streams within the site footprint.

Past studies have shown that residential communities adjacent to the South River, located in flood-prone areas, have a history of flooding following storms (USACE 2002). The projected impacts of sea level rise will further exacerbate the impacts of future storms potentially resulting in continued socioeconomic losses. The stated goal of the proposed project is to restore marsh habitat to serve as flood protection for adjacent communities, and provide high quality, non-degraded habitat for aquatic and terrestrial species.

The proposed restoration project includes restoration features roughly described in the U.S. Army Corps of Engineers' 2002 South River Hurricane and Storm Damage Reduction Feasibility Study and Environmental Impact Statement (USACE 2002). This document evaluated a range of structural and nonstructural measures that would increase hurricane and storm damage reduction and determined that the preferred alternative for the South River is to construct a levee/floodwall system with an upstream storm surge barrier. Although the proposed restoration project will not involve the construction of a levee/floodwall system, it will include restoration actions that were selected in the USACE 2002 as potential mitigation for levee/floodwall construction activities. The proposed restoration project includes the following elements: creation of improved tidal marsh habitat; expansion of high marsh habitat; reduction and control of *Phragmites australis*; implementation of shoreline erosion control measures; creation of living shoreline areas; and protection of restored vegetation areas with a goose exclusion fence. If contamination is identified during feasibility or construction phases, then this project may involve the excavation, relocation, and/or capping of contaminated soils or sediments and backfilling with clean material.

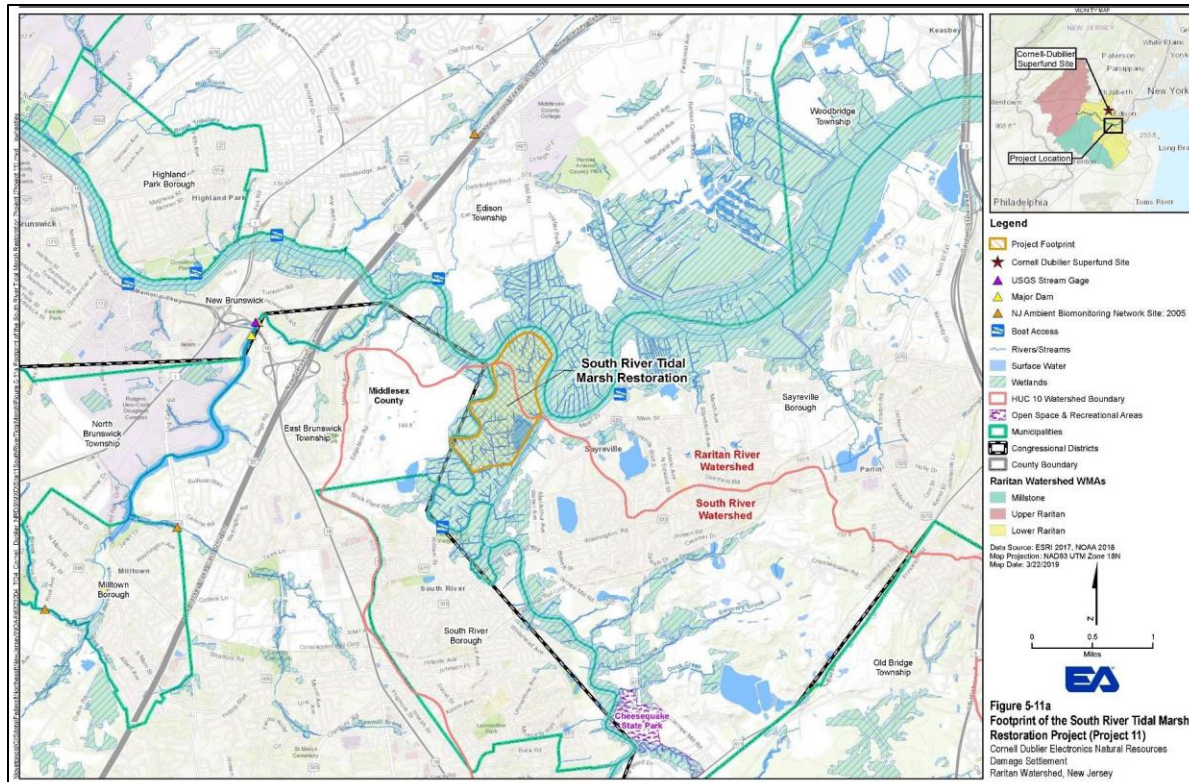


Figure 28. Proposed location of South River Tidal Marsh Restoration project, denoted by hashed orange lines.

The proposed project site is comprised of both public and privately owned parcels. Most of the site is at least partially owned by the Borough of Sayreville. Complete tax parcel and ownership information are not available for the proposed project site. Due to the industrialized nature of the surrounding project area, it is likely that the proposed restoration parcels contain contaminants consistent with those present throughout the lower Raritan River watershed.

Alternative 3.24 is a Tier III non-preferred restoration project. Technical uncertainties, uncertainties regarding the amount and extent of potential onsite contamination, and uncertainty regarding the project's cost-benefit ratio, indicate that this project, as proposed, does not meet the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances.

3.25 Non-Preferred Tier III Alternative: Edison Landfill Capping and Wetland Restoration

The Edison Landfill Wetland Restoration project is a proposed landfill capping and restoration of an adjacent wetland. The Edison Landfill is located along the mainstem Raritan River in Edison Township, Middlesex County, New Jersey. The proposed wetland restoration project includes: excavation and relocation of municipal waste, soils, and sediments of the lower Edison landfill; backfilling with clean material and regrading; capping of relocated waste materials; and replanting with native tidal salt marsh grasses and protection of those grasses with a goose exclusion fence. This Alternative meets the Trustees identified project categories of tidal wetland restoration and floodplain restoration.

The Edison Landfill spans for 4,839 feet along the mainstem Raritan River, and is located just south of the Kin-Buc Landfill Superfund Site (Figure 29). The landfill consists of two main areas: the main landfill mound located on the upper portion of the site, and the lower landfill area located to the southwest and immediately adjacent to the Raritan River. The main landfill mound is unlined and accepted waste between 1958 and 1990. Waste at the main landfill mound is approximately 80 to 100 feet thick and is covered with 1 to 4 feet of soil. The lower landfill is also unlined and accepted waste during the 1950s and 1960s. The lower landfill is heavily vegetated with *Phragmites australis*, and surficial waste is exposed along the edge of the Raritan River.

The Edison Landfill accepted municipal solid waste, construction debris, dry industrial waste, animal processing waste, and vegetative and bulky waste. Previous groundwater monitoring results show that some water quality parameters exceed Ground Water Quality Standards, although the quantity of waste and extent of potential contamination is unknown. Edison Township has submitted versions of landfill closure plans in 1992, 2004, 2010, and 2013, but the NJDEP has found them deficient and therefore an official closure plan has never been approved.

The proposed action is to remove waste from the 26.9-acre lower landfill, relocate the waste to the main landfill mound, and cap the main landfill mound. The lower landfill will be excavated and regraded to improve tidal flushing and maintain elevations conducive to native saltwater wetland marsh grasses. Some clean backfill material may be necessary to bring the lower landfill's

elevation to proper grade after removal of the waste materials. Replanting of native marsh plant species would encourage native wetland plant species to flourish, especially *Spartina* species.

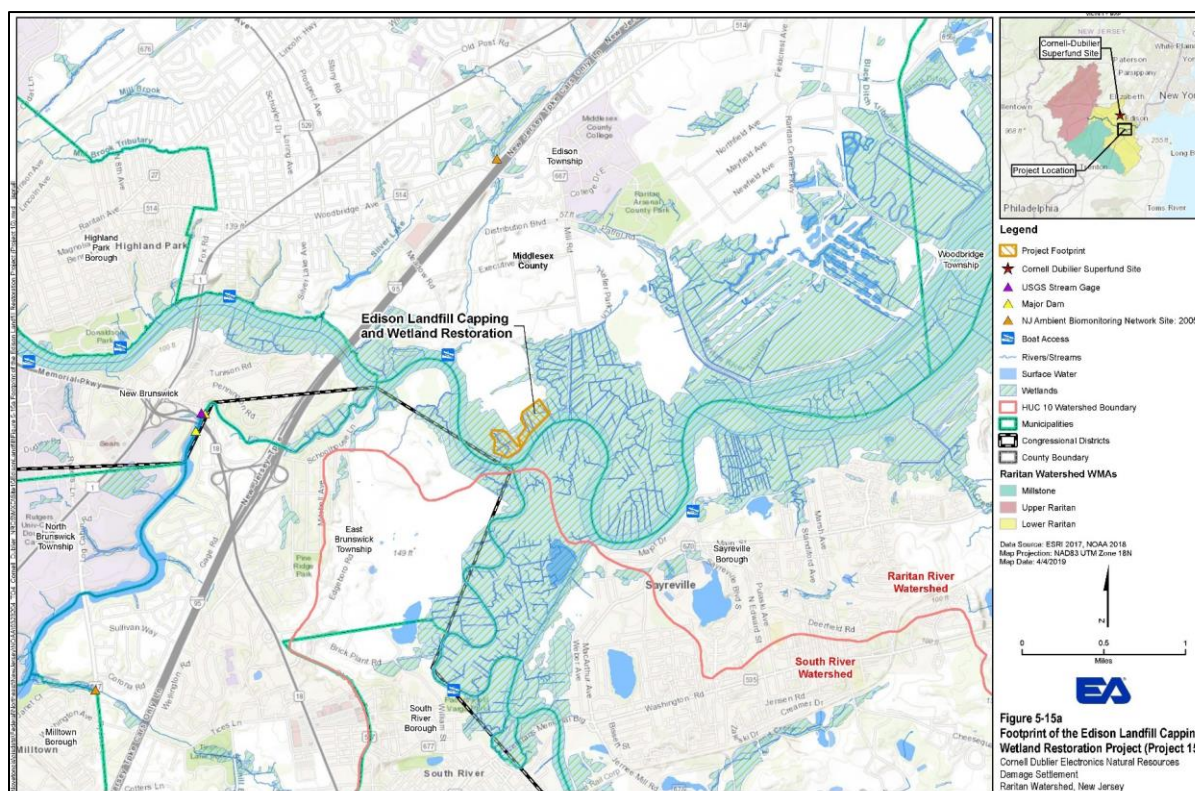


Figure 29. Proposed location of Edison Landfill Capping and Wetland Restoration project, denoted by hashed orange lines.

The proposed project site is comprised primarily of land parcels owned by Edison Township. Complete tax parcels and ownership information are not publicly available for the proposed project site. Due to the industrialized nature of the surrounding project area, the fact that the site is a historic landfill, and the fact that the site is adjacent to the Kin-Buc Landfill Superfund Site, it is likely that the proposed restoration parcels contain contaminants of concern, consistent with those present throughout the lower Raritan River watershed.

Alternative 3.25 is a Tier III non-preferred restoration project. Technical uncertainties, the lack of an approved closure plan, uncertainties regarding the amount and extent of onsite contamination, and uncertainty regarding the project's cost-benefit ratio indicate that this project, as proposed, does not meet the Trustees' identified restoration objectives and criteria to address the injuries caused by the release of hazardous substances.

CHAPTER 4 NEPA AFFECTED ENVIRONMENT

This section describes the general environmental setting that may be affected by the restoration alternatives proposed in this Draft RP/EA. This section includes information on the physical, biological, and socioeconomic environments of the Raritan River Watershed, as well as specific resources that may be affected by the preferred restoration alternatives described in Chapter 3.

4.1 Affected Environment

The Raritan River watershed is located entirely within the State of New Jersey and includes the mainstem Raritan River, the North and South Branches of the Raritan River, and major tributaries including the Manalapan Brook, South River, Lawrence Brook, Millstone River, Stony Brook, Green/Bound Brook, Neshanic Creek, Lamington/Black River, and Rockaway Creek (Figure 30). The affected environment includes portions of these waterways and adjacent lands that may be affected by the preferred restoration alternatives presented in Chapter 3.

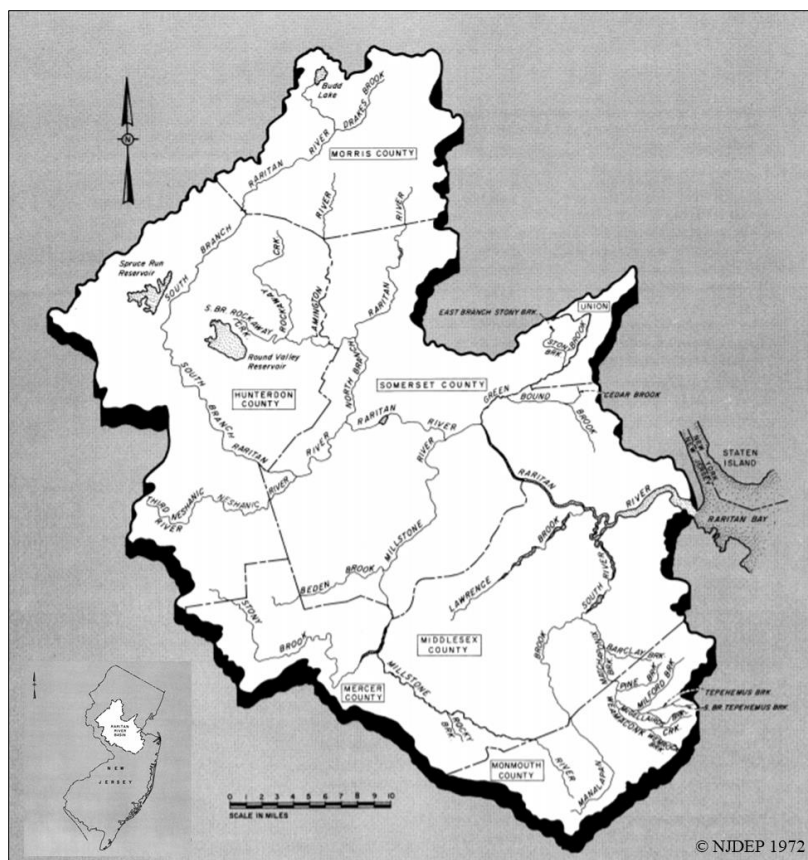


Figure 30. The major rivers and tributaries of the Raritan River Watershed, NJDEP 1972.

4.2 Physical Environment

4.2.1 Surface Water

The Raritan River watershed spans 1,105 square miles and encompasses 98 municipalities. Approximately 1.3 million people live in the watershed and more than 793,000 work in the watershed (NJDOH 2020). The watershed includes portions of Morris, Hunterdon, Union, Somerset, Middlesex, Mercer, and Monmouth counties. The Raritan River basin is the largest watershed located entirely within New Jersey. The watershed contains three primary subwatersheds: the Upper Raritan, the Lower Raritan, and the Millstone (Figure 31). The Upper Raritan includes the North and South Branch Raritan Rivers and spans approximately 468 square miles. Major tributaries to the North Branch Raritan include the Lamington/Black River and Rockaway Creek. Major tributaries to the South Branch River include Neshanic Creek. The North and South Branch Raritan Rivers meet to form the mainstem Raritan River, which demarks the upstream boundary of the Lower Raritan watershed. The Lower Raritan watershed is 352 square miles and includes the Green/Bound Brook, Lawrence Brook, the Manalapan Brook, and the South River. The Lower Raritan drains to the Raritan Bay. The Millstone watershed meets the Lower Raritan watershed near Manville, New Jersey. The Millstone watershed covers 285 square miles and includes the Stony Brook and Millstone River as well as a significant section of the Delaware and Raritan Canal.

The top ten causes of water quality impairment in the Raritan River watershed include: *Escherichia coli* (impairs recreation); arsenic (impairs water supply); total phosphorus, pH, temperature, dissolved oxygen, and biological cause unknown (impairs aquatic life); and mercury, PCB, and dioxin in fish tissue (impairs fish consumption; NJDEP 2019). Many of these water quality impairments are covered under an approved TMDL.

Impervious surface land cover is the best and most reliable predictor of water quality (as indicated by biological integrity) in the Raritan River watershed (NJDEP 2019). When watershed impervious land cover exceeds ten percent, biological integrity declines. Maintenance of appropriately sized riparian buffer zones that include wetlands are particularly important to water quality and watershed health. New Jersey has Surface Water Quality (SWQ) antidegradation policies that provide special protection to Category One (C1) waters; a designation based on

ecological significance, exceptional water supply, recreation and fisheries. The State SWQ guidelines for C1 streams dictate a 300-foot riparian buffer to protect the water quality, aesthetic value, and ecological integrity of these high-value streams. The State also dictates that 150-foot riparian buffers be maintained along trout production waters and all upstream tributaries; 150-foot riparian buffers be maintained along trout maintenance waters and within 1-mile upstream; and requires a 50-foot buffer along all other waters.

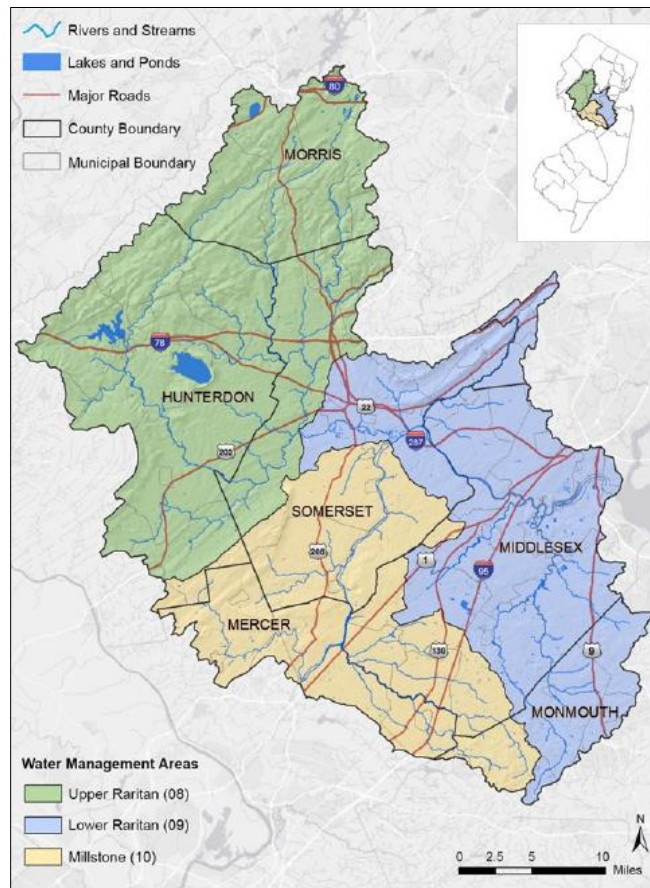


Figure 31. Raritan River sub-watersheds. Source: SRRI 2016.

Although the biota in the Raritan River watershed reflect extensive water quality impairment, there are large areas where water quality is good and biological communities are healthy, particularly in the Upper Raritan watershed, the Stony Brook, and Manalapan Brook watersheds (NJDEP 2019). The NJDEP routinely monitors fish and macroinvertebrate taxa as indicators of water quality in this region.

4.2.2 Regional Geology and Soils

The Raritan River watershed spans across three EPA level III ecoregions, including the northeastern highlands, the northern piedmont, and the Atlantic coastal pine barrens (EPA 2013). The northeastern highlands are characterized by high-gradient rugged ridge topography separated by narrow valleys; this area is comprised mostly of igneous and sedimentary rock. The northern piedmont is comprised of rolling plains separated by higher ridges, and is comprised mostly of sedimentary and igneous rock. The Atlantic coastal pine barrens are characterized by low gradient topography and sandy and acidic soils.

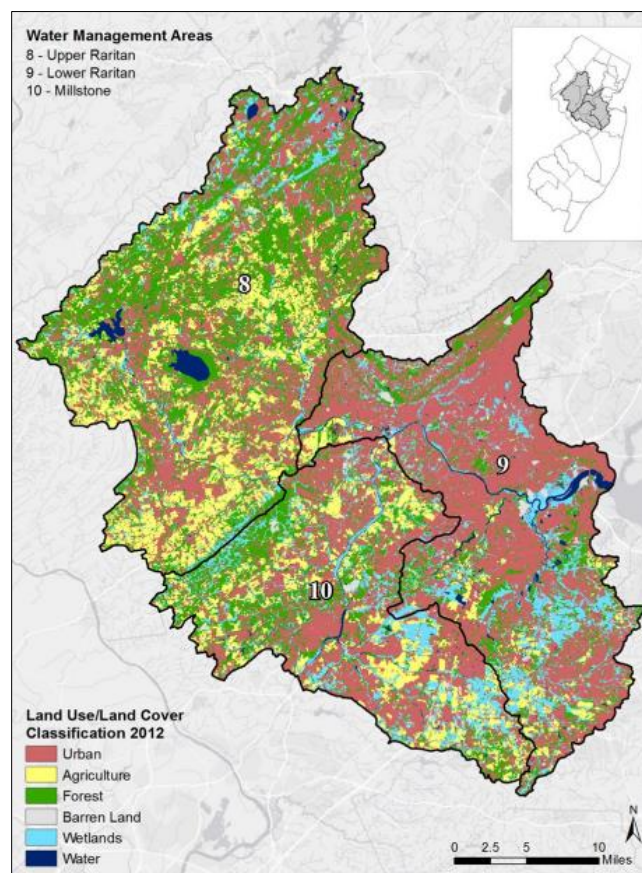


Figure 32. Land cover in the Raritan River watershed. Source: SRRI 2016.

4.2.3 Land Cover

Land cover in the region has changed drastically over the last 50 years and the most current land use analysis (2012) revealed that the Raritan River watershed as a whole is 44% urbanized, 16% in agricultural use, 25% forested, and 14% wetlands and waterbodies (SRRI 2016; Figure 32).

Urban land is the dominant land cover in the Lower Raritan (60%) and Millstone (41%) subwatersheds, while forest is the dominant land cover in the Upper Raritan (35%). The rate of urban development in the watershed has slowed in recent years, however the increase in urban cover was gained at the expense of a net loss in agricultural lands, wetlands, and forest cover. These types of land cover conversions tend to have a negative impact on water quality and aquatic health.

4.2.4 *Air*

The Raritan River watershed generally supports good air quality. Sources of air pollutants include, but are not limited to, fuel combustion (stationary and mobile), industrial processes, solvent uses, agriculture, dust, and fires. The Clean Air Act (CAA; 42 U.S.C. §§ 7401-7626) regulates air emissions from stationary and mobile sources to protect human health and the environment. Under the CAA, the EPA defines National Ambient Air Quality Standards (NAAQS) for pollutants that are harmful to public health and the environment (EPA 2018). The EPA is responsible for establishing primary and secondary NAAQS for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. All seven counties in the Raritan River watershed are currently in attainment of EPA's NAAQS for all criteria pollutants except ozone (8-hour ozone; EPA 2020b).

4.2.5 *Climate*

The Raritan River watershed has a relatively moderate climate characterized by cold winters and warm, humid summers. Average annual precipitation is approximately 51 inches (ONJSC 2020). Fall months are typically the driest, while other seasons average between 9 and 12 days per month with measurable precipitation. Snow may fall from November to April. Climate change is affecting New Jersey faster than much of the rest of the United States. As of 2019, New Jersey was one of the fastest-warming states in the nation with an approximate two degree Celsius increase in average temperatures since 1895 (Mufson *et al.* 2019).

4.3 Biological Environment²

4.3.1 *Terrestrial and Aquatic Habitat*

The affected environment includes a variety of habitats that support fish, birds, and other wildlife. The Raritan River watershed is heavily developed and has experienced an extensive loss and fragmentation of grassland, wetland, and forest habitats over time (NJDEP 2008). Despite these losses, the region maintains smaller habitat patches of grassland and agricultural areas, mixed-deciduous forests, hardwood swamps, tidal freshwater and brackish marshes, and relatively extensive riparian areas throughout the landscape. Streams and rivers range from low-gradient, low-flow brackish and freshwater stream and swamp habitats to high-gradient, high-flow freshwater habitats. Most aquatic environments show signs of historic stressors and degradation over time.

4.3.2 *Fish and Wildlife*

A variety of endemic game and nongame mammals, birds, reptiles, amphibians, invertebrates, and freshwater fish occur in the Raritan River watershed. New Jersey hosts approximately 90 mammal species, over 400 bird species, 74 reptiles and amphibian species, 91 species of freshwater fish, and numerous marine fish species. Because the Raritan River watershed ranges from coastal to highland ecoregions, many of these species are found in the watershed.

Common mammals include: white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), groundhog (*Marmota monax*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), North American beaver (*Castor canadensis*), striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis virginiana*), northern short-tail shrew (*Blarina brevicauda*), eastern mole (*Scalopus aquaticus*), American mink (*Neovision vison*), and North American river otter (*Lontra canadensis*).

The Raritan River watershed is located within the Atlantic flyway and provides habitat for both migrating and resident birds. Bird species that frequent the region include: American robin (*Turdus*

² Biological resources described in Sections 4.3.1 and 4.3.2 are analogous to “living coastal and marine resources” cited in Section 5.3, below.

migratorius), Canada goose (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), gray catbird (*Dumetella carolinensis*), blue jay (*Cyanocitta cristata*), northern cardinal (*Cardinalis cardinalis*), European starling (*Sturnus vulgaris*), American crow (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), herring gull (*Larus smithsonianus*), mourning dove (*Zenaida macroura*), red-bellied woodpecker (*Melanerpes carolinus*), wood thrush (*Hylocichla mustelina*), common yellowthroat (*Geothlypis trichas*), and song sparrow (*Melospiza melodia*; Tsipoura *et al.* 2012).

Common reptiles and amphibians in the Raritan River watershed include: northern watersnake (*Nerodia sipedon*), eastern ratsnake (*Pantherophis alleghaniensis*), common snapping turtle (*Chelydra serpentina*), eastern painted turtle (*Chrysemys picta picta*), spotted turtle (*Clemmys guttata*), eastern mud turtle (*Kinosternon subrubrum subrubrum*), eastern musk turtle (*Sternotherus odoratus*), American bullfrog (*Lithobates catesbeianus*), northern green frog (*Lithobates clamitans*), pickerel frog (*Lithobates palustris*), southern leopard frog (*Lithobates sphenoccephalus*), spring peeper (*Pseudacris crucifer*), marbled salamander (*Ambystoma opacum*), northern dusky salamander (*Desmognathus fuscus fuscus*), northern two-lined salamander (*Eurycea bislineata*), and slimy salamander (*Plethodon glutinosus*).

Common freshwater fish species include: American eel (*Anguilla rostrata*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), spottail shiner (*Notropis hudsonius*), blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), channel catfish (*Ictalurus punctatus*), margined madtom (*Noturus insignis*), rock bass (*Ambloplites rupestris*), bluegill (*Lepomis macrochirus*), redbreast sunfish (*Lepomis auritus*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), and tessellated darter (*Etheostoma olmstedii*).

Common diadromous fish species include: American eel (*Anguilla rostrata*), American shad (*Alosa sapidissima*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), hickory shad (*Alosa mediocris*), gizzard shad (*Dorosoma cepedianum*), sea lamprey (*Petromyzon marinus*), and striped bass (*Morone saxatilis*).

4.3.3 *Threatened and Endangered Species*

The Raritan River watershed provides habitat for several federally listed mammals, reptiles, and plants. Federally listed species include the Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), bog turtle (*Clemmys muhlenbergii*), Knieskern's beaked-rush (*Rynchospora knieskernii*), small whorled pogonia (*Isotria medeoloides*), and swamp pink (*Helonias bullata*; USFWS 2020). Approximately 65 U.S. Fish and Wildlife Service Birds of Conservation Concern (BCC) are found in the vicinity of the Raritan River watershed, and are protected under the Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-712), and the Bald and Golden Eagle Protection Act (16 U.S.C. § 668). Several prominent BCC birds include: the bald eagle (*Haliaeetus leucocephalus*), black-capped chickadee (*Poecile atricapillus praticus*), blue-winged warbler (*Vermivora cyanoptera*), prairie warbler (*Setophaga discolor*), red-headed woodpecker (*Melanerpes erythrocephalus*), and wood thrush (*Hylocichla mustelina*).

Numerous state listed threatened and endangered species are also found the Raritan River watershed, including, but not limited to: bobcat (*Lynx rufus*), northern harrier hawk (*Circus hudsonius cyaneus*), bobolink (*Dolichonyx oryzivorus*), upland sandpiper (*Bartramia longicauda*), night-heron (*Nycticorax nycticorax*), upland sandpiper (*Bartramia longicauda*), peregrine falcon (*Falco peregrinus*), wood turtle (*Glyptemys insculpta*), eastern box turtle (*Terrapene carolina carolina*), longtail salamander (*Eurycea longicauda*), brook floater (*Alasmidonta varicosa*), green floater (*Lasmigona subviridis*), triangle floater (*Alasmidonta undulata*), eastern lampmussel (*Lampsillis radiata*), and eastern pondmussel (*Ligumia nasuta*).

4.4 **Socioeconomic Resources**

As of the 2010 U.S. Census, the Raritan River watershed had a population of 1,307,003 (SRRI 2016). The Lower Raritan had the highest population, with 819,136 individuals, and the Upper Raritan and Millstone had similar population sizes, at 223,002 and 264,864 individuals, respectively. The Raritan River watershed is located in the middle of one of the most densely populated states in the nation. The population density of the Lower Raritan is approximately 2,327 persons per square mile, and the population densities of the Upper Raritan and Millstone is approximately 476 and 929 persons per square mile, respectively. The New Jersey Department of

Labor estimates that populations will continue to grow across the region in coming decades (NJDOL 2020).

Median household income in the counties that make up the Raritan River watershed are higher than the national median (national median = \$63,937 in 2018 dollars), however the average cost of living in New Jersey is also higher than the national average (Guzman 2019). Somerset and Middlesex Counties are located almost entirely within the Raritan River watershed. The median household income of Somerset County is \$111,772 in 2018 dollars, and the median household income of Middlesex County is \$85,954 in 2018 dollars (U.S. Census Bureau 2018). A moderate proportion of Morris and Hunterdon Counties are located within the Raritan River watershed. The median household income of Morris County is \$111,316 in 2018 dollars, and the median household income of Hunterdon County is \$112,535 in 2018 dollars. A small proportion of Mercer and Monmouth Counties are located within the Raritan River watershed. The median household income of Mercer County is \$79,990 in 2018 dollars, and the median household income of Monmouth County is \$95,699 in 2018 dollars. A very small portion of Union County is located within the Raritan River watershed. The median household income of Union County is \$77,095 in 2018 dollars.

4.4.1 *Environmental Justice*

Executive Order 12898, titled “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” guides federal agencies to “make environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” The EPA Environmental Justice (EJ) Mapper indicated that there may be sensitive EJ communities within the Raritan River watershed, based on environmental and demographic indicators (EPA 2020). In general, the Lower Raritan subwatershed has higher indicators of potential EJ communities than either the Upper Raritan or the Millstone. On a county-basis, Mercer County has a 10.9% population poverty rate; Middlesex has 8.2%; Monmouth has 6.7%; Somerset has 4.9%; Morris has 4.7%; Hunterdon has 4.4%, and Union has 7.8% (U.S. Census Bureau 2018).

4.5 Cultural and Historic Resources

The Raritan River watershed has played a central role in New Jersey's history, beginning with the Lenape Indians who inhabited the area prior to European settlement (Schneider 2019). The Dutch and English arrived in 1683 and spread their farms and settlements throughout the watershed. Coastal shipping and commerce became prevalent in the lower Raritan River throughout the 1700s, and the river became a focal area for several Revolutionary War battles in 1777. By the early 1800s, the American industrial revolution was underway, and the Raritan River and its tributaries became home to numerous mills and factories; most of the region's dams were built in this period. The Delaware and Raritan Canal was built in 1834 to move goods throughout the area and between the Delaware and Raritan Rivers. However, railroads would soon make the canal obsolete. By 1888, the Raritan River Railroad was built, connecting the burgeoning industries throughout the region to the shipping port at Raritan Bay. New Jersey's population doubled between 1900 and 1930, and manufacturing became a four-billion dollar industry. During this time, the public became increasingly aware of pollution due to local industry; the mainstem Raritan River was closed to swimming in the 1920s after numerous reports that the river tasted and smelled bad. Nonetheless, industry only expanded throughout the watershed during World War II, as corporations established large-scale electronics and chemical industrial operations such as CDE.

Historic federal environmental protections of the early 1970s, including the Clean Water Act, changed the Raritan River's relationship with industry forever. As a navigable water of the United States, the Raritan River gained legal protections against point-source pollution, marking the beginning of a new era of environmental cleanup actions in the region. CERCLA (*i.e.*, Superfund Law) was enacted in 1980, and numerous contaminated sites located in the Raritan River watershed were listed on the NPL shortly thereafter. Today the Raritan River watershed is home to 20 NPL sites and 1,703 other State-listed known contaminated sites (SRRI 2019). Of these, 8 NPL sites and 469 other known contaminated sites have been fully closed with institutional controls in place.

Many of the proposed projects in this Draft RP/EA involve dam removal and fish passage enhancement. Dam construction in the Raritan River watershed dates to the 1600s to supply water for private and municipal use, but early industry's reliance on dams to supply hydropower to small mills in the early 1800s marked the golden age of dam building in the Raritan River watershed.

While some dams continue to serve specific purposes including water supply or flood control, many dams are obsolete, in disrepair, and degrade local water quality and aquatic habitats. Today it is estimated that there are 149 dams that are greater than 5 feet tall in the Raritan River watershed (SRRI 2019). Sixty-six dams are located in the Upper Raritan, 38 dams are located in the Lower Raritan, and 45 dams are located in the Millstone.

CHAPTER 5 NEPA ENVIRONMENTAL CONSEQUENCES

5.1 NEPA Environmental Consequences

As noted in Section 1.3.2, this document constitutes the EA for the proposed restoration of natural resources, to address the potential impact of proposed restoration actions on the quality of the physical, biological, and cultural environment. The Trustees integrated the CERCLA and NEPA processes in this Draft RP/EA, as recommended under 40 C.F.R. § 1500.2(c).

5.2 Scope of NEPA Analysis and Trustee Approach

Restoration actions taken by the Trustees under CERCLA and other federal laws are subject to NEPA, 42 U.S.C. § 4321 *et seq.*, and the NEPA regulations at 40 C.F.R. §§ 1500-1508. In general, agencies contemplating implementation of a major federal action must produce an EIS if the action is expected to have significant impacts on the quality of the human environment. When it is uncertain whether the proposed action is likely to have significant impacts, agencies prepare an EA to evaluate the need for an EIS. If the EA demonstrates that the proposed action will not significantly impact the quality of the human environment, the agencies issue a Finding of No Significant Impact (FONSI), which satisfies the requirements of NEPA, and no EIS is required.

This Draft RP/EA complies with NEPA by: (1) describing the purpose and need for restoration (Section 1.2); (2) addressing public participation for this process (Section 1.8); (3) identifying and describing restoration alternative actions (Chapter 3); (4) summarizing the affected environment (Chapter 4); and (5) analyzing environmental consequences (Chapter 5).

In 2015, the NOAA Restoration Center developed a “Programmatic Environmental Impact Statement for Habitat Restoration Activities Implemented throughout the Coastal United States” (PEIS; NOAA 2015). NOAA developed the PEIS to evaluate coastal habitat restoration activities funded or implemented through its existing programs. The Service documented their adoption of the PEIS with a Record of Decision, dated August 20, 2019 (84 Federal Register 45515). The PEIS is available at: <https://www.fisheries.noaa.gov/resource/document/restoration-center-programmatic-environmental-impact-statement>. The PEIS includes an evaluation of typical impacts for a suite of restoration activities that are inclusive of the preferred alternatives identified in this Draft RP/EA, including:

- Planning, Feasibility Studies, Design Engineering, and Permitting
- Implementation and Effectiveness Monitoring
- Fish and Wildlife Monitoring
- Environmental Education Classes, Programs, Centers, Partnerships, and Materials
- Riverine and Coastal Habitat Restoration: Debris Removal
- Fish Passage: Dam and Culvert Removal, Modification or Replacement
- Fish Passage: Technical and Nature-Like Fishways
- Fish, Wildlife, Vegetation Management: Invasive Species Control
- Freshwater Stream Restoration: Channel Restoration
- Freshwater Stream Restoration: Bank Restoration and Erosion Reduction
- Shellfish Reef Restoration
- Road Upgrading and Decommissioning: Trail Restoration
- Road Upgrading and Decommissioning: Signage and Access Management
- Wetland Restoration: Levee and Culvert Removal, Modification, and Set-Back
- Wetland Restoration: Restoration and Shoreline Stabilization Techniques
- Wetland Restoration: Wetland Planting

To avoid duplication of effort and streamline the NEPA analysis in this Draft RP/EA, the Trustees are using the PEIS for NEPA compliance. Impacts are summarized briefly below in Section 5.3. However, the full analysis covered by the PEIS is incorporated by reference (40 C.F.R. § 1502.21).

5.3 Impacts of Proposed Alternatives

5.3.1 *No Action*

Under the No Action alternative, there would be no direct impacts to the ecological and socioeconomic environment since no actions would be taken to restore, rehabilitate, replace, and/or acquire the equivalent of injured natural resources or the supporting habitats and services they provide. Project area water, geological/soil, land cover, and climate conditions would not be affected since no restoration would occur. Terrestrial and aquatic habitats would not be affected, and the trajectory of any ecologically degraded areas would remain unchanged. Project area fish, wildlife, and threatened and endangered species would not be affected. Project area fish, wildlife, vegetation, and habitats would not be affected. Project area socioeconomic variables would not be

affected, and potential economic and ecological benefits to EJ communities would not be realized. There would be no effect on cultural and historic resources.

5.3.2 Planning, Feasibility Studies, Design Engineering, and Permitting

The PEIS Section 4.5.1.1 states the following regarding the potential impacts of Planning, Feasibility Studies, Design Engineering, and Permitting.

“The completion of project planning, feasibility studies, design engineering studies, and permitting activities would cause indirect, long-term, beneficial impacts to the affected environment. These activities would support the continued implementation of the most successful projects and therefore result in effective and efficient habitat restoration. Some feasibility studies would cause direct, short-term, minor impacts through associated fieldwork, including drilling into soil or sediment with an augur, drill rig, or other tools to remove surface, subsurface, or core samples. These impacts would be very minor and localized to the project site given how small such areas are in relation to an overall project area. Similar short-term impacts to living coastal resources...essential fish habitat...and threatened and endangered species may include effects from handling, noise, and displacement (see PEIS Section 4.7).”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. All restoration alternatives will involve planning and/or feasibility studies and/or design engineering and/or permitting.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.3 Implementation and Effectiveness Monitoring

The PEIS Section 4.5.1.2 states the following regarding the potential impacts of Implementation and Effectiveness Monitoring.

“The environmental consequences of the initial implementation of restoration monitoring could cause direct and indirect, short-term, minor, localized, adverse impacts. Impacts to threatened

and endangered species may include effects from handling, noise, turbidity, displacement, and mortality (see PEIS Section 4.7). These impacts would result from activities associated with in-water or on-site observation or experimentation, such as the use of equipment for sampling or monitoring of organisms. Although these adverse impacts may occur, the monitoring products would result in indirect, long-term, minor to major beneficial impacts that extend beyond the project site. The benefits would allow future restoration proposals to be planned with better information and implemented more effectively by using the most successful methods, materials, or equipment for achieving the goal of restoration.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. All restoration alternatives will involve implementation and effectiveness monitoring.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.4 Fish and Wildlife Monitoring

The PEIS Section 4.5.1.3 states the following regarding the potential impacts of Fish and Wildlife Monitoring.

“Fish and wildlife monitoring activities are related to monitoring the performance and progress of restoration projects relative to their established project goals. Because monitoring can allow for smarter decision-making, projects using this technique could cause indirect, long-term, minor to major beneficial impacts to geology and soils, water resources, living coastal and marine resources, and threatened and endangered species that may be localized or extend beyond the project site. The data gathered by trained individuals would be used to establish baseline information on species abundance and diversity and then to evaluate changes in these metrics through time. These data would be used as a basis for future aquatic habitat management decisions to benefit various programs. The observational data gathered by trained individuals would be used to develop baseline and ongoing measurements on species composition, diversity, and richness of

habitat. These data would then be used as a basis for future habitat management decisions and restoration actions to substantially benefit various wildlife species.”

“In addition, indirect and direct, short-term, localized, minor to moderate adverse impacts to living coastal resources and essential fish habitat, and threatened and endangered species may include effects from handling, noise, turbidity, displacement, and mortality (see PEIS Section 4.7). Cultural and historic resources may be impacted if disturbed during monitoring activities. Projects with successful monitoring programs would likely be more successful than those without such programs because monitoring would allow problems and flaws to be identified quickly, contained, and eradicated before they become widely established. Monitoring programs would have direct and indirect, long-term, minor beneficial impacts on land use and socioeconomics that extend beyond any project site, because the information gathered and any involvement of local citizens in environmental projects would promote environmental stewardship, and understanding of environmental issues, and a sense of community pride.”

“Despite the beneficial impacts expected from this activity, monitoring could cause adverse impacts. Direct, short-term, localized, minor adverse impacts are expected to geology and soils from human presence and movement around the project site (i.e., from soil compaction). Direct, short-term, localized, minor adverse impacts are also expected to air quality and noise at the project site due to the presence of crew members (and in the case of electrofishing, the operation of gas- or battery-powered electrofishing equipment). Direct, short-term, localized, minor adverse impacts may occur to water quality because, depending on the water body’s substrate, turbidity may increase from the movement of crewmembers throughout the project site. Potential impacts to air quality could include direct, short-term, minor adverse impacts to air quality during construction or other on-the-ground activities. These impacts include exhaust emissions from off-road construction equipment, boats, and employee commuting vehicles. These impacts may extend beyond the project site. Direct, short-term, localized, minor, adverse impacts would occur to land use and recreation because anglers or other individuals recreating the project site may need to vacate or avoid the site in order to avoid interacting with monitoring activities.”

“Adverse population level effects are not expected from monitoring activities (e.g., electrofishing) because the activity typically takes place over a relatively small area compared with the overall distribution of the population being monitored. Regardless of the level of mortality observed from

a monitoring event, it is reasonable to expect that areas that may observe mortality would be rapidly recolonized by individuals from surrounding, connected waters (e.g., Berra and Gunning 1970; Smock 2006).”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Island Farm Weir Fish Passage***: pre- and- post-project monitoring.
- ii. ***Headgates Dam Removal***: pre- and- post-project monitoring.
- iii. ***Califon Dam Removal***: pre- and- post-project monitoring.
- iv. ***Blackwells Mills Dam Removal***: pre- and- post-project monitoring.
- v. ***Nunn’s Mill Dam Removal***: pre- and- post-project monitoring.
- vi. ***North Branch Raritan River Corridor Riparian Buffer Restoration***: pre- and post- project monitoring.
- vii. ***East Brunswick Swamp Pink Restoration***: pre- and post-project monitoring.
- viii. ***Rockafellows Mills Dam Removal***: pre- and- post-project monitoring.
- ix. ***Klines Mill Dam Fish Passage***: pre- and- post-project monitoring.
- x. ***Beisler Lake Dam Removal***: pre- and post-dam removal monitoring.
- xi. ***Mill Street Dam Removal***: pre- and post-dam removal monitoring.
- xii. ***North Branch Raritan River, Lamington River, and Stony Brook Mussel Restoration***: mussel and habitat surveys, genetic and genomic studies.
- xiii. ***Raritan Bay Oyster Restoration***: oyster monitoring.
- xiv. ***South River Tidal Marsh Restoration***: pre- and post-project monitoring.
- xv. ***Edison Landfill Capping and Wetland Restoration***: pre- and post-project monitoring.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.5 Environmental Education Classes, Programs, Centers, Partnerships, and Materials

The PEIS Section 4.5.1.4 states the following regarding the potential impacts of Environmental Education Classes, Programs, Centers, Partnerships, and Materials.

“Projects that provide environmental educational classes, programs, and centers; encourage and maintain partnerships with local school systems; and fund the development of education materials would have direct and indirect, long-term, minor beneficial impacts on geology and soils, water resources, living coastal resources and essential fish habitat, threatened and endangered species, land use, and socioeconomics. The beneficial impacts would result because education of local citizens and youth about environmental issues in the community and beyond, habitat restoration, and conservation would promote environmental stewardship, an understanding of living coastal resources and environmental issues, and a sense of community pride. Educational materials developed would encourage conservation and environmental stewardship, and educate the public on the benefits of habitat restoration projects.”

“Projects that train volunteers to participate in restoration projects and provide outreach and education to the community would have indirect, long-term, minor beneficial impacts on all resources because training and involvement of local citizens in environmental projects would promote environmental stewardship, an understanding of living coastal resources and environmental issues, and a sense of community pride. Projects are not likely to adversely impact threatened and endangered species.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Lost Valley Nature Park***: installation of educational and informational signage.
- ii. ***North Branch Raritan River Corridor Riparian Buffer Restoration***: volunteer and education/outreach activities.
- iii. ***Stony Brook Green Infrastructure Demonstration Project***: education/outreach activities.
- iv. ***Lake Manalapan Riparian Restoration***: volunteer and education/outreach activities.
- v. ***Trash Trap Installation in the Lower Raritan River Watershed***: volunteer and education/outreach activities.
- vi. ***Rutgers Ecological Preserve Accessible Trail***: volunteer and education/outreach activities.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.6 Riverine and Coastal Habitat Restoration: Debris Removal

The PEIS Section 4.5.2.2 states the following regarding the potential impacts of Debris Removal.

“Most debris removal activities would have both adverse and beneficial impacts on the affected environment in the project area, but would ultimately restore habitat for marine species and reduce the hazards of debris to trust resources. Generally, debris removal projects would cause direct, short- and long-term, localized, minor to moderate beneficial impacts. By identifying, locating, and removing unwanted debris from the affected environments, beneficial impacts to geology, soils, and land use and recreation would occur simply because areas are cleaner. In some cases (e.g., general solid waste and unwanted natural debris), debris would re-accumulate in the project area and benefits would be short-lived. In other cases (e.g., derelict fishing gear, abandoned vessels, and pilings), pollution would no longer occur and benefits would be local and long-term or even permanent in some cases. Whether short- or long-term, there would be direct, moderate beneficial impacts to water quality when debris is removed and the debris or associated leachate is no longer present in the coastal environment. Implementation of debris removal projects would also result in indirect, long-term, moderate beneficial impacts on living coastal resources and essential fish habitat, and on the threatened and endangered species because habitats would be cleared of potentially injurious debris – these impacts would likely extend beyond the project site.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Trash Trap Installation in the Lower Raritan River Watershed:*** installation of trash trap technology to remove unwanted debris from riverine environment.
- ii. ***South River Tidal Marsh Restoration:*** identification, assessment, and the use of machinery to remove unwanted debris.
- iii. ***Edison Landfill Capping and Wetland Restoration:*** identification, assessment, and the use of machinery to remove unwanted debris.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.7 Fish Passage: Dam and Culvert Removal, Modification or Replacement

The PEIS Section 4.5.2.3.1 states the following regarding the potential impacts of Dam and Culvert Removal, Modification, or Replacement.

“In general, dam and culvert removal, modification, or replacement projects... produce short-term ecological impacts and considerations, but the long-term ecological benefits – improved water quality, sediment transport, and native resident and migratory species recovery – demonstrate that removal of these barriers could be an effective long-term and beneficial river restoration tool (Bednarek 2001).”

“Barrier removals may include indirect and direct, short-term, minor, moderate, or major adverse impacts on geology and soils, water resources, air quality, and living resources and essential fish habitat, both localized to the project site and beyond the project site. They may also have direct, long-term impacts to land use and recreation. Indirect and direct, short-term, minor, and moderate adverse impacts to threatened and endangered species may include effects from handling, noise, turbidity, contaminants, changes to hydraulics and local hydrology, additional habitat quality/quantity, and displacement (see PEIS Section 4.7). However, indirect and direct, long-term, moderate, and major benefits to threatened and endangered species, as well as other resources may result as well.”

“Adverse impacts to geology and soils during project construction are direct and indirect, short-term, and of minor to moderate effect, and may be localized to the project site or realized beyond the project site. These impacts stem from the use of heavy machinery and construction equipment and include soil compaction, temporary grading, minor bedrock removal, short-term downstream sediment deposition, and increased soil erosion and runoff in the immediate area of construction operations. The scales and duration of impacts may depend on the size of the dam or culvert to be removed, but more often will depend on the magnitude of the overall project footprint and include many factors such as the construction of haul roads, stockpile areas, cofferdams, or the size of area to be cleared for equipment storage. Post-construction scouring of the channel bed caused by a release of water and sediments that accumulated in the impounded area may occur, depending on the size and spatial configuration of the quantity of impounded sediment, the grain size of impounded sediments, flow competence, and other factors (Collins et al. 2007). Downstream

migration of impounded sediments can increase downstream flood elevations. Changes to any flood elevations would only occur after appropriate regulatory consultations.”

“Long-term, post-construction impacts from the removal of dams and culverts result in direct and indirect, long-term, moderate, and major impacts to water resources. Such removals may reintroduce nutrients downstream through sediment transport. The magnitude of changes is often, but not always, based on the size of the dam and impoundment. The removal of small run-of-river dams have shown in some cases to improve water quality to such a point that the river reach was removed from state impaired water lists. Within the former impoundment area, the stream channel may have higher dissolved oxygen levels than existed prior to removal.”

“Potential impacts to air quality could include direct, short-term, minor adverse impacts to air quality during construction or other on-the-ground activities.”

“Adverse impacts to living coastal resources such as vegetation and wildlife are direct and indirect, short-term, and of minor to moderate effect. Wildlife species near the project site, including endangered or threatened species, may be temporarily displaced or harassed during construction activities due to reverberations, noise, air quality impacts, and artificial lighting. Habitat may be lost by the filling or cutting off side channels from sediment deposits following dam removal, or when vegetation is uprooted by migrating stream channels. These types of habitat loss impacts are anticipated to be temporary until a large flood event or groundwater sources carve new channels in such areas. Human activities may also be temporarily affected.”

“Eroded sediments can impact downstream floodplain and aquatic habitat and spawning grounds, as well as water and food quality. Sediment releases may also increase bed elevations, which can cause short-term increases in flood stages and potentially impact bridges, floodplain land uses (including low-lying structures), and recreational uses. Sediments can be quickly flushed out following a dam removal (Heinz Center 2002; Stanley and Doyle 2003), or may be released in pulses over time (Pearson et al. 2011). Sediment deposition downstream does not always cause measurable changes in algal or invertebrate communities (Stanley and Doyle 2003), and, if they do show decreases, they may be short-term and can realize a relatively quick recovery (Orr et al. 2008). In other cases, there is evidence of shifts in downstream riverine and estuarine food webs following dam removal that show animals with invertebrate diets shifting increasingly to

terrestrial-based invertebrates for their food source (NIFC 2013). One study showed that some fish were impacted by sediment accumulation downstream, but effects appeared short-term (Bushaw-Newton et al. 2002)."

"Post-construction impacts to living resources also occur. A reduction in species preferring reservoir habitats may occur, as conditions change to favor more lotic than lentic species. Without obstruction, migratory fish can reach historic spawning areas (Baish et al. 2002). Additional impacts are triggered by the shifts in temperature and nutrient gradients...which lead to changes such as fish assemblages and behavior; re-establishment of natural flow regimes; sediment, nutrient, and organic material being available to downstream habitats; and possible reductions in flood elevations in the former impoundment upstream. Dam removal may increase the abundance and diversity of aquatic insects, fish, and other organisms (Heinz Center 2002), and may even decrease invasive and undesirable species (Bednarek 2001)."

"A dam and culvert removal, modification, or replacement project that results in a reduced impoundment frequently causes changes in land use and recreation, along with the composition of localized ecosystems. They may have direct, long-term, minor adverse impacts to land use that extend beyond the project site, as well as direct, long-term, moderate beneficial impacts. This includes direct impacts such as the conversion of wetland areas to uplands around the former reservoir margins, as well as the potential colonization of invasive vegetation on newly exposed soils. Barrier removal can impact some recreational users, as well as aesthetic conditions for those who prefer flat water created by an impoundment. Beneficial impacts may also result. Although wetlands may decrease at the former impounded area edge, they could redevelop both above and below the dam site. The downstream channel may also improve its connection to the floodplain, enhancing existing riparian wetlands. In addition, these projects can create new recreational opportunities and waterfront revitalization, provide sediment to replenish beaches, and decrease safety and liability concerns. Lastly, despite barrier removal costs and the value of lost services (if applicable), removal may save financial resources otherwise required for operating costs and rehabilitation of the dam for safety or ecological reasons."

"Many dam and culvert removal, modification, or replacement projects result in long-term changes to cultural and historic resources. In some cases, cultural and historic sites are made accessible after a barrier removal where they were once submerged by reservoirs. Such activities

may be considered to have direct, long-term, or potentially permanent, major beneficial impacts to such cultural/historic resources. However, if the barrier (usually a dam) meets criteria for eligibility in the National Register of Historic Places, removal will have major impacts to historic resources. In such cases [the Trustees] will enter into agreement with the relevant agency (through a memorandum of agreement or other formal or informal means) that will determine the specific steps needed to mitigate adverse impacts to cultural and historic resources. Historic and cultural resources will only be adversely affected under [the] PEIS once National Historic Preservation Act consultation requirements are complete.”

“There are generally direct and indirect, long-term socioeconomic impacts related to changes in aesthetics at a removal site, increased access for recreation, and increased business opportunities for the local recreation sector, which are largely beneficial.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Island Farm Weir Fish Passage:*** design and construction of dam infrastructure modifications associated with installation of rock ramp fishway, scour protection.
- ii. ***Headgates Dam Removal:*** design and construction of dam removal, restoration and reconstruction of surrounding channel and habitat, scour protection, rerouting public utility infrastructure.
- iii. ***Califon Dam Removal:*** design and construction of dam removal, removal and disposal of sediment, restoration and reconstruction of surrounding channel and habitat, scour protection.
- iv. ***Blackwells Mills Dam Removal:*** design and construction of dam removal, restoration and reconstruction of surrounding channel and habitat, relocation and/or recalibration of USGS gage infrastructure (similar to installation of new infrastructure to meet needs provided by original barrier and rerouting public infrastructure), scour protection.
- v. ***Nunn’s Mill Dam Removal:*** design and construction of dam removal, removal and disposal of sediment, restoration and reconstruction of surrounding channel and habitat, scour protection.
- vi. ***Pond Removal on Tributary to Rockaway Creek:*** design and construction of weir removal, restoration and reconstruction of surrounding channel and habitat.

- vii. ***Rockafellows Mills Dam Removal***: design and construction of dam removal, removal and disposal of sediment, restoration and reconstruction of surrounding channel and habitat, scour protection.
- viii. ***Klines Mill Dam Fish Passage***: design and construction of dam removal or fishway, removal and disposal of sediment, restoration and reconstruction of surrounding channel and habitat, scour protection, diverting water flows through side channel.
- ix. ***Beisler Lake Dam Removal***: design and construction of dam removal, reconstruction of surrounding channel and restoration of surrounding habitat, scour protection.
- x. ***Mill Street Dam Removal***: design and construction of dam removal, restoration and reconstruction of surrounding channel and habitat, scour protection, relocation and/or recalibration of USGS gage infrastructure (similar to installation of new infrastructure to meet needs provided by original barrier and rerouting public infrastructure).
- xi. ***Cherry Brook Preserve Constructed Wetland***: reconstruction or repair of portions of the existing pond retaining wall, replacement of the outlet pipe to a box culvert, reconstruction of the outlet control structure and outlet headwall.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.8 Fish Passage: Technical and Nature-Like Fishways

The PEIS Section 4.5.2.3.2 states the following regarding the potential impacts of Technical and Nature-Like Fishways.

“Fishway projects result in some adverse impacts, but the long-term ecological benefits to native resident and migratory species make this an effective habitat restoration tool. During construction direct, short-term, localized, minor to moderate, adverse impacts to geology and soils may result including soil compaction, temporary grading, and increased erosion. These impacts would occur due to the use of heavy machinery, construction equipment, and the movement of restoration practitioners throughout the project site during construction of access roads, staging areas, and/or the fishway itself. Water and air resources may also be affected during construction with direct, short-term, minor to moderate, adverse impacts expected to water and air quality. Due to the

introduction of fine sediment to the water column during construction, water turbidity would increase at the project site, and may extend beyond the project site, depending on the degree of attenuation. Also, as is the case during any construction activity, an accidental contaminant spill (e.g., fuel, oil, grease, hydraulic fluid) may have short-term, direct adverse impacts on water quality.”

“During construction, fishway projects could result in direct and indirect, short- to long-term, minor to moderate adverse impacts to living coastal resources, and threatened and endangered species, which are localized or extend beyond the project site. Most directly, these projects may temporarily displace aquatic organisms from the immediate project area because construction may require the use of a cofferdam or other method used to exclude aquatic organisms. Additionally, fishway projects could delay upstream or downstream migration of aquatic organisms during construction. However, this delay would only be temporary. Increased sedimentation and turbidity during construction could also negatively impact aquatic organisms with increased mortality, reduced physiological function, and decreases in available or apparent food resources possible (Henley et al. 2000). These impacts could be localized or extend beyond the project site, depending on the degree of attenuation. Riparian vegetation may also be removed or crushed during construction in order to build staging areas, increase access to the project site, or to make room for the fishway itself. This reduction in riparian vegetation could indirectly affect aquatic organisms by altering water temperatures at the project site, or decreasing the amount of large woody debris available for input into the water body.”

“Land use and recreation may be temporarily disturbed, as people not associated with the project will be unable to access the project site during construction. Increases in noise from the operation of heavy machinery and construction equipment could also result in short-term adverse impacts to land use and recreational activities in the area surrounding the project site.”

“Fishway projects could also result in direct, long-term, localized, minor changes to adverse impacts to cultural and historic resources. A fishway project site may meet criteria for eligibility in the National Register of Historic Places and, consequently, altering these sites may have impacts to historic resources. Construction would begin at these sites under this PEIS only after a consultation that meets the requirements of the National Historic Preservation Act has been completed.”

“Fishway projects may also result in direct and indirect, short- and long-term, minor beneficial impacts to socioeconomic resources, as we would expect a varying number of jobs to be created and a beneficial impact on the local economy to result from the funding spent on project construction.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Island Farm Weir Fish Passage***: design and construction of rock ramp fishway.
- ii. ***Klines Mill Dam Fish Passage***: design and construction of fishway, if applicable.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.9 Fish, Wildlife, Vegetation Management: Invasive Species Control

The PEIS Section 4.5.2.4.1 states the following regarding the potential impacts of Invasive Species Control.

“The impacts of invasive species removal ultimately benefit the immediate ecosystem by allowing native species the chance to re-establish. ...Generally, invasive species removal activities may cause direct, short-term, localized, minor adverse impacts to the affected area from mechanical or human activities. For terrestrial and aquatic invasive plant removal, direct adverse impacts to geology and soils may include compaction, whereas impacts to in-water substrate and water resources may include ephemeral sedimentation, turbidity, or other water quality impacts. However, long-term moderate to major beneficial impacts to geology and soils, water resources, coastal resources and essential fish habitat, and threatened and endangered species would result as non-native species are replaced by diverse native plant and animal communities.”

“Herbicide use for removal of invasive plant species could cause direct, short-term, moderate, adverse impacts to geology and soils, water, air, living coastal resources and essential fish habitat, threatened and endangered species, and land use and recreation. These impacts would result from the potential for lethal effects on soil biota and the short-term loss of shading and habitat for prey species provided by the invasive plant. The potential impacts to birds, aquatic organisms, and

terrestrial organisms will be mitigated by the use of the least toxic herbicides, surfactants, and spray pattern indicators available, but sub-lethal impacts are possible. These include impacts to reproduction, survival to adulthood, and disrupted food webs (NMFS 2005). Potential impacts to non-target plant species are reduced when proper application methods are prescribed, but rainfall and wind may cause herbicides to leach into the surrounding soil or be transported to non-invasive plants, causing unintentional damage. Appropriate herbicide application methods should reduce the risk of such herbicide drift. Suggested methods include backpack spraying, cut stump, and hack-and-squirt; however, other methods may be used as the site or target species dictates. These methods also greatly reduce the chance of exposing surface waters and their ecological communities to these chemicals due to the high level of applicator control. Methods that do not require surfactants would be used when possible. If necessary, surfactants would be limited to products determined to be the least toxic to the terrestrial, aquatic, and marine/estuarine organisms found in the immediate area. Herbicide tracers (i.e., spray pattern indicators) should be used whenever possible to track herbicide application progress. ...Where feasible, the area will be regularly monitored for regrowth of the target or new invasive species. Generally, use of herbicides in project areas would be conducted according to established protocols for the locality, as determined by a licensed herbicide applicator. Such protocols would include information and guidelines for appropriate chemical to be used, timing, amounts, application methods, and safety procedures relevant to the herbicide application.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Pond Removal on Tributary to Rockaway Creek***: invasive species control.
- ii. ***Lost Valley Nature Park***: invasive species control.
- iii. ***North Branch Raritan River Corridor Riparian Buffer Restoration***: invasive species control.
- iv. ***East Brunswick Swamp Pink Restoration***: invasive species control.
- v. ***Stony Brook Green Infrastructure Demonstration Project***: invasive species control.
- vi. ***Lake Manalapan Riparian Restoration***: invasive species control.
- vii. ***South River Tidal Marsh Restoration***: invasive species control.
- viii. ***Edison Landfill Capping and Wetland Restoration***: invasive species control.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.10 Freshwater Stream Restoration: Channel Restoration

The PEIS Section 4.5.2.5.1 states the following regarding the potential impacts of Channel Restoration.

“Construction activities related to restoration of in-stream channel and off-channel habitat can cause direct and indirect, short- and long-term, minor and moderate, localized, beneficial and adverse impacts. Geology and soils and water resources would receive direct, short-term, minor adverse impacts due to a temporary increase in turbidity and exposure of bare stream banks as a result of the restoration activity. Channel and in-stream restoration can involve the use of heavy equipment, which could disturb soil and the channel beds.”

“Reconnection of side channels and installation of habitat features can redirect water flows within the stream corridor, which can lead to bank erosion or channel evulsion, or expansion of invasive species populations. Woody debris structures could mobilize and deposit in undesirable places downstream. While these adverse impacts are possible, they are unlikely to occur or unlikely to last at a restoration site because in-stream habitat features would likely be anchored in areas without any human infrastructure, such as bridges, and habitat features would be installed by specialists with the goal of reducing adjacent bank erosion and resulting turbidity. Direct, long-term, moderate beneficial impacts (including increased bank stability, water oxygenation and in-stream wood retention, diverse winter rearing habitat, and increased pool depth for aquatic resources) would likely be the predominant result from this restoration activity.”

“In-stream and off-channel restoration could have direct and indirect, short- and long-term, minor and moderate, beneficial and adverse impacts to living coastal resources and essential fish habitat and threatened and endangered species. More in-stream complexity promotes higher benthic organism productivity throughout the system, increased feeding opportunities, lowered predation rates on juvenile fish, more suitable spawning substrate, and deeper rearing habitat – conditions that are beneficial to living coastal resources and essential fish habitat, and threatened and endangered species. In-stream restoration construction activities could cause temporarily

alteration of essential fish habitat and disruption or mortality of living coastal resources and threatened and endangered species.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Headgates Dam Removal***: side channel restoration.
- ii. ***Blackwells Mills Dam Removal***: side channel restoration.
- iii. ***Pond Removal on Tributary to Rockaway Creek***: excavating and creating floodplain topography, creation of off-channel vernal pool habitat.
- iv. ***Lost Valley Nature Park***: design and implementation of rain gardens, constructed wetlands, and other green infrastructure for stormwater management.
- v. ***Stony Brook Green Infrastructure Demonstration Project***: design and implementation of bioswales and other green infrastructure for stormwater management.
- vi. ***Klines Mill Dam Fish Passage***: side channel restoration.
- vii. ***Beisler Lake Dam Removal***: creation of off-channel vernal pool habitat.
- viii. ***Cherry Brook Preserve Constructed Wetland***: dredging and regrading of accumulated sediments and conversion of existing pond into wetland/floodplain environment.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.11 Freshwater Stream Restoration: Bank Restoration and Erosion Reduction

The PEIS Section 4.5.2.5.2 states the following regarding the potential impacts of Bank Restoration and Erosion Reduction.

“Bank restoration and erosion reduction activities would cause direct and indirect, short-term, minor adverse impacts on geology and soils, water, air quality, living coastal resources and essential fish habitat, and threatened and endangered species during the on-the-ground implementation phase. Impacts to threatened and endangered species may include effects from handling, noise, turbidity, contaminant exposure, altered hydrology, additional habitat quality/quantity, displacement, and mortality (see PEIS Section 4.7). These impacts would result

from installation of natural features or geotextile materials, stabilization of slopes, removal of bulkheads or other artificial shoreline armoring, or introduction of new vegetation (planting). Depending on the nature of each project, the installation of materials and stabilization of slopes could require small or large earth-moving machines, which would cause minor amounts of localized soil compaction, may introduce non-native species if not properly decontaminated, and other impacts as described above. The duration of impacts typically range from weeks to months, depending on the length of the shoreline or stream bank. Wildlife would also be displaced temporarily during construction activities. By protecting erodible or unstable soils, bank restoration and erosion reduction would result in indirect, long-term, minor and moderate beneficial impacts to water quality and benthic habitat in wetlands, water bodies, and other sensitive riparian or coastal habitats where erosion is a problem beyond the project site. Natural processes (beginning after planting) would help stabilize banks and shorelines. Installation of biologs or geotextile materials also would stabilize areas of high erosion.”

“Habitat restoration practices that are most likely to take place on stream banks, riparian habitat, and coastal areas usually involve revegetation, placement of woody debris, stabilization of banks, removal of bulkheads or other artificial shoreline armor, and stormwater management practices. Revegetation usually results in minor disturbance of the surrounding habitat, which is quickly remedied by the revegetation of the area itself. However, the placement of woody debris and other wildlife habitat features, stabilization of banks, removal of bulkheads or other artificial shoreline armor, and stormwater management practices may require the use of heavy machinery. The use of heavy machinery can often cause damage to the surrounding riparian area such as clearing of existing vegetation, compaction, and disruption of the soil. This, in turn, may cause sedimentation in the adjacent stream, with turbidity plumes typically being short-term and quickly dispersed by the river current.”

“The restoration activity will also have direct, short- and long-term, minor and moderate, adverse and beneficial impacts to land use and recreation because increases in recreational opportunity will likely occur in the project area and beyond in the larger river system in the long term; however, short-term use may be curtailed during construction activities.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Lost Valley Nature Park***: removal of impervious surfaces and replacement with pervious surfaces, design and implementation of constructed wetland for stormwater management, planting of native vegetation.
- ii. ***North Branch Raritan River Corridor Riparian Buffer Restoration***: stream bank riparian plantings to improve water quality.
- iii. ***Stony Brook Green Infrastructure Demonstration Project***: design and implementation of bioswales, removal of impervious surfaces and replacement with pervious surfaces, and planting of native vegetation.
- iv. ***Lake Manalapan Riparian Restoration***: riparian shoreline plantings to improve water quality.
- v. ***Bridge over the Delaware and Raritan Canal Spillway***: erosion and sediment control measures, bank stabilization with biodegradable and plant material.
- vi. ***Cherry Brook Preserve Constructed Wetland***: design and implementation of constructed wetland and planting of native vegetation.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.12 Shellfish Reef Restoration

The PEIS Section 4.5.2.6.2 states the following regarding the potential impacts of Shellfish Reef Restoration.

“Shellfish reef restoration activities may have direct, short-term, minor adverse impacts as well as indirect, long-term, moderate beneficial impacts.”

“Impacts to geology and soils may include short-term adverse impacts such as compaction to underlying soils where reef material is placed. Long-term beneficial impacts may occur through reductions in wave energy, thereby reducing erosion along adjacent shorelines.”

“Direct, short-term, minor adverse impacts and indirect, long-term, minor beneficial impacts to water resources could result from reef restoration. The direct impacts include increased turbidity during project construction and the indirect impacts may include improvements to water quality in the immediate project area as a result of increased oyster filtering capacity over the long term. Turbidity related to construction activities can be reduced through the use of Best Management Practices (BMPs). Few, if any, adverse effects are expected from building and operating small-scale aquaculture facilities to assist in shellfish restoration. No long-term impacts to the aquatic environment or marine species from the water discharge are anticipated; unlike some forms of aquaculture, shellfish culture does not create high nutrient discharge because shellfish often feed on phytoplankton in seawater, rather than needing nutrient-rich feed (Mugg et al. 2000).”

“When shells are imported from other locations, they may carry other organisms or diseases. Several states have recognized the risk in transporting shells from one area to another and have instituted requirements or recommendations for shells transplanted into state waters. Research and biosanitary protocols are used to prevent the spread of invasive species and diseases through the relocation of bivalve shells (Cohen and Zabin 2009). Although deployment of shellfish does have the potential to spread shellfish diseases or non-native organisms, restoration will use BMPs and follow state regulations that require that shellfish be certified as disease-free (Bushek et al. 2004).”

“Reef restoration projects have the potential to convert one habitat type into another. This conversion frequently involves re-establishing a reef in a formerly degraded shellfish area. In general, shellfish restoration projects convert shallow, open water habitats to subtidal or intertidal reefs or beds (the latter in the case of

and some Atlantic state estuaries). While open water habitats are valuable, the historical loss of shellfish habitat within the coastal United States has been significant. For example, in the United States there has been an estimated 88 percent decline in oyster biomass and an estimated 63 percent decline in the spatial extent of oyster habitat over the past 100 years (zu Ermgassen et al. 2012), making this conversion a minor impact in most locations.”

“Coral reefs, artificial reef, and live/hard bottom – all in the marine environment – are not impacted due to their location relative to typical oyster restoration sites. Oyster reefs or beds may

promote the development (or re-establishment) of submerged aquatic vegetation beds or marsh habitat in their landward or intertidal areas through increased shoreline stabilization. In either configuration, oysters serve as habitat, providing food and refuge for recreationally and commercially important fish and crustaceans (e.g., crabs and shrimp) and their prey. In addition, these habitats can help protect marsh habitat by reducing the erosion caused by wave action.”

“All restoration actions occurring in near shallow or intertidal habitat may displace living coastal resources through the increased activity and noise associated with restoration project construction. Vegetation may be disturbed if the shellfish restoration site is accessed from land instead of by boat. These impacts are expected to be temporary. In most cases, fish return to restoration sites almost immediately after construction.”

“Both water- and land-based recreation and land use activities near a shellfish restoration site may be adversely impacted in short-term, minor ways by changing boat traffic or other resource use patterns, or beneficially impacted by improved recreational fishing near successfully restored oyster reefs. In building and operating small-scale aquaculture facilities to assist in shellfish restoration, little or no impact is expected. Facilities are frequently located in areas of existing marine industry.”

“The socioeconomic benefits of conducting reef restoration projects may result insofar as such projects create viable habitat that support a diverse array of commercial and recreational fish species, and therefore communities that benefit from these resources may realize benefits related to increased ecological productivity.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. **North Branch Raritan River, Lamington River, and Stony Brook Mussel Restoration:** mussel relocation, propagation at pre-permitted rearing facilities, and stocking.
- ii. **Raritan Bay Oyster Restoration:** design and construction of oyster reefs in the Raritan Bay.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.13 Road Upgrading and Decommissioning: Trail Restoration

The PEIS Section 4.5.2.7 states the following regarding the potential impacts of Trail Restoration.

“Road upgrading and decommissioning, and trail restoration activities would cause direct and indirect, short-term, minor and moderate adverse impacts, typically in riparian and upland affected environments, resulting from temporary construction activities in the project area. Aside from construction impacts, however, most of the impacts resulting from these activities would be direct and indirect, moderate to major beneficial impacts, as they are designed to control access to sensitive areas, limit the use of sensitive areas as routes for vehicular transportation, and reduce a road’s propensity for erosion.”

“Trail restoration projects would take place in all types of habitat areas; however, they have historically occurred most frequently in riparian and upland affected environments. These activities would cause direct, short-term, minor, adverse impacts on geology and soils, water, and air quality, and would cause direct and indirect, short-term, minor, adverse impacts on living coastal resources and essential fish habitat, and threatened and endangered species, resulting from temporary construction activities, as previously described. There may be direct, long-term minor to moderate adverse impacts that result from increased shading over previously exposed habitat that depends on photosynthetic processes. Areas that experience such impacts are relatively small, and may be reduced with BMPs (e.g., increased spacing of boardwalk boards). Trail restoration projects would cause indirect, short-term, minor impacts on land use, resulting from construction activities required to restore the trail (e.g., temporarily blocking trails with machinery). Impacts to threatened and endangered species may include effects from handling, noise, turbidity, contaminant exposure, altered hydrology, additional habitat quality/quantity, displacement, and mortality (see PEIS Section 4.7).”

“Trail restoration projects would also cause direct and indirect, long-term, minor to major beneficial impacts on geology and soils, water, living coastal resources and essential fish habitat, threatened and endangered species, cultural and historic resources, and socioeconomics. The

beneficial impacts would result from reduced erosion potential and rates after projects were implemented and from both allowing and controlling access to sensitive areas.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***County Boat Launch and Fishing Platform at Lincoln Avenue Park***: resurfacing and grading of existing boat launch and parking area, design and construction of raised fishing platform (similar to raised walkway).
- ii. ***Lost Valley Nature Park***: design and construction of walkways and driving paths, regrading and pervious material resurfacing of driving paths and parking areas.
- iii. ***Rutgers Ecological Preserve Accessible Trail***: creation and resurfacing of ADA accessible trail and pullout area.
- iv. ***Bridge over the Delaware and Raritan Canal Spillway***: design and construction of raised footbridge over spillway.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.14 Road Upgrading and Decommissioning: Signage and Access Management

The PEIS Section 4.5.2.8 states the following regarding the potential impacts of Signage and Access Management.

“The installation of temporary or permanent fencing, signage, or netting would have direct, long-term (fencing would likely have a long-term impact, but not netting), moderate beneficial impacts on the geology and soils of the project site, and on water resources, living coastal resources and essential fish habitat, and threatened and endangered species beyond the project site. The benefits of these actions are reduced disturbance by humans, animals, and vehicles.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***County Boat Launch and Fishing Platform at Lincoln Avenue Park***: installation of informational and wayfinding signage.
- ii. ***Lost Valley Nature Park***: installation of informational and wayfinding signage.
- iii. ***East Brunswick Swamp Pink Restoration***: installation of deer exclusion fencing and anti-herbivory cages.
- iv. ***Lake Manalapan Riparian Restoration***: installation of temporary fencing to exclude geese and humans.
- v. ***Rutgers Ecological Preserve Accessible Trail***: installation of educational signage.
- vi. ***South River Tidal Marsh Restoration***: installation of goose exclusion fencing.
- vii. ***Edison Landfill Capping and Wetland Restoration***: installation of goose exclusion fencing.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.15 Wetland Restoration: Levee and Culvert Removal, Modification, and Set-Back

The PEIS Section 4.5.2.11.1 states the following regarding the potential impacts of Levee and Culvert Removal, Modification, and Set-Back.

“The removal and/or modification of levees, dikes, culverts, and similar infrastructure would cause direct and indirect, short-term, localized, minor adverse impacts on geology and soils, water, air, living coastal resources and essential fish habitat, and threatened and endangered species during the construction phase of the project. These impacts also apply to the construction of new or replacement levees (set-back levees) as part of the overall project. The use of heavy machinery and construction equipment is the primary cause of the direct, adverse impacts associated with this activity, which may include soil compaction, emissions from heavy equipment, removal or crushing of understory vegetation, increased soil erosion in the immediate area of construction operations, and unintentional introduction of non-native, potentially invasive, species.”

“These restoration activities would provide direct and indirect benefits to geology and soils, water, living coastal resources and essential fish habitat, and threatened and endangered species. These projects result in benefits to riparian, stream and river channel habitats, and shoreline habitats

such as wetlands, mangrove swamps, beaches, and mudflat areas. Restoration of natural hydrology would aid in the development of vegetated communities that provide vital rearing, feeding, and refuge habitat for fish and benthic communities and wildlife species. This technique is beneficial for anadromous fish that need connected coastal waterways and rivers with unaltered hydrology for passage during migration events, as well as for estuarine fish species that benefit from increased habitat area. Long-term major beneficial effects to the quality of surface water resources at the project site and beyond are expected due to restoration of tidal flow and water movement. Restoration of these areas to natural states would enhance water quality and salinity, reduce turbidity and soil erosion, increase carbon sequestration and storage capacity (providing climate change mitigation), and enhance habitat quality, although some increases in turbidity in the water column could result due to increased water movement. In areas where berms and levees bounded ponded areas restored to wetland, indirect, long-term minor beneficial effects would be expected by uptake and transformation of nutrients resulting from enhanced vegetative growth in the restoration area.”

“Cultural and historic resources and land use could experience indirect, long-term, minor adverse impacts resulting from levee modification or removal. The land use in the floodplain, including any potentially culturally sensitive areas, would change as the water resources in the floodplain changed. Because land use would stabilize in the floodplain over time, the impact would be minor.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***South River Tidal Marsh Restoration:*** levee and/or berm modification, site grading and placement of clean fill to establish appropriate marsh elevations.
- ii. ***Edison Landfill Capping and Wetland Restoration:*** levee and/or berm modification, site grading and placement of clean fill to establish appropriate marsh elevations.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.16 Wetland Restoration: Restoration and Shoreline Stabilization Techniques

The PEIS Section 4.5.2.11.2 states the following regarding the potential impacts of Wetland Restoration and Shoreline Stabilization Techniques.

“Construction impacts from sediment removal, materials placement, and shoreline stabilization activities are similar, and would cause direct and indirect, short-term, localized, minor adverse impacts on geology and soils, water, living coastal resources and essential fish habitat, and threatened and endangered species during the implementation phase of the projects.”

“Potential impacts to air quality could include direct, short-term, minor adverse impacts to air quality during construction or other on-the-ground activities. These impacts include exhaust emissions from off-road construction equipment, on-road hauling, construction worker employee commuting vehicles, and fugitive dust emissions from paved roads and earthmoving activities.”

“Impacts to living coastal resources, essential fish habitat, and threatened and endangered species may include effects from handling, noise, turbidity, contaminants, changes to hydrology, and displacement (see PEIS Section 4.7). In the case of any activities using heavy machinery to conduct restoration work for marsh restoration activities, potential impacts are related to compaction of the soils, leaking petroleum products, and increased turbidity at the restoration site. Many of these impacts would be ameliorated through the use of BMPs.”

“These restoration activities may impact vegetation on the project site or nearby. Impacts to vegetation should be minimal, as the most frequently removed mature plants would not be native to the site or would be invasive species. For instance, shrub and tree species would be removed if the end goal is a habitat dominated by wetland obligate species. The removed plant species may not provide the same quality of habitat for fish as the goal habitat and consequently the overall impact of this removal is low. In instances where sediment and vegetation are not removed from the site, those working on the site may potentially trample existing vegetation or unintentionally introduce non-native species, but this would be kept to a minimum through the use of BMPs.”

“Increased water turbidity and temporary decreases in water quality may result from sediment removal, materials placement, and shoreline stabilization activities, which may in turn impact living resources in the area. Behavior of species that use wetlands impacted by this restoration

activity may be temporarily modified. Mitigation for potential impacts would focus on implementation of BMPs. Direct short-term, localized moderate impacts would be expected on benthic fauna and infauna smothered by sediment placement. Materials with contaminant concentrations consistent with published sediment quality guidelines and background levels rarely impact biota, and will be considered non-significant.”

“After construction, these projects would result in direct and indirect long-term or permanent, moderate to major beneficial impacts to geology and soils, water, living coastal resources and essential fish habitat, and threatened and endangered species, and minor beneficial impacts related to socioeconomic resources as a result of increased tourism opportunities that could result from an improved resource.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***South River Tidal Marsh Restoration***: site grading and placement of clean fill to establish appropriate marsh elevations, bank stabilization with biodegradable and plant materials, shoreline erosion control measures and installation of living shorelines, installation of stormwater management infrastructure.
- ii. ***Edison Landfill Capping and Wetland Restoration***: site grading and placement of clean fill to establish appropriate marsh elevations, bank stabilization with biodegradable and plant materials, shoreline erosion control measures, installation of stormwater management infrastructure.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.17 Wetland Restoration: Wetland Planting

The PEIS Section 4.5.2.11.3 states the following regarding the potential impacts of Wetland Planting.

“Wetland planting may occur as a separate restoration activity or in combination with other restoration types described in this [PEIS] document. Planting may cause short-term, direct

adverse impacts to living coastal and marine resources when existing vegetation is trampled during the donor harvest or planting process. Planting is generally short-term in duration, lasting days to weeks, but the length of time between the restoration efforts that prepare a site for planting and when planting is begun may be several months, as planting cannot be completed outside the local growing season. For this reason, active wetland restoration activities may last over a year, even at smaller sites. Short-term damage to stands of healthy wetland vegetation may occur where native species are harvested from donor sites using species-appropriate techniques. The growth habit and length of the growing season determines how rapidly a donor site would recover. Generally, the benefits of using a local, native plant source outweigh the damage to the donor site, which is temporary. For restoration activities that involve building native plant nurseries, although the nursery use may be long-term, the impacts are low because the sites are generally constructed in areas that do not have existing habitat value (e.g., a school playground, a disturbed upland area, or former sewage treatment plant or aquaculture pond). Minor adverse impacts to cultural and historic resources may occur during wetland restoration, when historic structures are present within a project site.”

“Long-term, moderate beneficial impacts to water resources, living coastal resources and threatened and endangered species would occur due to the erosion reduction and increased shelter provided by wetland plants. Wetland planting activities would result in beneficial impacts by restoring or creating wetland and/or shallow-water habitats that provide areas for feeding and shelter for fish, as well as nutrient cycling and carbon sequestration and storage capacity.”

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***Lost Valley Nature Park:*** installation of native plants for pollinator gardens, green infrastructure, wetlands, uplands, meadows, and transitional areas.
- ii. ***South River Tidal Marsh Restoration:*** planting of native marsh vegetation.
- iii. ***Edison Landfill Capping and Wetland Restoration:*** planting of native marsh vegetation.
- iv. ***East Brunswick Swamp Pink Restoration:*** implement best forestry practices to promote new growth of white cedar stand and/or plant white cedar saplings.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives fall within the range of alternatives and scope of potential environmental impacts analyzed in the PEIS and do not have significant adverse impacts.

5.3.18 Impacts Not Addressed in the PEIS

Riverine and coastal habitat projects that include environmental justice and contaminated debris removal and associated remediation (e.g., capping) are not directly addressed in the PEIS, therefore, the Trustees have provided additional NEPA analysis for projects that include these potential activities and impacts.

Environmental Justice

Restoration activities supported by the Trustees help to ensure the enhancement of environmental quality for all populations in New Jersey. The Trustees have determined that all proposed restoration projects would provide long-term or permanent beneficial impacts to the Environmental Justice communities described in Section 4.41 by improving the quality of the natural environment and ecosystem services, and providing recreational and educational benefits to local communities. None of the alternatives are expected to adversely impact minority or low-income populations.

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. All restoration alternatives will involve Environmental Justice.

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives do not have significant adverse impacts to Environmental Justice.

Contaminated Sediment Debris Removal and Sediment Capping

Contaminated Sediment/Debris Removal: Sediment removal and/or dredging of wetland areas affected by contamination would likely result in increased injury to wetlands and associated living coastal resources, representing short-term minor to moderate adverse impacts due to physical habitat disturbance, including the removal of well-developed wetland geology, soils, and existing vegetation. Direct, short-term, localized, minor adverse effects to air quality and noise are expected

at the project site due to the operation of heavy equipment and other on-the-ground activities. Direct and indirect, short-term moderate beneficial impacts to socioeconomic resources are expected from job creation as a result from the funding spent of the projects. Following sediment and debris removal, clean fill would need to be brought in and the site revegetated. Losses in habitat value would occur until the dredged areas recovered from remedial activities. The removal of contaminated sediments and debris would have short- or long-term moderate beneficial impacts to water quality, and short- or long-term moderate beneficial impacts on living coastal resources and threatened and endangered species because habitats would be cleared of potentially deleterious contamination. However, the site should be monitored for potential recontamination from external sources, which may reinjure wetlands and habitats and put living coastal resources at risk of further exposure to contaminants.

Sediment Capping: Sediment capping would likely require 1-2 feet of fill, and would alter the bottom contours of the wetland causing changes in wetland sediments, hydrology, and associated plant communities. Considerable time and effort would be required to revegetate capped areas, including effort to keep invasive species at bay. Short-term losses of wetland habitat would occur while remedial activities were conducted. Long-term negative impacts may result from changes in hydrology that arise from partially filling the wetland. However, sediment capping will result in direct, long-term benefits to water quality, geology and soils, and living coastal resources due to the prevention of future leaching of contaminants.

There is potential for sediment/debris removal and sediment capping activities to impact cultural and historic resources. Care would be taken to ensure such properties are avoided during removal, and coordination with the State Historic Preservation Officer would be carried out, as appropriate. Short- or long-term beneficial impacts to recreation would occur simply because the area is cleaner.

The Trustees determined that the following restoration alternatives are relevant to this impact category:

- i. ***South River Tidal Marsh Restoration:*** contaminated sediment/debris removal and sediment capping, as warranted.

- ii. ***Edison Landfill Capping and Wetland Restoration:*** contaminated sediment/debris removal and sediment capping

The Trustees have preliminarily determined that the impacts from these proposed restoration alternatives do not have significant adverse impacts.

5.3.19 *Summary of Impacts*

Based on the analysis in this Draft RP/EA, the Trustees have made the preliminary determination that all proposed restoration alternatives are either within the range of alternatives and scope of potential environmental consequences analyzed in the PEIS or in Section 5.3.18, and do not have significant adverse impacts. Moreover, the Trustees have fully considered and determined that there are no geographic, project- or site-specific conditions, sensitivities, unique habitat, or resources that warrant additional NEPA analyses beyond which is provided in the PEIS or Section 5.3.18.

As projects progress, if it is determined that project activities no longer fall within the scope of the PEIS or Section 5.3.18, additional NEPA review may be warranted and would be conducted and provided in a subsequent NEPA document.

5.4 Cumulative Impacts

5.4.1 *Cumulative Impacts of No Action Alternative*

The No Action alternative would have long-term, minor adverse effects to physical and biological resources in the Raritan River watershed, since no active restoration would occur. Natural resources would not return to baseline and interim losses would not be compensated for.

5.4.2 *Cumulative Impacts of Preferred Alternatives*

The preferred alternatives would have no major adverse impacts on habitats, lands, or waterways in the Raritan River watershed. The preferred alternatives may result in minor, short-term adverse impacts and both short- and long-term beneficial impacts to habitats and the natural resources they support. When considered in tandem with other past, present, and reasonable foreseeable future actions within the Raritan River watershed, the preferred alternatives are not anticipated to have adverse cumulative impacts. Direct and indirect adverse impacts are likely to be short-term and

will occur primarily during and immediately after periods of active construction. The preferred alternatives are expected to result in long-term, beneficial cumulative impacts on the human environment since they may positively impact the areas land use, recreational use, and economic activity through habitat restoration, land preservation, and improved public access and recreational activities.

5.4.3 *Cumulative Impacts of Non-Preferred Alternatives*

The Raritan Bay Oyster Restoration non-preferred alternative would have no major adverse impacts on habitats, lands, or waterways. This alternative may result in minor, adverse impacts during construction, but impacts would be localized and short-term. The Cherry Brook Preserve Constructed Wetland non-preferred alternative may have some minor long-term adverse effects on water quality, and the South River Tidal Marsh Restoration and the Edison Landfill Capping and Wetland Restoration non-preferred alternatives may have some minor adverse impacts on climate change ‘resiliency’, as currently proposed. These alternatives may additionally result in minor, adverse impacts during construction, but impacts would be localized and short-term. When considered in tandem with other past, present, and reasonably foreseeable future actions within the Raritan River watershed, the non-preferred alternatives are not anticipated to have adverse cumulative impacts, and may result in localized beneficial impacts to biological and habitat resources.

CHAPTER 6 COMPLIANCE WITH OTHER LAWS AND REGULATIONS

As appropriate, the Trustees will ensure compliance with applicable statutes, regulations, and policies prior to implementation of any restoration alternatives. The following is a list of statutes that may apply to proposed projects. Compliance with these authorities, and other authorities not listed, is considered part of the restoration planning process. All projects that receive funding will be responsible for obtaining necessary permits and complying with relevant statutes, regulations, and policies.

6.1 Federal Laws

6.1.1 *National Environmental Policy Act*

The National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 *et seq.*), requires that federal agencies consider the environmental impacts of proposed actions and reasonable alternatives to those actions. The Authorized Official will determine, based on the facts and recommendations in this document and input from the public, whether this EA supports a FONSI or whether an EIS should be prepared.

6.1.2 *Federal Water Pollution Control Act (Clean Water Act)*

The Clean Water Act (CWA; 33 U.S.C. § 1251 *et seq.*), is the principle law governing pollution control and water quality of the nation's waterways. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States. Section 401 of the CWA requires any applicant for a federal license or permit that conducts any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates or would originate. The Trustees will require all necessary permits to be in place prior to all construction activities.

6.1.3 *Fish and Wildlife Coordination Act*

The Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*) requires that federal agencies consult with the Service, NOAA, and state wildlife agencies regarding activities that affect, control, or modify waters of any stream or bodies of water, in order to minimize the adverse impacts of such actions on fish and wildlife resources and aquatic environments. This coordination

is generally incorporated into compliance processes used to address the requirements of other applicable statutes, such as Section 404 of the CWA.

6.1.4 *Endangered Species Act*

The Endangered Species Act (ESA; 16 U.S.C. § 1531 *et seq.*), is intended to protect species that are threatened with extinction. It provides for the conservation of habitats and ecosystems that these species depend on and produces a program for identification and conservation of these species. Federal agencies are required to ensure that any actions are not likely to jeopardize the continued existence of a threatened and endangered species. The Trustees will engage in required ESA consultations prior to implementing any restoration actions.

6.1.5 *Migratory Bird Treaty Act*

The Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-712), protects all migratory birds and their eggs, nests, and feathers and prohibits the taking, killing, or possession of migratory birds. The proposed restoration actions would not result in the taking, killing, or possession of any migratory birds.

6.1.6 *National Historic Preservation Act*

The National Historic Preservation Act (NHPA; 16 U.S.C. § 470 *et seq.*), is intended to preserve historic and archaeological sites. Compliance with the NHPA would be fulfilled through coordination with the State Historic Preservation Office (SHPO). Federal agencies will consult with SHPO and Tribal Historic Preservation Officers (if applicable) to identify historic properties that may be affected by a proposed project and to assess potential adverse effects of restoration actions.

6.1.7 *Occupational Safety and Health Act*

The Occupational Safety and Health Act (OSHA; 29 U.S.C. § 651 *et seq.*), governs the health and safety of employees from exposure to recognized hazards, such as exposure to toxic chemicals, excessive noise, mechanical dangers, and unsanitary conditions. Work conducted on the proposed restoration actions will comply with OSHA requirements.

6.1.8 *Americans with Disabilities Act*

The Americans with Disabilities Act (ADA; 42 U.S.C. § 12101), is a civil rights law that prohibits discrimination against individuals with disabilities in all areas of public life, including jobs, schools, transportation, and all public and private places that are open to the general public. The purpose of the law is to ensure that people with disabilities have the same rights as opportunities as everyone else. The preferred recreational alternatives will comply with ADA requirements.

6.1.9 *Coastal Zone Management Act*

The Coastal Zone Management Act (CZMA; 16 U.S.C. §§ 1451-1464), encourages states to preserve, protect, develop, and where possible, restore and enhance the nation's coastal resources. Restoration actions undertaken or authorized by federal agencies within a state's coastal zone are required to comply, to the maximum extent practicable, with the enforceable policies of a state's federally approved Coastal Zone Management Program. The proposed projects will comply with the CZMA and be consistent with state policy.

6.1.10 *Magnuson-Stevens Fishery and Conservation Management Act*

The Magnuson-Stevens Fishery and Conservation Management Act (MSFCMA; 16 U.S.C. § 1801 *et seq.*), requires federal agencies to consult with the National Marine Fisheries Service when their actions or activities may adversely affect habitat identified as essential fish habitat. The Trustees will require MSFCMA consultation prior to implementing any pertinent restoration actions.

6.1.11 *Rivers and Harbors Act*

The Rivers and Harbors Appropriation Act (33 U.S.C. § 403 *et seq.*), regulates development and use of the nation's navigable waterways, and regulates obstruction or alteration of navigable waters. The Trustees will require all necessary permits be in place prior to construction activities.

6.1.12 *Floodplain Management, Executive Order 11998*

Executive Order 11998 (42 Federal Register 26951) requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there

is a practicable alternative. The Trustees will ensure compliance with this executive order as part of the state permitting process.

6.1.13 Protection of Wetlands, Executive Order 11990

Executive Order 11990 (42 Federal Register 26961) requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for acquiring, managing, and disposing of federal lands and facilities; providing federally undertaken, financed, or assisted construction and improvements; and conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. The Trustees will ensure compliance with this executive order as part of the state permitting process.

6.1.14 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Executive Order 12898

Executive Order 12898 (59 Federal Register 7629) directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The Executive Order directs each agency to develop a strategy for implementing Environmental Justice, is intended to promote nondiscrimination in federal programs that affect human health and the environment, and provides minority and low-income communities access to public information and public participation.

6.2 State and Local Laws

The Natural Resource Trustees will ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the State of New Jersey. All projects that receive funding will be responsible for obtaining necessary permits and complying with relevant statutes, regulations, and policies.

List of Preparers and Reviewers

- Cathy Marion, U.S. Fish and Wildlife Service
- Carl Alderson, NOAA
- Reyhan Mehran, NOAA
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List of Agencies and Persons Consulted

- NJDEP Office of Natural Resource Restoration
- U.S. Fish and Wildlife Service, Ecological Services
- NOAA Restoration Center
- NOAA Assessment Restoration Division
- Project Sponsors, including but not limited to: The Watershed Institute, New York-New Jersey Harbor and Estuary Program, Rutgers University, Borough of Highland Park, City of New Brunswick, Borough of Manville, Montgomery Township, Raritan Headwaters Association, Lower Raritan Watershed Partnership, Rutgers Cooperative Extension of Middlesex County, Natural Resources Conservation Service, Ridge and Valley Chapter of Trout Unlimited, The Nature Conservancy, GreenTrust Alliance, Inc., Township of Raritan, Franklin Township, Bethlehem Township, Township of Plainsboro, East Amwell Township, East Windsor Township, City of Perth Amboy, Hunterdon County, Middlesex County, and North Jersey Resource Conservation and Development.

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