4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The baseline condition of the affected environment (or existing conditions) serves as the basis for analysis of effects and comparison of each alternative. The current conditions and any known trends are described to provide a foundation for assessing the consequences of the alternatives. The resources and potential impacts discussed in the following sections include topics identified during public and agency scoping. Effects are quantified where possible and qualitative discussions are also included. This affected environment and environmental consequences section is divided into the following nine subject areas: (1) natural resources, (2) cultural resources, (3) noise, (4) vibration, (5) visual and aesthetic resources, (6) air quality, (7) hazardous waste, (8) socioeconomics and land use, and (9) transportation and infrastructure. Technical Environmental Studies (TES) have been prepared for natural resources, cultural resources, noise, vibration, air quality, hazardous waste, and socioeconomic and land use. A technical memo has been prepared for traffic. These disciplines are summarized in this section and further information regarding these resources can be found in the Attachments. The analyses in this section utilized the project's Study Area, which has the following approximate boundaries: the portion of the Hudson River which encompasses piers within the Study Area to the east; Baldwin Avenue (in Weehawken) to the north; the Palisades to the west; and 18th Street, Washington Boulevard, and 14th Street (in Jersey City) to the south (see **Figure 4.1**). Some disciplines, however, used discipline-specific analysis areas, which are explained within their respective methodology discussions.

The following terminology is used throughout the impact analysis section of this document to describe the nature of impacts arising from the three Build Alternatives and the No Action Alternative.

Short-term or long-term

These characteristics are determined on a case-by-case basis and do not refer to any rigid time period. In general, short-term effects are those that would occur only with respect to a particular activity, for a finite period of time, or only during the time required for construction activities. Long-term effects are those that are more likely to be persistent and chronic.

Direct or indirect

As stated in Council on Environmental Quality (CEQ) regulations (40 CFR Part 1508.8), a direct effect is caused by and occurs contemporaneously at or near the location of the action. An indirect effect is caused by a proposed action and might occur later in time or be farther removed in distance, but is still a reasonably foreseeable outcome of the action. For example, a direct effect of erosion on a stream might include sediment-laden waters in the vicinity of the action, whereas an indirect impact of that erosion might be lack of spawning habitat and lowered reproduction rates of indigenous fish downstream.

Negligible, minor, moderate, or major

These relative terms are used to characterize the magnitude or intensity of an impact. Negligible effects are generally those that might be perceptible but are at the lower level of detection. Impacts are considered minor if project-related impacts would occur, but

View looking east at Long Slip Canal

Figure 4.1 Study Area

The following statutes are not analyzed further in this document, since none of the resources identified are in close proximity to the Project.

Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 et seq.)

Airport Hazards (24 CFR 51 Subpart D)

Farmland Protection Policy Act (7 U.S.C. 4201 et seq, implementing regulations 7 CFR Part 658, of the Agriculture and Food Act of 1981, as amended).

Coastal Barrier Resources Act of 1982 (16 U.S.C. 3501)

resources would retain existing character and overall baseline conditions. Impacts are considered moderate if project-related impacts would occur and resources would partially retain existing character. Some baseline conditions would remain unchanged. Finally, project-related impacts that are considered major would create a high degree of change within the existing resource character and overall condition of resources.

Adverse or beneficial

An adverse effect is one having unfavorable or undesirable outcomes on the man-made or natural environment. A beneficial effect is one having positive outcomes on the man-made or natural environment. A single act might result in adverse effects on one environmental resource and beneficial effects on another resource.

Significant or Intensity

Significant effects are those that, in their context and due to their intensity (severity), meet the thresholds for significance set forth in CEQ regulations (40 CFR Part 1508.27). The intensity of an effect is determined through consideration of several factors, including whether an alternative might have an adverse impact on the unique characteristics of an area (e.g., historic properties or ecologically-critical areas), public health or safety, endangered or threatened species, or designated critical habitat. Effects are also considered in terms of their potential for violation of federal, state, or local environmental law; the degree of uncertainty, unknown effects, or unique or unknown risks; and if there are precedent-setting effects.

Context

The context of an effect can be localized or more widespread (e.g., regional).

Cumulative effects

Cumulative effects are described in the next section of this document (see Section 5.0). CEQ has defined cumulative effects (40 CFR 1508.7) as impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

A discussion of mitigation measures and best management practices (BMPs) are provided following the discussion of impacts for each alternative. These sections describe mitigation measures and BMPs applicable to the Resist component, the DSD component, or measures that are applicable to both. In addition, mitigation measures and BMPs are applicable to all Build Alternatives, unless otherwise specified.

The U.S. Department of Housing and Urban Development (HUD) policies require analysis of a number of environmental protection statutes in all National Environmental Policy Act (NEPA) documents. The following statutes are not analyzed further in this document, since none of the resources identified are in close proximity to the Project.

Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271 et seq.)

The Wild and Scenic Rivers Act of 1968 protects selected rivers in a free-flowing wild and scenic condition (16 U.S.C. 1271) and prohibits federal support for activities that would harm a designated river's free-flowing condition, water quality, or outstanding resource values. The nearest designated wild and scenic river, the Musconetcong River, is located approximately 41 miles to the west of the Study Area. Therefore, the Project would have no impact to designated Wild and Scenic rivers.

Airport Hazards (24 CFR 51 Subpart D)

HUD regulations at 24 CFR 51 Subpart D are applied to prevent incompatible development in close proximity to civil airports and military airfields. For the purpose of this regulation, a civil airport is defined as an existing airport that is designated as a commercial services airport in the National Plan of Integrated Airport Systems, and prepared by the Federal Aviation Administration (FAA). HUD funding is generally not permitted for projects within an Airport Clear Zone (an area extending 3,000 feet from the end of a civil airport runway) or in an Accident Potential Zone (an area extending approximately 15,000 feet from a military airfield runway). The nearest commercial service airports are Newark Liberty International Airport (approximately 6.5 miles to the west) and LaGuardia Airport (approximately 7.3 miles to the east). Teterboro Airport is located approximately 5 miles to the north of the Study Area, but it is classified by the FAA as a general aviation airport and is not considered under this regulation. The nearest military airfield is Lakehurst Naval Air Station, which is located approximately 50 miles to the south of the Study Area. Therefore, the Project is not within an Airport Clear Zone or an Accident Potential Zone and is in compliance with 24 CFR 51 Subpart D.

Farmland Protection Policy Act (7 U.S.C. 4201 et seq, implementing regulations 7 CFR Part 658, of the Agriculture and Food Act of 1981, as amended).

HUD-funded projects must consider impacts on farmlands of statewide or national importance. Projects that are located in areas that are already committed to urban use (such as through zoning regulations) or are not located within designated prime or unique farmland are not subject to the Farmland Protection Policy Act. According to the USDA soil classifications of the Study Area (see discussion in Section 4.1.2.2), the soils on-site are primarily urban land and historic fill, which are not prime or unique farmland. In addition, zoning within the Study Area is a mix of commercial, residential, and industrial (see Section 4.8.2.2) and does not contain areas zoned for agricultural uses. Therefore, the Farmland Protection Policy Act is not applicable to the Project.

Coastal Barrier Resources Act of 1982 (16 U.S.C. 3501)
The Coastal Barrier Resources Act (CBRA) of 1982 prohibits federally funded projects on designated relatively undeveloped coastal barriers along the Atlantic and Gulf coasts. No federally-funded projects can occur in an area designated within the CBRA, with the exception of exempt activities (such as nature trails) after consultation with the U.S. Fish and Wildlife Service (USFWS). The nearest CBRA Unit to the Study Area is NY-60P Jamaica Bay in Queens and Brooklyn, New York, approximately 10 miles to the southeast of the Study Area. Therefore, the Project would not impact the CBRA system and it is in compliance with the CBRA.

HUD policies also provide for an analysis of project sustainability. Sustainability is a central component of the Project. According to the United Nations, "a sustainable society meets the needs of the present without sacrificing the ability of future generations and non-human forms of life to meet their own needs." In recent years, sustainability has taken an increasingly important role in project development and implementation with recognition that fostering sustainable societies would be made more difficult with climate change.

Current guidance on sustainability and energy usage within the federal government originates from two executive orders: EO 13653 *"Preparing the United States for the Impacts of Climate Change"* (November 1, 2013) and EO 13693 *Planning for Federal Sustainability in the Next Decade* (March 19, 2015). Executive Order 13653 requires federal agencies to modify their policies and planning to recognize climate change, modernize federal programs to support climate resilient investments and establishes a federal Council on Climate Preparedness and Resilience. Executive Order 13693 sets targets for federal agencies to reduce: greenhouse gases, energy utilization by facilities and vehicles, potable water utilization, and waste generation. This executive order also establishes a Federal Interagency Sustainability Steering Committee and requires each agency to develop a sustainability plan.

In accordance with these executive orders, HUD established a Federal Sustainability Plan on November 19, 2015. Goal 10 in the current plan provides that HUD would manage the effects of climate change on the agency's operations and mission, in both the short and ong-term.

The comprehensive urban water strategy that was developed as a part of the Project would directly enhance the resiliency and sustainability of the Study Area in the face of climate change impacts, such as sea level rise. The components of the Project advance sustainability objectives by enhancing coastal resiliency; protecting the communities of Hoboken, Jersey City, and Weehawken from storm-related flood damages; and promoting sustainable infrastructure. Therefore, the Project, in its entirety, is in compliance with EO 13653 and EO 13963.

4.1 Natural Resources

4.1.1 Methodology

The methodology for the natural resources analysis involved three major tasks: data collection and review, site reconnaissance, and assessment of potential impacts. Available information regarding existing conditions was assembled and reviewed to describe the Study Area relative to geology, soils, groundwater, surface water quality, aquatic ecology, floodplains, tidelands, wetlands, upland vegetation, and wildlife. For purposes of this analysis, the Study Area was defined as a 1,253-acre area, which includes 1,020 acres of uplands and 233 acres of the Hudson River. A natural ecosystems analysis area (see **Figure 4.2**) was also defined to include a 150-foot buffer around the Study Area to evaluate impacts to natural resources that may extend beyond the Study Area. For example, noise generated from construction activities along the project boundary could travel up to 150 feet beyond the Study Area, potentially affecting any sensitive wildlife in this buffer zone. The Project Area, which is defined as the potential area of ground disturbance during construction activities, is also depicted in **Figure 4.2**.

The affected environment for each resource (e.g., geology, soils, and endangered species) presents the information obtained from the natural ecosystems analysis area reconnaissance, review of federal and state studies and mapping, wetland delineation, and agency coordination. Resources that were reviewed, but which yielded no pertinent information, are not cited in this report.

Existing information identified in literature and obtained from government and non-government agencies included documents such as: studies conducted within the Lower Hudson River Estuary/Hudson River; New York/New Jersey Harbor Estuary Program; New York City Department of Environmental Protection (NYCDEP) Harbor Water Quality Survey (NYCDEP 2010b); USFWS National Wetland Inventory (NWI) maps; US Environmental Protection Agency (EPA) Regional Environmental Monitoring and Assessment Program (R-EMAP); Federal Emergency Management Agency (FEMA) flood insurance rate maps; and United States Army Corps of Engineers (USACE) studies conducted as part of the New York and New Jersey Harbor Navigation Project.

The delineation of wetlands in the Study Area was conducted in accordance with the 1989 Federal

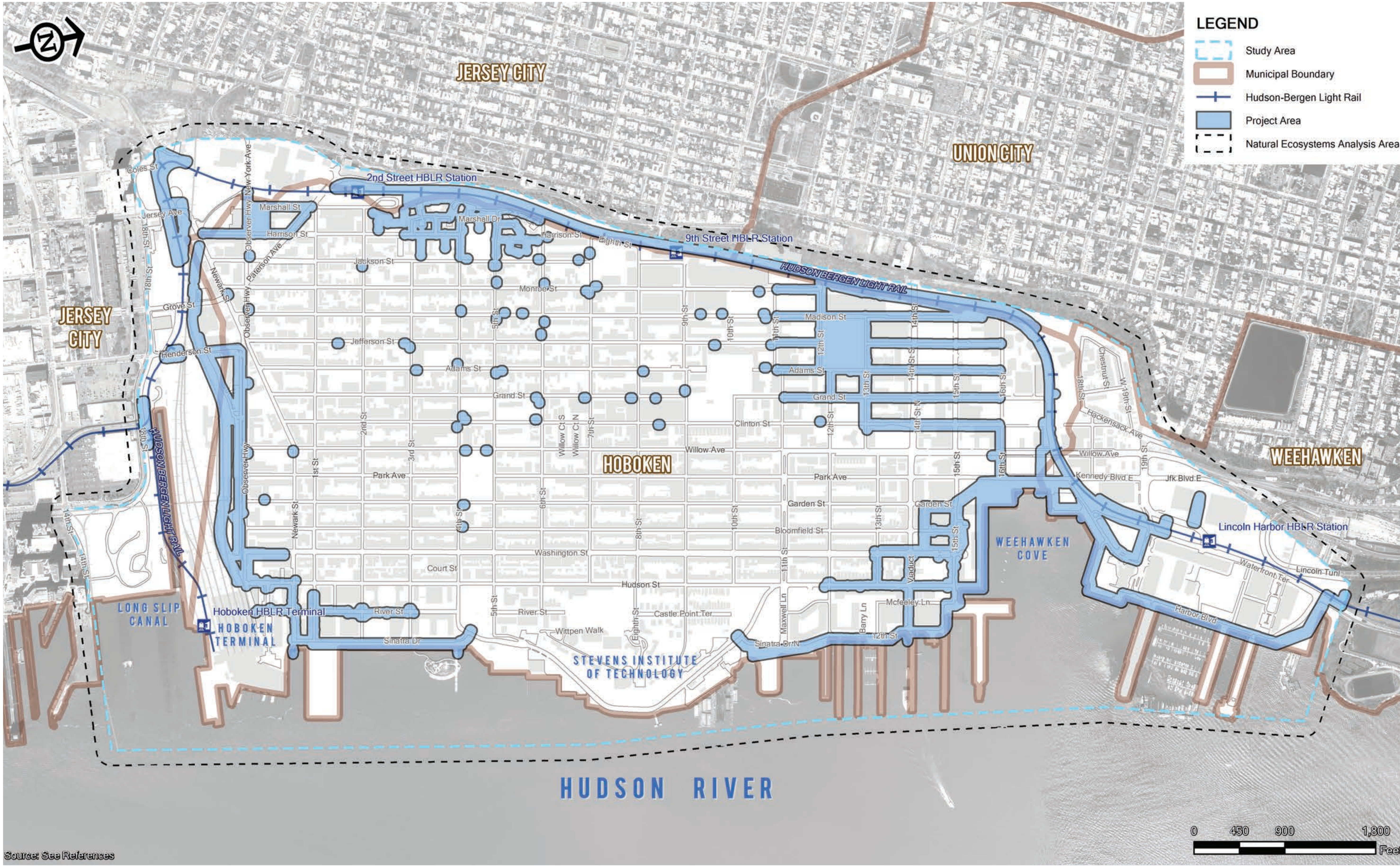


Figure 4.2 Natural Ecosystems Analysis Area Map

Manual for Identifying and Delineating Jurisdictional Wetlands - Federal Interagency Committee for Wetland Delineation.

Federal and state regulatory agencies were contacted regarding environmental resources with potential to exist in and around the Study Area that may be affected by the project activities. Requests for information on rare, threatened, or endangered species in the vicinity of the Study Area were submitted to the National Marine Fisheries Service (NMFS) and the NJDEP Natural Heritage Program (NHP). The NMFS regulates federally-listed threatened or endangered marine species. The NHP identifies state-listed plant and animal species, as well as representative habitats and ecological communities. The presence of threatened or endangered species was also reviewed using the NJDEP Landscape Project Version 3.1 data via the NJDEP GeoWeb mapping application. The federally-listed threatened and endangered freshwater and terrestrial species information, under the jurisdiction of the USFWS, was collected by generating an Information for Planning and Conservation (IPaC) Trust Resource Report for the Study Area.

4.1.2 Affected Environment

4.1.2.1 Geology

Several different geologic units underlie the Study Area. The eastern portion of the Study Area, from a point west of Clinton Street to the shoreline and from south of Observer Highway to 10th Street, is underlain by Cambrian and Late Proterozoic-age Serpentinite (Czs). In New Jersey, these deposits of light yellow green to dark green stone have only been exposed along the Hudson River waterfront in Hoboken. The western portion of the Study Area, west of the Serpentinite deposits and along the majority of the northern portion of the Study Area from 10th Street northward, is associated with the Stockton Formation (Trs). The Stockton Formation dates to the Upper Triassic and consists primarily of sandstone deposits with lesser amounts of mudstone, siltstone, and shale. A narrow swath of the Study Area, a triangular area from a point west of the intersection of Clinton and 3rd Streets, which extends to the northeast towards the intersection of 14th Street and Frank Sinatra Drive on its northern extent and the intersection of 12th Street and Sinatra Drive on its southern extent, consists of Manhattan Schist (CZm) deposits dating to the Late Cambrian and/or Late Proterozoic. Manhattan Schist consists of medium-dark gray, medium to coarse-grained schist and gneiss deposits. Narrow swaths of the Lockatong Formation (Trl) and Jurassic diabase (Jd) also are located along the western border of Hoboken (Dalton 2016).

In the 1700s, there was an island in the area of Castle Point, in what is now the east-central portion of the City of Hoboken, surrounded by tidal marsh. The outcroppings of serpentine rock near the Stevens Institute of Technology campus along Sinatra Drive are remnants of this island. Much of the area to the south, west, and north of Hoboken "Island" was marsh land that, over time, was filled and developed. As a result, Hoboken's topography varies from a high elevation of approximately 100 feet above sea level at Castle Point to less than five feet above sea level in a few areas in the western half of the city.

A geology map of the Study Area is provided in **Figure 4.3**.

4.1.2.2 Soils

According to the Natural Resource Conservation Service (NRCS) Web Soil Survey, a total of eight distinct soil types have been mapped within the Study Area, as displayed on **Figure 4.4**. Six of these soil types consist of urban land complex soils or composite urban land complex soils. The remaining two soil types–Greenbelt Loam (GtbA) and Laguardia Artifactual Coarse Sand (LagA)–are both associated with modified landscapes in urbanized areas that include human transported soil materials. The majority of the Study Area, the western and northern portions of Hoboken and the extreme northern portion of the Study Area in Weehawken, is associated with Urban Land, wet substratum soils. The majority of the eastern portion of the city consists of urban land, till substratum soils (see **Table 4.1**).

A geotechnical investigation was completed for the Study Area, which included soil borings (Dewberry 2017). A hard stratum below a five to 45 foot thick soft clay layer was detected. This hard stratum layer serves as a deep foundation bearing layer. The following description of soil conditions summarizes the findings in the geotechnical study.

Subsurface conditions encountered throughout the Study Area are generally in agreement with the soil descriptions published in the Surficial Geology of the Jersey City (1995) and Surficial Geology of Weehawken and Central Park Quadrangle, Hudson and Essex Counties, New Jersey (1993).

The typical soil profile consists of a loose to medium-dense sand and gravel fill stratum from 15 to 50 feet deep, underlain by a cohesive soil stratum extending to depths ranging from 30 to 70 feet. This cohesive soil stratum occasionally contains interbedded silt and sand layers of varying thickness with a plasticity range from silty-clay to silt. Thickness of the cohesive layer varied from five to 45 feet. In general, the consistency of the cohesive soil varies from very soft to very stiff. This cohesive stratum is underlain by a loose to very dense sandy glacial till stratum with N values ranging from four to greater than 100 blows per foot (bpf).

Laboratory test results from available historic borings were used for this study. The test results include grain size, specific gravity, unit weight, moisture content, and Atterberg Liquid and Plastic Limits. One-dimensional consolidation and triaxial compression strength tests results were available for undisturbed Shelby Tube samples.

The following generalized descriptions of the subsurface conditions in the Study Area are primarily based on interpretation of the available historic

Figure 4.3 Geology Map

Figure 4.4 Soils Map

Table 4.1 Soil Types Mapped within the Study Area

SOIL TYPE	HORIZON	DEPTH (INCHES)	SOIL COLOR	SOIL TEXTURE	SLOPE (%)	DRAINAGE
Greenbelt Loam (GtbA)	A	0-5	Dark Reddish Brown	Loam	0-3	Well-drained
	Bw1	5-16	Dark Reddish Brown	Loam		
	Bw2	16-30	Dark Reddish Brown	Loam		
	C	30-79	Dark Reddish Brown	Sandy Loam		
Laguardia Artifactual Coarse Sand (LagA)	A	0-8	Brown	Cobbly-artifactual coarse sandy loam	0-3	Well-drained
	BCu	8-26	Brown	Very cobbly-artifactual coarse sandy loam		
	Cu	26-79	Brown	Very cobbly-artifactual coarse sandy loam		
Urban Land, bedrock substratum (URBEDB)	M1	0-6	Not provided	Material	0-8	Not provided
	M2	6-20	Not provided	Material		
	2R	20-79	Not provided	Bedrock		
Urban Land, till substratum (URTILB)	M	0-15	Not provided	Material	0-8	Not provided
	2C	15-79	Not provided	Gravelly Sandy Loam		
Urban Land, wet substratum (URWETB)	M1	0-6	Not provided	Material	0-8	Not provided
	M2	6-20	Not provided	Material		
	2Cu	20-79	Not provided	Very Artifactual Coarse Sandy Loam		
Urban Land-Greenbelt Complex (USGRTA)	M	0-15	Not provided	Cemented Material	0-3	Not provided
	2C	15-79	Not provided	Gravelly Sandy Loam		
Urban Land-Greenbelt Complex (USGRTB)	M	0-15	Not provided	Cemented Material	3-8	Not provided
	2C	15-79	Not provided	Gravelly Sandy Loam		
Urban Land-Greenbelt Complex (USGRTC)	M	0-15	Not provided	Cemented Material	8-15	Not provided
	2C	15-79	Not provided	Gravelly Sandy Loam		

Source: USDA's Web Soil Survey software

borings, laboratory test results, and the results of the additional preliminary subsurface investigation.

Stratum 1: Fill

Fill material was encountered in all test boring locations and the thickness ranged between 15 and 50 feet. The fill encountered typically consisted of loose to very dense, black, brown sand and/or gravel, with varying amounts of silt, gravel, organics, brick, coal, ash, wood, glass, refractory brick, cinder, porcelain, etc. Note that gravel to boulder sized obstructions were encountered in borings along the Hudson River shorefront.

Stratum 2: Silty Clay

Below the fill stratum, a layer of silty clay consisting of varying amounts of clayey silt and silt was encountered in most of the test borings. This layer extended to the ranges from five to 45 feet below the fill stratum. The relatively thinner layer ranges from five to 20 feet in thickness and was observed along the Hudson River shoreline and the north side of Hoboken. The layer thickness varies from 20 to 45 feet along the Hoboken rail yard and NJ TRANSIT rail road embankment.

Stratum 3: Glacial Till

The glacial till layer was encountered in most of the test borings below the fill and silty clay stratum. The glacial till typically consisted of loose to very dense reddish-brown gravel and/or sand with variable amounts of fines. The glacial till layer ranged between four and 50 feet in thickness.

Stratum 4: Rock

Rock was encountered within the range of 50 to 100 feet below ground surface (bgs). Mostly hard sandstone or siltstone was encountered to the north of Castle Point. To the south of Castle Point, soft serpentine was encountered. Available serpentine rock core indicates highly decomposed status.

4.1.2.3 Groundwater

Regulatory Setting

The Safe Drinking Water Act (SDWA)

Groundwater quality in New Jersey is regulated under the Safe Drinking Water Act (SDWA), which includes regulations protecting those areas identified as Sole Source Aquifers (SSA). Enacted in 1974, the SDWA is the main federal law that sets national standards to ensure the quality of Americans' drinking water, protecting Americans from health risks associated with naturally-occurring and man-made contaminants (USEPA). Because of the potential impact to groundwater due to construction activities, the potential presence of SSAs within the Study Area must be assessed. SSAs are aquifers that contribute more than 50 percent of the drinking water to a specific area, whose water would be impossible to replace if the aquifer were contaminated. Under Section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et seq.), no project is to receive a commitment for federal financial assistance if the area has an aquifer that is the sole source of drinking water for that area and if that project may contaminate the aquifer through a recharge zone, creating a significant hazard to public health.

No water supply wells are located in Hudson County. Hoboken Water Services provides the potable water supply to the Study Area. The Study Area's water supply comes from the Jersey City Reservoir in the Town of Boonton and the Split Rock Reservoir in Rockaway Township. It is then treated at the Jersey City Water Treatment Plant to meet safe drinking water standards. Based on a review of SSA mapped in New Jersey, it has been determined that the Study Area is not located within or immediately adjacent to an SSA. A map of the SSA located in northern New Jersey is provided in **Figure 4.5.**

Affected Environment

To evaluate groundwater levels, 10 observation wells were installed at selected locations across the Study Area. Groundwater levels at these wells were periodically monitored between October 2015 and May 2016 (see **Figure 4.6**). A total of 22 field permeability tests were performed in the Study Area. The depths of soil borings were either 10 feet bgs or eight feet bgs. Groundwater was encountered less than eight feet bgs in most locations. In addition, due to past industrial uses within the Study Area and the nature of fill used across the Study Area, it is anticipated that the near surface groundwater would be contaminated with a variety of potential pollutants, including potentially hazardous materials. Please see Section 4.7 for a discussion on potential contaminated soil and groundwater within the Study Area.

4.1.2.4 Surface Water

Regulatory Setting

Surface water in New Jersey is protected under both state and federal regulations. Applicable regulations for surface water in the natural ecosystems analysis area are the Clean Water Act (CWA), NJDEP Division of Land Use, the Water Pollution Control Act, and the Rivers and Harbors Act of 1899.

The objective of the CWA, also known as the Federal Water Pollution Control Act, is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. It regulates: (1) point sources of water pollution such as discharges of municipal sewage, industrial wastewater, and stormwater, as well as the discharge of dredged or fill material into navigable waters and other waters including wetlands and (2) non-point source pollution such as atmospheric deposition and runoff.

Under Section 401 of the CWA, any applicant for a federal permit or license for an activity that may result in a discharge to navigable waters must provide the federal agency issuing a permit with a certificate, either from the state where the discharge would occur or from an interstate water pollution control agency, that the discharge would comply with Sections 301, 302, 303, 306, 307, and 316 (b) of the CWA. Applicants for discharges to navigable waters in New Jersey must also obtain a Water Quality Certification from the NJDEP as part of the permit approval process.

Section 404 (b)(1) of the Clean Water Act

The Project must comply with USACE guidelines for discharges of dredged or fill material in the waters of the United States (40 CFR Part 230). The guidelines require that no discharge shall be permitted if there is a practicable alternative "which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences."

The guidelines also require that appropriate and

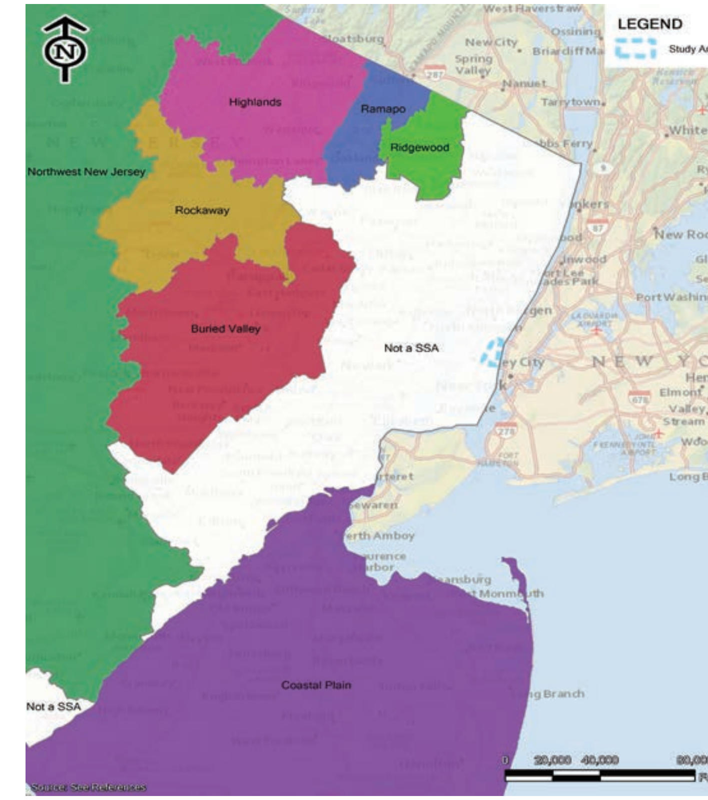


Figure 4.5 Sole Source Aquifer Map

practicable steps be taken "which would minimize potential adverse impacts on the aquatic ecosystem."

Most of the New Jersey laws and regulatory programs that would apply to the potential project activities fall under the regulatory responsibility of the NJDEP Division of Land Use Regulation (DLUR). DLUR reviews applications for permits to build or develop on environmentally sensitive lands such as freshwater wetlands, coastal areas, and floodplains. DLUR implements the laws through regulations or rules found in the New Jersey Administrative Code (NJAC). Stormwater management is an important part of the application review process.

Rivers and Harbors Act of 1899

For the purpose of protecting navigation and navigable

Figure 4.6 Groundwater Observation Well Location Map

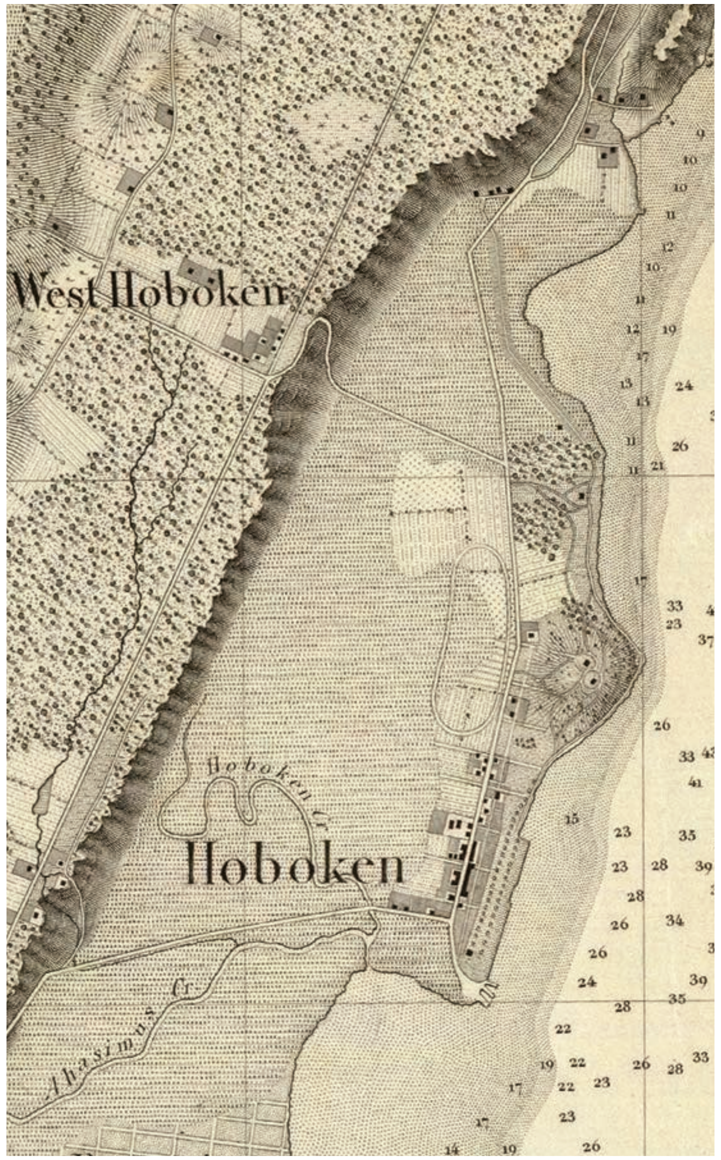


Figure 4.7 U.S. Coastal Survey, 1844

channels, Section 10 of the Rivers and Harbor Act of 1899 requires authorization from the Secretary of the Army, acting through the USACE, for the construction of any structure in or over any navigable waters of the United States, the excavation from or deposition of material in these waters, or any obstruction or alteration in navigable waters. Any structures placed in navigable waters (such as pilings, piers, or bridge abutments) up to the mean high water line would be regulated pursuant to this Act. The USACE must evaluate the probable impacts, including cumulative impacts of the proposed activity, on the public interest. This statute would apply to any of the proposed Build Alternatives that include impacts at or below the mean high water line, including the replacement of bulkhead along the waterfront.

Water Pollution Control Act, NJSA 13:19 and Rules at NJAC 7:14A, NJAC 7:8, NJAC 7:9B, and NJAC 7:9C

The Water Pollution Control Act sets forth the state's policy to restore, enhance, and maintain the chemical, physical, and biological integrity of the State's waters; to protect public health; to safeguard fish and aquatic life and scenic and ecological values; and to enhance the domestic, municipal, recreational, industrial, and other uses of the State's waters. This Act includes responsibilities for administering the New Jersey Pollutant Discharge Elimination System (NJPDES). NJPDES applies to any discharge of a pollutant into the waters of the state or onto land or into wells from which it might flow or drain into state waters, as well as the discharge of stormwater. Under this Act, all projects requiring a federal permit for the discharge of dredged or fill material into state waters and/or adjacent wetlands require a state Water Quality Certification (pursuant to Section 401 of the Federal Clean Water Act) that ensures consistency with the New Jersey State Water Quality Standards (NJAC 7:9B). In addition, compliance with New Jersey State Ground Water Quality Standards (NJAC 7:9C) is required when discharges to groundwater subsequently discharge into surface waters. Compliance with New Jersey's Stormwater Management Regulations (NJAC 7:8) is required for those projects involving greater than 0.25 acre of new impervious surface coverage or greater than one acre of land disturbance. There are also federal and state requirements for implementation of new municipal separate storm sewer systems (MS4s) and compliance would be managed upon the selection of the Preferred Alternative.

Affected Environment

The Study Area is generally level at an elevation less than 10 feet above sea level. The topography rises to the east around Garden Street and steadily increases towards a crest at Castle Point situated approximately 100 feet above sea level. The higher terrain along the eastern portion of the city represents the original highlands, the first portions of the Study Area to be historically settled (see **Figure 4.7**). The remaining sections of the Study Area were tidal marshlands in the eighteenth and for much of the nineteenth centuries. U.S. Coastal Survey Map of Hudson County of 1844 reflects the presence of undeveloped marshland in the majority of the Study Area from Bloomfield Street to the west, extending from Newark Street to north of 17th Street. These marshlands were fed by tidal watercourses located in the southwestern and northwestern portions of the city, Hoboken Creek, and Sluice Creek, respectively. Hoboken Creek was formerly connected to the Hudson River in the area of present-day Long Slip Canal, while Sluice Creek had a tidal connection via Weehawken Cove. A third tidal watercourse, Ahasimus Creek, was located in the far

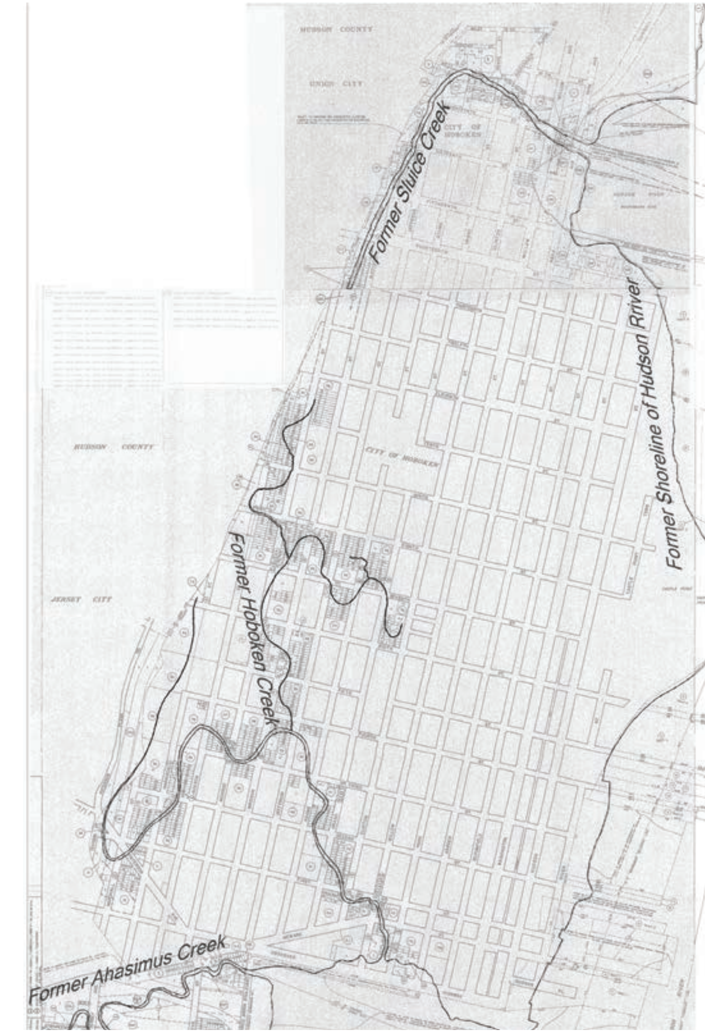


Figure 4.8 Map showing conveyances on Hudson River

southwestern portion of the Study Area in Jersey City and was also connected to the Hudson River near the location of Long Slip Canal. The sinuous courses of these former tidal creeks are depicted on nineteenth century maps of Hoboken, showing the creeks running from the Hudson River to the base of the Palisades (see **Figure 4.8**). By the turn of the twentieth century, the creeks appear to have been filled.

Table 4.2 Surface Water Quality Assessment Reporting Year 2012 Lower Hudson River Estuary HUC NJ02030101170030-01 (USEPA, 2015)

DESIGNATED USE	DESIGNATED USE GROUP	STATUS
Aquatic Life	Fish, Shellfish, and Wildlife Protection and Propagation	Impaired
Fish Consumption	Aquatic Life Harvesting	Impaired
Secondary Contact Recreation	Recreation	Not Assessed

Source: NJDEP, 2014. Division of Water Monitoring and Standards, Bureau of Water Quality Standards and Assessment. 2012 New Jersey Integrated Report Appendix A: 2012 Final Integrated List of Waters (Assessment Unit Summary List). Available online at: http://www.state.nj.us/dep/wms/bears/docs/2012_final_integrated_list.pdf.

4.1.2.4.1 *New Jersey Surface Water Quality Classifications*

The only surface water in the natural ecosystems analysis area is the Lower Hudson River, which borders the entire eastern side of the Study Area. Seventy three percent of the Study Area upland is located within the floodplain of the Lower Hudson River, a tidally-influenced portion of the Hudson River that is part of the larger New York/New Jersey Harbor Estuary.

The Lower Hudson River Estuary is a part of NJDEP Watershed Management Area 5–Hackensack, Hudson, and Pascack. The Lower Hudson River Estuary (Hydrologic Unit Code (HUC) NJ020-30-101-170-030-01) supports a diverse community of aquatic biota; however, it is an urban estuary that has been impacted by development and stormwater/combined sewer discharges into the waters, resulting in degraded water and habitat quality including sediment contamination.

In New Jersey, surface waters are classified based on the type of waterbody and the designated use of the waterbody. New Jersey saline waters are classified as saline estuarine (SE) and saline coastal (SC). SE waters are classified into SE1, SE2, and SE3 based on their designated uses. The Lower Hudson River Estuary is classified by NJDEP as a Class SE2 (fishing/fish propagation) saline/estuarine surface water. The recommended best uses of Class SE2 waters are secondary contact recreation and fishing. The water quality should be sufficient for maintenance; migration; and propagation of the natural and established biota, migration of diadromous fish, maintenance of wildlife, and any other reasonable uses. Additionally, SE2 waters possess an anti-degradation designation under the classification of Category Two waters, which are protected from any measurable change in existing water quality. However, some lowering of existing water quality may be allowed by the NJDEP based on a social or economic justification.

The NJDEP is responsible for conducting and coordinating water quality assessments for all waters of the state. These assessments are reported through the New Jersey Integrated Water Quality Monitoring and Assessment Report (Integrated Report). The Integrated Reports provide effective tools for maintaining high-quality waters and improving the quality of waters that do not attain their designated uses (i.e., contain impaired water bodies). The Integrated Reports describe progress toward attainment of the designated uses of surface waters of the State, as specified in the New Jersey Surface Water Quality Standards (NJAC 7:9B). These include aquatic life, recreation, drinking water, fish/shellfish consumption, and industrial and agricultural uses.

Water quality monitoring data used for the 2012 Integrated Report was generally collected between January 1, 2006 and December 31, 2010 and was used to identify high-quality waters that are fully supporting applicable designated uses, low-quality waters that are not supporting designated uses, and waters for which insufficient information is available to assess water quality. The Integrated Report also identified causes and sources of water quality problems so that appropriate strategies may be implemented by the State to maintain high-quality waters, improve low-quality waters, and gather sufficient information to assess all waters of the state.

The information provided in the Integrated Report is used by Congress, USEPA, and the State of New Jersey to establish program priorities and funding for federal and state water resource management programs for maintaining and restoring water quality including the development of Total Maximum Daily Loads (TMDLs) for waters that do not meet surface water quality standards despite the implementation of technology-based effluent limits, as identified on the List of Water Quality Limited Waters (303(d) List). A TMDL serves as a planning tool and potential starting point for restoration or protection activities with the ultimate goal of attaining or maintaining water quality standards.

Table 4.2 summarizes the NJDEP's 2012 water quality findings for the Lower Hudson River Estuary.

Furthermore, the Lower Hudson River Estuary is an urban estuary that has been impacted by runoff from development and stormwater/combined sewer discharges into the waters. These events have resulted in degraded water quality and sediment contamination.

Table 4.3 summarizes the NJDEP's findings in its 2012 causes of surface water quality impairment studies for the Lower Hudson River Estuary.

Regarding the tides, representative tide data for the Study Area is provided by the National Oceanic and Atmospheric Administration (NOAA) tide station for Union City, New Jersey. This tide station (No. 8530645) is approximately 1,000 feet north of the Study Area. The mean tidal range at this site is approximately 4.5 feet. The astronomical spring tidal range is approximately 5.29 feet, which is the difference between the mean high water spring (MHWS) elevation and the mean low water spring (MLWS) elevation.

Table 4.3 Water Quality Causes of Impairment Reporting Year 2012 Lower Hudson River Estuary HUC NJ02030101170030-01

CAUSE OF IMPAIRMENT	CAUSE OF IMPAIRMENT GROUP	DESIGNATED USE(S)	STATE TMDL DEVELOPMENT STATUS
Benzo[a]pyrene (PAHs)	Toxic Organics	Fish Consumption	TMDL needed
Cause Unknown	Cause Unknown	Aquatic Life	TMDL needed
Chlordane in Fish Tissue	Pesticides	Fish Consumption	TMDL needed
DDT in Fish Tissue	Pesticides	Fish Consumption	Non-pollutant impairment
Dieldrin	Pesticides	Fish Consumption	TMDL needed
Dioxin (Including 2,3,7,8-TCDD)	Dioxins	Fish Consumption	TMDL needed
Hexachlorobenzene	Pesticides	Fish Consumption	TMDL needed
Mercury in Fish Tissue	Mercury	Fish Consumption	TMDL needed
PCB(s) in Fish Tissue	Polychlorinated Biphenyls (PCBs)	Fish Consumption	TMDL needed

Source: NJDEP, 2014. Division of Water Monitoring and Standards, Bureau of Water Quality Standards and Assessment. 2012 New Jersey Integrated Report Appendix B: Final 2012 303(d) List of Water Quality Limited Waters. Available online at http://www.nj.gov/dep/wms/bears/docs/2012_final_303(d)_list.pdf

4.1.2.5 Floodplains

Regulatory Setting

Floodplains are regulated by a variety of both state and federal rules and regulations. Executive Order (EO) 11988 Floodplain Management (1977) 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 or indirect support of floodplain development wherever there is a practicable alternative."

FEMA has primary federal jurisdiction for administration of EO 11988. FEMA guidance for compliance with EO 11988 is found at 44 CFR 9. HUD has issued additional guidance (24 CFR 55.20) for compliance with EO 11988. HUD guidance has established an eight-step process for compliance with the executive order, starting with early public notification. The eight-step process would be accomplished through completion of the EIS for the Project, this process is summarized in Attachment 7.

EO 13690 (2015) Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input amended EO 11988, and established the Federal Flood Risk Management Standard (FFRMS) to improve the Nation's resilience to current and future flood risks, which are anticipated to increase over time due to the effects of climate change and other threats. EO 13690 and the FFRMS reinforce the important tenets and concepts articulated in EO 11988, such as avoiding adverse impacts associated with actions in a floodplain and minimizing potential harm if an action must be located in a floodplain. EO 13690 and the FFRMS expand upon these tenets and concepts by calling for agencies to use a higher vertical flood elevation and corresponding horizontal floodplain than the base flood for federally-funded projects to address current and future flood risk so that projects last as long as intended.

Flood Hazard Area Control Act, NJSA 58:16A, and Rules at NJAC 7:13

Within New Jersey, the Flood Hazard Area Control Act protects rivers, lakes, and streams (including their floodplains and riparian zones) and is regulated by the NJDEP DLUR. The regulated floodplain is the area that would be covered by water during the 100-year storm event, a storm that has a one in 100 chance of occurring in any given year. Most activities regulated under this program include the placement of structures or fill in a floodplain that could block or displace floodwaters. Activities within the riparian zone of regulated watercourses are also covered under this program. Riparian buffers typically extend 50 feet from the top of bank (or mean high water line in the case of a tidal waterbody). The riparian zone extends 150 feet from top of bank or the mean high water line for waters inhabited by threatened or endangered species.

New Jersey's Stormwater Management rules (NJAC 7:8) are implemented by the NJDEP through the review of permits issued by the DLUR (Flood Hazard Area, Freshwater Wetlands, CAFRA, Waterfront Development, and Coastal Wetlands). The Stormwater Management rules are also implemented by local authorities through the Municipal Land Use Law (MLUL) and the Residential Site Improvement Standards (RSIS). Per the New Jersey Department of Community Affairs, the RSIS are applicable to any residential application that goes before a local board. Through the RSIS, the stormwater rules are activated whenever a municipality requires the control of runoff from a site that is the subject of a site or subdivision application. Therefore, consistent with its duly adopted ordinances, a municipality may require compliance with the stormwater rules through the RSIS whether or not a development is a "major development" as defined in the stormwater rules; however, local implementation may differ, particularly with regard to municipal jurisdiction. Consequently, municipal ordinances must be examined to determine development thresholds at which the stormwater rules would apply. The rule clarification and interpretation offered herein is consistent with the current application of the stormwater rules by the DLUR and do not supersede local authority under the MLUL. New Jersey Flood Hazard Area Control Act rules at NJAC 7:13 require either acquisition or written concurrence from any landowner whose property is adversely affected by increased flooding as a result of permitted action within a floodplain.

4.1.2.5.1 *Floodplain Zones*

Before Superstorm Sandy, FEMA's Region II office had begun a coastal flood study to update Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) reports for portions of coastal New York and New Jersey using improved methods and data to better reflect coastal flood risk. After Sandy, FEMA released Advisory Base Flood Elevation (ABFE) maps for certain communities based on the partially-completed flood study, which were designed to help in rebuilding and recovery efforts. After the completion of the ABFE maps, FEMA released (and continues to release) preliminary work maps for certain communities which include the full results of the coastal flood study. Preliminary FIRMs for Hudson County were released on January 30, 2015. The flood hazard areas shown on the preliminary FIRMs are used to determine flood insurance rates and requirements and where floodplain development regulations apply.

Seventy-three percent of the Study Area is located in the one-percent annual chance floodplain (also known as the 100-year floodplain), which limits the type of development permitted on the ground floor of buildings in these areas.

Areas susceptible to flooding within the Study Area are primarily identified in two categories: 'AE' and 'VE' zones, with varying base flood elevations. Coastal 'AE' zones include areas where base flood elevations have been determined. These are typically inland areas where the potential for breaking waves is smaller. Coastal high hazard areas, or 'VE' zones, are the areas closest to the shoreline and most susceptible to significant wave action. As a result, properties that fall within a 'VE' zone are most likely to suffer damage due to flooding. Areas depicted as 'X Shaded' are also shown, which indicates areas of 0.2-percent annual chance flood. The "island" effect of Hoboken is evident on the new topographical mapping, which shows features of Hoboken's natural landscape. The highest elevations are found at Castle Point, the location of Stevens Institute of Technology; along Hudson, Washington, and Bloomfield Streets; as well as several adjoining areas. These areas have the lowest potential to flood.

4.1.2.6 Aquatic Ecology

The Study Area is located near the southern end of the Lower Hudson River Estuary, which is typically defined as running from the tip of Battery Park, Manhattan, generally referred to as River Mile (RM) 0, north to the Stony Point area, RM 41. The Study Area contains just over two miles of shoreline from the northern portion of Jersey City, along all of Hoboken, to the southern portion of the Weehawken waterfront (approximately RM 2 to 4). The New York/New Jersey Harbor Estuary, including the Lower Hudson River Estuary, supports a diverse and productive aquatic community of over 100 species of finfish, more than 100 invertebrate species, and a variety of phytoplankton and zooplankton. Marine mammals and sea turtles also occasionally occur in the New York/New Jersey Harbor estuary. The following sections of the DEIS provide a brief description of the aquatic biota found in the harbor estuary, focusing on the lower Hudson River. The discussion in this section reflects the aquatic biota across the entire Lower Hudson River Estuary and may include a greater number of species than is found in the Study Area or the natural ecosystems analysis area.

Regulatory Setting

Several regulations are applicable to the aquatic ecology within the Study Area, including the Magnuson-Stevens Fishery Conservation and Management Act, the Endangered Species Act, and the Fish and Wildlife Coordination Act.

Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 to 1883)

Section 305(b)(2)-(4) of the Magnuson-Stevens Fishery Conservation and Management Act outlines the process for the NMFS and the Regional Fishery Management Councils (in this case, the Mid-Atlantic Fishery Management Council) to comment on activities proposed by federal agencies (issuing permits or funding projects) that may adversely impact areas designated as essential fish habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC §1802(10)).

Seventy-three percent of the Study Area is located in the one-percent annual chance floodplain (also known as the 100-year floodplain), which limits the type of development permitted on the ground floor of buildings in these areas.

The Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) protects all marine mammals, including cetaceans (whales, dolphins, and porpoises), pinnipeds (seals and sea lions), sirenians (manatees and dugongs), sea otters, and polar bears within the waters of the United States.

The Endangered Species Act (ESA) of 1973

The ESA recognizes that endangered species of wildlife and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. The ESA prohibits the importation, exportation, taking, possession, and other activities involving illegally-taken species, as well as interstate or foreign commercial activities. The ESA also provides the protection of critical habitats on which endangered or threatened species depend for survival. Consultation under Section 7 of the ESA is required for any federal activities which "may affect" listed species.

The Fish and Wildlife Coordination Act (16 USC 661-666)

The Fish and Wildlife Coordination Act (FWCA) provides assistance for the cooperation of Federal and State agencies to protect land and waters recognized as vital wildlife resources to the nation. The FWCA provides NOAA fisheries with recommendations to conserve EFH. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources" within the natural ecosystems analysis area.

Below is a discussion of phytoplankton, zooplankton, benthic bnvertebrates, finfish, submerged aquatic vegetation and benthic algae, essential fish habitat, species of interest to NMFS, marine mammals, and marine species.

Affected Environment

Phytoplankton

Phytoplankton are microscopic plants whose movements within the system are largely governed by prevailing tides and currents. Diatoms such as *Skeletonema costatum* and *Thalassiosira* spp. generally dominate the phytoplankton community within the Lower Hudson River Estuary, with lesser contributions from dinoflagellates and green algae (Brosnan and O'Shea 1995). Phytoplankton sampling in the Lower Hudson River over a 10-year period between 1991 and 2000 resulted in the collection of a total of 71 taxa. The most frequently collected taxa were *Nannochloris atomus* (found in 98 percent of the samples) and *Skeletonema costatum* (52 percent) (NYCDEP 2007a). Phytoplankton sampling near Pier 26 on the Hudson River from 1996 through 2003 indicated that the most dominant species were *Asterionella japonica, Chaetoceros subtilis, Coscinodiscus excentricus, Ditylum brightwelli, Eucampia zodiacus, cf. Gyrosigma sp., Nitzchia reversa, cf. Pseudonitzchia seriata, Rhizosolenia setigera*, and *Ebria tripartite* (Levandowsky and Vaccari 2004). While nutrient concentrations in most areas of New York Harbor are very high, low-light penetration has often precluded the occurrence of phytoplankton blooms.

Zooplankton

Zooplankton are an integral component of aquatic food webs. Zooplankton are the primary grazers on phytoplankton and detritus material and are themselves used by organisms of higher trophic levels as food. The higher-level consumers of zooplankton typically include forage finfish, such as bay anchovy (*Anchoa mitchilli*), as well as commercially and recreationally important species, such as striped bass (*Morone saxatilis*) and white perch (*Morone americana*) during their early life stages. Zooplankton sampling in the Hudson River over a 10-year period between 1991 and 2000 resulted in the collection of a total of 16 taxa. The most frequently collected taxa were *Tintinnopsis* spp. (31 percent) and Nauplius (first larval stage) of copepods (25 percent) (NYCDEP 2007a).

Benthic Invertebrates

The major groups of benthic invertebrates collected in the estuary include aquatic worms (oligochaetes), segmented worms (polychaetes), snails (gastropods), bivalves, barnacles, cumaceans, amphipods, isopods, crabs, and shrimp (EEA 1988; EA Engineering Science and Technology 1990; Coastal 1987; PBS&J 1998. Bain et al (2006)). A total of 145 benthic invertebrate taxa were collected in Hudson River Park between July 2002 and June 2004. Examples of abundant species include the polychaetes *Mediomastus* spp., *Streblospio benedicti*, *Leitoscoloplos* spp., *Heteromastus* sp., *Spio setosa*, and *Tharyx* spp; the bivalves *Mulinia lateralis* and *Tellina agilis*; oligochaetes; the gastropods A*cteocina canaliculata* and *Rictaxis punctostriatus*; and the crustacean *Leucon* sp. (Bain et al. 2006).

Submerged Aquatic Vegetation and Benthic Algae

Submerged aquatic vegetation (SAV) are rooted aquatic plants that are often found in shallow areas of estuaries, at water depths of up to six feet at low water (Holochuck 2000). The depth of the water column adjacent to the hardened shoreline in the natural ecosystems analysis area ranges from six to 18 feet. Limited light penetration restricts the presence of SAV in the vicinity of the natural ecosystems analysis area (Olson et al. 1996). The extensively-developed shorelines that are present, as well as the swift currents, also severely limit colonization of this area by SAV. According to NWI, vascular subtidal estuarine vegetation is not mapped in the natural ecosystems analysis area. Furthermore, due to the depth and light limitations of the natural ecosystems analysis area, SAV is not mapped by either the NJDEP or NOAA. Discussions with Karen Greene of NOAA confirmed that SAV is not expected to be present in the natural ecosystems analysis area.

The Hudson River Estuary acts as a spawning ground, migratory pathway, and a nursery/foraging area for a wide variety of fish species.

Benthic macroalgae are large multicellular algae that are important primary producers in the aquatic environment. Species of macroalgae that occur in the Harbor Estuary include sea lettuce (Ulva spp.), green fleece (Codium fragile), and brown algae (Fucus spp.) (PBS&J 1998).

Finfish

The fish community in the Lower Hudson River is typical of large coastal estuaries and inshore waterways along the Mid-Atlantic Bight. It supports a variety of estuarine, marine, and anadromous fish species. The Hudson River Estuary acts as a spawning ground, migratory pathway, and a nursery/foraging area for a wide variety of fish species.

Many of the species that are seasonally abundant in the Lower Hudson Estuary are transient or migratory species, moving through the area to upstream spawning grounds or entering the area on a seasonal basis from nearby ocean waters. These include the estuarine migratory species that depend on the Lower

Hudson Estuary primarily as a nursery, or as a forage area for juveniles or adults. Striped bass are among those species that rely on the estuary as a nursery and forage area for juveniles and adults. Species that frequent the Lower Hudson Estuary during similar life stages include both marine and estuarine predators such as winter flounder (*Pseudopleuronectes americanus*), (*Pomatomus saltatrix*), and summer flounder (*Paralichthys dentatus*). These fish migrate in and out of the estuary on a seasonal basis depending on spawning area (estuarine vs. marine) and the period (winter vs. summer).

Estuarine species tolerate the naturally wide-range and abrupt changes in salinity from tidal freshwater to marine environments (0.5 to 30 parts per thousand, or ppt). These species generally begin spawning in late spring and continue through most of the summer. Most life stages of these species may be found in the Lower Hudson Estuary throughout the year. These species provide an important forage base for larger predatory species.

Previous biological investigations have characterized the seasonal distribution and composition of the fish community in various habitats and areas of the Lower Hudson Estuary. Fish sampling was conducted in the Arthur Kill, Kill Van Kull, and Newark Bay in 1984-1985 (USACE, 1986), as well as from April 1995 to March 1996 (LMS 1996). Sampling specific to Newark Bay was conducted in 1987-1988 (Will and Houston, 1988) and from May 1993 to April 1994 (NMFS 1994).

The NJDEP conducted fish surveys of the Upper Bay of New York Harbor/Hudson River estuary and collected 23 fish species, dominated by five species: bay anchovy (*Anchoa mitchilli*), winter flounder, American shad (*Alosa sapidissima*), Atlantic tomcod (*Microgadus tomcod*), and alewife (*Alosa pseudoharengus*). Fish were most abundant in the spring and summer. Salinity varied over the year from three to 26 ppt and temperature from 35.6 to 77.9°F (2.0 to 25.5°C). The NJDEP survey area exhibits low dissolved oxygen (DO) concentrations during the stratified spring and summer periods. Bottom DO was 2.8 to 3.8 milligrams per liter (mg/l). It was theorized that fish utilize the area for shelter and reduced current velocities and that adjacent shoal and pier structures may represent important juvenile feeding areas.

In the New Jersey portion of the Lower Hudson River to Piermont, 40 fish species and 26 invertebrates were collected. The most abundant species collected throughout the area were alewife, American eel (*Anguilla rostrata*), American shad, Atlantic tomcod, bay anchovy, blueback herring (*Alosa aestivalis*), hogchoker (*Trinectes maculatus*), striped bass, white perch, and winter flounder. The area between Jersey City and Edgewater, RM 1.5 to 8.8, was found to be an important overwintering habitat for striped bass. Salinities ranged from 0 to 26 ppt, and in temperature from 35.6 to 82.4°F (2.0 to 28.0°C); DO was stratified throughout the area, with lower values in the bottom waters. DO levels generally above 4.0 mg/l were observed; however, certain lagoon, interpier, and combined sewer overflow areas caused locally depressed DO.

A number of species of interest have been identified by the NMFS within the natural ecosystems analysis area. This includes both species with EFH established pursuant to Section 303(a)(7) of the Magnuson-Stevens Fishery Conservation and Management Act and species identified pursuant to the Fish and Wildlife Coordination Act. EFH provisions are intended to prevent, mitigate, or minimize adverse effects of fishing on species of interest. The EFH within the Natural Ecosystem Analysis Area was determined from the NMFS Estuarine Tables and **Table 4.4** presents the results from these tables including species life stages. These are species of finfish, mollusks, and crustaceans, whose habitats have been identified and described by NMFS and the regional fishery management councils as necessary to fish for spawning, breeding, feeding, or growth to maturity.

NMFS has identified the following additional species in comments provided pursuant to the Fish and Wildlife Coordination Act: Atlantic tomcod, striped bass, alewife, blueback herring, and American shad (see Appendix B for email communication dated August 25, 2015).

Striped Bass

Striped bass are anadromous fish. They spawn in freshwater rivers but live their adult lives in the ocean. In New York/New Jersey, the Hudson River is the main spawning ground for striped bass. In the spring, mature striped bass swim up the Hudson River to spawn. The fertilized eggs float downstream until hatching a few days after spawning. The bass larvae continue to move downstream until they reach the estuary in areas such as Haverstraw Bay to the Tappan Zee Bridge. These areas function as nursery areas for the larvae and juvenile fish during the summer. By late summer and into fall, these "young-of-the-year" fish move into the estuaries of New York Harbor and western Long Island bays, where they will live until they are large enough to join the adults off the coast. Adult striped bass follow a seasonal migration pattern. They swim south and offshore from New York waters during the winter and migrate back north and inshore in the spring. In the spring, mature adults once again head upriver to spawn.

Photograph 4.1 American Shad

American Shad

The shad (see **Photograph 4.1**) spends most of its life in the Atlantic Ocean, but swims up freshwater rivers, including the Hudson River, to spawn. Northern populations are iteroparous and may survive breeding, return to the sea, and then return to freshwaters to spawn several more times. The transparent fertilized eggs are carried along by the current. The larvae hatch in four to 12 days. Juvenile shad spend their first summer in freshwater. By autumn, the young shad

Table 4.4 Life Stages of Fish Species of Interest to NMFS, which may be found in the Natural Ecosystems Analysis Area

SPECIES	EGGS	LARVAE	JUVENILES	ADULTS
Atlantic cod (Gadus morhua)				
haddock (Melanogrammus aeglefinus)				
pollock (Pollachius virens)				
whiting (Merluccius bilinearis)				
offshore hake (Merluccius albidus)				
red hake (Urophycis chuss)		X	X	X
white hake (Urophycis tenuis)				
redfish (Sebastes fasciatus)	n/a			
witch flounder (Glyptocephalus cynoglossus)				
winter flounder (Pseudopleuronectes americanus)	X	X	X	X
yellowtail flounder (Limanda ferruginea)				
windowpane flounder (Scophthalmus aquosus)	X	X	X	X
American plaice (Hippoglossoides platessoides)				
ocean pout (Macrozoarces americanus)				
Atlantic halibut (Hippoglossus hippoglossus)				
Atlantic sea scallop (Placopecten magellanicus)				
Atlantic sea herring (Clupea harengus)		X	X	X
monkfish (Lophius americanus)				
bluefish (Pomatomus saltatrix)			X	X
long finned squid (Loligo pealeii)	n/a	n/a		
short finned squid (Illex illecebrosus)	n/a	n/a		
Atlantic butterfish (Peprilus triacanthus)		X	X	X
Atlantic mackerel (Scomber scombrus)			X	X
summer flounder (Paralichthys dentatus)		X	X	X
scup (Stenotomus chrysops)	X	X	X	
black sea bass (Centropristis striata)	n/a		X	X
surf clam (Spisula solidissima)	n/a	n/a		
ocean quahog (Artica islandica)	n/a	n/a		
spiny dogfish (Squalus acanthias)	n/a	n/a		
tilefish (Lopholatilus chamaeleonticeps)				
king mackerel (Scomberomorus cavalla)	X	X	X	X
Spanish mackerel (Scomberomorus maculatus)	X	X	X	X
cobia (Rachycentron canadum)	X	X	X	X
sand tiger shark (Carcharias taurus)		X		
sandbar shark (Carcharhinus plumbeus)		X		X

Source: NOAA EFH Mapper, NMFS consultation, 2016.

gather in schools and swim to the ocean. They will live in the ocean for three to six years, until sexually mature, then return to freshwater to complete their life cycle. Like other herring, the American shad is primarily a plankton feeder, but will eat small shrimp and fish eggs. Occasionally they eat small fish, but these are only a minor item in their general diet. The sexually mature fish enter coastal rivers in spring or early summer, usually when the river water has warmed to 50 to 55 °F (10 to 13 °C). Cooler water appears to interrupt the spawn. Spawning occurs in May and June in northern streams, generally from Delaware to Canada.

Atlantic Tomcod

The Atlantic tomcod is strictly found in inshore waters, including the Hudson River. Tomcod spawn in the shoal waters of estuaries, in stream mouths, in either salt or brackish water. The spawning season lasts from November to February with the height of production in January. The eggs sink to the bottom where they stick together in masses, or to seaweeds, stones, or any available support. The fry remain through their first summer in the waters where they are hatched.

Alewife

The alewife is an anadromous species of herring found in North America. The alewife spawns in April and May in shallow freshwaters. They scatter their eggs over sand or gravel substrate and provide no parental care. They feed on a wide variety of plankton.

Blueback Herring

The blueback herring (see **Photograph 4.2**) or blueback shad is an anadromous species of herring

Photograph 4.2 Blueback Herring

from the east coast of North America. Blueback herring form schools and are believed to migrate offshore to overwinter near the bottom. It is one of the typical North American shads.

This fish is anadromous, living in marine systems and spawning in deep, swift freshwater rivers with hard substrates. It migrates to spawning grounds in the spring (late March through mid May). During spawning, many eggs are deposited over the stream bottom, where they stick to gravel, stones, logs, or other objects. Adults migrate quickly downstream to the ocean after spawning. Juveniles spend three to seven months in freshwater and then migrate to the ocean. The blueback shad is a planktivorous forage species.

Further consultation with NMFS under Section 7 of the Endangered Species Act and Section 303 of the Magnuson-Stevens Fishery Conservation and Management Act has been conducted with respect to these species with a determination of Not Likely to Adversely Affect (see Section 4.1.3.6 and Appendix B).

Marine Mammals

Humpback whales (*Megaptera novaeangliae*) and fin whales (*Balaenoptera physalus*) have occasionally made their way into the Lower Hudson River Estuary. In addition, bottlenose dolphins (*Tursiops truncatus*), harbor seals (*Phoca vitulina*), grey seals (*Halichoerus gryphus*), and harp seals (*Pagophilus groenlandicus*) have occasionally been observed in the Lower Hudson River Estuary. Harbor seals sporadically appear in the Hudson River in the vicinity of the Jersey City-Hoboken border.

4.1.2.6.1 *Marine Species Listed Pursuant to the Endangered Species Act*

Within the natural ecosystems analysis area, there are two marine species which may occur that have been listed pursuant to the ESA. These species are the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrinchus*). The shortnose sturgeon was listed as endangered throughout the species range in 1967. There has been substantial progress toward recovery for this species in the Hudson River. The Distinct Population Segment of the Atlantic sturgeon in the New York Bight was listed as endangered in 2012. In June 2016, NMFS proposed Critical Habitat for the Atlantic sturgeon throughout its range in the New York Bight, including those waters within the natural ecosystems analysis area. Furthermore, the NJDEP Landscape Project Version 3.1 indicates that the natural ecosystems analysis area has been used as a migration corridor for the state-listed shortnose sturgeon.

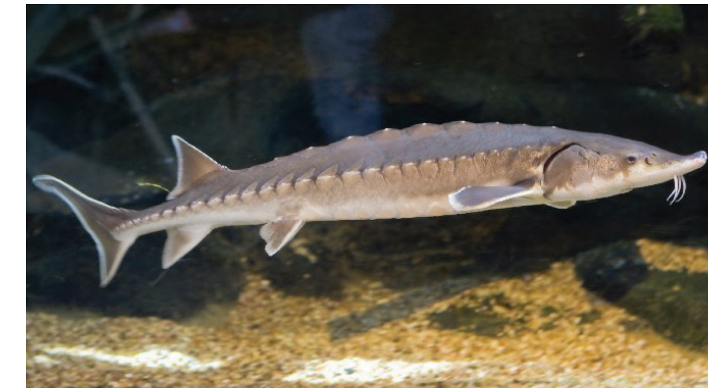
Photograph 4.3 Shortnose Sturgeon

Pursuant to Section 7 of the ESA, federal agencies must consult with respect to all actions authorized and/or funded to be carried out that have the potential to impact listed species. Since certain project actions may impact these listed species and proposed critical habitat, Section 7 consultation with NMFS was required (see Section 4.1.3.6 and Appendix B).

Shortnose Sturgeon

The shortnose sturgeon (see **Photograph 4.3**) is restricted in range to the Atlantic seaboard in North America. It occurs in estuaries and large coastal rivers. In New York State, it is found in the Lower Hudson River Estuary from the southern tip of Manhattan upriver to the Federal Dam at Troy. Using their barbels to locate food, shortnose sturgeon eat sludge worms, aquatic insect larvae, plants, snails, shrimp, and crayfish. The shortnose sturgeon is protected as an endangered species and must be released without harm whenever taken.

The shortnose sturgeon is semi-anadromous. Each year, between April and May, most adult sturgeon migrate from a single overwintering site in the Hudson



Photograph 4.4 Atlantic Sturgeon

River channel near Kingston to spawn in freshwater sites located slightly downstream of the Troy Dam. Kingston and Troy Dam are both located more than 100 miles to the north of Hoboken. Males spawn every other year and females every third year. Eggs are deposited and hatch in approximately 13 days. The newly-hatched fry are poor swimmers and drift with the currents along the bottom. As they grow and mature, the fish move downriver into the most brackish waters of the Lower Hudson River Estuary. Smaller than the Atlantic sturgeon, the shortnose sturgeon grows up to four feet long.

The potential life stages for this species which could occur in the Study Area include juveniles and adults (see **Table 4.4**).

Atlantic Sturgeon

Atlantic sturgeon (see **Photograph 4.4**) may live more than 60 years, reaching a weight of 800 pounds and a length of fourteen feet. Sturgeon are bottom feeders, using whisker-like barbels on the underside of their snouts to find food–chiefly worms, insects, crustaceans, and small fish–that is sucked up in their tube-like mouths. While they prefer deep water, sturgeons occasionally bask at the surface and leap into the air.

Atlantic sturgeons spend most of their lives in ocean waters near estuaries. Adults spawn in freshwater from May through July, mainly from Hyde Park to Catskill. Spawning sturgeon scatter the eggs across a wide area. The eggs are sticky and attach themselves to stones and vegetation. Young fish may stay in the Hudson River in freshwater for two to seven years before going to sea. As they grow, they feed on a variety of benthic or bottom organisms including worms, amphipods, isopods, midge larvae, plants, and small fishes. Males return to spawn as early as age 12. Females return closer to age 20.

The potential life stages for this species that could occur in the Study Area include juveniles and adults (see **Table 4.4**).

4.1.2.7 Coastal Resources

Regulatory Setting

The coastal resources of the New York/New Jersey Lower Hudson River Estuary include habitats and ecosystems located within coastal zones, waterfront, and tidelands. They are maintained and protected under the following regulations.

Coastal Zone Management Act, 1972

The Coastal Zone Management Act (CZMA) encourages the management of coastal zone areas and provides grants to be used in maintaining coastal zone areas. It requires that federal agencies be consistent in enforcing the policies of state coastal zone management programs when conducting or supporting activities that affect a coastal zone. It is intended to verify that federal activities are consistent with state programs for the protection of and, where possible, enhancement of the nation's coastal zones.

The CZMA definition of a coastal zone includes coastal waters extending to the outer limit of state submerged land title and ownership, adjacent shorelines, and land extending inward to the extent necessary to control shorelines. A coastal zone includes islands, beaches, transitional, and intertidal areas, as well as salt marshes.

Waterfront Development Act, NJSA 12:5-3, and Rules at NJAC 7:7

The Waterfront Development Act regulates activities on lands in or near tidally flowed waters. Activities regulated under this program include placement of structures, fill, or dredging within or over a tidally-flowed waterway and development adjacent to a tidally-flowed waterway. A Waterfront Development Permit is needed for projects that develop waterfront near or on any tidal or navigable waterway. Waterfront development can include docks, wharfs, piers, bulkheads, bridges, pipelines, cables, pilings, filling, dredging, or removal of sand or other materials from lands under all tidal waters and limited upland construction within up to 500 feet of tidally flowed waters. The regulated area extends from the mean high water line to the first paved public road, railroad, or surveyable property line. At a minimum, the zone extends at least 100 feet, but no more than 500 feet inland from the tidal water body.

Tidelands Act, NJSA 12:3-1

The Tidelands Act protects all lands owned by the State of New Jersey that are now tidally flowed or were formerly tidally flowed by the mean high tide. Projects that include building in or near tidal waters may need a grant, lease, or license from the state for portions of the Project occurring on state-owned lands. The NJDEP Bureau of Tidelands Management manages this program.

Tidelands, also known as riparian lands, are lands that currently and formerly flowed by the mean high tide of a natural waterway. The State of New Jersey claims ownership of these tidelands and holds them in trust for the people of the state under the Public Trust Doctrine. Since tidelands are public lands, written permission from the state must be obtained and a fee must be paid in order to use these lands. Common uses of tidelands include docks, mooring piles, bulkheads, and other fill materials. Some tidelands may be sold in the form of a Riparian Grant while others may only be rented through either a Tidelands License or Lease. Current policy is to issue grants only for historic (filled) tidelands. That is, the State of New Jersey no longer sells currently flowed tidelands. Exceptions are sometimes made when the area of the Tidelands Claim is now part of an artificial waterway, such as a lagoon, or in the case of public infrastructure, such as a bridge.

> *The properties/right-of-ways (ROWs) identified ... may still be owned by the state under the tidelands program. To definitively identify ownership, a review of state grants and/or a property title search would be required.*

Affected Environment

Most of the Hudson River waterfront is within the 500-foot jurisdictional limit of the Waterfront Development Act. Therefore, approval by the NJDEP DLUR would be required for construction within the regulated area(s). In addition, approval by the NJDEP Bureau of Tidelands Management may be required for project activities on mapped, state-owned tidelands that have not been conveyed to public or private parties.

A review of the NJDEP Tideland Maps (686-2172, 693-2172, 693-2178, 700-2172, 700-2178) that cover the Study Area was conducted at the NJDEP Bureau of Tidelands office. The review revealed that large portions of the Study Area waterfront, as well as former watercourses located within the 100-year floodplain of the Study Area, have been filled in the past. The majority of these former tideland areas have been granted to private and/or public parties by the State of New Jersey, although some former tidelands may still be owned by the state. All of the former tidelands located along the waterfront have been granted in the past to public or private parties. The former tidelands that appear to remain in state ownership are summarized in **Table 4.5** and are

Table 4.5 Summary of Tideland Map Reviews

TIDELAND MAP NO.	MUNICIPALITY BLOCK/LOT	REASON FOR POTENTIAL TIDELAND CLAIM	PROPOSED STRUCTURE/PUBLIC OR PRIVATE PROPERTY
693-2172	Jersey City Bl 6002, Lot 4 Bl 6002, Lot 5 Bl 6002, Lot 6	Former Ahasimus Creek	Resist structure Private (Lot 4) Public (Lot 5 - NJ TRANSIT) Public (Lot 6 - NJDOT)
	Hoboken Observer Highway	Former shoreline of Hudson River	Resist structure/ Underground stormwater storage tank / piping Public ROW
	Hoboken Marshall Street Paterson Street	Former Hoboken Creek	Underground conveyance or discharge piping Public ROW
	Hoboken Grand Street	Former Hoboken Creek	Underground stormwater storage tanks / piping Public ROW
	Hoboken Bl 35, Lot 6 Bl 45, Lot 1 Bl 46, Lot 1 Bl 55, Lot 1 Bl 64, Lot 1	Former Hoboken Creek	Underground conveyance or discharge piping Public (Hoboken Housing Authority)
700-2172	Hoboken Madison Street	Former Sluice Creek	Underground conveyance or discharge piping Public ROW
	Hoboken Willow Street 17th Street	Former Sluice Creek	Underground conveyance or discharge piping Public ROW
	Hoboken Bl 136, Lot 6.01	Former Sluice Creek	Underground conveyance or discharge piping Public (NJ TRANSIT)
	Hoboken Bl 146, Lot 1	Former Sluice Creek	Underground conveyance or discharge piping Public (NJ TRANSIT)

Source: NJDEP Bureau of Tidelands, Sheet 693-2172, Sheet 686-2172, Sheet 700-2178 and Sheet 693-2178.

depicted in **Figure 4.9**) The properties/right-of-ways (ROWs) identified above may still be owned by the state under the tidelands program. To definitively identify ownership, a review of state grants and/or a property title search would be required.

4.1.2.8 Wetlands

Regulatory Setting

The term wetlands refers to those areas that are inundated by surface water or groundwater with a frequency sufficient to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, wet meadows, river overflows, mud flats, and natural ponds. They are protected under several federal and state regulations including EO 11990 (1977), the Federal Clean Water Act, and the New Jersey Freshwater Wetlands Protection Act. Invasive species often colonize wetland areas and were identified within the Study Area. EO 13112 (1999) directs federal agencies to work together to prevent the introduction of invasive species and provide for their control.

Executive Order 11990 - Protection of Wetlands, 1977

Federal policy recognizes that wetlands have unique and significant public values and calls for the protection of wetlands. Policy directives set forth in EO 11990 are:

a. Avoid long- and short-term adverse impacts associated with the destruction or modification of wetlands;

b. Avoid direct or indirect support of new construction in wetlands;

c. Minimize the destruction, loss, or degradation of wetlands;

d. Preserve and enhance the natural and beneficial values served by wetlands; and

e. Involve the public throughout the wetlands protection decision-making process.

HUD has issued additional guidance (24 CFR 55.20) for compliance with EO 11990. The HUD guidance establishes an eight-step process for compliance with the executive order, starting with early public notification. The eight-step process would be accomplished through completion of the EIS for the Project. This process is summarized in Attachment 7 of this document.

Federal Water Pollution Control Act (33 USC §§ 1251 TO 1387)

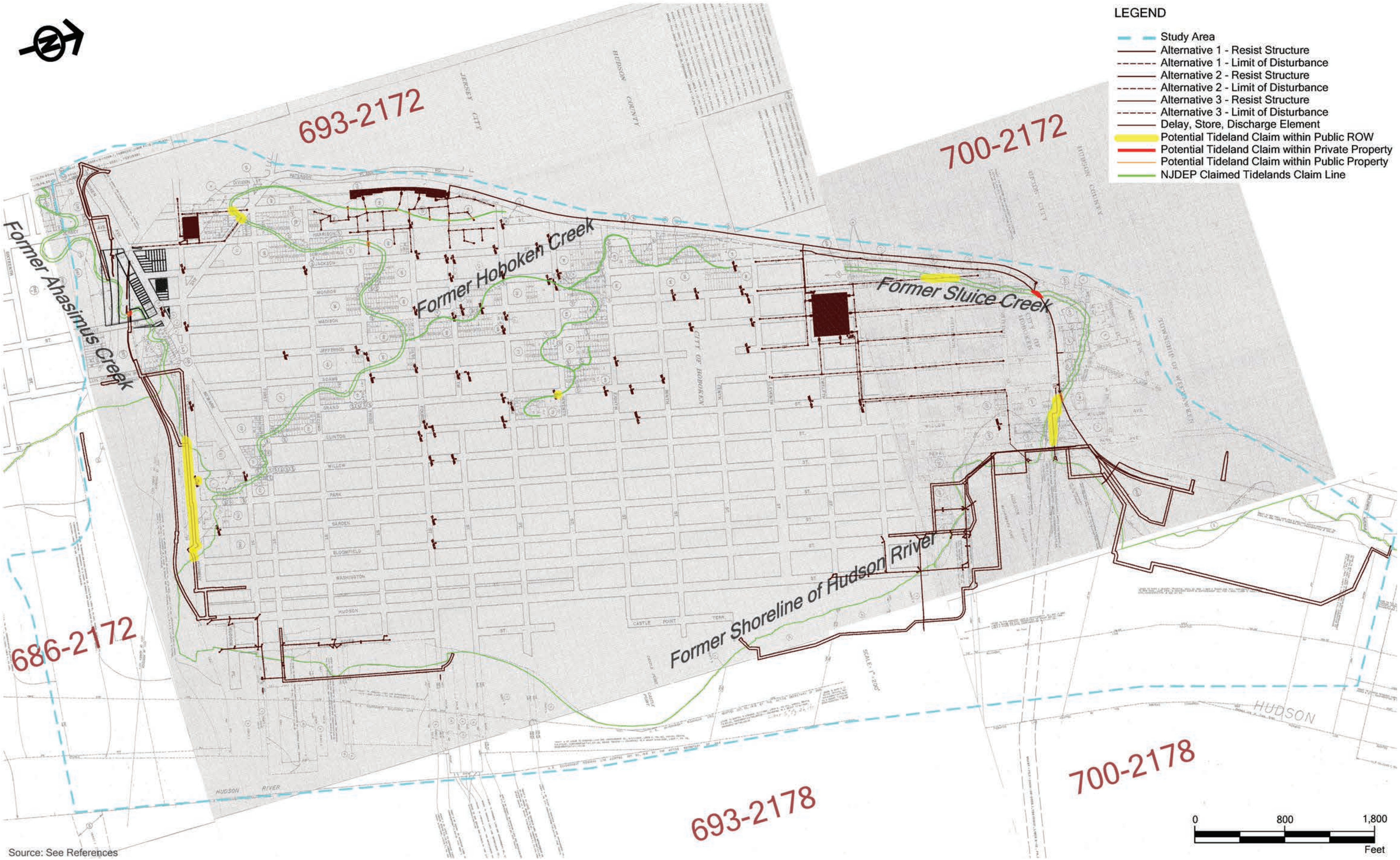
See Section 4.1.2.4 for a discussion of the applicability of this statute to wetlands.

Freshwater Wetlands Protection Act, NJSA 13:9B, and Rules at NJAC 7:7A.

The New Jersey Freshwater Wetlands Protection Act and regulatory program protects freshwater wetlands; the transition areas (buffers) around these wetlands; and other surface waters such as lakes, ponds, rivers, and streams. Most activities that disturb soil or vegetation in freshwater wetlands or in buffers adjacent to freshwater wetlands and the discharge of dredged or fill material into surface waterbodies are regulated under this program.

Executive Order 13112 - Invasive Species, 1999

EO 13112 was issued to enhance federal coordination and response to the complex and accelerating problem of invasive species. The EO defines an invasive species as: "…an alien species (a species that is not native to the region or area) whose introduction does or is likely to cause economic or environmental harm or harm to human health." This definition encompasses all types of invasive species including plants, animals, and microorganisms (NISC. 2005). The EO was designed to encourage federal agencies



Source: See References

Figure 4.9 Tideland Claim Map

Photograph 4.5 View facing west of Wetland C; located in Area #2

Photograph 4.6 View facing west of Wetland D; located in Area #7

to adopt a comprehensive approach to invasive species problems, instead of a less effective and more reactive species-by species approach, which was more commonly used in the past (NISC. 2005).

4.1.2.8.1 *Jurisdictional Wetland Delineation Effort Results*

Preliminary desktop references, including aerial photography, soil maps, and NWI and NJDEP wetland mapping, were used to depict general locations within the Study Area that could potentially include areas meeting the criteria for wetlands. Ten potential wetland areas were identified and a site reconnaissance for the purpose of identifying and delineating wetland areas within the Study Area was completed. Six wetland areas were delineated as a result of this effort (see **Figure 4.10)**.

The wetland identification and delineation of the Study Area was completed on May 5, 9, and 11, 2016, using the 1989 Federal Interagency Wetland Delineation Manual criteria which uses indicators for hydrology, hydric soils, and hydrophytic vegetation to determine wetland boundaries. Various areas of potential wetlands were investigated, primarily located in the western portions of the Study Area and associated with the Hudson-Bergen Light Rail Line (HBLR). The 10 areas investigated and the resulting six delineated wetland areas are described below.

Several invasive species were identified in the wetland areas including common reed (*Phragmites australis*, FACW) , purple loosestrife (*Lythrum salicaria*, FACW), and reed canary grass (*Phalaris arundinacea*, FACW) . During the past century, these species have invaded palustrine wetlands throughout New Jersey, particularly in the northeastern area of the state. These species generally dominate the wetland vegetation in freshwater marshes in the project area. Dense stands of these species alter the structure of natural plant communities and reduce biological diversity. These stands also affect wildlife and can change drainage patterns by restricting the flow of water.

Area 1 is located in the southwest corner of the City of Hoboken, along the HBLR. Area 1 contains a highly disturbed, man-made drainage ditch that is located between the northern and southern HBLR tracks. The drainage ditch is dominated by common reed and purple loosestrife. Standing water was observed in the ditch at the time of the delineation. Wetland A was delineated within this drainage ditch.

Wetland A is hydrologically connected to a smaller wetland area, also located in Area 1 and to the west of the HBLR tracks. Wetland A (drainage ditch) runs through a piped culvert beneath the western HBLR and connects to the smaller wetland, delineated as Wetland B.The bottom of the drainage ditch in this area is lined with concrete and is dominated by common reed. This area was inundated with standing water at the time of the site visit. A retaining wall bordering the drainage ditch to the west serves as the western boundary of Wetland B.

Area 2 is located to the north of Area 1, east of the HBLR tracks and west of the pedestrian/bike path located in this area. Area 2 consists of a man-made drainage swale surrounded by a wetland area. The drainage swale is dominated by common reed; wax myrtle (*Morella cerifera*, FAC); and eastern cottonwood (*Populus deltoides*, FAC). Standing water was observed at the time of the delineation (see **Photograph 4.5**).

Area 3 is located west of the HBLR tracks and south of the HBLR Second Street Station and is surrounded by a 10-foot high retaining wall. Area 3 consists of a man-made drainage swale surrounded by a wetland area. The wetland area is located on each side of the drainage swale and is dominated by common reed; seaside goldenrod (*Solidago sempervirens*, FACW); reed canary grass; high-tide bush (*Iva frutescans*, FACW); and wrinkleleaf goldenrod (*Solidago rugosa*, FAC). Standing water was also observed.

The HBLR tracks run east to west along the northern border of Hoboken. Area 7 is located north of the HBLR tracks in this area. A man-made drainage ditch with a concrete bottom is located along the northern side the HBLR tracks, to the north of the North Hudson Sewerage Authority (NHSA) Wastewater Treatment Plant facility. A wetland area dominated by common reed extends north into the adjacent property that is currently vacant and secured by a chain link perimeter fence. During the site visit, standing water was observed in the drainage ditch and wetland area (see **Photograph 4.6**).

Figure 4.10 Delineated Wetlands Map

Area 10 is located along the northern border of the Study Area, south of the Weehawken Waterfront Park and Recreation Center. A wetland area dominated by common reed and seaside goldenrod extends from the toe of slope located along the park's southernmost driveway, south to the rocky shoreline. The wetland line follows the rocky shoreline/bulkhead to the west until the bulkhead turns south along the sidewalk. During the site visit, the wetland area north of the rocky shoreline was holding standing water.

Areas 5, 8, and 9 are adjacent upland areas that were investigated for the presence of wetlands, but did not meet the wetland criteria. These areas all contain a concrete bottom and serve as man-made drainage swales. Some portions of these concrete swales contained standing water during the site visit. Areas 4 and 6 were eliminated from consideration as potential wetland areas based on the initial site evaluation. Area 4 is located along the east side of the HBLR tracks, to the west of the Hoboken Housing Authority complex. It consists of a gravel-surfaced area, with sparse upland vegetation. Area 6 is located in the northwestern portion of the Study Area, to the north of the HBLR tracks and the NJSA Wastewater Treatment Plant. The area consists of a vacant lot containing patches of asphalt pavement and upland vegetation.

The dominant vegetation in the wetland areas was common reed. No specimen trees or unique plant communities were observed during the wetland delineation effort. Wetland data forms and photographs of the wetlands can be found in the Natural Ecosystems Technical Environmental Study (Dewberry, October 2016).

The functions and values of the wetlands within the Study Area were evaluated by field observations and the professional judgment of the wetland scientists who performed the jurisdictional wetland delineation effort. Delineated wetlands are anticipated to have an "Ordinary Resource Value," based on the fact that they serve as stormwater drainage swales/basins and do not contain habitat of any significance. Ordinary Resource Value wetlands do not require a wetland transition area.

4.1.2.9 Upland Vegetation and Wildlife

Regulatory Setting

Upland vegetation and wildlife in the natural ecosystems analysis area are regulated under several federal and state level statutes including the ESA, the Fish and Wildlife Coordination Act, the New Jersey Endangered Species Conservation Act, the Migratory Bird Treaty Act, and the New Jersey No Net Loss Reforestation Act.

Endangered Species Act of 1973 (16 USC §§ 1531 TO 1544)

See Section 4.1.2.6 for a discussion of the applicability of this Act.

The Fish and Wildlife Coordination Act (16 USC 661-666)

FWCA requires that the USFWS be consulted whenever the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted or otherwise controlled or modified" when a federal permit or license is involved. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." There are no regulations implementing the FWCA.

The law applies to any project that receives either federal funding or a federal permit and proposes to alter a perennial waterway or water body.

The New Jersey Endangered Species Conservation Act

The New Jersey Endangered Species Conservation Act of 1973 protects species whose continuing inhabitance of New Jersey is jeopardized by loss of habitat, over-exploitation, pollution, or other impacts. The list of New Jersey's threatened and endangered wildlife species is maintained by the Division of Fish and Wildlife's Endangered and Nongame Species Program (ENSP).

The Migratory Bird Treaty Act of 1918 (16 USC §§ 703-71)

The Migratory Bird Treaty Act makes it illegal for anyone to take; possess; import; export; transport; sell; purchase; barter; or offer for sale; offer for purchase; or offer for barter any migratory bird, the nests, eggs, or parts of such a bird except under the terms of a valid permit issued pursuant to federal regulations.

New Jersey No Net Loss Reforestation Act (N.J.S.A. 13:1L-14.1 et seq.)

According to the New Jersey No Net Loss Reforestation Act, any loss of more than one-half acre of forested area would need to be replaced. According to the guidelines under N.J.S.A 13:1L-14.2 et seq. Determination of Existing Forested Area, "areas such as parking lots, courtyards, and other built environments that are primarily impervious surfaces but have tree canopy over them because of engineered planting sites are not forested areas." Therefore, it has been determined that the Study Area is not a forest and the New Jersey No Net Loss Reforestation Act is not applicable.

Affected Environment

Upland Vegetation

Prior to the early European settlement of Hoboken, the upland portion of the Study Area was likely vegetated by a mixed-hardwood forest dominated by American chestnut (*Castanea dentata*) and various oak species (*Quercus spp.*). American beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), a variety of maples (*Acer* spp.), ashes (*Fraxinus* spp.), and hickories (*Carya* spp.) probably occurred as co-dominant species in this community. The undergrowth in these forests often included dogwoods (*Cornus* spp.), sassafras (*Sassafras albidum*), and ironwood (*Ostrya virginiana*), in addition to viburnum (*Viburnum* sp.) or spicebush shrubs (*Lindera benzoin*). The meadowlands within the western and northern portions of the Study Area would have supported saline-tolerant marsh grasses. These marshes may have also supported the growth of goldenrod (*Solidago* spp.), sea myrtle (*Baccharis halimifolia*), and marsh elder (*Iva frutescens*). Historic and modern development of the Study Area has dramatically altered the environment and removed the predevelopment vegetation (Beryl 1973).

Ninety-four percent of the terrestrial landscape within Study Area is heavily urbanized and dominated by impervious surfaces. The Study Area includes urban properties, vacant lots, mowed lawns, paved paths and roads, railroad, and light railways.

In the Study Area, characteristic species include non-native invasive species such as Norway maple (*Acer platanoides*), tree-of-heaven (*Ailanthus altissima*) and Japanese knotweed (*Polygonum cuspidatum*). Mugwort (*Artemisia vulgaris*), foxtail grasses (*Setaria faberi, Setaria* sp.), and Japanese honeysuckle (*Lonicera japonica*) are commonly found in the herbaceous layer. Asiatic bittersweet (*Celastrus orbiculatus*) and porcelainberry vines (*Ampelopsis brevipedunculata*) were observed to be present in all strata in some locations.

At the foot of the Palisades cliffs to the west of the HBLR, the following species were observed: Norway maple, red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), black oak (*Quercus velutina*), tree-of-heaven, eastern cottonwood, American elm (*Ulmus americana*), Chinese elm (*Ulmus parvifolia*), Japanese knotweed, American pokeweed (*Phytolacca americana*), Virginia creeper (*Parthencissus quinquefolia*), poison ivy (*Toxicodendron radicans*), American bittersweet (*Celastrus scandens*), and bluegrass (*Poa* spp.).

Due to the history of development and disturbance (e.g., clearing, mowing, pedestrian, and roadway traffic), areas in the Study Area have little vegetation coverage or are dominated by non-native invasive vegetation. The results are terrestrial communities of low ecological value. In the Study Area, there are planted shade trees, surrounded by maintained (mowed) grass areas and other landscaping.

Wildlife

The Study Area is heavily developed and characteristic of an urbanized landscape. Undisturbed habitats are not present and most of the available habitat to wildlife is constrained to small residential yards, tree-lined streets, and recreational parks in close proximity to people. Terrestrial wildlife communities in the Study Area are largely composed of disturbance-tolerant species that are associated with fragmented habitats and forest edges and that can co-exist with anthropogenic activities in highly disturbed areas.

Birds

Over 200 species of birds occur in the Lower Hudson River Estuary, owing to the region's geographical position and habitat diversity. Some are present year-round, whereas others only nest in, overwinter in, or migrate through the area. Most of the Study Area offers little habitat for species that are intolerant of habitat degradation and disturbance.

Water-dependent birds can be found on or flying over the Lower Hudson River Estuary during the breeding season including the double-crested cormorant (*Phalacrocorax auritus*), Canada goose (*Branta canadensis*), ring-billed gull (*Larus delawarensis*), great black-backed gull (*Larus marinus*), herring gull (*Larus argentatus*), mallard (*Anas platyrhynchos*), and mute swan (*Cygnus olor*). Most of the Hudson River shoreline in the Study Area consists of bulkhead and/or rip-rap and lacks shallow waters and exposed mudflats, which limit foraging areas for wading birds. Appropriate nesting habitat features for colonial water birds, such as large trees along the water, are not present in the Study Area.

Most of New Jersey is overlain by migration flyways for waterfowl, shorebirds, and birds of prey. Broad-front migrants, such as warblers and other songbirds, that do not follow distinct flyways like many other groups of birds, generally pass through the state in high numbers as well. Large numbers of birds occur in the Lower Hudson River valley during migration periods.

The location of the Study Area, on the Lower Hudson River Estuary, is not in proximity to any significant ecological barriers to birds that would potentially create a funnel or other concentrations of migrating birds through this area. Migrating birds of prey occur in increased abundance along the Palisades to the north, but well above the Study Area, where they ride daytime updrafts coming off the ridgeline. Based on count data from the nearby Hook Mountain Hawk Watch in Nyack, NY (NEHW 2008), birds of prey that may pass over the Study Area during the daytime include the turkey vulture (*Cathartes aura*), black vulture (*Coragyps atratus*), osprey (*Pandion haliaetus*), bald eagle (*Haliaetus leucocephalus*), northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), broad-winged hawk (*Buteo platypterus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), merlin (*Falco columbarius*), and peregrine falcon (*Falco peregrinus*). On relatively rare occasions, the northern goshawk (*Accipiter gentilis*), rough-legged hawk (*Buteo lagopus*), and golden eagle (*Aquila chrysaetos*) may also pass over the Study Area. Migrating waterfowl also occur in the area, but the Lower Hudson River is not a major migration corridor for waterfowl (Bellrose 1968).

Many of the birds that occur in the Study Area during the breeding season are year-round residents that remain during winter. Land bird species expected to occur in the Study Area during winter include mostly urban-adapted species. Waterfowl and other water birds are commonly found on the Lower Hudson River during winter, while bald eagles also overwinter along the Lower Hudson River Estuary, where they often perch on ice floes in areas of open water.

Amphibians and Reptiles

As with the plant and bird communities, the degree of habitat fragmentation and development in the Study Area limits the numbers and diversity of reptile and amphibian species that occur. Species accustomed to disturbed habitats in urban and suburban residential areas have the potential to occur in the Study Area, including the American toad (*Bufo americanus*), snapping turtle (*Chelydra serpentina*), red-eared slider (*Trachemys scripta elegans*), garter snake (*Thamnophis sirtalis*), and northern brown snake (*Storeria dekayi*).

Mammals

Terrestrial mammal communities are limited to primarily disturbance-tolerant and urban-adapted generalists such as gray squirrel (*Sciurus carolinensis*), house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), striped skunk (*Mephitis mephitis*), eastern cottontail (*Sylvilagus floridanus*), groundhog (*Marmota monax*), raccoon (*Procyon lotor*), white-footed mouse (*Peromyscus leucopus*), moles (*Scalopus* spp.), eastern chipmunk (*Tamias striatus*), and Virginia opossum (*Didelphis virginiana*). White-tailed deer (*Odocoileus virginianus*), eastern coyote (*Canis latrans*), and red fox (*Vulpes vulpes*) may occur occasionally in the lesser-developed parts of the region.

4.1.2.9.1 *Threatened and Endangered Species*

The July 14, 2015 USFWS IPaC Trust Resource Report and Official Species List indicates that there are no federally-listed threatened or endangered species nor critical habitats or refuges identified for the onshore region of the Study Area. However, it does indicate that many species of migratory birds may use the area. The project sponsors are required to prevent any harm or taking of migratory bird species under the Migratory Bird Treaty Act (MBTA). The IPaC lists 29 bird species of conservation concern. A copy of the IPaC report and Official Species List is provided in the Natural Ecosystems Technical Environmental Study (Dewberry, October 2016).

The NJDEP NHP was also contacted about state-listed threatened and endangered species in the Study Area and an additional analysis was conducted using the NJDEP Landscape Project Version 3.1 map. Map analysis and the letter dated July 28, 2015 from the NHP indicated that shortnose sturgeon (federally-listed as endangered) uses the Lower Hudson River as a migration corridor. The NHP and Landscape Project map also reported that foraging habitat occurs in the Study Area for three species of special concern: glossy Ibis (Plegadis falcinellus), little blue heron (Egretta caerulea), and snowy egret (Egretta thula).

4.1.3 Environmental Consequences

4.1.3.1 Geology

Alternative 1

The construction of Resist features and DSD infrastructure would cause disturbance of subsurface materials by excavations including for the foundations required for Resist structures and underground storage tanks for DSD. Installation of foundation elements, such as piles, may result in vibratory impacts and possibly short-term settlement of adjacent loose soils/sediments. The magnitude of vibration impacts would be related to the extent of Resist barrier construction and underlying geology. However, overall impacts from Alternative 1 on underlying geology are expected to be negligible.

Alternative 2

Impacts on geology from Alternative 2 are expected to be negligible.

Alternative 3

Impacts on geology from Alternative 3 are expected to be negligible.

No Action Alternative

No impacts on geology would result from the No Action Alternative, since there is no ground disturbance.

4.1.3.1.1 *Mitigation Measures and Best Management Practices (BMPs) Included in Alternatives 1, 2 and 3*

As no adverse impacts are anticipated, no mitigation measures or BMPs related to geology have been identified.

4.1.3.2 Soils

Alternative 1

Under Alternative 1, Option 1, there would be an estimated total of approximately 29.4 acres of surface disturbance for construction of 16,291 linear feet of Resist barrier (floodwalls, flood logs, and gates) and DSD infrastructure. Under Alternative 1, Option 2, there would be an estimated total of approximately 29.3 acres of surface disturbance for construction of 15,887 linear feet of Resist barrier (floodwalls, flood logs, and gates) and DSD infrastructure. Permanent aboveground infrastructure would occupy 7.54 acres for Option 1 and 7.57 acres for Option 2. Disturbance of areas mapped as Urban Land, URWETB, LagA, USGRTA, USGRTB, and URTILB would result from Alternative 1. The discharge of soil during rainfall events could pose increased risk for surface water impacts for Alternative 1 as well, since the Alternative 1 limit of disturbance is located adjacent to the Hudson River for the construction of waterfront structures. The potential for off-site soil deposition arising from project construction activities is expected to be short-term and minor in magnitude (see **Figure 4.11**).

Based on the geotechnical investigation that was completed for the Study Area, no problematic soil conditions were found along the proposed Resist barrier alignment proposed in Alternative 1. A hard stratum layer below a five to 45 feet thick, soft clay layer was detected. This hard stratum layer would serve as a deep foundation bearing layer.

Alternative 2

Under Alternative 2, Option 1, there would be an estimated total of approximately 30.1 acres of surface disturbance for construction of 9,323 linear feet of Resist barrier (floodwalls, berms, flood logs, and gates) and DSD infrastructure. Under Alternative 2, Option 2, there would be an estimated total of approximately 30.2 acres of surface disturbance

Figure 4.11 Soils Impact Map - Alternative 1

Figure 4.12 Soils Impact Map - Alternative 2

Figure 4.13 Soils Impact Map - Alternative 3

for construction of 9,150 linear feet of Resist barrier (floodwalls, berms, flood logs, and gates) and DSD infrastructure. Permanent aboveground infrastructure would occupy 5.81 acres under Option 1 and 5.85 acres under Option 2. Disturbance of areas mapped as Urban Land, URWETB, URTILB, URBEDB and LagA would result from Alternative 2. The potential for off-site soil deposition arising from project construction activities is expected to be short-term and negligible in magnitude (see **Figure 4.12**).

Based on the geotechnical investigation that was completed for the Study Area, no problematic soil conditions were found along the proposed Resist barrier alignment proposed in Alternative 2. A hard stratum layer below a five to 45 feet thick, soft clay layer was detected. This hard stratum layer would serve as a deep foundation bearing layer.

Alternative 3

Under Alternative 3, Option 1, there would be an estimated total of approximately 29.8 acres of surface disturbance for construction of 8,913 linear feet of Resist barrier (floodwalls, berms, flood logs, and gates) and DSD infrastructure. Under Alternative 3, Option 2, there would be an estimated total of approximately 29.9 acres of surface disturbance for construction of 8,757 linear feet of Resist barrier (floodwalls, berms, flood logs, and gates) and DSD infrastructure. Permanent aboveground infrastructure would occupy 5.76 acres under Alternative 3,Option 1 and 5.80 acres under Alternative 3, Option 2. Disturbance of areas mapped as Urban Land, URWETB, URTILB, URBEDB, and LagA would result from Alternative 3. The potential for off-site soil deposition arising from project construction activities is expected to be short-term and negligible in magnitude (see **Figure 4.13**).

Based on the geotechnical investigation that was completed for the Study Area, no problematic soil conditions were found along the Resist alignment proposed in Alternative 3. A hard stratum layer below a five to 45 feet thick, soft clay layer was detected. This hard stratum layer would serve as a deep foundation bearing layer.

No Action Alternative

Analysis of waterfront structures within the Study Area has identified structural integrity issues along most of the 8,500-foot length of structures examined. Based on this review, it is likely that discharge of sediment into the Hudson River from deteriorating structures is ongoing and would continue under the No Action Alternative.

4.1.3.2.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures would be implemented in order to minimize impacts from the Resist portion of the project on soils:

- For Alternative 1, in-water coffer dams and silt curtains would be used in all areas where waterfront bulkhead reconstruction or replacement is undertaken.

The following measures would be implemented in order to minimize project impacts from both the Resist and DSD portions of the project on soils:

- A stormwater pollution prevention plan (SWPPP) would be completed in accordance with requirements under NJ code, which is expected to substantially reduce the risk of off-site transport of soils;
- Precautions would be taken to minimize spillage and tracking of sand and silt on the road surfaces and prompt clean-up would be initiated should they occur;
- Silt fences, hay bales, and stabilized entrances to construction sites would be deployed in accordance with the SWPPP;
- Mulch or other suitable ground cover would be placed on all slopes following grading; and
- Slopes would be seeded with plant materials approved by the appropriate local jurisdictions and Soil and Water Conservation District.

Pursuant to NJAC 7:8-2.2, the proposed alternatives would be designed to meet the NJDEP goals of stormwater management planning, including:

- reducing flood damage;
- minimizing, to the extent practicable, any increase in stormwater runoff;
- reducing soil erosion;
- maintaining groundwater recharge, as applicable;
- minimizing pollutants in surface waters; and
- protecting public safety.

4.1.3.3 Groundwater

Alternative 1

Since shallow groundwater is prevalent throughout the Study Area, construction of Alternative 1 would likely require de-watering of shallow groundwater for construction and repair of Resist feature bulkheads and for excavation associated with the DSD features. De-watering would likely induce flow toward the excavations. This water would be sampled and handled/disposed of appropriately, in accordance with a NJPDES General Permit. These activities would depress the local groundwater, but these effects would be short-term and localized, and would not extend significantly beyond the project boundaries. No impacts to groundwater quality are anticipated. Furthermore, since there are no potable wells within the Study Area and the Study Area is not within a SSA, no adverse impacts to groundwater or water supplies are anticipated.

Alternative 2

Impacts to groundwater under Alternative 2 would be similar to the impacts described in Alternative 1, but in the locations of the proposed construction under this alternative.

Alternative 3

Impacts to groundwater under Alternative 3 would be similar to the impacts as described in Alternative 1, but in the locations of the proposed construction under this alternative.

No Action Alternative

No impacts on groundwater would result from the No Action Alternative.

4.1.3.3.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures would be implemented in order to minimize impacts from the Resist and DSD portions of the project on groundwater:

- Based on the project size and volume of excavation below groundwater in all of the Build Alternatives, de-watering activities beyond thirty days in a year and 100,000 gallons per day (gpd) may be required. If this occurs, a Dewatering Permit-by-Rule would be applicable, since the de-watering is related to construction activity and cofferdams would be utilized. If cofferdams are not used, a Temporary Dewatering Permit would be required. Conditions of these permits would outline measures designed to avoid any impacts to groundwater; and
- A soil and groundwater Sampling, Analysis, and Monitoring Plan (SAMP) would be implemented to identify and address any potentially hazardous materials encountered during groundwater de-watering activities.

4.1.3.4 Surface Water

Alternative 1

The only surface water in the natural ecosystems analysis area is the Hudson River. Since Alternative 1 involves reconstruction of approximately 8,500 linear feet of waterfront structures, this alternative has the greatest risk of soil runoff and subsequent impacts on the surface water quality of the Hudson River. The risk of soil runoff is related to the nature of the proposed construction activities. The current waterfront structures include anchored and cantilevered sheet piles, block or concrete retaining walls, rip-rap, and pile-supported concrete deck. Repair and replacement of some of these Resist structures, such as rip-rap, can be completed from the land side and pose limited risk of sediment runoff into the Hudson River. Repair and replacement of other waterfront structures, such as sheet piles and concrete block, would require in-water work, where risk of soil disturbance and runoff into the Hudson River is much greater. In these areas, it is anticipated that construction techniques would involve the installation of cofferdams approximately 10 feet offshore. Use of these cofferdams is anticipated to confine project impacts to a very narrow area along the shoreline. In addition to the reconstruction of waterfront structures for the Resist infrastructure, an estimated 15 to 20 linear feet of existing waterfront structures may need to be improved at each of the two stormwater discharge sites at Weehawken Cove. Current design provides for a pipe up to 24 inches in diameter to discharge stormwater through a perforation in the sheeting. Construction methods at these sites would be similar to construction methods for other waterfront structures.

Based on the proposed BMPs, impacts of sedimentation on the Hudson River are anticipated to be short-term and minor and are not expected to result in measurable sedimentation impacts within the Hudson River. The total area of open waters to be temporarily impacted along the bulkheads to be replaced is approximately 0.73 acres in the areas shown on **Figure 4.14.**

Other potential impacts to surface water quality under Alternative 1 are related to the proposed discharge of stormwater to be collected in the various underground tanks during storms, then discharged to the Hudson River. There are two different treatment pathways for the surface waters collected and stored under the DSD portion of the Project. Treatment of stormwater collected in the three large storage sites (BASF, NJ TRANSIT, and Block 10) would consist of filtration and settling within the collection and storage systems prior to discharge into the Hudson River in the vicinity of Weehawken Cove. Water collected in approximately 61 smaller stormwater storage sites distributed across the Study Area would be fully treated in the North Hudson Wastewater Treatment Plant prior to discharge in the Hudson River. Most of the estimated seven million gallons of stormwater collected and stored under the Project would be at the three large storage sites. The total volume of stormwater projected to be discharged annually from the three large storage sites is 264 acre-feet, assuming average annual rainfall and storm patterns. Given the total volume of water in the Hudson River and current water quality of the Hudson River, any impacts from the discharge of stormwater under Alternative 1 is expected to be negligible, both in terms of quantity and quality.

In addition, the new DSD system is anticipated to reduce the number of Combined Sewer Overflow (CSO) discharges from the existing system into the Hudson River, thereby reducing the total annual volume of CSO, and reducing the impacts of CSO discharges on Hudson River water quality. However, the reduction in total CSO discharge resulting from this project is expected to have a negligible impact on Hudson River water quality.

Alternative 2

Alternative 2 involves reconstruction of approximately 400 linear feet of shoreline structures along Weehawken Cove and the Hudson River shoreline in the northern portion of the Study Area. This work would be undertaken along the Cove Park shoreline and at up to four stormwater discharge locations. Current design provides for an estimated 15 to 20 linear feet of existing waterfront structures to be improved at each of the stormwater discharge sites and approximately 300 linear feet of waterfront structures to be improved at Cove Park. A pipe up to 24 inches in diameter would be used to discharge stormwater through a perforation in the bulkhead sheeting at each of the discharge locations. At the two DSD discharge locations in Weehawken Cove, and at the shoreline along Cove Park, the bulkhead is separated from the water by a rip-rap field ranging from 10 to 15 feet in width. It is anticipated that the

Figure 4.14 Bulkhead Replacement - Alternative 1

shoreline structures at these discharge sites and along Cove Park in Weehawken Cove can be constructed from the landward side and that no in-water work would be required. Therefore, construction proposed at these sites poses limited risk of sediment discharge into the Hudson River.

Repair and replacement of the waterfront structure at the high level storm sewer discharge sites in the north and south would require in-water work, where risk of soil disturbance and discharge into the Hudson River is much greater. In this location, it is anticipated that construction would involve the installation of a cofferdam approximately 10 feet offshore. Use of this cofferdam is anticipated to confine project impacts to a very narrow area along the shoreline. The estimated duration of the in-water work at the high level storm sewer discharge locations is several days.

Based on the proposed BMPs and limited amount of in-water work, any sedimentation impacts of the project on surface water quality are expected to be short-term and negligible.

Treatment of this stormwater collected in the high level storm sewer system would be similar to treatment of stormwater collected at the three large stormwater collection sites. An estimated 48 acre-feet of stormwater is anticipated to be discharged from this high level storm sewer system annually. Based on this estimate of annual discharge, impacts from the “High Level” storm sewer system on surface water quality of the Hudson River are expected to be negligible.

The new DSD system is anticipated to reduce the number of CSO discharges from the existing system into the Hudson River, thereby reducing the total annual volume of CSO and reducing the impacts of CSO discharges on Hudson River water quality. However, given the total volume of water in the Hudson River and current water quality of the Hudson River, any impacts from the discharge of stormwater under Alternative 2 on the Hudson River is expected to be negligible, both in terms of quantity and quality.

Alternative 3

Impacts to surface water quality under Alternative 3 would be similar to those described under Alternative 2.

No Action Alternative

Under the No Action Alternative, there would be no reduction in the average annual CSO discharge into the Hudson River; therefore, impacts of this CSO discharge on Hudson River water quality would remain unchanged. There would be no potential for impacts to surface water quality arising from construction.

4.1.3.4.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures would be implemented in order to minimize impacts from the Resist portion of the project on surface waters:

- In-water cofferdams and silt curtains would be used in all areas where bulkhead reconstruction or replacement is undertaken; and
- Timing/construction restrictions would be implemented as necessary to avoid spawning periods and sensitive life stage timeframes for various aquatic species.

The following measures would be implemented in order to minimize impacts from the Resist and DSD portions of the project on surface waters:

- A SWPPP would be completed in accordance with requirements under NJ code;
- Precautions would be taken to minimize spillage and tracking of sand and silt on the road surfaces and prompt clean-up would be initiated should they occur;
- Silt fences, hay bales, and stabilized entrances to construction sites would be deployed in accordance with the SWPPP;
- Mulch or other suitable ground cover would be placed on all slopes following grading;
- Slopes would be seeded with plant materials approved by the appropriate local jurisdictions and the Soil Conservation District; and
- The drainage and stormwater management plan for each Build Alternative would meet NJDEP stormwater management planning requirements and would provide for treatment of contaminants in stormwater runoff from the construction areas. The stormwater management plan developed for each build alternative would meet NJDEP stormwater regulation requirements and provide improvements to existing conditions. A soil erosion and sediment control plan would be prepared and implemented to address temporary surface water impacts during construction.

4.1.3.5 Floodplains

There are no practicable Build Alternatives that would avoid impacts to floodplains. All of the alternatives evaluated would result in floodplain impacts.

To comply with EO 11988, the Project would be designed to avoid floodplain impacts where practicable, minimize impacts to the greatest extent possible, and adequately mitigate unavoidable impacts. None of the Build Alternatives would completely avoid floodplain impacts. Each Build Alternative would include measures (floodwalls, berms, gates, green infrastructure features, etc.), that would reduce flooding risk in various portions of the Study Area during the 100-year coastal storm event and the 5-year rainfall event.

A Conditional Letter of Map Revision (CLOMR) is FEMA’s comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). The letter indicates whether the project, if built as proposed, would be recognized by FEMA. Once built the CLOMR can be used to support a Letter of Map Revision (LOMR). As noted in Section 7.5 Individual Stakeholder Meetings, FEMA has recognized that the accreditation process for the Project can be used to support a CLOMR/LOMR submittal.

Table 4.6 Floodplain Impacts for Alternative 1, Options 1 and 2

	PERMANENT FLOODPLAIN IMPACTS	TEMPORARY FLOODPLAIN IMPACTS
Alternative 1, Option 1 (Resist infrastructure only)	3.2 Ac.	5.8 Ac
Alternative 1, Option 2 (Resist infrastructure only)	3.2 Ac.	6.1 Ac
Alternative 1 (DSD infrastructure only)	N/A	

Source: Dewberry, 2015-2017

Table 4.7 Properties Impacted by Modeled Increase in Flood Depths Under Alternative 1

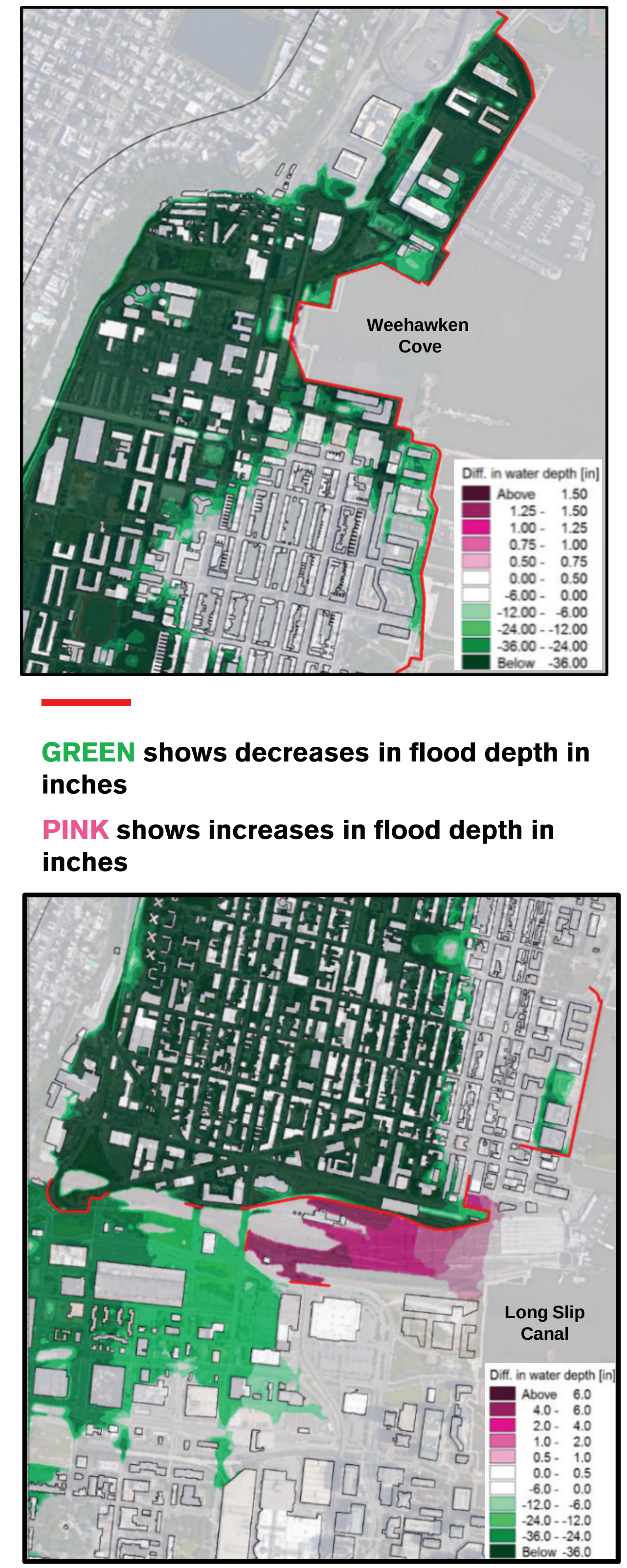
BLOCK	LOT	OWNER	EXISTING CONDITIONS	APPROX. MAX. FLOOD DEPTHS FOR 100-YEAR (NAA)	APPROX. MAX. FLOOD DEPTHS FOR 100-YEAR (ALT 1)
7302	1	NJ TRANSIT	NJ TRANSIT property near Long Slip Canal containing multiple rail tracks.	8.14 feet	8.66 feet (Diff. 6.24 inch)
210, 210.01	1-6, 26-29	Washington-Hudson Assoc.	Existing parking lot on Observer Hwy. and Washington St.	1.51feet	1.71 feet (Diff. 2.4 inch)

Source: Dewberry, 2015-2017

Alternative 1

Table 4.6, Figure 4.15 and Figure 4.16 shows the areas of floodplain disturbance for Alternative 1, including Options 1 and 2. Permanent disturbance occurs where above-ground structures are proposed, such as the Resist infrastructure. Temporary disturbance occurs where disturbance is only required during construction, such as at staging areas or areas where construction would be required for below-ground infrastructure (including DSD components) but no permanent above-ground structures are proposed. DSD components would be located below-grade; therefore, no permanent impacts to the floodplain are anticipated for DSD. Alternative 1 would result in a minor permanent disturbance to approximately one percent of the 100-year floodplain within the Study Area.

Under Alternative 1, where Resist structures are located along the Study Area waterfront, the potential for and magnitude of impacts resulting from coastal storm surge flooding would be reduced for 98 percent of the persons residing within the 100-year floodplain. These coastal storm surge flood risk reduction benefits were calculated using coastal modeling (conducted as part of the project's feasibility study) and 2010 census data. Of the two percent of the population still experiencing coastal flooding, the majority of the properties would experience no increase in flooding over that which would occur in the No Action Alternative. However, there is the potential for a minimal increase in floodwater depth at the peak of a 100-year storm to two parcels identified in Table 4.7. Flood depth increases are less than 2.5 inches for the Washington-Hudson Association property. The western portion of NJ TRANSIT's Hoboken Terminal rail yard may experience an increase of up to 6.5 inches of flood water at the peak of a 100-year storm (impacts to NJ TRANSIT are further discussed in Section 4.9). These potential increases are in addition to flooding that would occur without the proposed improvements being constructed. The approximate difference in flooding depths for these properties is shown on **Table 4.7**.



GREEN shows decreases in flood depth in inches

PINK shows increases in flood depth in inches

Figure 4.15 Modeled Increase in Flood Depths - Alternative 1

Figure 4.15 depicts the changes in coastal flood inundation from Alternative 1 during a 100-year coastal storm event. The areas in green are those that would receive reduced coastal flooding; the areas in pink (which includes the properties on **Table 4.7**) show the potential increase in flooding. Areas not shaded would either experience no flooding or would experience no difference in flooding than what would happen during a storm under the No Action Alternative.

In order for the Project to be compliant with applicable state laws (including the New Jersey Flood Hazard Area Control Act), if impacts cannot be minimized or avoided either an easement on properties listed in **Table 4.7** must be acquired, or written permission must be secured from the affected property owner(s) to authorize the projected increase in flooding. During the design phase of the project additional flood

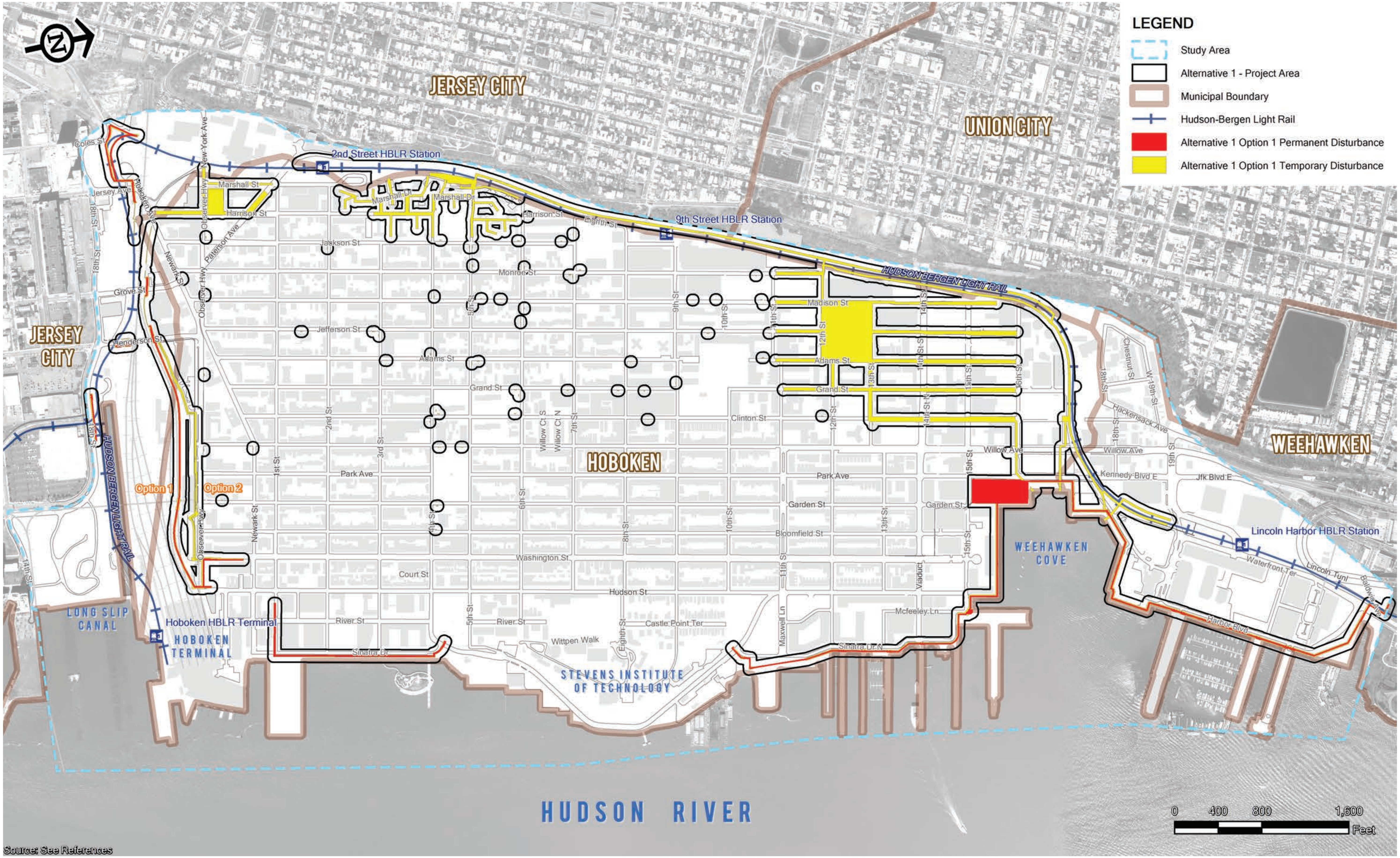


Figure 4.16 Floodplain Impacts Map - Alternative 1

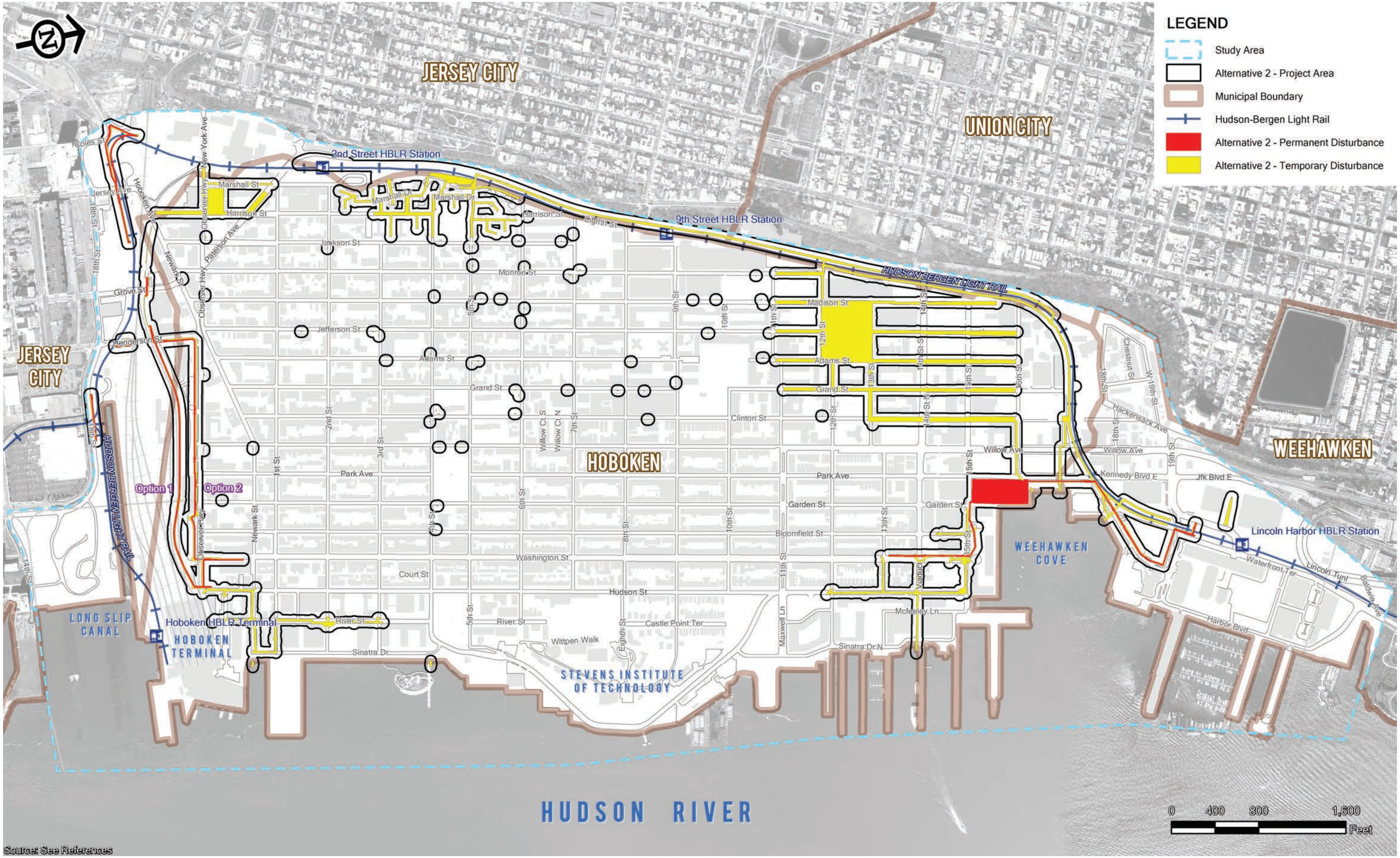


Figure 4.17 Floodplain Impacts Map - Alternative 2

Table 4.8 Floodplain Impacts for Alternative 2, Options 1 and 2

	PERMANENT FLOODPLAIN IMPACTS	TEMPORARY FLOODPLAIN IMPACTS
Alternative 1, Option 1 (Resist infrastructure only)	2.8 Ac.	5.5 Ac.
Alternative 1, Option 2 (Resist infrastructure only)	2.8 Ac.	6.4 Ac.
Alternative 1 (DSD infrastructure only)	N/A	

Source: Dewberry, 2015-2017

Table 4.9 Properties Impacted by Modeled Increase in Flood Depths Under Alternative 2

BLOCK	LOT	OWNER	EXISTING CONDITIONS	APPROX. MAX. FLOOD DEPTHS FOR 100-YEAR (NAA)	APPROX. MAX. FLOOD DEPTHS FOR 100-YEAR (ALT 2)
7302	1	NJ TRANSIT	NJ TRANSIT property near Long Slip Canal containing multiple rail tracks.	8.14 feet	8.66 feet (Diff. 6.24 inch)
210, 210.01	1-6, 26-29	Washington-Hudson Assoc.	Existing parking lot on Observer Hwy. and Washington St.	1.51 feet	1.71 feet (Diff. 2.4 inch)
268.01	1	1500 Garden St.	Harborside Lofts. Existing residential building.	3.97 feet	4.04 feet (Diff. 0.79 inch)
34.03	1.01 & 1.02	BDLJ Associates	Vacant properties.	5.71 feet	5.81 feet (Diff . 1.2 inch)
34.03	4.01	HARTZ	Existing parking lot.	3.47 feet	3.48 feet (Diff . 0.1 inch)

Source: Dewberry, 2015-2017

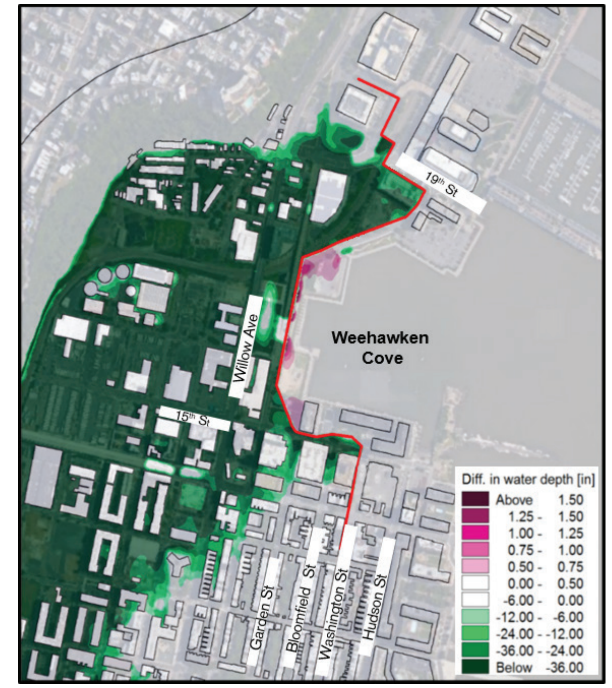
modeling and outreach with impacted property owners will be performed which may enable site-specific mitigation measures to be developed for the impacted properties prior to the application for the Flood Hazard permit.

In addition to flood risk reduction benefits observed within the Study Area, flood model results show that for the 100-year coastal storm surge event, additional benefits were observed in the adjacent areas of Jersey City. As shown on **Figure 4.15**, areas in northwestern Jersey City (bounded roughly by 18th Street in the north, the HBLR tracks to the east, 12th Street to the south, and the Palisades to the west) would still flood during a coastal surge event, but may see a reduction in flooding of up to three feet. This is because some flood waters would have previously been flowing into Jersey City from Hoboken, but with the southern Resist alignment in place, these waters are prevented from entering into Hoboken (and thus Jersey City) in the first place.

Alternative 2

Table 4.8, Figure 4.17 and Figure 4.18 shows the areas of floodplain disturbance for Alternative 2, including Options 1 and 2. Permanent disturbance occurs where above-ground structures are proposed, such as the Resist infrastructure. Temporary disturbance occurs where disturbance is only required during construction, such as at staging areas or areas where construction would be required for below-ground infrastructure (including DSD and High Level Storm Sewer components) but no permanent above-ground structures are proposed. DSD components would be located below-grade; therefore, no permanent impacts to the floodplain are anticipated for DSD. Alternative 2 would result in a minor permanent disturbance to approximately one percent of the 100-year floodplain within the Study Area.

Under Alternative 2, where Resist barriers are located inland, coastal modeling indicates the potential for and magnitude of impacts resulting from coastal storm surge flooding would be reduced for 86 percent of the persons residing within the 100-year floodplain in the Study Area. These coastal storm surge flood risk reduction benefits were calculated using coastal modeling (conducted as part of the project's feasibility study) and 2010 census data. Of the 14 percent of the population still experiencing coastal flooding, the majority of the properties would experience no increase in flooding over that which would occur in the No Action Alternative. However, there is the potential for a minimal increase in floodwater depth at the peak of a 100-year storm at five properties identified in **Table 4.9.** Flood depth increases are less than 2.5 inches for these properties, except for the western portion of NJ TRANSIT's Hoboken Terminal rail yard, which may experience an increase of up to 6.5 inches



GREEN shows decreases in flood depth in inches

PINK shows increases in flood depth in inches

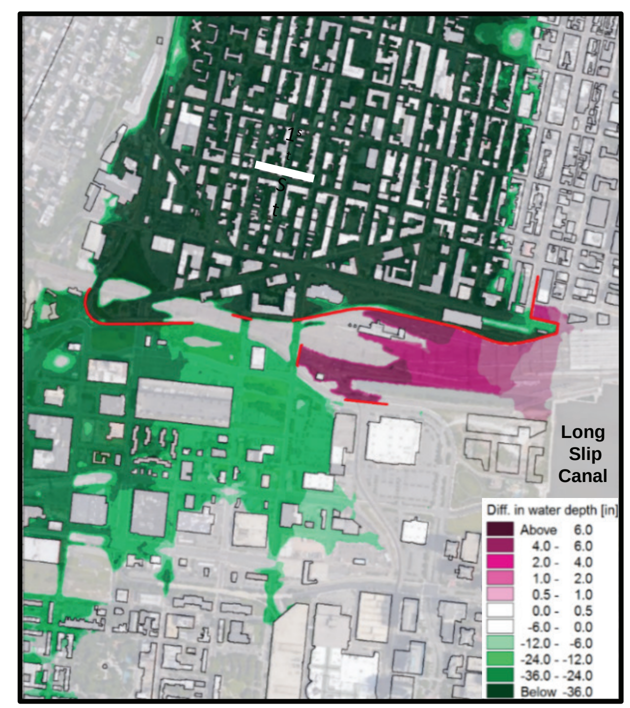


Figure 4.18 Modeled Increase in Flood Depths - Alternative 2

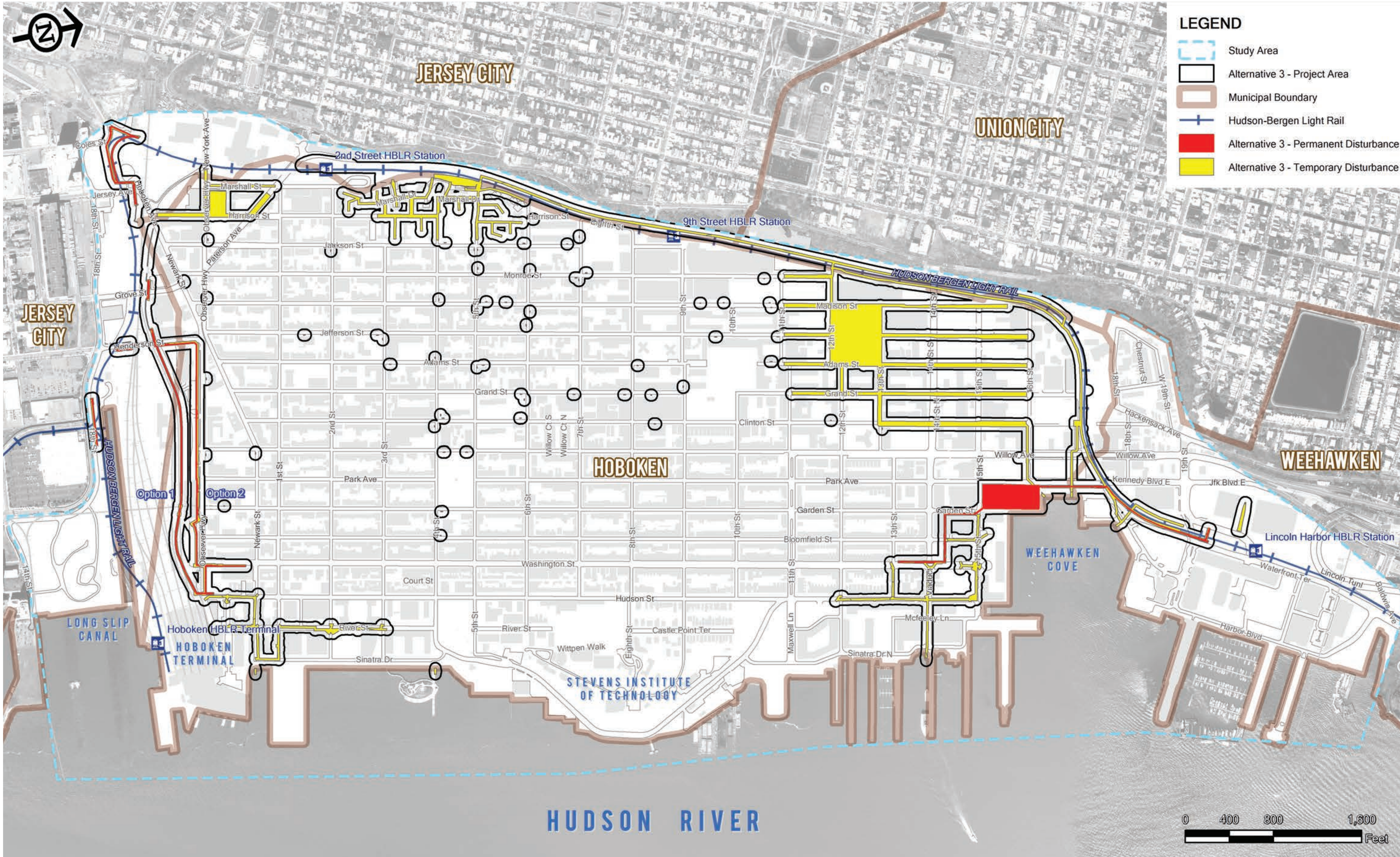


Figure 4.19 Floodplain Impacts Map - Alternative 3

Table 4.10 Floodplain impacts for Alternative 3, Options 1 and 2

	PERMANENT FLOODPLAIN IMPACTS	TEMPORARY FLOODPLAIN IMPACTS
Alternative 1, Option 1 (Resist infrastructure only)	2.8 Ac.	7.5 Ac.
Alternative 1, Option 2 (Resist infrastructure only)	2.8 Ac.	5.9 Ac.
Alternative 1 (DSD infrastructure only)	N/A	

Source: Dewberry, 2015-2017

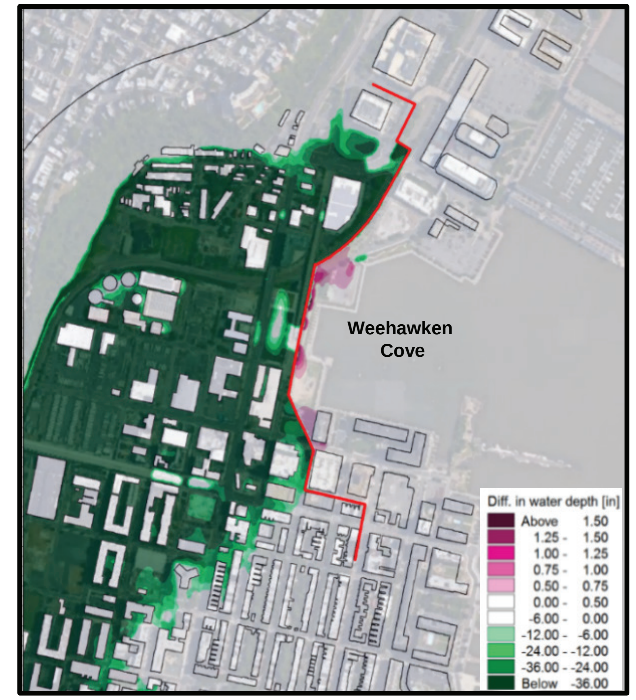
Table 4.11 Properties Impacted by Modeled Increase in Flood Depths Under Alternative 3

BLOCK	LOT	OWNER	EXISTING CONDITIONS	APPROX. MAX. FLOOD DEPTHS FOR 100-YEAR (NAA)	APPROX. MAX. FLOOD DEPTHS FOR 100-YEAR (ALT 2)
7302	1	NJ TRANSIT	NJ TRANSIT property near Long Slip Canal containing multiple rail tracks.	8.14 feet	8.66 feet (Diff. 6.24 inch)
210, 210.01	1-6, 26-29	Washington-Hudson Assoc.	Existing parking lot on Observer Hwy. and Washington St.	1.51 feet	1.71 feet (Diff. 2.4 inch)
268.01	1	1500 Garden St.	Harborside Lofts. Existing residential building.	3.97 feet	4.04 feet (Diff. 0.79 inch)
34.03	1.01 & 1.02	BDLJ Associates	Vacant properties.	5.71 feet	5.81 feet (Diff . 1.2 inch)
34.03	4.01	HARTZ	Existing parking lot.	3.47 feet	3.48 feet (Diff . 0.1 inch)

Source: Dewberry, 2015-2017

at the peak during a 100-year storm (impacts to NJ TRANSIT are further discussed in Section 4.9). These potential increases are in addition to flooding that would occur without the proposed improvements being constructed. The approximate difference in flooding depths for these properties is shown on **Table 4.9**.

Figure 4.18 depicts the changes in coastal flood inundation from Alternative 2 during a 100-year coastal storm event. The areas in green are those that would receive reduced coastal flooding; the areas in pink (which includes the properties on **Table 4.9**) show the potential increase in flooding. Areas not shaded would either experience no flooding or would experience no difference in flooding other than what would happen during a coastal storm under the No Action Alternative. In order for the Project to be compliant with applicable state laws (including the New Jersey Flood Hazard Area Control Act), if impacts cannot be minimized or avoided either an easement on properties listed in **Table 4.9** must be acquired, or written permission must be secured from the affected property owner(s) to authorize the projected increase in flooding. During the design phase of the project additional flood modeling and outreach with impacted



shows resist feature alignment

GREEN shows decreases in flood depth in inches

PINK shows increases in flood depth in inches

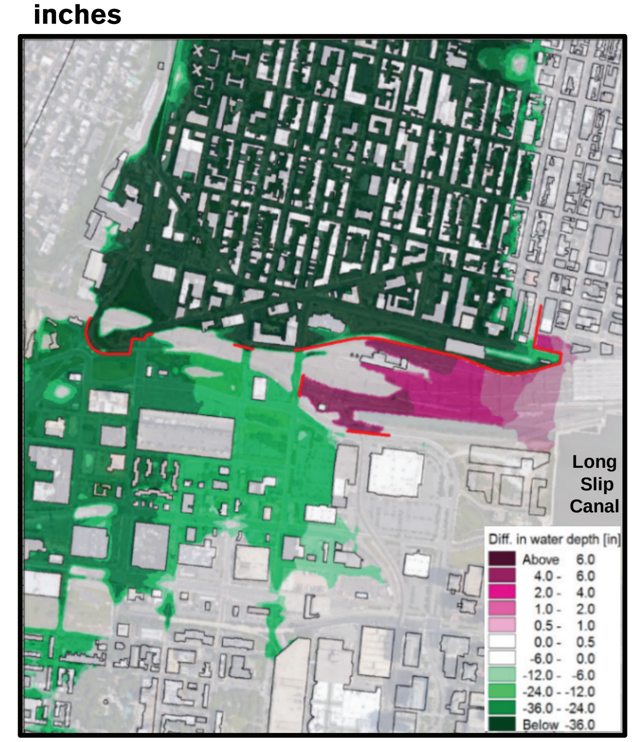


Figure 4.20 Modeled Increase in Flood Depths - Alternative 3

property owners will be performed which may enable site-specific mitigation measures to be developed for the impacted properties prior to the application for the Flood Hazard permit.

Under Alternative 2, the flood risk reduction benefits to adjoining areas in Jersey City would be the same as Alternative 1.

Alternative 3

Table 4.10, Figure 4.19 and Figure 4.20 shows the areas of floodplain disturbance for Alternative 3, including Options 1 and 2. Permanent disturbance occurs where above-ground structures are proposed, such as the Resist infrastructure. Temporary disturbance occurs where disturbance is only required during construction, such as at staging areas or areas where construction would be required for below-ground infrastructure (including DSD and High Level Storm Sewer components), but no permanent above-ground structures are proposed. DSD components would be located below-grade; therefore, no permanent impacts to the floodplain are anticipated for DSD. Alternative 3 would result in a minor permanent disturbance to approximately one percent of the 100-year floodplain within the Study Area.

Under Alternative 3, where Resist barriers are located inland, coastal modeling indicates the potential for and magnitude of impacts resulting from coastal storm surge flooding would be reduced for 85 percent of the persons residing within the 100-year floodplain within the Study Area. These coastal storm surge flood risk reduction benefits were calculated using coastal modeling (conducted as part of the project's feasibility study) and 2010 census data. Of the 15 percent of the population still experiencing coastal flooding, the majority of the properties would experience no increase in flooding over that which would occur in the No Action Alternative. However, there is the potential for a minimal increase in floodwater depth at the peak of a 100-year storm at five properties as depicted on **Table 4.11**. Flood depth increases are less than 2.5 inches for these properties, except for the western portion of NJ TRANSIT's Hoboken Terminal rail yard, which may experience an increase of up to 6.5 inches at the peak during a 100-year storm (impacts to NJ TRANSIT are further discussed in Section 4.9). These potential increases are in addition to flooding that would occur without the proposed improvements being constructed. The approximate differences in flood depths for these properties is shown on **Table 4.11.**

Figure 4.20 depicts the changes in coastal flood inundation from Alternative 3 during a 100-year coastal storm event. The areas in green are those that would receive reduced coastal flooding; the areas in pink (which includes the properties on **Table 4.11**) show the potential increase in flooding. Areas not shaded would either experience no flooding or would experience no difference in flooding other than what would happen during a coastal storm under the No Action Alternative. In order for the Project to be compliant with applicable state laws (including the New Jersey Flood Hazard Area Control Act), if impacts cannot be minimized or avoided either an easement on properties listed in **Table 4.11** must be acquired, or written permission must be secured from the affected property owner(s) to authorize the projected increase in flooding. During the design phase of the project additional flood modeling and outreach with impacted property owners will be performed which may enable site-specific mitigation measures to be developed for the impacted properties prior to the application for the Flood Hazard permit.

Under Alternative 3, the flood risk reduction benefits to adjoining areas in Jersey City would be the same as Alternative 1.

No Action Alternative

No impacts on floodplains would result from the No Action Alternative. The No Action Alternative would not implement any flood risk reduction measures, leaving the potential for future flooding and risk to lives or properties the same as the current condition.

4.1.3.5.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

Since the Study Area is already fully developed, many of the traditional approaches for minimizing and avoiding floodplain impacts identified in the procedures of implementation of EO 11988 are not applicable to this Project. The following measure would be implemented in order to minimize impacts from the DSD portion of the project on floodplains:

- Green infrastructure projects would be implemented in the DSD portion of the Project.

The following measure would be implemented in order to minimize impacts from the Resist portions of the project on floodplains:

- The project must obtain a permit pursuant to the New Jersey Flood Hazard Area Control Act rules at N.J.A.C. 7:13. These rules prohibit issuance of a permit for any project that may result in increased flooding of other properties in a floodplain. As previously described, the project may cause an increase to peak flooding during a coastal storm event for properties identified in Tables 4.7 (Alternative 1), 4.9 (Alternative 2) and 4.11 (Alternative 3). For the Project to be compliant with the state laws, if impacts cannot be minimized or avoided either an easement on these properties must be acquired or written permission must be secured from the affected property owner to authorize the modeled increase in flooding. During the design phase of the project additional flood modeling and outreach with impacted property owners will be performed which may enable site-specific mitigation measures to be developed for the impacted properties prior to the application for the Flood Hazard permit.

The following measures would be implemented in order to minimize impacts from the Resist and DSD portions of the project on floodplains:

- Vegetation removal would be minimized and all re-vegetation activities would be in accordance with accepted practices, including appropriate species selection;
- Local jurisdictions would pursue opportunities to provide flood risk reduction for infrastructure and buildings that do not receive flood risk reduction benefits from the Project;
- Public access to the urban waterfront would continue to be provided; and
- The Project would be a constant and visible reminder to residents and visitors of the importance of proper floodplain management.

4.1.3.6 Aquatic Ecology

Alternative 1

Alternative 1 involves reconstruction of approximately 8,500 linear feet of waterfront structures. This alternative has the greatest risk of impacts on aquatic species found in the Hudson River. Impacts to aquatic ecology, including EFH, could arise from shading, sedimentation, and noise/vibration. Potential impacts from shading are considered negligible since there is no SAV within the natural ecosystems analysis area. Potential impacts from sedimentation on aquatic ecology are considered short-term and minor and are discussed in Section 4.1.3.4 Surface Water. Any mobile aquatic species found in the area would be expected to temporarily relocate to avoid any potential impacts associated with increased sedimentation. Therefore, impacts of sedimentation on aquatic species including phytoplankton, zooplankton, benthic invertebrates, and marine mammals, are considered to be negligible.

The Project is located within the NMFS Greater Atlantic Regional Fisheries Office (GARFO) region and within nearshore of the Hudson River. As a result, NMFS' in-house tool for assessing potential effects on fish, including EFH and listed species exposed to underwater sound as a result of impact pile and vibratory sheet pile driving, was utilized. The Simple Attenuation Formula (SAF) was utilized, based on best available scientific and commercial information, for the hydroacoustics analysis. Attenuation rates assumed within the SAF were estimated using measurements reported in Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish, prepared for the California Department of Transportation (CALTRANS), November 2015. All structures along the waterfront and on land within 200 feet of the Hudson River were included in the analysis.

Based on conceptual review of structural needs, engineers have preliminarily determined that the Project may require a combination of W-piles (21" x 182") and H-piles (14" x 89") ranging in length from 32 feet to 66 feet, driven via an impact pile driving rig and vibratory hammer, respectively. Hudson River waterfront water depths range from two feet to 15 feet below grade, depending on ground surface elevation.

W-piles (21" x 182") were assumed to be required along the entire Resist structure alignment. Source data as a result of impact pile driving is limited and the SAF provides a few different levels based on pile size, pile type, and water depth. In lieu of source levels specifically listed for W-piles (21" x 182"), in-water analyses were based on the most representative source level (12" steel H-pile), using a cushioned impact hammer and standard attenuation rate of 5 dB/10 m. Identical reference source data was utilized for on-land analyses, but reduced by 10 dB to account for pile driving on land, as suggested within Appendix IV (CALTRANS Pile Driving Screening Tool) of the Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish guidance document.

Based on the 206 dBPeak injury threshold for impact pile driving, no sturgeon injury (Atlantic or shortnose) is expected as a result of any in-water or on-land impact W-pile driving utilizing a cushioned impact hammer under Alternative 1. However, based on a behavioral disturbance threshold of 150 dBRMS, behavioral disturbance of sturgeon (Atlantic and shortnose) is predicted within 125 feet of the shoreline as a result of in-water impact pile driving activities. No behavioral disturbance was predicted as a result of any on-land impact pile driving.

In addition to W-piles, H-piles (14 x 89) are assumed to be necessary along the entire Resist structure alignment. Source data as a result of vibratory sheet pile driving is limited and the SAF provides a few different levels based on pile size, pile type, and water depths. In lieu of source levels specifically listed for 14" H-piles, the in-water analysis was based on the most representative source levels (12" steel H-pile), using a vibratory hammer and standard attenuation rate of 5 dB/10 m. Identical reference source data was utilized for on-land analyses, but reduced by 10 dB to account for vibratory sheet driving on land, as suggested within Appendix IV (CALTRANS Pile Driving Screening Tool) of the Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish guidance document.

Based on the 206 dBPeak injury threshold, no sturgeon (Atlantic or shortnose) injury is expected during H-sheet pile driving utilizing a vibratory hammer under Alternative 1. However, based on a behavioral disturbance threshold of 150 dBRMS, behavioral disturbance of sturgeon (Atlantic or shortnose) is predicted within 131 feet of shoreline as a result of in-water vibratory sheet pile driving activities. No behavioral disturbance was predicted as a result of any on-land vibratory sheet pile driving.

Both juvenile and adult Atlantic and shortnose sturgeon seasonally migrate up and down the Hudson River. However, there is no record of spawning near the natural ecosystems analysis area and there is no record of occurrence for either species within the natural ecosystems analysis area. While it is possible that either species could occur in the natural resources analysis area, the preferred habitat for both species is in the deep water channel of the Hudson River, which is outside the boundary of the natural ecosystems analysis area ("Sturgeon of the Hudson River", M. Bain et. al. Hudson River Foundation, May 1998 and "Recovery Plan for the Shortnose Sturgeon [Acipenser brevirostrum]", National Marine Fisheries Service, May 1998). Therefore, it is highly unlikely that either species would enter the relatively shallow water of Weehawken Cove or along the Hudson River shoreline, where the water is approximately 10 feet deep.

Of the estimated 8,500 linear feet of waterfront structure reconstruction under Alternative 1, about 6,000 linear feet is along the Hudson River waterfront and the remaining 2,500 linear feet is within Weehawken Cove. Since there is no suitable habitat for sturgeon in Weehawken Cove, the impact on the species during waterfront reconstruction in that area is considered negligible. Assuming construction would progress at 240 linear feet per month, the duration of potential elevated aquatic noise levels along the Hudson River is approximately 25 months. While movement of sturgeon within 125 to 131 feet of the shoreline is possible during the 25-month construction period, it is considered unlikely since there is no suitable habitat in this area. In addition, it has been shown that sturgeon can effectively avoid potential impacts arising from underwater acoustical noise ("Avoidance of Pile-Driving Noise by Hudson River Sturgeon During Construction of the New NY Bridge at Tappan Zee", Krebs, J. et. al. Adv Exp Med Biol. 2016;875:555-63). As the Hudson River is approximately 4,000 feet wide in the vicinity of the natural ecosystem analysis area and the potentially elevated noise levels only extend 125 to 131 feet from the shoreline, the zone of passage for any fish encountering elevated noise levels is considerable. For these reasons, noise impacts on fish and EFH are expected to be short-term and range from negligible to minor in magnitude under Alternative 1.

Similarly, potential noise impacts to other mobile aquatic species found in the Natural Ecosystem Analysis Area, including marine mammals, are expected to be negligible because species would be anticipated to temporarily relocate to avoid any disturbance impacts.

The waterfront structures that have been identified as having integrity issues would be repaired/ replaced under Alternative 1. These structural improvements would prevent long-term soil erosion and sedimentation release and any impacts to aquatic species resulting from this ongoing sedimentation would be reduced over the long-term under Alternative 1.

In general, the waterfront areas along the Hudson River in the Study Area are already completely hardened. Alternative 1 would increase resiliency against flooding, but would not generally restore habitat. There may be some new structures that fish may use during the time they spend in this portion of the river. In addition, the use of non-polluting construction materials would minimize any long-term impacts from the reconstruction of waterfront structures.

NMFS typically consults on proposed actions only. Therefore, NMFS consultation was initiated on March 16, 2017, after the issuance of the DEIS, which recommended Alternative 3 as the Preferred Alternative. Consultation with NMFS was on impacts arising from the Preferred Alternative only. The results of that consultation can be found in the discussion of Alternative 3 below.

In terms of water quality, Alternative 1 would result in a long-term stormwater discharge (see Section 4.1.3.4 Surface Water), but this discharge is anticipated to be minor and is expected to result in negligible aquatic ecology impacts from water quality within the Hudson River. The stormwater discharge would be accompanied by a corresponding decrease in discharge of NHSA's CSO.

Alternative 2

The potential impacts arising from shading and sedimentation under Alternative 2 are the same as described under Alternative 1. Reconstruction of waterfront structures under Alternative 2 is limited to approximately 400 linear feet of shoreline in Weehawken Cove and along the Hudson River. In-water work required under Alternative 2 is limited to 30-40 linear feet of shoreline at two high level discharge sites. Therefore, impacts of this reconstruction on aquatic ecology, including listed fish species is considered negligible.

NMFS typically consults on proposed actions only. Therefore, NMFS consultation was initiated on March 16, 2017, after the issuance of the DEIS, which recommended Alternative 3 as the Preferred Alternative. Consultation with NMFS was on impacts arising from the Preferred Alternative only. The results of that consultation can be found in the discussion of Alternative 3 below.

In terms of water quality, Alternative 2 would result in a long-term stormwater discharge (see Section 4.1.3.4 Surface Water), but this discharge is anticipated to be minor and is not expected to result in measurable aquatic ecology impacts from water quality within the Hudson River. The stormwater discharge would be accompanied by a corresponding decrease in discharge of NHSA's CSO. Alternative 2 would not address the structural integrity issues associated with the existing waterfront structures and current levels of sedimentation would continue.

Alternative 3

Consultation with the NMFS was initiated on March 16, 2017. NMFS responded on April 21, 2107 with concurrence that the project is not likely to adversely affect listed species or critical habitat. NMFS stated that no further consultation pursuant to Section 7 of the Endangered Species Act is required for aquatic species, unless new information reveals effects to species in a manner not previously considered, if the proposed project is modified that causes a change to impacts that had not been previously considered, or if a new species is listed or new critical habitat designated that may be affected. A copy of the NMFS concurrence is included in Appendix B.

In addition, NMFS's Habitat Conservation Division responded on May 8, 2017 stating that the Study Area has been designated EFH for a number of federally-managed species. The Habitat Conservation Division stated that mitigation of in-water impacts should be managed by timing restrictions. Installation of cofferdams for in-water work must be done prior to January 15 and removed after May 31 of any given year. Turbidity curtains may be removed at any time. Further, the NMFS Habitat Conservation Division stated that discharge from proposed stormwater outfalls may increase scouring of bottom sediments, thereby impacting benthic organisms. Outfalls must be designed to minimize potential for scouring of sediments at the discharge points. The NMFS Habitat Conservation Division stated that further consultation with them is required, however, they recognized that the design of the outfalls at this stage may not be detailed enough to allow for a further evaluation of impacts. This consultation with NMFS will occur during final design once the outfalls have been further developed.

In terms of water quality, Alternative 3 would result in a long-term stormwater discharge (see Section 4.1.3.4 Surface Water), but this discharge is anticipated to be minor and is not expected to result in measurable aquatic ecology impacts from water quality within the Hudson River. The stormwater discharge would be accompanied by a corresponding decrease in discharge of NHSA's CSO. Alternative 2 would not address the structural integrity issues associated with the existing waterfront structures and current levels of sedimentation would continue.

No Action Alternative

No additional impacts on aquatic ecology would result

Figure 4.21 Impacted Wetlands

from the No Action Alternative. The existing waterfront structures have been identified as having structural integrity issues which are likely resulting in adverse impacts on aquatic ecology from sedimentation. Any adverse impacts would continue for the long-term under the No Action Alternative. The No Action Alternative would also continue the current level of CSO discharge within the Hudson River, thereby continuing any ongoing impacts of CSO discharge on aquatic ecology.

4.1.3.6.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures, as approved by the NMFS, would be implemented to minimize impacts from the Resist component of the project on aquatic ecology (the discussion of mitigation for outfalls is also applicable to DSD components):

- Peak underwater noise levels would remain below 150 dB to avoid physiological and behavioral impacts to listed aquatic species;
- The zone of passage for this Project would be maintained for 24 hours per day. Since the Project is on the NJ shoreline side of the Hudson River, species would have a wide passage to bypass the impacted area and avoid noise and other short-term disturbances; and
- Installation of cofferdams for in-water work must be done prior to January 15 and removed after May 31 of any given year. Turbidity curtains may be removed at any time.
- Outfalls must be designed to minimize potential for scouring of sediments at the discharge points. Further consultation with NMFS Habitat Conservation Division is required, however, NMFS recognized that the design of the outfalls at this stage may not be detailed enough to allow for a further evaluation of impacts. This consultation with NMFS will occur during final design once the outfalls have been further.

4.1.3.7 Coastal Resources

Alternative 1

Under Alternative 1, the properties/ROWs identified in **Table 4.5** may be owned by the state under the tidelands program. The majority of the former tidelands are located in the area of the waterfront structures included under Alternative 1; however, the former tidelands located along the waterfront have been granted in the past to public or private parties. Exceptions are the proposed Resist structure and an underground stormwater storage tank and piping associated with the DSD portion of the project, both located in the ROW of of Observer Highway. Based on a review of Tideland Grant Maps at the NJDEP, the former tidelands in this area do not appear to have been granted to the City of Hoboken. If a tidelands grant has not already been issued by the NJDEP, one would need to be obtained for these areas of tideland claims.

There are also potential tidelands claims located in the areas of the DSD facilities for each of the alternatives. These are located on public property, public ROW and/or private property, as shown on Figure 15. If a tidelands grant has not already been issued by the NJDEP, one would need to be obtained for these areas of tideland claims.

The project involves work within areas regulated under the Coastal Zone Management Act; therefore, the project would need to demonstrate consistency with the Coastal Zone Management Act. Alternative 1 would involve a significant amount of in-water work for the replacement of bulkheads associated with the Resist structure and DSD outfalls. Therefore, a Waterfront Development Individual Permit would need to be obtained. No other Coastal Zone Management permits would be required.

Alternative 2

The potential tidelands claims under Alternative 2 would be identical to those described in Alternative 1. Alternative 2 would involve in-water work for the replacement of bulkheads associated with proposed outfalls. Therefore, a Waterfront Development Individual Permit would need to be obtained. No other Coastal Zone Management permits would be required.

Alternative 3

The potential tidelands claims and Coastal Zone Management/Waterfront Development permitting under Alternative 3 would be identical to those described in Alternative 1.

No Action Alternative

There would be no impact to tideland claims under the No Action Alternative.

4.1.3.7.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures would be implemented in regards to tidelands claims for both Resist and DSD portions of the project:

- To definitively identify ownership, a review of state tideland grants and/or a property title search would be required for all Build Alternatives; and
- If no tideland grants are determined to be present for the potential tideland claims within the project area (**Table 4.5**), grants would be sought from the Tidelands Resource Council.

4.1.3.8 Wetlands

Alternative 1

Under Alternative 1, wetland impacts are related to the installation of the Resist feature in the southwestern portion of the Study Area (see **Figure 4.21**). No wetland impacts due to the proposed DSD features are anticipated. The wetland that would be impacted by the Resist feature is Wetland B, a man-made drainage ditch with a concrete lining, in the area of the HBLR line. Wetland B is a palustrine emergent wetland (PEM). It is anticipated that Wetland B would be classified as Ordinary Resource Value and would not require a transition area.

Figure 4.22 Upland Vegetation Impacts - Alternative 1

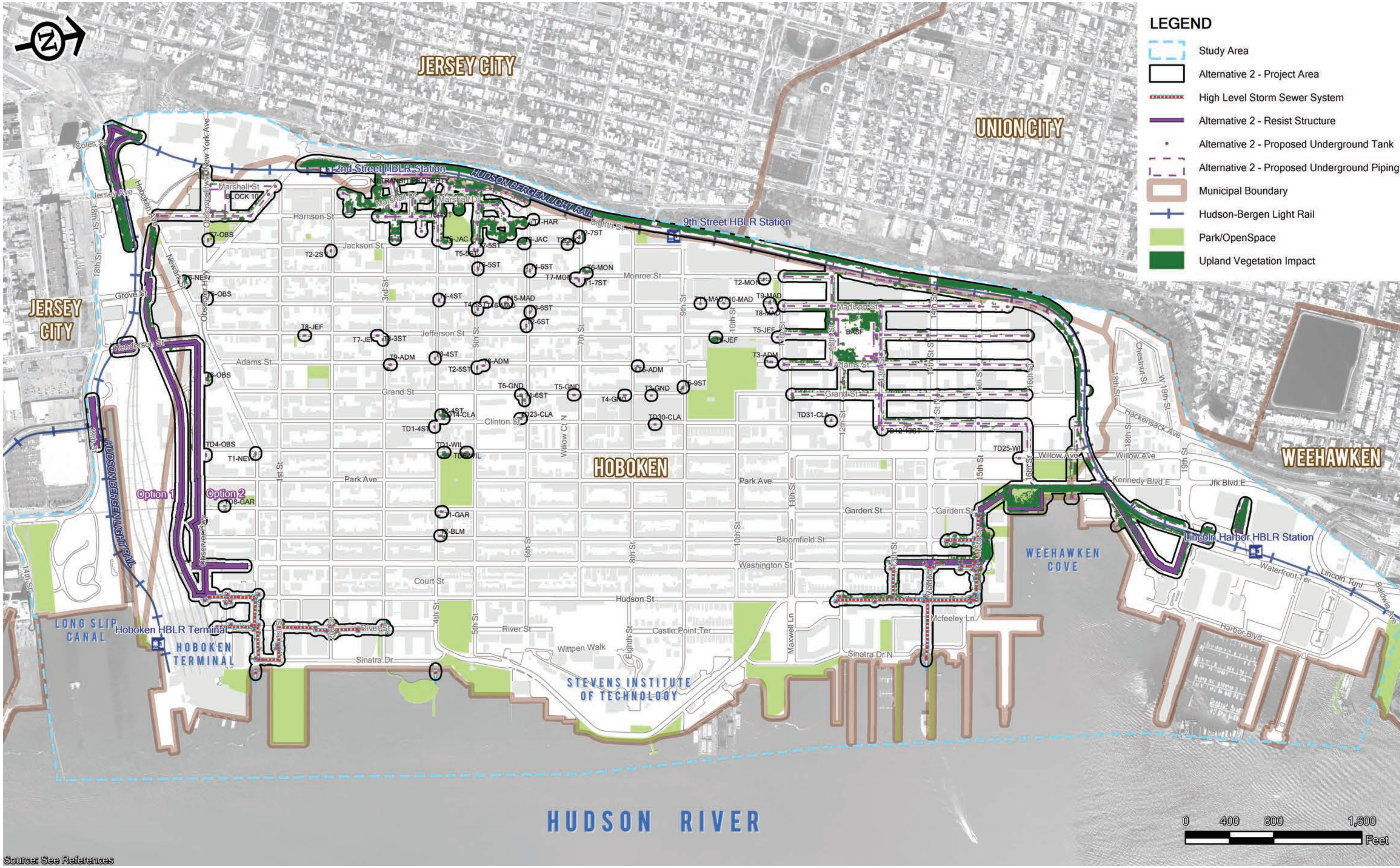


Figure 4.23 Upland Vegetation Impacts - Alternative 2

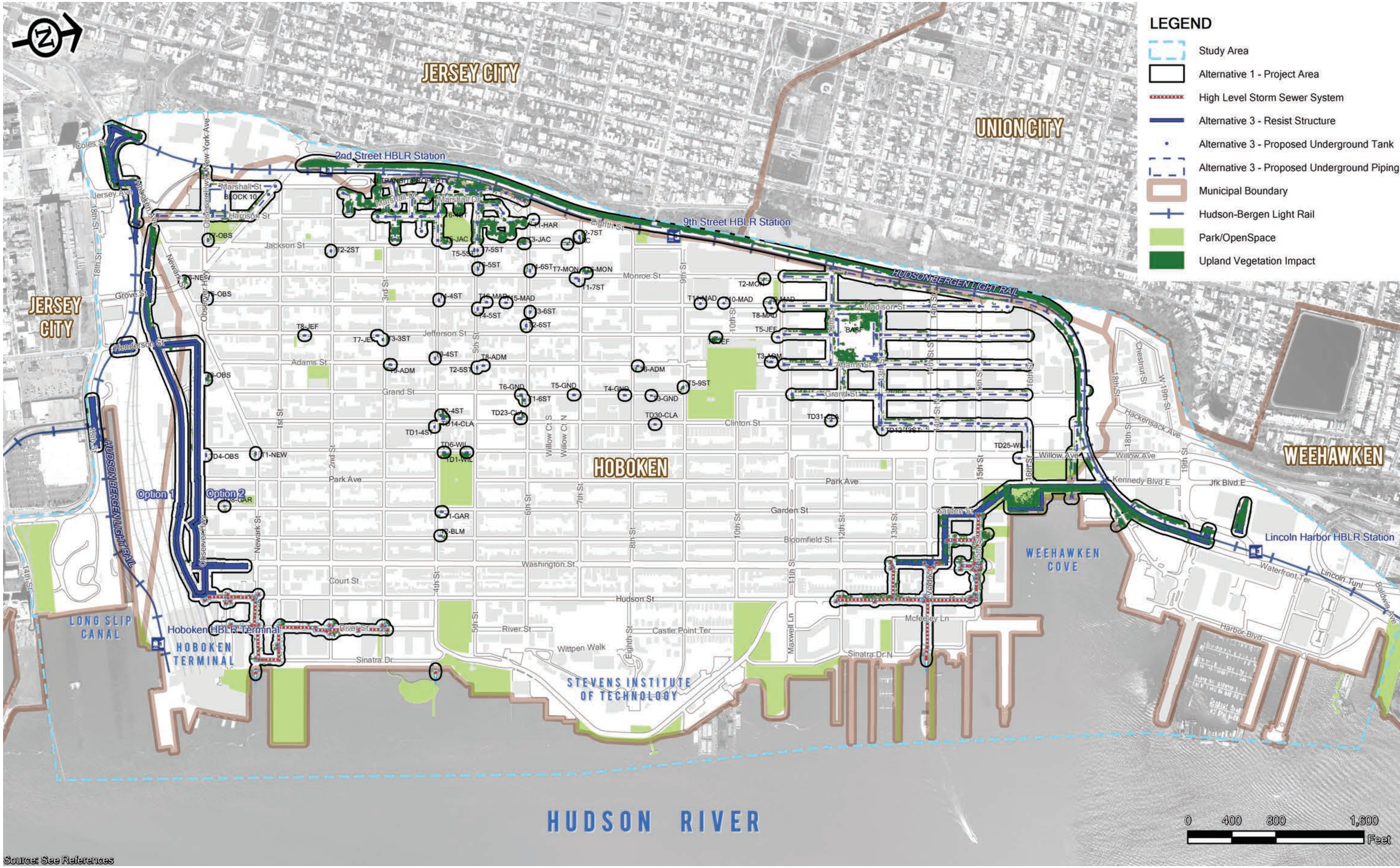


Figure 4.24 Upland Vegetation Impacts - Alternative 3

There would be an estimated total of 230 SF (0.005 acres) of PEM impacts under Alternative 1. The loss of the functions and values of the impacted wetlands would be negligible in terms of stormwater conveyance and flood flow alteration and the wetland provides little in terms of habitat and wildlife values. Its functions would be replaced by the proposed floodwall. The wetland impact resulting from Alternative 1 would be minor and compensatory mitigation is not anticipated to be required.

Alternative 2

The wetland impacts under Alternative 2 would be identical to the impacts described in Alternative 1.

Alternative 3

The wetland impacts under Alternative 3 would be identical to the impacts described in Alternative 1.

No Action Alternative

No impacts on wetlands would result from the No Action Alternative, since there is no ground disturbance.

4.1.3.8.1 *Wetland Mitigation*

As required by EO 11990 and in accordance with Section 404(b)1 guidelines, wetland mitigation should include compensation for unavoidable losses. Generally, mitigation must be conducted in concert with the construction of the Project to compensate for the loss of wetland functions and values. Under the wetlands rules (NJAC 7:7A-15.8), mitigation is required for the permanent loss of greater than 0.1 acres of freshwater wetlands and may be required for less than 0.1 acres if the application fails to demonstrate that "all activities have been designed to avoid and minimize impacts to wetlands."The method of mitigation and compensation ratio for wetlands permanently disturbed is outlined below:

1. On-site or off-site wetland creation/restoration at a 2:1 ratio
2. On-site or off-site wetland enhancement: ratio determined on a case-by-case basis
3. Purchase of credits from a wetlands mitigation bank: determined on a case-by-case basis
4. Monetary contribution to the Wetlands Mitigation Counsel: formula provided under NJAC 7:7A-15.21(d); the amount of monetary contribution for all property owners, excluding single-family property owners, shall be the acreage of wetlands/open water impacts multiplied by $300,000, adjusted annually using the Consumer Price Index
5. Land donation to the Wetlands Mitigation Counsel: determined on a case-by-case basis
6. NJDEP requires that impacted wetlands be mitigated as part of the project plan. Mitigation sites must be identified during the design of the Project so that suitable areas are available

Based on the estimated potential wetland impact resulting from each of the Build Alternatives (230 SF, 0.005 ac.), mitigation is not anticipated to be required. However, an on-site field search was performed in conjunction with the wetland delineation activities and an area in the southwest portion of the Study Area was identified as a potential wetland creation location, if one is needed. In regards to mitigation bank credits, MRI-3 Mitigation Bank in Carlstadt, Bergen County, New Jersey serves the Hackensack Meadowlands District and HUC 020-30-101-170. As of June 1, 2016, the MRI-3 Mitigation Bank had PEM credits available.

4.1.3.8.2 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures would be implemented to minimize impacts from the Resist portion of the project on wetlands and open waters:

- Identified wetland areas that are not included in the Build Alternatives' limit of disturbance would not be impacted;
- Any potential introduction or spread of invasive species due to ground disturbance in wetlands would be assessed. If it is determined that the spread of invasive species is a risk, preventative measures recommended in the New Jersey Strategic Management Plan for Invasive Species, such as cleaning of boots and tires and the cleaning of equipment prior to arriving at new job sites to remove mud that potentially contains seeds of invasive species would be implemented; and
- Open water impacts along the Hoboken waterfront would be avoided and minimized to the greatest extent practicable. Only those areas of bulkhead that need to be replaced for the Resist structure would be changed and the design and construction methods would minimize the extent of the impacts to open waters associated with the replacement process.

4.1.3.9 Upland Vegetation and Wildlife

Alternative 1

All of the upland vegetation impacts under Alternative 1 would be in previously developed and disturbed areas. Since only typical urban plant and animal species were observed in the Study Area, this loss of upland vegetation would be a minor, short-term impact until re-vegetation efforts are successful. Under Alternative 1, approximately 25.5 acres of upland vegetation are present within a 50-foot buffer for both Options 1 and 2. By using the limits of disturbance for both Resist and DSD, the impact is anticipated to be 3.98 acres. The vegetation that would be disturbed outside of developed areas would be replaced following construction activities. As discussed previously, the New Jersey No Net Loss Reforestation Act has been determined not to be applicable to the upland vegetation located within the Study Area.

As described in Section 4.1.2.9.1, the USFWS IPaC Trust Resource Report indicated no federally-listed threatened or endangered species on the onshore portion of the Study Area (impacts to federally-listed aquatic species is included in Section 4.1.3.6). Therefore, consultation with the USFWS is not required. In addition, the NJDEP NHP analysis did not identify state or federally-listed threatened or endangered species, with the exception of shortnose sturgeon (see Section 4.1.3.6). The NHP results did identify three bird species of special concern with potential foraging habitat; however, no nesting habitat was identified and there is no protection status for these species.

There would be negligible to minor effects to wildlife and wildlife corridors resulting under Alternative 1 because the majority of animals in and around the Study Area are accustomed to fragmented, urban areas. Any wildlife in the area would temporarily avoid the construction areas and the proposed Build Alternatives are not expected to affect long-term use of the areas by wildlife (see **Figure 4.22**).

Alternative 2

Impacts on upland vegetation and wildlife under Alternative 2 would be similar to the impacts described under Alternative 1. Under Alternative 2 approximately 23.4 acres of upland vegetation are present within a 50 foot buffer for both Options 1 and 2. By using the limits of disturbance for both Resist and DSD, the impact is anticipated to be 3.37 acres (see **Figure 4.23**).

Alternative 3

Impacts on upland vegetation and wildlife under Alternative 3 would be similar to the impacts described under Alternative 1. Under Alternative 3, approximately 22.2 acres of upland vegetation are present within a 50-foot buffer for both Options 1 and 2. By using the limits of disturbance for both Resist and DSD, the impact is anticipated to be 3.34 acres (see **Figure 4.24**).

No Action Alternative

No impacts on upland vegetation would result from the No Action Alternative, since there would be no ground disturbance.

4.1.3.9.1 *Mitigation Measures and BMPs Included in Alternatives 1, 2, and 3*

The following measures would be implemented in order to minimize impacts from both the Resist and DSD portions of the project on upland vegetation and wildlife:

- Prior to any vegetation clearing, a pre-construction nest survey would be completed to identify active nests. If active nests are observed in the project area, protective buffer zones around the nest would be established (dependent on species) and construction would be allowed to commence only when the young are fully fledged and able to fly;
- Impacts to areas outside of the limits of construction would be avoided; and
- Disturbed areas would be reseeded or landscaped in accord with species lists provided by local jurisdictions, and disturbed areas and presence of invasive species would be monitored and controlled, as required.