Chapter 5.6: Natural Resources

A. INTRODUCTION

This chapter describes existing natural resources within the project area and vicinity and evaluates potential effects that may result from implementation of the proposed project. The natural resources described and evaluated include geologic and soil resources; groundwater resources; wetlands; flood hazard areas; surface waters; aquatic resources; and terrestrial resources including wildlife, ecological communities, and threatened and endangered species. Potential effects to natural resources from construction activities are evaluated in Chapter 6.5, “Construction—Natural Resources.”

STUDY AREA

The study area for the analysis of natural resources includes Project Area One, Project Area Two, and a 400-foot buffer surrounding these areas. The 400-foot buffer area encompasses some parts of inland Manhattan that would not be subject to construction. The 400-foot buffer area also encompasses the nearshore area of the East River that abuts Project Area One and Project Area Two. In total, the study area consists of approximately 255 acres of land, 127 acres of water, and 2.2 miles of shoreline (see **Figure 5.6-1**).

B. PRINCIPAL CONCLUSIONS

NO ACTION ALTERNATIVE (ALTERNATIVE 1)

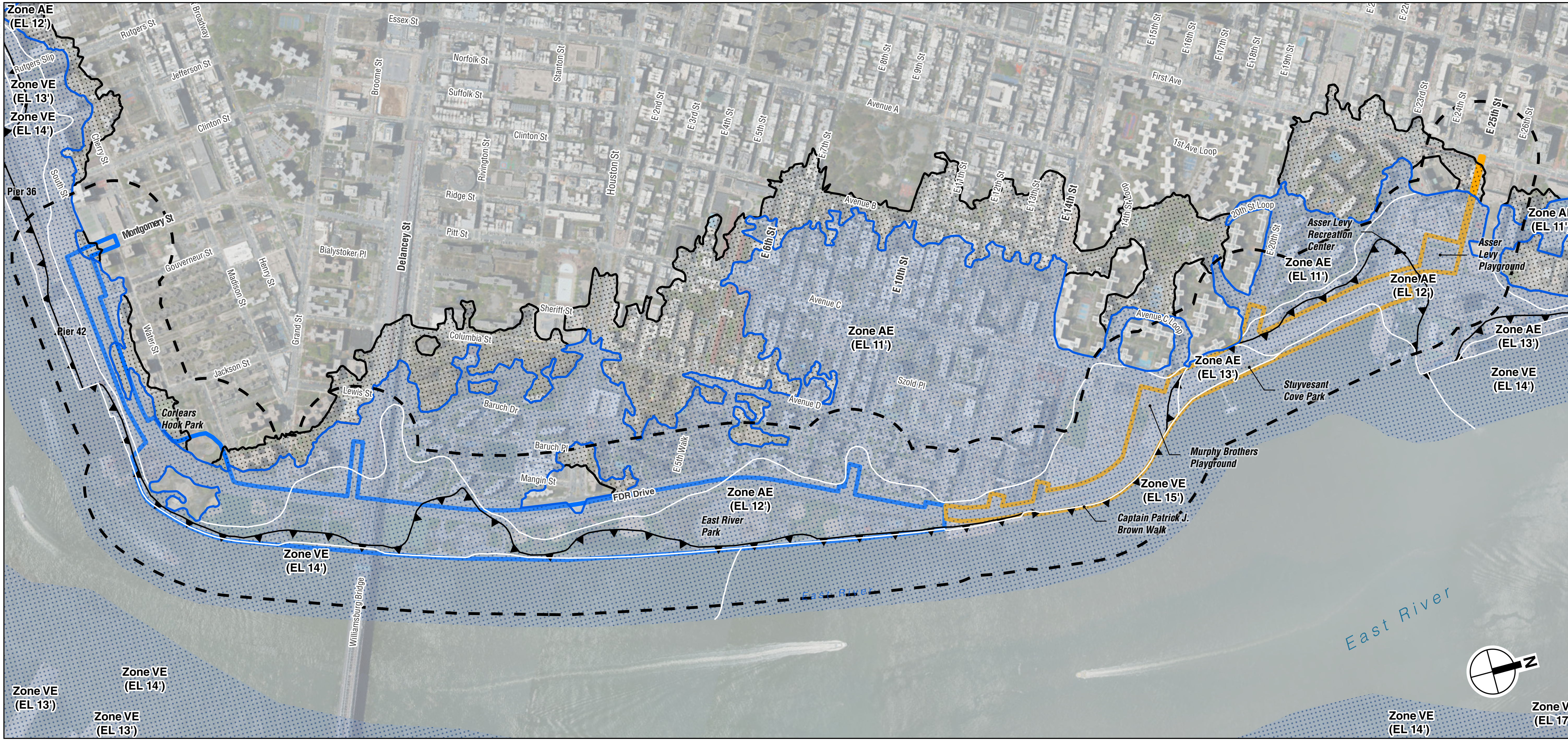
The No Action Alternative could potentially result in adverse effects to natural resources conditions. In the absence of the proposed project, the neighborhoods in the protected area (see Figure 1.0-2) would remain at risk to coastal flooding during design storm events. Future storms would be expected to cause further damage to natural resources within the Parks, beyond the effects caused by Hurricane Sandy. Hundreds of trees in East River Park have been removed due to saltwater inundation, and additional trees are still in decline and will likely require removal in the near future. Targeted resiliency measures described in **Appendix A1** may reduce the effects in certain locations but would not provide comprehensive protection against the design storm (the 100-year flood events with sea level rise projections to the 2050s).

PREFERRED ALTERNATIVE (ALTERNATIVE 4): FLOOD PROTECTION SYSTEM WITH A RAISED EAST RIVER PARK

The Preferred Alternative proposes to move the line of flood protection further into East River Park, thereby protecting both the community and the park from design storm events, as well as increased tidal inundation resulting from sea level rise. The Preferred Alternative would raise the majority of East River Park. This plan would reduce the length of wall between the community and the waterfront to provide for enhanced neighborhood connectivity and integration. A shared-use pedestrian/bicyclist flyover bridge linking East River Park and Captain Brown Walk would be built cantilevered over the northbound FDR Drive to address the narrowed pathway (pinch point) near the Con Edison East River Dock between East 13th Street and East 15th Street, substantially

8/19/2019

Source: FEMA Preliminary Flood Insurance Rate Maps, 1/30/2015



Project Area One

Project Area Two

Natural Resources Study Area (400-Foot Study Area Radius)

100-Year Flood Hazard Area (1% Annual Chance)

500-Year Flood Hazard Area (0.2% Annual Chance)

Boundary Dividing Flood Hazard Area Zones and Areas of Different Base Flood Elevations

Limit of Moderate Wave Action (Coastal A Zone)

0 1,000 FEET

Capital Project SANDRESM1

EAST SIDE COASTAL RESILIENCY PROJECT

Natural Resources Study Area and
FEMA Preliminary Flood Hazard Areas (2015)

Figure 5.6-1

improving the City's greenway network and north-south connectivity in the project area and reducing the potential for flooding, wave damage, and the resulting scouring and erosion. The Preferred Alternative would, therefore, be consistent with the City's Waterfront Revitalization Program (WRP) policies regarding improving public access to the City's waterfront Parks offering waterfront views and improved experiences while accommodating longstanding passive and active recreational amenities in existence for decades.

The Preferred Alternative would result in temporary adverse effects to trees, with a total of 991 trees to be removed for the proposed flood protection system, of which 819 are located within East River Park (see **Table 5.6-1**). Mitigation would be provided through the implementation of a landscape restoration plan, which is comprised of several elements. First, to the extent practicable, the City would transplant existing park trees that are in excellent condition and, based on prior NYC Parks arborist experiences and approvals, are suitable for a successful transplanting. Second, approximately 1,815 replacement trees are proposed to be planted as part of the landscape design within the project areas, which would result in a net increase of 745 trees over the existing conditions. The value of this restoration plan, in combination with approximately $32.9 million of restitution, would be in compliance with Chapter 5 of Title 56 of the Rules of New York (NYC Parks Rules) and Local Law 3 of 2010. The restitution funds would be used towards targeted tree planting and urban forest enhancements throughout the adjacent communities, including the Lower East Side greening program, which proposes to plant up to 1,000 trees in parks and streets, and create up to 40 bioswales starting in fall of 2019..

The landscape restoration plan includes over 50 different species, reflecting research around the benefits of diversifying species to increase resilience and adaptive capacity in a plant ecosystem and also pays special attention to species that can handle salt spray, strong winds, and extreme weather events. The design also focuses on creating a more layered planting approach, allowing for informal planting areas that layer plant communities together to express ecological richness. A more diverse native plants palette has the ability to better adapt to climate change stressors. Once planted and established, the new landscape would represent an improvement in ecological sustainability, habitat creation, and adaptability in the face of a changing climate. The landscape restoration plan would ultimately result in a net increase of 745 total trees within the project area (see **Table 5.6-1**). While these trees would not be as mature as some existing trees, over time, the new tree canopy would fill in and represent an improved habitat over the existing conditions, which is largely dominated by London plane trees, known for their poor response to salt-water inundation.

The Preferred Alternative would also include permanent in-water elements such as support foundations for the shared-use flyover bridge to connect the north end of East River Park to Captain Patrick J. Brown Walk to the north as well as the relocation of the two existing embayments. Installation of the structural supports for the flyover bridge and relocation of the embayments would result in adverse effects to 29,825 square feet of New York State Department of Environmental Conservation (NYSDEC) unvegetated littoral zone tidal wetlands and U.S. Army Corps of Engineers (USACE) Waters of the United States within the East River. Adverse effects to aquatic resources would be mitigated for with the creation of 24,868 square feet of new embayments within the project area and the purchase of credits from the Saw Mill Creek Wetland Mitigation Bank operated by New York City Economic Development Corporation (EDC) located on Staten Island, New York, or off-site wetland restoration, pursuant to NYSDEC and USACE permit requirements. The mitigatory elements of the Preferred Alternative are consistent with the City's WRP policies of protecting water quality, sensitive habitats, and the aquatic ecosystem.

Adverse effects to unvegetated littoral zone wetland have the potential to affect Essential Fish Habitat (EFH) and habitat for epifaunal benthic organisms that may provide a foraging habitat for certain fish that are protected under the Fish and Wildlife Coordination Act (FWCA). However, the EFH and habitat with the potential to be affected by the Preferred Alternative constitutes a very small portion of the available EFH and habitat within the New York Harbor Estuary waters (<0.1 percent). The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic organism productivity and biomass. In addition, the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park is also being explored as design advances. Specific elements of the habitat enhancements in the new embayments include ECOncrete® tidal pools, pile jackets installed on the existing steel esplanade piles, as well as an armor block breakwater at the southern embayment, which are described in greater detail below. Lastly, additional habitat would be created within the NY Harbor Estuary through purchase of wetland mitigation credits or the creation of off-site tidal wetland habitat.

A consultation with NOAA NMFS was reinitiated to reflect the Preferred Alternative as required by the FWCA, Magnuson Stevens Fishery Conservation and Management Act, the Endangered Species Act, and the Clean Water Act. A response letter dated August 15, 2019 indicated NOAA NMFS's concurrence that the project would not result in substantial impacts to EFH and FWCA species with the implementation of conservation measures. Recommended conservation measures specific to the construction of the Preferred Alternative are discussed in Chapter 6.5, "Construction—Natural Resources."

Due to these measures in addition to the limited extent of adverse effects within the East River and the proposed mitigation strategy, the Preferred Alternative is unlikely to result in significant adverse effects to wetland resources, threatened, endangered or special concern species, EFH, FWCA trust resources managed by NOAA NMFS, or surface water resources. No significant adverse effects to other existing natural resources are anticipated.

OTHER ALTERNATIVES

The natural resources that would be affected under the Flood Protection on the West Side of East River Park – Baseline Alternative (Alternative 2), the Flood Protection on the West Side of East River Park – Enhanced Park and Access Alternative (Alternative 3), and the Flood Protection System Alignment East of FDR Drive Alternative (Alternative 5) are also analyzed in this chapter. During storm conditions, the flood protection systems of Alternatives 2 and 3 would largely limit storm surge effects to East River Park and Stuyvesant Cove Park to the unprotected side of the flood protection system. This inundation would affect soil and other vegetated areas such as tree pits, landscape beds, all existing horticulture, and other park resources. Alternative 5 includes the same flood protection alignment as the Preferred Alternative, including protection of East River Park, except for the area between East 13th Street and Avenue C where the northbound lanes of the FDR would be raised.

Alternatives 2 and 3 would require the removal of trees but would leave any remaining or newly planted trees in East River Park susceptible to the effects of future storms. Alternative 5 would require the same number of tree removals as the Preferred Alternative and would include the long-term protection of these terrestrial resources accomplished through the raising of East River Park proposed under the Preferred Alternative. For Alternatives 2, 3 and 5, the tree removals would also constitute a temporary adverse effect to terrestrial resources and a NYC Parks approved landscape restoration plan would be implemented to improve the landscape. Alternatives 3 and 5 would result in a net increase of trees within the project area (325 and 745, respectively) while

Alternative 2 would result in no net loss of trees (see **Table 5.6-1**). Over time, the new tree canopy would fill in and represent an improved habitat over the existing condition; however, the number of trees that would remain susceptible to future storm events would be significantly higher under Alternatives 2 and 3 than under the Preferred Alternative (1,074, 563, and 348, respectively).

Similar to the Preferred Alternative, Alternatives 2 and 3 would also adversely affect wetland resources though the footprint of disturbance would be limited to the placement of shafts for the flyover bridge within the East River. Compared to the Preferred Alternative, Alternative 5 would result in a slightly larger footprint of adverse effects to these resources due to the placement of shafts for the raised FDR Drive within NYSDEC littoral zone tidal wetlands and USACE Waters of the United States in addition to the in-water elements described for the Preferred Alternative. The adverse effects to wetland resources would be mitigated through a combination of on-site and off-site wetland restoration with the purchase of credits from the Saw Mill Creek Wetland Mitigation Bank that meets all NYSDEC and USACE permit conditions, or off-site tidal wetland restoration. Similar to the Preferred Alternative, effects to threatened, endangered or special concern species, EFH, FWCA trust resources managed by NOAA NMFS, or surface water resources are not anticipated to be significant and the same conservation measures recommended for the construction of the in-water components would be employed. Due to these measures, these alternatives are not anticipated to result in significant adverse effects to wetland resources. No significant adverse effects to other natural resources are anticipated.

A comparison of anticipated adverse effects to natural resources for all With Action Alternatives is shown in **Table 5.6-1**.

Table 5.6-1
Comparison of Anticipated Adverse Effects to Natural Resources

	Proposed Tree Removals	Net Change in Trees with Landscaping Plan	Existing Trees to Remain in FEMA 100-Year Flood Zone	Adverse Effects to Wetlands*
Preferred Alternative	991	+745	348	29,825 square feet
Alternative 2	265	0	1,074	260 square feet
Alternative 3	776	+325	563	260 square feet
Alternative 5	991	+745	348	29,982 square feet

Note:
*Adverse effects to wetlands would be mitigated for in compliance with NYSDEC and USACE permit requirements, including on-site wetland restoration or purchase of wetland mitigation bank credits or off-site wetland restoration. On-site wetland restoration for the Preferred Alternative and Alternative 5 will consist of creating 24,868 square feet of new embayments along East River Park.
* This table has been revised for the FEIS.

C. REGULATORY CONTEXT

The regulatory context for the proposed project includes the following federal, state, and local laws, programs, rules, legal requirements, and policies for which each of the alternatives have been analyzed to result in a determination of environmental effects with project implementation.

FEDERAL

BALD AND GOLDEN EAGLE PROTECTION ACT (16 USC §§ 668 TO 668C)

The Bald and Golden Eagle Protection Act was enacted in 1940 to prohibit anyone without a permit issued by the Secretary of the Interior, acting through the USFWS, from taking bald or golden eagles, including their parts, nests or eggs. The Act defines “take” as pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing. As the proposed project would require the removal of trees, an analysis of the proposed project’s compliance with the Act is warranted.

CLEAN WATER ACT (33 USC §§ 1251 TO 1387)

The Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), is the primary federal law in the United States governing water pollution. It regulates point sources of water pollution, such as discharges of municipal sewage and industrial wastewater, and the discharge of dredged or fill material into navigable waters and other waters of the United States. The Act also regulates non-point source pollution from sources other than the end of a pipe, such as runoff from streets, agricultural fields, construction sites and mining that enter waterbodies. Through the CWA, states identify where water quality may be compromised due to pollutants. The East River was included on the 2014 New York State list of affected waterbodies due to combined sewer overflow (CSO) events, contaminated sediment, and urban runoff.

Under Section 401 of the Act, any applicant for a federal permit or any license for an activity that may result in a discharge to navigable waters must provide to the federal agency issuing a permit 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 Clean Water Act. Applicants for discharges to navigable waters in the State of New York must obtain a Water Quality Certificate from the New York State Department of Environmental Conservation (NYSDEC).

Section 402 of the Act provides guidance on the National Pollutant Discharge Elimination System (NPDES), which governs the issuance of permits to control and prevent water pollution at point sources that discharge pollutants. In the State of New York, the NPDES permit program is administered through NYSDEC’s State Pollution Discharge Elimination System (SPDES) permit program, described below.

The With Action Alternatives would require authorization from the Secretary of the Army acting through USACE for activities that would result in a permanent or temporary discharge to navigable waters and Waters of the United States, including mooring of temporary construction barges, the placement of support structures for the proposed shared-use flyover bridge, relocation of embayments, and modifications of CSO outfalls that outlet to the East River. These activities would also require a Water Quality Certificate from NYSDEC that the discharge from such activities would comply with the CWA.

ENDANGERED SPECIES ACT OF 1973 (16 USC §§ 1531 TO 1544)

The Endangered Species Act (ESA) of 1973 is intended to protect and recover imperiled species and the ecosystems upon which they depend. ESA also provides for the protection of designated critical habitats on which endangered or threatened species depend for survival.

For the proposed project, the ESA requires consultation with the U.S. Fish and Wildlife Service (USFWS) and NOAA NMFS to ensure the protection of listed species or their habitat. For the U.S. Department of Housing and Urban Development (HUD), which is providing partial funding for the proposed project, Title 24 of the Code of Federal Regulations Sections 50.4 and 58.5 specifically state that HUD must comply with the ESA, among other regulations. If a federal agency determines that a project is likely to adversely affect a listed species, a biological assessment must be conducted to determine the extent of the effect, feasible alternatives, and mitigation. Consultations with NOAA NMFS and USFWS were reinitiated for the Preferred Alternative (see **Appendices G and H2**).

FISH AND WILDLIFE COORDINATION ACT (*PL 85-624; 16 USC §§ 661 TO 667D*)

The Fish and Wildlife Coordination Act (FWCA), as amended in 1964, requires federal agencies to consult with USFWS and NOAA NMFS when proposed actions may result in modifications to a natural stream or body of water. Under this authority, USFWS and NOAA NMFS seeks to protect, conserve, and enhance species and habitats of a wide range of species to ensure that wildlife conservation receives equal consideration and coordination with other water-resource development programs. For NOAA NMFS, the duty under FWCA is to ensure aquatic resources that are not managed by the federal fisheries management councils and therefore do not have designated EFH are also protected, as deemed necessary. The New York Harbor Estuary and the East River are highly productive habitat for a wide variety of NOAA trust resources covered by the FWCA, many of which are listed in **Table 5.6-3**. As the proposed project would affect both terrestrial and aquatic resources, a consultation with USFWS was completed for threatened and endangered species (see **Appendix H2**) and a consultation for potential FWCA species and habitat was reinitiated with NOAA NMFS for the Preferred Alternative (see **Appendix G**).

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT (16 USC §§ 1801 TO 1883)

The Magnuson-Stevens Act, administered through NOAA NMFS is the primary law governing marine fisheries management in U.S. waters, including areas designated as EFH. The Magnuson-Stevens Act outlines the process for NOAA NMFS to comment on activities proposed by federal agencies that may adversely affect EFH. Adverse effects to EFH can include direct effects and indirect effects. Direct effects can include dredging, the placement of permanent structures, or the discharge of pollutants. Indirect effects can include the loss of prey species or submerged aquatic vegetation, or the reduction in feeding rates, fecundity, or other effects to the fitness of managed species. The proposed project includes components that would constitute the placement of permanent structures within the East River, which has the potential to adversely affect EFH and marine fisheries. As such, a consultation with NOAA NMFS was reinitiated for the Preferred Alternative. Consultation materials are provided in **Appendix G**.

MIGRATORY BIRD TREATY ACT (16 USC §§ 703 TO 712)

The Migratory Bird Treaty Act states that, unless permitted, it is unlawful to pursue, hunt, take, capture, kill, or sell any of the species listed in Code of Federal Regulations Title 50 §10.13. Species may be covered under the Canadian Convention of 1916, the Mexican Convention of 1936, the Japanese Convention of 1972, or the Russian Convention of 1976. The act does not include nonnative species whose occurrences in the United States are solely the result of human-assisted introductions. The statute applies equally to both live and dead birds, and grants full protection to any bird parts, including feathers, eggs, and nests. As the proposed project would require the removal of trees, an analysis to evaluate compliance with the Migratory Bird Treaty Act is warranted.

RIVERS AND HARBORS ACT OF 1899, SECTION 10 (33 USC §§ 403)

Section 10 of the Rivers and Harbors Act of 1899 is administered through USACE and states that it is unlawful to build any structure or obstruction such as piers, pilings, or bulkheads in any navigable Waters of the United States and that it is also unlawful to excavate or fill, in any manner, any navigable Waters of the United States without authorization. The purpose of the Act is to protect navigation and navigable channels. Any structure built up to the mean high-water line in navigable water requires authorization from USACE. The East River is classified as a navigable Waters of the United States and, as such, excavation or filling proposed within this waterbody would be subject to this federal statute. The With Action Alternatives propose one or both of the following components that would constitute filling within the East River: installation of support structures for the shared-use flyover bridge, and relocation of existing embayments.

EXECUTIVE ORDER 11988 – FLOODPLAIN MANAGEMENT

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse effects associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Floodplain mapping used to identify the presence of a floodplain in a project area is managed by the Federal Emergency Management Agency (FEMA). FEMA issues maps, called Flood Insurance Rate Maps (FIRMs), as part of the National Flood Insurance Program. For HUD, which is providing partial funding for the proposed project, Title 24 of the Code of Federal Regulations Section 55 specifically states HUD must comply with Executive Order 11988.

The applicable HUD regulations for Executive Order 11988 are contained in Code of Federal Regulations Title 44, §9.6, which includes an Eight-Step Decision Making Process. This analysis would discuss why the proposed project must be situated within the floodplain and provide the full range of effects associated with the proposed project. Further, the analysis requires a discussion of any reasonable alternative to locating the proposed project in a floodplain. This analysis can be found in **Appendix L**.

EXECUTIVE ORDER 11990- PROTECTION OF WETLANDS

Executive Order 11990 requires federal agencies to avoid to the extent possible the long- and short-term adverse effects associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. Title 24 of the Code of Federal Regulations Section 55 specifically states HUD, which is providing partial funding for the proposed project, must comply with Executive Order 11990. In addition, as noted above, under Code of Federal Regulations Title 44, §9.6, an analysis pursuant to HUD's Eight-Step Decision Making Process would be required to evaluate adverse effects to wetlands associated with the project as well as reasonable alternatives that would minimize or eliminate those adverse effects. This analysis can be found in **Appendix L**.

NEW YORK STATE

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM (ECL ARTICLE 17; 6 NYCRR PART 750)

Title 8 of ECL Article 17 authorizes the creation of the State Pollutant Discharge Elimination System (SPDES) to regulate discharges to New York State's waters. Activities requiring a SPDES permit include point source discharges of wastewater into surface or groundwater of the State, including the intake and discharge of water for cooling purposes, constructing or operating a disposal system, discharge of stormwater runoff, and construction activities that disturb one or more acres. As the proposed project would include modifications to the combined sewer system, which is regulated under a SPDES permit for Newtown Creek Wastewater Treatment Plant (WWTP), an analysis of compliance with this regulation is warranted.

TIDAL WETLANDS ACT (ECL ARTICLE 25, 6NYCRR PART 661)

Tidal wetland regulations apply anywhere tidal inundation occurs on a daily, monthly, or intermittent basis, such as the East River. NYSDEC administers the tidal wetlands regulatory program and the mapping of the State's tidal wetlands. A permit is required for almost any activity that would alter tidal wetlands or tidal wetland adjacent areas (within the limits of the City of New York, tidal wetland adjacent areas are identified up to 150 feet inland from a tidal wetland boundary). As the proposed project would include temporary and permanent alterations to NYSDEC littoral zone tidal wetlands, an analysis of the proposed project's compliance with this Act is warranted.

PROTECTION OF WATERS, (ECL ARTICLE 15, 6NYCRR PART 608)

NYSDEC administers the Protection of Waters Permit Program to prevent unregulated effects to surface waters of New York. The Protection of Waters Program regulates the following: protected streams including their bed and banks; the construction of or modification to dams or other impoundment structures; the construction of or modification to docks, piers, wharves, or other floating structures in navigable waters; and the excavation or placement of fill in navigable waters and adjacent areas. Additionally, the Protection of Waters Program issues Water Quality Certifications for actions that result in discharges to Waters of the United States in accordance with Section 401 of CWA. As the proposed project would involve placement of fill in navigable waters, an analysis of the proposed project's compliance with the Protection of Waters Permit Program is warranted.

ENDANGERED AND THREATENED SPECIES OF FISH AND WILDLIFE; SPECIES OF SPECIAL CONCERN (ECL ARTICLE 11, 6 NYCRR PART 182)

The Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern regulations prohibit the taking, import, transport, possession, or selling of any endangered or threatened species of fish or wildlife, or any hide, or other part of these species as listed in 6 NYCRR §182. 6. The proposed project involves substantial modifications to habitat and as such an analysis of the proposed project's consistency with this statute is warranted.

COMBINED SEWER OVERFLOW ABATEMENT PROGRAM AND COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN (DEP)

Implemented by DEP, the objective of this program and long-term control plan is to reduce pollution in and around the City's waters. The plan provides for field investigations, sewer system and water quality monitoring, and modeling in areas that are heavily impacted by combined sewer overflows (CSO) to determine appropriate mitigation measures. The program aims to establish source controls and stormwater best management practices suited for New York City. The CSO abatement program is under a 2005 Consent Order, which was executed between NYSDEC and DEP and contains milestones for the completion of various projects and planning documents associated with the program. A 2011 modification to the Consent Order contained changes to various planned and ongoing CSO abatement construction projects, as well as to long-term control plan (LTCP) milestones, funding for green infrastructure, and fines for any missed LTCP milestones. A Citywide Open Waters LTCP is currently in the early development stage and includes the East River within the study area. Consistency with the long-term control plan is evaluated for the proposed project as changes are proposed to the existing combined sewer system under the With Action Alternatives.

NEW YORK STATE DEPARTMENT OF STATE (NYSDOS) COASTAL MANAGEMENT PROGRAM

After enactment of the federal Coastal Zone Management Act (CZMA) in 1972, the New York State Department of State (NYSDOS) developed a Coastal Management Plan (CMP) and enacted implementing legislation (Waterfront Revitalization and Coastal Resources Act) in 1981, with the purpose of achieving a balance between economic development and preservation, thus promoting waterfront revitalization and water-dependent uses and protecting open space, scenic areas, and public access to the shoreline, fish, wildlife, and farmland. The program also aims to minimize significant adverse effects to ecological systems, erosion, and flood hazards. The NYSDOS administers the program at the State level, and the New York City Department of City Planning (DCP) administers it in the City. As the proposed project is located within a coastal zone, compliance with CZMA is warranted. A full consistency analysis is available in **Appendix D**.

NEW YORK CITY

TITLE 56 CHAPTER 5 OF THE RULES OF THE NEW YORK CITY, NYC PARKS

The Title 5 Chapter 56 Rules require the review and approval of tree removals and restitution for trees under the jurisdiction of NYC Parks. NYC Parks has jurisdiction over trees growing in the public right-of-way, including trees along streets, parkways, and in city parks. NYC Parks Forestry Division evaluates the trees proposed for removal and determines the restitution value. In addition to the Rules, work within 50-feet of a street tree requires a Tree Work Permit from NYC Parks prior to the start of construction to ensure measures such as tree protection are made to avoid unsafe or hazardous conditions that may be detrimental to any City tree. Since the proposed project involves removal of trees under the jurisdiction of NYC Parks in East River Park, Murphy Brothers Playground, and Asser Levy Playground, an analysis for compliance with these rules is warranted.

NEW YORK CITY LOCAL WATERFRONT REVITALIZATION PROGRAM

The proposed project would be located within the Coastal Zone as designated by New York State and New York City, and would therefore be subject to City and State coastal management policies. Pursuant to federal legislation, New York State and the City have adopted policies aimed at protecting resources in the coastal zone. New York City's WRP is the City's primary tool for guiding the development of the coastal zone and waterfront. The WRP contains 10 major policies, each with several objectives focused on improving public access to the waterfront; reducing damage from flooding and other water-related disasters; protecting water quality, sensitive habitats, such as wetlands, and the aquatic ecosystem; reusing abandoned waterfront structures; and promoting development with appropriate land uses. When a proposed project is located within the coastal zone and requires federal, state or local discretionary action, a determination of the project's consistency with the policies of the WRP must be made before the project can proceed. Since the waterfront portions of the area affected by the proposed project are within the City's coastal zone, a detailed assessment of the project's consistency with New York City's WRP policy is covered in Section F, "Environmental Effects," below as well as in **Appendix D**.

D. METHODOLOGY

This section identifies the methods used to define baseline conditions within the study area and assess the potential effects resulting from the proposed project on natural resources including geologic and soil resources; groundwater resources; wetlands; flood hazard areas; surface waters; aquatic resources; and terrestrial resources including wildlife, ecological communities, and threatened and endangered species. The methodology was informed by applicable federal and State policies, as appropriate, as well as guidance from the 2014 *City Environmental Quality Review (CEQR) Technical Manual*.

The *CEQR Technical Manual* was used as guidance to inform the criteria taken into consideration when determining whether adverse effects to natural resources as a result of the proposed project rise to the level of significant. Consistent with the manual's guidance, the analyses considered the direct and indirect effects on natural resources and their ability to continue to serve designated functions within the larger ecological setting, including but not limited to recreational use, aesthetic enhancement, and physical protection (e.g., flood protection). Loss of habitat or degradation of existing habitat was considered as well as consistency with natural resources policies of the City, including the policies identified in the WRP. The possibility for direct or indirect effects to significant, sensitive, or designated resources, or the potential effects to resident or migratory endangered, threatened, or rare animal species or species of special concern was also considered.

GEOLOGIC AND SOIL RESOURCES

Geologic and soil resources currently and historically occurring within the study area were identified using the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, literature, and technical data from project-related boring activities. The potential for effects to geologic and soil resources was assessed by determining whether construction or operational activities associated with the proposed project would have the potential to cause erosion, instability, or compositional changes to geology and soils within the study area.

GROUNDWATER RESOURCES

Groundwater resources occurring within the study area were described using the USDA NRCS Web Soil Survey, literature, and technical data from project-related boring activities. The potential for effects to groundwater resources was assessed by determining whether construction or operational activities associated with the proposed project would have the potential to result in the displacement, degradation, or changes in conveyance of groundwater within the study area.

WETLANDS

Wetlands in the study area were identified by utilizing USFWS National Wetlands Inventory (NWI) maps, NYSDEC freshwater and tidal wetland maps, and on-site surveys. Additionally, a jurisdictional determination was approved by USACE on July 21, 2017 to identify and locate jurisdictional waters of the United States, including USACE regulated wetlands (see **Appendix F2**). The NWI maps are generated based on orthoimagery, soil surveys, and USGS topographic maps. No field verification of NWI wetlands occurs in the mapping process. NYSDEC freshwater wetlands maps are identified with similar processes but are typically field-verified and are a minimum of 12.4 acres in size. NYSDEC tidal wetlands maps from 1974 are used to identify tidal wetlands and are field verified through use of visual observation and site survey. The potential for effects to wetland resources was assessed by determining if any activities associated with the proposed project could cause direct and indirect effects on wetland water levels, size, and quality within the study area.

As documented in a March 22, 2016 memorandum, natural resources field surveys were conducted within the project areas (see **Appendix F1**). Low tide surveys were conducted on July 10, 2015, and high tide surveys were conducted on June 19, 2015. The surveys were performed along the

East River shoreline within the project area. During the low tide survey, any areas adjacent to the largely bulkheaded East River Park were inspected to identify any observable intertidal habitat.

SPECIAL FLOOD HAZARD AREAS

Floodplains alleviate flooding by allowing flood waters to dissipate their energy and recharge into the ground. Floodplains include Special Flood Hazard Areas (SFHA) defined by FEMA as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHA in the study area were identified using preliminary FEMA Flood Insurance Rate Maps (FIRMs) for New York City. The preliminary FIRMs are currently the Best Available Flood Hazard Data (BAFHD) for New York City. FIRMs typically show the areas of inundation anticipated for the 100-year storm, or the storm that has a 1 percent chance of occurring annually and the areas of inundation anticipated for the 500-year storm, or the storm that has a 0.2 percent chance of occurring annually. The potential for effects to SFHA was assessed by determining if any construction and/or operational activities associated with the proposed project could cause disturbance to SFHA within the study area.

Since the waterfront portions of the area affected by the proposed project are within the City's coastal zone, an assessment of the project's consistency with the City's Waterfront Revitalization Program (WRP) is covered in Section F, "Environmental Effects," below as well as in **Appendix D**.

SURFACE WATER RESOURCES

Surface waters in the study area were identified using desktop mapping such as orthoimagery and NYSDEC hydrography data and with on-site surveys (see **Appendix F1**). Water quality classification and standards specified in Part 701 of the New York Code of Rules and Regulations for surface waters in the study area were identified. Baseline conditions regarding the water quality of identified surface waters were defined using the DEP Harbor Water Quality Survey, US Environmental Protection Agency (EPA) National Sediment Quality Survey Database, and additional literature and studies from governmental and non-governmental agencies such as NYSDEC, USACE, and the NY/NJ Harbor Estuary Program. The potential for effects to surface waters was assessed by determining if activities associated with the proposed project could cause direct or indirect effects on surface water levels and water quality within study areas.

AQUATIC RESOURCES

Aquatic resources, such as benthic invertebrates, fish, and EFH occurring in the study area, were identified using the results of surveys and studies of the East River conducted by governmental and non-governmental organizations including DEP, NYC Parks, USACE, NOAA, Con Edison, and the New York State Energy Research and Development Authority (NYSERDA). EFH potentially occurring in the study area was identified using "The Guide to Essential Fish Habitat Designations in the Northeastern United States" published by NOAA NMFS. The potential for effects to aquatic resources were assessed by determining if any construction and/or operational activities associated with the proposed project could cause direct or indirect effects to aquatic and benthic resources within the study area. A consultation with NOAA NMFS in accordance with the Magnuson-Stevens Fisheries Act Conservation and Management Act as well as the FWCA was reinitiated for the Preferred Alternative (see **Appendix G**).

TERRESTRIAL RESOURCES

WILDLIFE

Terrestrial resources occurring in the study area, including ecological communities, wildlife, and threatened, endangered, and special concern species, were identified using the NYSDEC Breeding Bird Atlas, the NYSDEC Amphibian and Reptile Atlas, through a request for information with the New York Natural Heritage Program (NYNHP), and a Section 7 Endangered Species Act consultations with USFWS and NOAA NMFS. Site investigations were also conducted on two occasions in early and late summer 2015. The results and findings of these site investigations are documented in an August 10, 2015, memorandum (see **Appendix F1**).

The 2000–2005 Breeding Bird Atlas is the result of a five-year survey which divided the State into three-mile by three-mile survey blocks that were assessed for breeding bird species by State biologists, researchers, volunteer ornithologists, and bird watchers. This data is available in a database through the NYSDEC website (New York State Breeding Bird Atlas, 2000).

The NYSDEC Amphibian and Reptile Atlas is a State-wide survey of amphibians and reptiles that was conducted over 10 years starting in 1990. The NYSDEC Amphibian and Reptile Atlas information is organized by USGS 7.5-minute quadrangles and is also available through the NYSDEC website (New York Amphibian and Reptile Atlas Project, 1999).

NYSNHP is a joint venture between NYSDEC and State University of New York College of Environmental Science and Forestry that maintains a continuously updated scientific inventory of rare plants and animals native to New York State. NYNHP's database of state listed rare species and natural communities was consulted to identify the potential for any such species or natural communities to occur within the project area (see **Appendix H1**).

A Section 7 consultation with USFWS was initiated utilizing the Information Planning and Conservation (IPaC) tool to identify federally protected species with the potential to occur in the study area. The Official Species List indicated no threatened or endangered species under USFWS jurisdiction within the study area (see **Appendix H2**).

PLANTS

A tree inventory of the study area was conducted over the months of June through August of 2015, following NYC Parks' Tree Inventory Protocols and New York City Department of Design and Construction's (DDC) General Requirements (GR) 4.16 and subsequently updated on June 22, 2017, and July 7, 2017 (see **Appendix I**). Additional surveys were conducted on May 8, 9, 10, and 13, 2019 to include project areas not covered under the original survey. This information was sorted in the following categories:

- Trees to be removed with project implementation—trees in the footprint of disturbance (regrading/construction) of the proposed alternative that would be removed due to construction of the proposed project
- Trees to be removed due to condition—trees that were determined by a Certified Arborist to be in a condition which may require removal within the timeframe of the proposed construction, and any tree stumps that would require removal
- Trees to be retained—trees outside of the project disturbance footprint that would be protected during construction
- Trees to be planted—replacement trees proposed as part of the proposed project's landscaping plan

Trees to be removed included trees in poor condition and dead trees (including tree stumps) that were identified for removal during the 2015, 2017, and 2019 tree inventory[1] or trees in poor to fair condition that were noted for potential future removal.[2]

- Of the trees to be removed with project implementation, some were designated as potential transplant trees, which may be moved elsewhere within the City. Trees measuring 7 inches diameter at breast height (dbh) or less were evaluated as potential transplant candidates as per NYC Parks. If a tree scored 27 or higher in the inventory it was considered to be in "excellent" condition and, therefore, a transplant candidate.[3]
- Due to routine maintenance of East River Park by NYC Parks forestry officials, trees have been removed in the project areas and vicinity since the tree inventory was initially collected. Many of these trees had been in severe decline due to the effects of salt water inundation from Hurricane Sandy. To keep an accurate inventory, a desktop geospatial analysis was conducted using NYC Parks' tree work order data to identify which trees included on the initial project survey have since been removed.

A desktop survey was also conducted using high-resolution land cover data from NYC's Urban Tree Canopy Assessment Metrics, a dataset managed and owned by NYC Parks. The survey was conducted to analyze and quantify the acreage of tree canopy within the natural resources study area of the proposed project. Additionally, Light Detection and Ranging (LiDAR) data provided by the New York City Department of Information Technology and Telecommunication was used to quantify the percent of canopy change between pre- and post-Hurricane Sandy conditions.

The potential for effects to terrestrial resources was assessed by determining if activities associated with the proposed project could result in a disturbance to terrestrial resources from tree removal activities or cause a disturbance to significant natural communities within the study area.

E. AFFECTED ENVIRONMENT

GEOLOGIC AND SOIL RESOURCES

The native surficial geology of Manhattan consists of unconsolidated glacial deposits made up of sand, gravel, clay, and boulders ranging from 0 feet below land surface to greater than 250 feet below land surface. This unconsolidated material was deposited as a result of the Pleistocene glaciation (Perlmutter and Theodore, 1953; Stumm et. al., 2007). The island of Manhattan is underlain by metamorphic bedrock consisting of Harrison/Ravenswood Gneiss (Baskerville and Mose, 1989).

The surficial soils in the study area consist of highly modified urban soils. The Manhattan shoreline has been subject to intense anthropogenic modification, including the filling of coastal areas, to expand usable land surface. The study area, which was historically part of the East River, was filled approximately 100 years ago and has been modified numerous times since, including during the original construction of East River Park in 1939 (Walsh, 1991). Fill materials during the last century have varied and may consist of waste materials such as coal ash, wood ash, putrescible and commercial refuse, and demolition debris. Subsurface material in the study area is

[1] If the notes and scores suggested that the tree is in poor condition, the Certified Arborist reviewed the photographs of the tree and determined the potential for future removal.

[2] No potential trees to be removed due to condition were counted in any other categories.

[3] As documented in the NYC Parks "Field Inventory" Sheet of the Tree Inventory Spreadsheet (version 7.2) template prepared during the tree inventory.

known to contain contamination consistent with manufactured gas plant (MGP) operations. MGPs were historically present in the study area at several locations. Other contaminants from legacy sources such as lead and volatile organic compounds (VOC) were also documented. See Chapters 5.7, "Hazardous Materials," and 6.6, "Construction—Hazardous Materials," for additional detail on hazardous materials in the study area.

GROUNDWATER RESOURCES

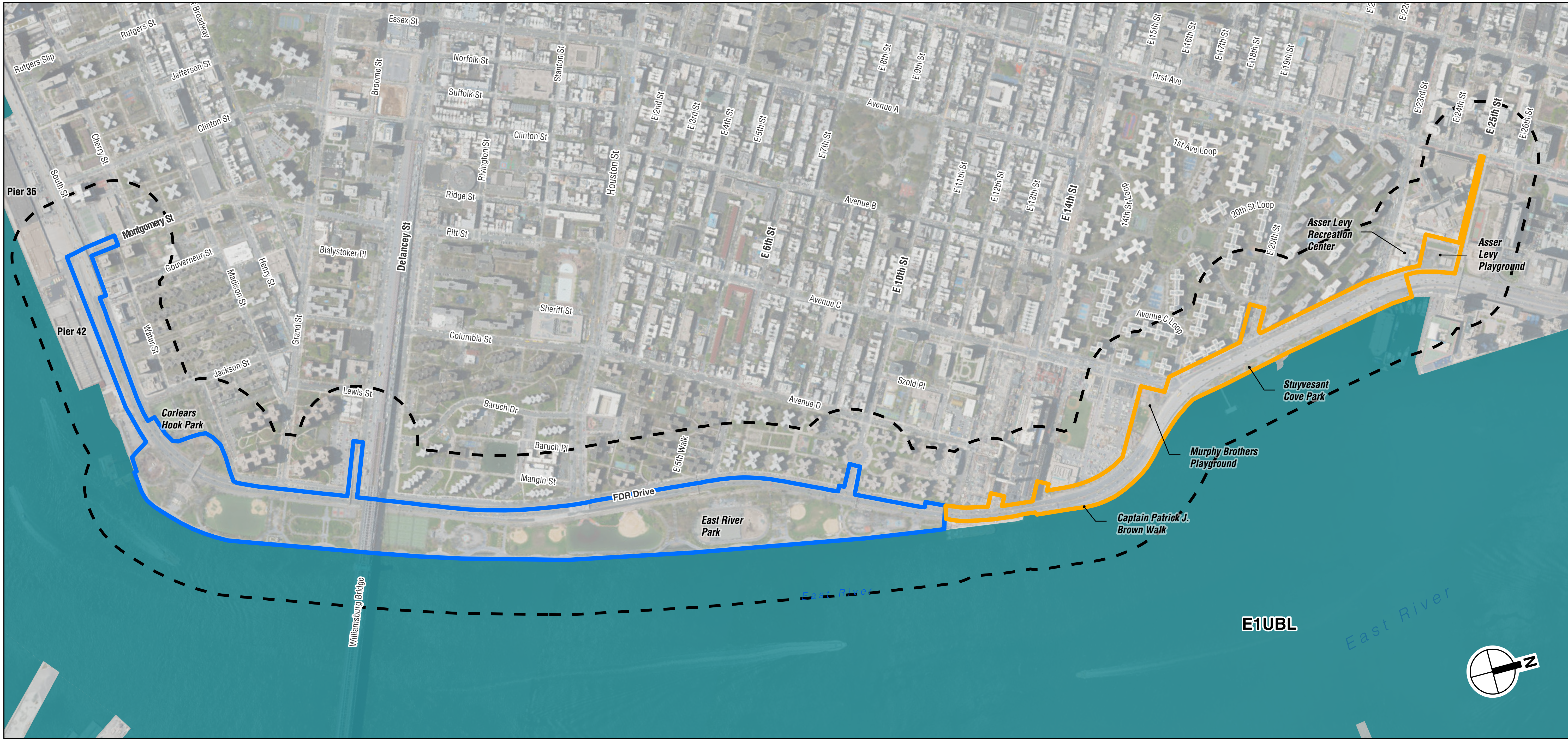
Groundwater is known to occur on the island of Manhattan within fractures in the bedrock. The bedrock is metamorphic and is overlain with unconsolidated glacial sediments. Depth to bedrock can range between 8 and 108 feet below ground surface. Fractures in the bedrock that contain and convey groundwater can occur as shallow as sea level (Stumm et al. 2003). At sea level, groundwater is often tidally influenced.

From central Manhattan, groundwater passes through the fractures in the bedrock downgradient towards the adjacent waterbodies, primarily the Hudson River and the East River. Groundwater on the island of Manhattan is not used for potable purposes. Soil borings in the project area were conducted to identify potential contamination (see Chapters 5.7, "Hazardous Materials," and 6.6, "Construction—Hazardous Materials"). Depth to groundwater at boring locations in Project Area One and Project Area Two was approximately seven feet below ground surface.

WETLAND RESOURCES

The entire East River shoreline within the study area is bulkheaded. The East River is mapped by NWI as estuarine subtidal wetlands with an unconsolidated bottom (E1UBL) (see **Figure 5.6-2**). Subtidal estuarine wetlands are defined by USFWS as deep-water tidal habitats and adjacent tidal wetlands that are influenced by water runoff, often enclosed by land, that have low energy and variable salinity. Unconsolidated bottoms have at least 25 percent cover of particles smaller than six to seven centimeters and less than 30 percent vegetative cover (Cowardin et. al., 1979).

The study area also includes NYSDEC regulated littoral zone tidal wetland that is unvegetated (see **Figure 5.6-3**). Littoral zone is defined as "the tidal wetland zone that includes all lands under tidal waters which are not included in any other category. There shall be no littoral zone under waters deeper than six feet at mean low water (6NYCRR Part 661)." NYSDEC tidal wetland maps indicate that the entire East River constitutes littoral zone. However, much of the East River exceeds depths of six feet below mean low water (see **Figure 5.6-4**). Based on observations made during the low tide shoreline surveys, it is anticipated that there are portions of the East River adjacent to or underneath the bulkhead that are six feet deep or less at mean low water and, therefore, have the littoral zone classification. This includes two existing embayments, which are areas where the shoreline curves inward, located along the East River just north and south of the Houston Street entrance to the park. These embayments were created as part of the esplanade redesign in 2005–2008 to make the East River more accessible to park users and heighten their experience of the river and its currents and tidal flow. They consist of narrow areas that allow tidal water from the East River to flow beneath pedestrian bridges along the esplanade onto a rip rap slope that ends at the bulkhead. Rip rap does not provide suitable attachment habitat for most sessile organisms, such as oysters and mussels, or adequate refuge for prey fish and benthic organisms. Natural resources surveys and design studies performed for the proposed project~~,~~ conducted along the shoreline~~,~~ confirmed that at low tide, no substrate type other than riprap was observed. On the lowest riprap, green algae and rockweed were observed. No other invertebrates or plants, and no fish were observed in this area (see **Appendix F1**). In the existing condition both the northern and southern embayments were conceived and constructed with pedestrian bridges



8/22/2019

Source: USFWS

Project Area One

Project Area Two

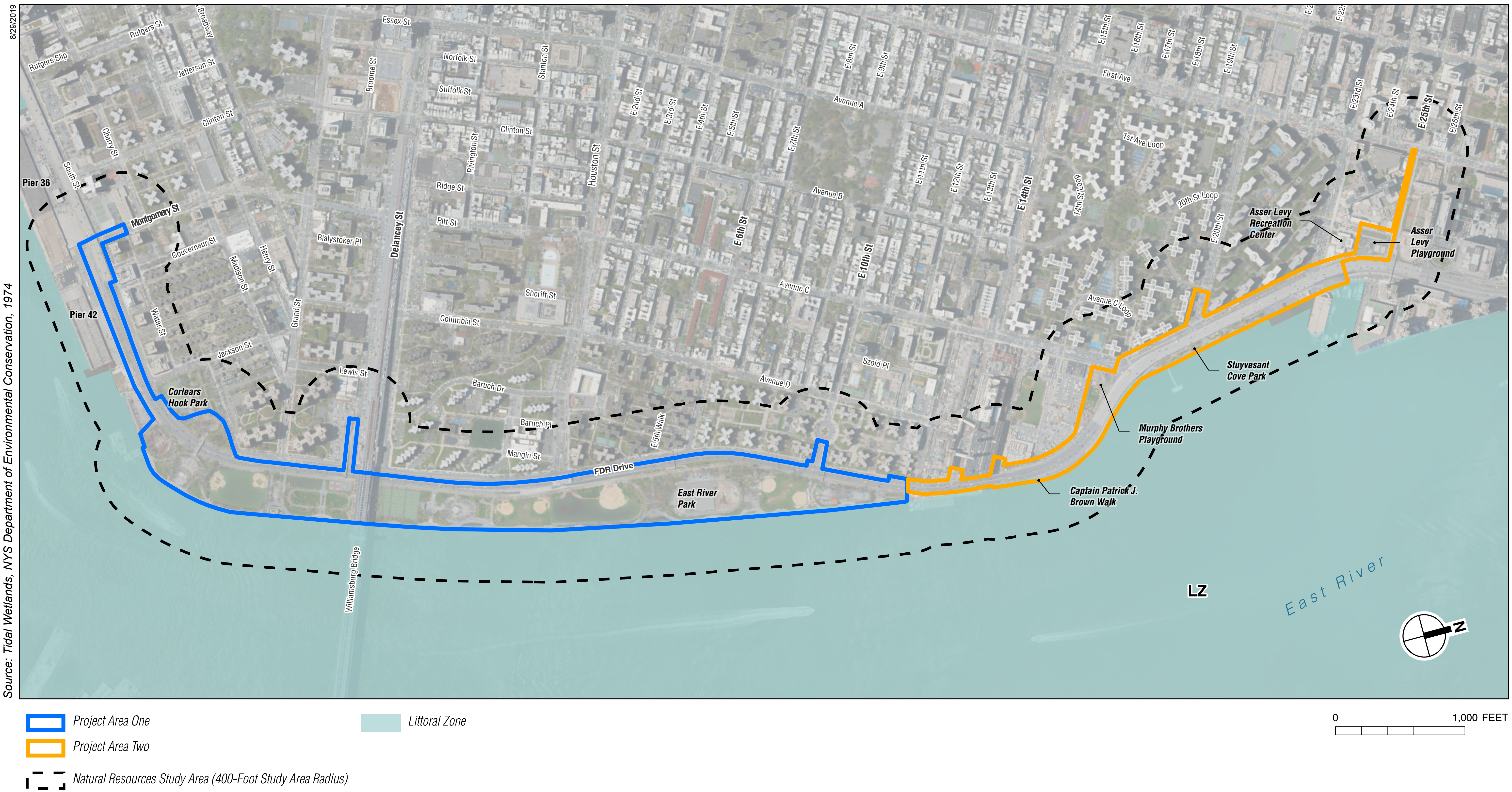
Natural Resources Study Area (400-Foot Study Area Radius)

Estuarine and Marine Deepwater (Estuarine Subtidal Wetlands with an Unconsolidated Bottom- E1UBL)

0 1,000 FEET

Capital Project SANDRESM1
EAST SIDE COASTAL RESILIENCY PROJECT

National Wetlands Inventory Map
Figure 5.6-2



Capital Project SANDRESM1
EAST SIDE COASTAL RESILIENCY PROJECT

NYSDEC Tidal Wetlands Map
Figure 5.6-3

8/22/2019

Project Area One

Project Area Two

Natural Resources Study Area (400-Foot Study Area Radius)

Mean High Water Line/Bulkhead Line

Approximate Federal Navigation Channel (35 Foot Depth or Greater)

Bathymetry - Depth in Feet

- 43 to 35
- 35 to 30
- 30 to 25
- 25 to 20
- 20 to 10
- <10

0 1,000 FEET

Capital Project SANDRESM1
EAST SIDE COASTAL RESILIENCY PROJECT

Depth of Water and East River Channel
Figure 5.6-4

spanning across the entrance to the embayment, shading significant portions of the water below.. The southern embayment is 10,040 square feet, of which approximately 50 percent is shaded by the short pedestrian bridge; the northern embayment is 16,692 square feet, of which approximately 31 percent is shaded by a pedestrian bridge.

There are no NYSDEC mapped freshwater wetlands in the study area and no freshwater wetlands were identified in the study area during natural resources surveys.

The study area also includes wetlands that are regulated by USACE as Waters of the United States. USACE also regulates tidal and freshwater wetlands, when deemed jurisdictional. Jurisdictional wetlands are those that are navigable and/or have a significant nexus with a navigable waterway.

Shoreline surveys conducted during low tide found three locations within the study area where the substrate of the East River is either visible or exposed (see **Figure 5.6-5**). Although these areas are mapped as littoral zone, they could be classified by NYSDEC as coastal shoals, bars, and mudflats tidal wetlands. Growth of rockweed (*Ascophyllum spp.)*, a brown alga, and sea lettuce (*Ulva spp*.), a green alga, was visible in these areas. While the entirety of the East River has been mapped as littoral zone, only the areas up to six feet in depth are regulated as such by NYSDEC.

SPECIAL FLOOD HAZARD AREA

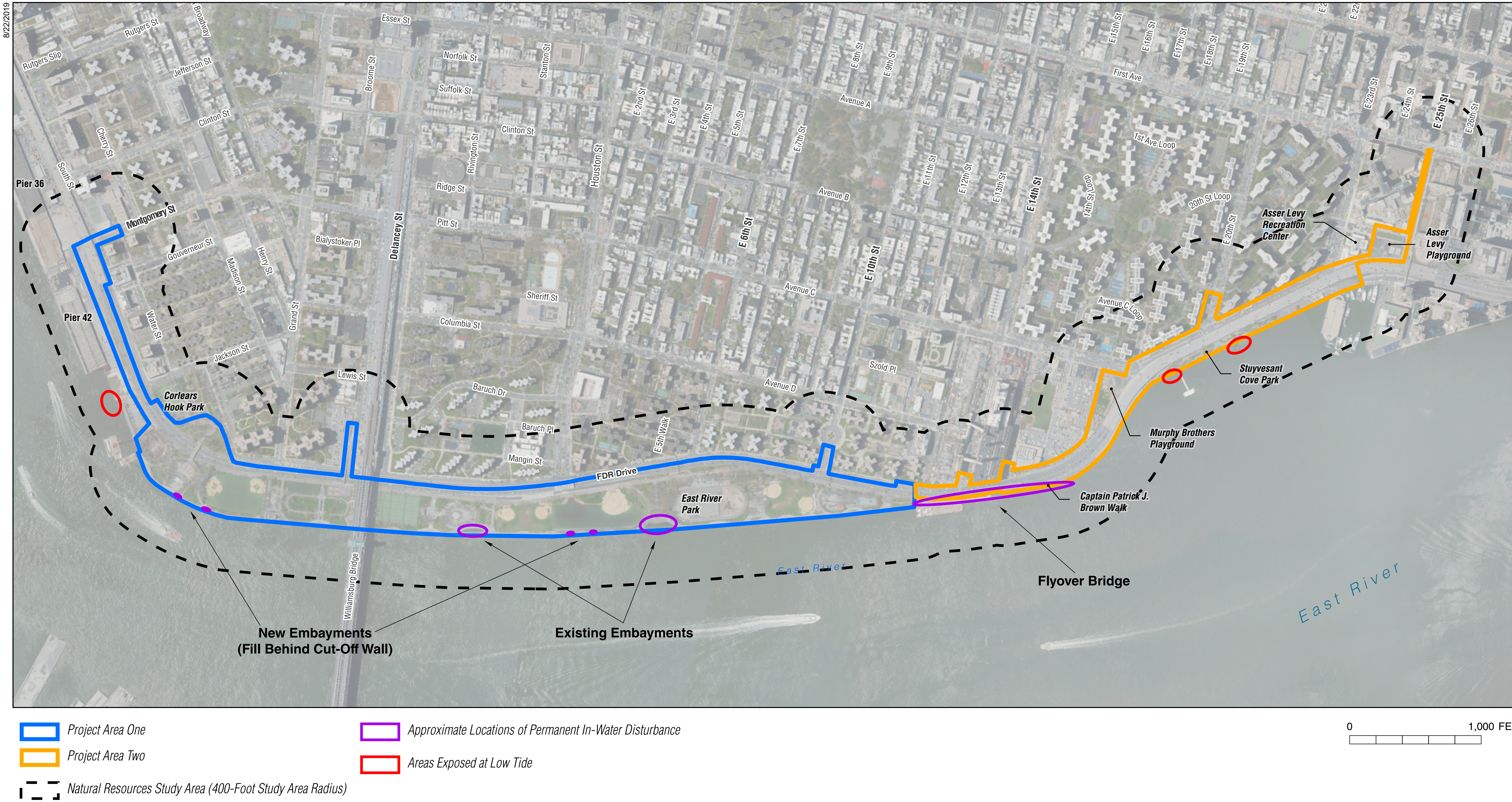
The majority of the study area is designated as within the 100-year floodplain (see **Figure 5.6-1**) according to the preliminary FIRMs for New York City. Exceptions to this in Project Area One include inland portions west of Water Street, the area surrounding East River Park Amphitheater, the area surrounding the Houston Street Overpass, and an area along East 7th Street between Avenue D and the FDR Drive. In Project Area Two, exceptions include an area in Stuyvesant Town between Avenue C Loop and Avenue C, East 23rd Street between First and Second Avenues and an area north and west of East 25th Street.

SURFACE WATER RESOURCES

The study area is located along the western shore of the lower East River, a tidal strait that connects New York Harbor with Long Island Sound. The river is approximately 16 miles long and generally ranges between 600 to 4,000 feet wide. The lower East River, which runs from the Battery in Manhattan to Hell Gate in Queens, is narrower and deeper than the upper East River, which runs from Hell Gate in Queens to Long Island Sound. Mean depth of the lower East River is approximately 30 feet below mean low water (Blumberg and Pritchard, 1997); however, depth varies and can be as deep as approximately 65 feet below mean low water (USACE, 2015).

The East River's circulation and salinity structure are largely determined by conditions in the Upper Harbor and Long Island Sound. Currents in the East River are swift and can approach 8 feet/second (Bowman, 1976). The strong currents are a result of the width of the East River, its channelization and bottom topography, and the influence of tidal water from the Hudson River, Harlem River, and Long Island Sound. Ebb tides are particularly powerful. A large difference in water surface elevation from the Long Island Sound to The Battery also contributes to the strong currents (Blumberg and Pritchard, 1997).

Freshwater input into the East River consists of several systems: the Bronx River, Westchester Creek, and the Hudson River. Additionally, overland flow, combined sewer overflow, and point source discharges from wastewater treatment plants account for freshwater inputs into the East River. There are over 100 combined sewer overflow outfalls in the lower East River, with 23 occurring along the shoreline of Project Area One and Project Area Two (OASIS, 2014).



Locations of Permanent In-Water Disturbance for the Preferred Alternative
Figure 5.6-5

WATER QUALITY

Title 6 NYCRR Part 701 is the regulatory framework that classifies surface water and groundwater in New York State. The lower portion of the East River within the study area is a Class I saline surface water body. Class I water bodies are best suited for secondary contact, which includes fishing and recreational activities. Wildlife species should be capable of establishing successful habitats in these waters. Prolonged physical contact, such as swimming in these waters, is not advised. Consumption of fish from this classification of water body is restricted or not advised.

Title 6 NYCRR Parts 703.3 and 703.4 establish water quality standards for fecal and total coliform, dissolved oxygen (DO), and pH in New York. The water quality standards for the lower East River are provided in **Table 5.6-2**.

DEP has monitored New York Harbor water quality since 1909 through the Harbor Survey. Data from the Harbor Survey are used to produce the annual State of the Harbor Report. DEP evaluates surface water quality of four designated regions: Inner Harbor Area, Upper East River-Western Long Island Sound, Lower New York Bay-Raritan Bay, and Jamaica Bay (DEP 2012). The study area is included in the Inner Harbor Area, which spans from the lower East River to the Battery. Harbor Survey Station E2 is located within the study area at East 23rd Street.

Table 5.6-2
New York State Water Quality Standards for Class I Waterbodies

Standard	Criteria
Fecal Coliform	Monthly geometric mean of ≤ 200 colonies/100mL from five or more samples.
Total Coliform	Monthly median value ≤2,400 colonies/100 mL from five or more samples. Monthly 80th percentile ≤5,000 colonies from five or more samples
Dissolved Oxygen (DO)	Never less than 4 mg/L
pH	Normal range shall not be extended by >0.1 of a pH unit.

Over the past twenty years, Harbor Survey data show that the water quality of New York Harbor has improved significantly as a result of measures undertaken by the City (DEP 2012). These measures include eliminating 99 percent of raw dry-weather sewage discharges, reducing illegal discharges, increasing the capture of wet-weather related floatables, and reducing the toxic metals loadings from industrial sources by 95 percent (DEP 2002). The 1999 and 2000 Interstate Environmental Commission (IEC) 305(b) reports also indicate that the year-round disinfection requirement for discharges to waters within its district (including New York Harbor) has contributed significantly to water quality improvements since the requirement went into effect in 1986 (IEC 2000, 2001). In the 2012 State of the Harbor Report, seven of the eight water quality performance metrics showed an improvement in the Inner Harbor (DEP 2012).

Temporary increases in fecal coliform concentrations may occur during wet weather due to increased fecal coliform loadings from CSOs following a rain event. Overall, fecal coliform concentrations in this area have declined, significantly improving water quality from the early 1970s, when levels were well above 2,000 colonies/100 mL (DEP 2001). Fecal coliform concentrations in the study area at Harbor Survey Station E2 station ranged from 4 to 168 colonies/100mL at the surface in 2017 (DEP 2017). The peak concentration of fecal coliform was recorded in July. No fecal coliform samples were collected from bottom waters at Station E2. Higher concentrations in warmer months are anticipated, as there can be more wet weather events.

Dissolved oxygen in the water column is necessary for respiration by all aerobic forms of life, including fish and invertebrates such as crabs, clams, and zooplankton. The bacterial breakdown of high organic loads from various sources can deplete dissolved oxygen to low levels and persistently low dissolved oxygen can degrade habitat and cause a variety of sublethal or, in extreme cases, lethal effects. Consequently, dissolved oxygen is one of the most common indicators of overall water quality in aquatic systems. Dissolved oxygen concentrations in the Inner Harbor area have increased over the past 30 years from an average of below 3 mg/L in 1970 to above 5 mg/L in 2001, a value supportive of ecological productivity (DEP 2002). Dissolved oxygen concentrations in the study area at Harbor Survey Station E2 station ranged from 4.03 to 10.67 mg/l at the surface and from 3.80 to 10.71 mg/l in bottom waters in 2017 (DEP 2017). The lower dissolved oxygen values were recorded during the summer months.

High levels of nutrients can lead to excessive plant growth (a sign of eutrophication) and depletion of dissolved oxygen. Eutrophication occurs when a water body experiences undesirable levels of nutrients. The elevated nutrients can occur from both natural and anthropogenic sources. Concentrations of the plant pigment chlorophyll-a in water can be used to estimate productivity and the abundance of phytoplankton. Chlorophyll-a concentrations greater than 20 micrograms per liter (µg/L) are considered suggestive of eutrophic conditions. The average summer chlorophyll-a value in the Inner Harbor area of the DEP Harbor Survey program (which includes Station E2) was 7.69 µg/l, which was fairly consistent with Harbor Survey results over the past five years (DEP, 2016). DEP is implementing a program to reduce nitrogen loadings from wastewater treatment plants to the East River. Upgrades implemented at four upper East River treatment plants have decreased nitrogen discharges from these plants by over 30,000 pounds per day since 1993.

Secchi transparency measures the clarity of surface waters.[4] Transparency greater than 5 feet is indicative of clear water. Decreased clarity can be caused by high suspended solid concentrations or blooms of plankton. Secchi transparencies less than 3 feet are generally indicative of poor water quality conditions. Average secchi readings in the Inner Harbor area have remained relatively consistent since measurement of this parameter began in 1986, ranging between about 3.5 and 5.5 feet (DEP 2012). For the Harbor Survey Monitoring Program in 2017, secchi transparency at Station E2 averaged 3.3 feet (DEP 2017).

NYSDEC is leading a collaborative effort to reduce toxic chemicals in New York Harbor. The overall goal of the initiative is to reduce the flow of contaminants to the Port of New York and New Jersey. The principal chemicals of concern include dioxins/furans, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals (mercury, cadmium, and lead), and pesticides (dieldrin and chlordane). This work is being done under the Contamination Assessment and Reduction Project (CARP). NYSDEC developed a comprehensive, multi-media contaminant identification program simultaneously with the Office of the Governor of New Jersey, New Jersey Department of Environmental Protection (NJDEP), and the CARP Work Group, a group of government, academic, and consultant experts. Together with the CARP Work Group, New York and New Jersey are undertaking a variety of projects including studies of the water in the Harbor and tracking down contaminant sources in the surface water, groundwater, and wastewater of the Harbor.

[4] Completed using a secchi disk (plain white circular disk 12 inches in diameter attached to a measurement demarcated pole or line). The disk is lowered into the water until the disc is no longer visible from the water's surface. This is known as the Secchi depth.

AQUATIC RESOURCES

The East River is an urban water body situated along the shores of the boroughs of Queens, Manhattan, and Brooklyn. The variation in sources of runoff affect the type of biota that can exist in the river where a wide array of conditions must be tolerated.

PHYTOPLANKTON

Phytoplankton are microscopic plants whose movements are largely dictated by prevailing tides and currents. Light penetration, turbidity, and nutrient concentrations are important in determining phytoplankton productivity and biomass. Organisms found in Long Island Sound and Hudson River are also usually found in the East River due to the proximity of these waterbodies to each other and strong currents.

A survey conducted in 1983 of the East River concluded that diatoms were generally the most widely represented class of phytoplankton, accounting for over 90 percent of the different taxa collected, and the green alga *Nannochloris* was the most abundant single taxa identified (Hazen and Sawyer 1983). In a 1993 survey of New York Harbor, 29 taxa of phytoplankton were identified, with the diatom *Skeletonema costatum* and the green algae *Nannochlorus atomus* determined to be the most abundant species at the monitored sites (Brosnan and O'Shea 1995). The average summer cell counts in that year ranged from 6,300 to 97,000 cells/mL. Resident times of phytoplankton species within New York Harbor are short as species move quickly through the system due to strong tidal currents. Investigators have suggested that the overall composition and relative abundance of phytoplankton taxa in the East River are more heavily influenced by the influx from waters of Long Island Sound and New York Harbor than by localized water quality conditions (Con Edison 1982).

SUBMERGED AQUATIC VEGETATION AND BENTHIC ALGAE

Submerged aquatic vegetation (SAV) refers to rooted aquatic plants that are often found in shallow areas of estuaries. These organisms are important because they provide nursery and refuge habitat for fish. Benthic algae can be large multicellular plants that can be important primary producers in the aquatic environment. They are often seen on rocks, jetties, pilings, and sandy or muddy bottoms (Hurley 1990). Since these organisms require sunlight as their primary source of energy, the limited light penetration of New York Harbor limits their distribution to shallow areas. Light penetration, turbidity, and nutrient concentrations are all important in determining SAV and benthic algae productivity and biomass. Surveys conducted in the study area documented sea lettuce and rockweed, which are species of benthic algae, occurring on intertidal riprap at several locations along the shoreline including just north of Pier 42, the riprap coves at Stanton Street and East 4th Street, and at Stuyvesant Cove Park. No SAV was observed within the study area.

ZOOPLANKTON

Zooplankton are an integral component of aquatic food webs. They are primary grazers on phytoplankton and detritus material and are themselves used by organisms of higher trophic levels as a food source. The higher-level consumers of zooplankton typically include forage fish, such as bay anchovy, as well as commercially and recreationally important species, such as striped bass (*Morone saxatilis*) and white perch (*Morone americana*) during their early life stages. Predacious zooplankton species can consume eggs and larvae, which can have a detrimental effect on certain fish species.

Crustacean taxa are generally the most abundant group of zooplankton collected in New York Harbor. The most dominant species include the copepods *Acartia tonsa*, *Acartia hudsonica*, *Eurytemora affinis*, and *Temora longicornis*. These species are not all present at the same time and their abundance varies seasonally (Stepien et al. 1981, Lonsdale and Cosper 1994, Perlmutter 1971, Lauer 1971, Hazen and Sawyer 1983).

BENTHIC INVERTEBRATES

Benthic invertebrates typically inhabit bottom sediments and the surfaces of submerged objects such as rocks, pilings, or debris. These organisms contribute to the flow of energy within an ecosystem by converting detrital and suspended organic material into carbon (or living material) and are part of the diets of fish and waterfowl within the East River. Benthic invertebrates promote the exchange of nutrients between the sediment and water column. Benthic invertebrates that are typically retained on a 0.5 mm screen are referred to as macroinvertebrates. Smaller benthic invertebrates are referred to as meiofauna and include nematodes (a class of roundworm) and harpacticoid copepods (order of copepods that are primarily benthic). Some of these animals live on top of the substratum (epifauna) and some within the substratum (infauna). The concentration of benthic invertebrates found is influenced by the type of substrate (rocks, pilings, sediment grain size, etc.), salinity, and dissolved oxygen levels. Currents, wave action, predation, succession, and disturbance also influence their concentrations and survival.

Over 100 benthic invertebrate taxa (mostly crustaceans or polychaete worms) have been identified in the East River (Coastal Environmental Services 1987). Common infaunal macroinvertebrates include aquatic earthworms, segmented worms, snails, bivalves, soft-shell clams, barnacles, cumaceans, amphipods, isopods, crabs, and shrimp. Epifauna include hydrozoans, sea anemones, flatworms, oligochaete worms, polychaetes, bivalves, barnacles, gammaridean and caprellid amphipods, isopods, sea squirts, hermit crabs, rock crabs, grass shrimp, sand shrimp, blue crabs, mud dog whelks, mud crabs, horseshoe crabs, blue mussels, softshell clams, and the sea slug (EA Engineering, Science, and Technology 1990, Able et al. 1995, NYC Parks 1994, PBS&J 1998). Two benthic invertebrate sub-communities have been identified in the East River on the basis of substrate hardness (Hazen and Sawyer 1983). The hard substrate community is characterized by organisms that are either firmly attached to rocks and other hard objects (e.g., mussels or barnacles), or that build or live in tubes. Species of polychaete worms, amphipods, and several other species have adapted to the East River's hard bottoms and rapid currents by living within the abandoned tubes of other species. The soft substrate community occurs in the more protected areas within the East River where detritus, clay, silt, and sand have accumulated in shallow, low velocity areas near piers and pilings. Common soft substrate organisms included oligochaete worms, the soft-shelled clam *Mya arenaria*, and a variety of flatworms, nemerteans, polychaetes, and crustaceans (Hazen and Sawyer, 1985). Recent benthic and epibenthic sampling by DEP in the lower East River documented nine benthic macroinvertebrate taxa, including annelids, arthropods, and mollusks. The annelid *Haploscoloplos robustus* and mollusks *Melampus bidentatus* and *Mulinia lateralis* were found in the highest densities (DEP 2007). Benthic macroinvertebrates sampled between Piers 6 and 9 on the Manhattan shoreline of the East River in 2002 found mostly pollution-tolerant taxa (primarily polychaetes in the families *Capitellidae* and *Spionidae*), although some pollution-sensitive species (e.g., *Ampelisca* spp.) were also found. Other invertebrates collected were mussels, crabs, shrimp, isopods, and nematodes (AKRF 2002).

FISH

The finfish community in Upper New York Harbor, including the lower East River, is typical of large coastal estuaries and inshore waterways along the Mid-Atlantic Bight, supporting a variety of estuarine, marine, and diadromous fish species that use this area as spawning grounds, a migratory pathway, or nursery/foraging habitat. Diadromous fish species can be either anadromous or catadromous. Anadromous species live as adults in the open ocean and return to freshwater locations to breed. Catadromous species live as adults in freshwater locations and return to open ocean to breed.

Hogchoker (*Trinectes maculates*), tomcod (*Microgadus tomcod*), winter flounder (*Pseudopleuronectes americanus*), white perch, bay anchovy (*Anchoa mitchilli*), Atlantic menhaden (*Brevoortia tyrannus*) and striped bass, are examples of common fish found within the lower East River during at least one life stage. Atlantic silverside (*Menidia menidia*), mummichog (*Fundulus heteroclitus*), northern pipefish (*Syngnathus fuscus*), striped killifish (*Fundulus majalis*), and three-spined stickleback (*Gasterosteus aculeatus*) are common to the East River year-round (NOAA 2001). Among breeding finfish of the lower East River, ichthyoplankton tow sampling (NOAA) found egg density to be greatest for cunner (*Tautogolabrus adspersus*), followed by tautog (*Tautoga onitis*). Other species' eggs that were found in relatively low abundance included bay anchovy, herrings (*Clupeidae* spp.), fourbeard rockling (*Enchelyopus cimbrius*), wrasses (*Labridae* spp.), North American searobins (*Prionotus* spp.), and windowpane flounder (*Scophthalmus aquosus*). Winter flounder was the most abundant species collected at the larval stage. Other larvae found included American sand lance (*Ammodytes americanus*), bay anchovy, blennies (*Blenniidae* spp.), Atlantic menhaden, herrings, fourbeard rockling, true gobies (*Gobiidae* spp.), sculpins (*Myoxocephalus* spp.), windowpane flounder, northern pipefish, and tautog (DEP 2007).

American eel (*Anguilla rostrata*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), striped bass, tomcod, Atlantic sturgeon (*Acipenser oxyrhynchus*), and rainbow smelt (*Osmerus mordax*) are diadromous fish that may pass through the East River during migration to and from spawning areas in the upper Hudson River and its tributaries (NOAA 2001). Transient shortnose sturgeon (*Acipenser brevirostrum*) also have the potential to occur briefly in the East River (Bain 1997). Examples of marine species found in the East River from spring through fall include bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), tautog, and weakfish (*Cynoscion regalis*) (NOAA 2001). Overall, the East River's fish community is spatially and seasonally dynamic. See **Table 5.6-3** for a complete list of currently known species that have the potential to be found in the study area.

Table 5.6-3
Fish Species with the Potential to Occur in the East River

Common Name	Scientific Name
Alewife	*Alosa pseudoharengus*
Alosa sp.	*Alosa* spp.
American eel	*Anguilla rostrata*
American sand lance	*Ammodytes americanus*
American shad	*Alosa sapidissima*
Atlantic croaker	*Micropogonias undulatus*
Atlantic herring	*Clupea harengus*
Atlantic menhaden	*Brevoortia tyrannus*
Atlantic silverside	*Menidia menidia*
Atlantic sturgeon	*Acipenser oxyrhynchus*
Atlantic tomcod	*Microgadus tomcod*
Bay anchovy	*Anchoa mitchilli*
Black sea bass	*Centropristis striata*
Blenny	*Blenniidae* spp.
Bluefish	*Pomatomus saltatrix*
Blueback herring	*Alosa aestivalis*
Clearnose skate	*Raja eglanteria*
CongereEel	*Conger* spp.
Cunner	*Tautogolabrus adspersus*
Fourbeard rockling	*Enchelyopus cimbrius*
Gizzard shad	*Dorosoma* spp.
Grubby	*Myoxocephalus aeneus*
Hickory shad	*Alosa mediocris*
Hogchoker	*Trinectes maculatus*
Little skate	*Leucoraja erinacea*
Mummichug	*Fundulus heteroclitus*
Naked goby	*Gobiosoma bosc*
Northern pipefish	*Syngnathus fuscus*
Northern puffer	*Sphoeroides maculatus*
Red hake	*Urophycis chuss*
Scup	*Stenotomus chrysops*
Shortnose sturgeon	*Acipenser brevirostrum*
Silver hake	*Merluccius bilinearis*
Smallmouth flounder	*Etropus microstomus*
Spotted hake	*Urophycis regia*
Striped bass	*Morone saxatilis*
Striped cusk-eel	*Ophidion marginatum*
Striped killifish	*Fundulus majalis*
Striped mullet	*Mugil cephalus*
Striped searobin	*Prionotus evolans*
Summer flounder	*Paralichthys dentatus*
Tautog	*Tautoga onitis*
Three-spined stickleback	*Gasterosteus aculeatus*
Weakfish	*Cynoscion regalis*
White perch	*Morone americana*
Windowpane flounder	*Scophthalmus aquosus*
Winter flounder	*Pseudopleuronectes americanus*
Wrasse	*Labridae* spp.

Sources:
Bain, 1997; Lawler, Matusky and Skelly Engineers, LLP (LMS), 2003; National Oceanic and Atmospheric Administration (NOAA), 2001; New York City Department of Parks and Recreation (NYC Parks), 2003; United States Fish and Wildlife Service (USFWS); 1997; USFWS, 2012.

ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH) is any aquatic habitat that promotes fish spawning, breeding, feeding, or growth for any federally regulated fish species. These species and their EFH are regulated by the NOAA NMFS. A consultation with NOAA NMFS has been reinitiated for the Preferred Alternative and documents pertaining to that consultation are in **Appendix G**. The study area is located within the Hudson River Estuary EFH. This EFH identifies one or multiple life stages for 16 species of fish (see **Table 5.6-4**) that are described in greater detail below.

Table 5.6-4
Species with Essential Fish Habitat within the Natural Resources Study Area

Species	Eggs	Larvae	Juveniles	Adults
Red hake (*Urophycis chuss*)	N/A	X	X	X
Winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X
Windowpane flounder (*Scophthalmus aquosus*)	X	X	X	X
Atlantic herring (*Clupea harengus*)	N/A	X	X	X
Bluefish (*Pomatomus saltatrix*)	N/A	N/A	X	X
Atlantic butterfish (*Peprilus triacanthus*)	N/A	X	X	X
Summer flounder (*Paralichthys dentatus*)	N/A	X	X	X
Black sea bass (*Centropristis striata*)	N/A	N/A	X	X
King mackerel (*Scomberomorus cavalla*)	X	X	X	X
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
Cobia (*Rachycentron canadum*)	X	X	X	X
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X
Scup (*Stenotomus chrysops*)	X	X	X	X
Little skate (*Leucoraja erinacea*)	N/A	N/A	X	X
Clearnose skate (*Raja eglanteria*)	N/A	N/A	X	X
Winter skate (*Leucoraja ocellata*)	N/A	N/A	X	X

Notes:
X = Lifestage is present in study area.
N/A = The species does not have this lifestage in its life history or has no EFH designation for this lifestage.
Source:
National Marine Fisheries Service. "Summary of Essential Fish Habitat (EFH) Designation" posted on the internet at https://www.habitat.noaa.gov/application/efhmapper/index.html
Consultation with NOAA NMFS (see **Appendix G**).

Red hake (Urophycis chuss)

EFH for red hake larva consists of surface waters of the Gulf of Maine, Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras, North Carolina. Generally, the following conditions exist where red hake larvae are found: sea surface temperatures below 19°C, water depths less than 200 meters, and a salinity greater than 0.5 ppt (NMFS, 1998b). Red hake larvae have been reported from the Hudson-Raritan Estuary; however, they are most abundant at the middle and outer continental shelf throughout the Middle Atlantic Bight (Steimle et al., 1999).

EFH for red hake juveniles consists of bottom habitats with a substrate of shell fragments, including areas with an abundance of live scallops in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where red hake juveniles are found: water temperatures below 16°C, depths less than 100 meters, and a salinity range from 31–33 ppt (NMFS, 1998b). Shelter is considered crucial for juvenile red hake (Steimle et al., 1999).

EFH for red hake adults consists of bottom habitats in depressions with a substrate of sand and mud in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where non-spawning red hake adults are found: water temperatures below 12°C, depths from 10–130 meters, and a salinity range from 33–34 ppt (NMFS, 1998b). This salinity is above the range found in the East River. Additionally, non-spawning red hake are abundant in the Long Island Sound, but not in the Hudson-Raritan Estuary (Steimle et al., 1999). Spawning adult red hake are known to use the New York Bight primarily in May–June and will utilize waters with salinity less than 25 ppt. The East River meets this salinity range, however both non-spawning and spawning adults do not inhabit water with dissolved oxygen (DO) less than 3 parts per million (ppm). DO in the East River is at or below 3.0 ppm periodically during the summer (NYCDEP, 2015).

High-quality EFH for larval and juvenile red hake is not found in the East River, and red hake larvae and juveniles that occur in the East River are most likely transient. Adult red hake are known to occur in the East River from impingement and entrainment studies conducted at the Ravenswood Power Plant on the Queens side of the East River (Normandeau Associates, 1994). However, adult red hake are not abundant in the Hudson-Raritan Estuary during any season (Stiemle et al., 1999a). Therefore, spawning and non-spawning adult red hake have the potential to occur in the East River but would most likely be transient individuals. Adult red hake would not be anticipated to be found in the East River during the summer when DO is periodically low.

Winter flounder (Pleuronectes americanus)

EFH for winter flounder eggs consists of bottom waters with a substrate of sand, muddy sand, mud and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder eggs are found: water temperatures less than 10°C, salinities between 10 to 30 ppt, and water depths less than 5 meters (NMFS, 1998c).

Winter flounder larvae EFH consists of pelagic and bottom waters of Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder larvae are found: sea surface temperatures less than 15°C, salinities between 4–30 ppt, and water depths less than 6 meters (NMFS, 1998c).

EFH for winter flounder juveniles consists of bottom waters with a substrate of mud or fine-grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Young-of-the-year juveniles generally persist where the following conditions are found: water temperatures below 28°C, depths from 0.1–10.0 meters, and salinities between 5–33 ppt. Juveniles over one year old are generally found where the following conditions exist: water temperatures below 25°C, depths from 1–50 meters, and salinities between 10–30 ppt (NMFS, 1998c).

Adult winter flounder EFH consists of bottom waters with a substrate of mud, sand, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to the Delaware Bay. Generally, the following conditions exist where winter flounder adults are found: water temperatures below 25°C, depths from 1–100 meters, and salinities between 15–33 ppt (NMFS, 1998c). Adults found in the Hudson-Raritan Estuary are known to utilize waters with salinities as low as 15 ppt, although most were found at salinities less than 22 ppt (Pereira et al. 1999). Spawning winter flounder are typically found in shallower, cooler bottom waters where the temperature is below 15°C, depth is less than 6 meters, and salinity is between 5.5–36 ppt (NMFS, 1998c). Winter flounder spawn between February and April in waters with temperatures lower than 15°C, salinities between 10 and 32 ppt, and on substrates like sand, gravel, or mud in depths less than 6 meters. Spawning winter flounder have the potential to be present in shallow areas of the East River. Winter flounder were collected during impingement and entrainment studies at the Ravenswood power plant on the Queens side of the East River and found to be the most abundant fish at the site (Normandeau Associates, 1994).

Windowpane flounder (Scopthalmus aquosus)

Windowpane flounder, also called sand flounder, is found from the Gulf of St. Lawrence to South Carolina and has its maximum abundance in the New York Bight. EFH for windowpane flounder eggs consists of surface waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, windowpane flounder eggs are found where sea surface temperatures are less than 20°C and water depths are less than 70 meters (NMFS, 1998d).

EFH for windowpane flounder larvae consists of pelagic waters (i.e., the water column of open coastal waters) around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, windowpane flounder larvae are found where sea surface temperatures are less than 20°C, and water depths are less than 70 meters (NMFS, 1998d). Based on collections from southern New Jersey, it appears that settlement of spring-spawned individuals occurs both in estuaries and on the continental shelf, while settlement of autumn-spawned individuals occurs primarily on the continental shelf (Chang et al., 1999).

EFH for juvenile windowpane flounder consists of bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras (NMFS, 1998d). Generally, the following conditions exist where windowpane flounder juveniles are found: water temperatures below 25°C, depths between 1–100 meters, and salinities between 5.5–36 ppt (NMFS, 1998d). In the Hudson-Raritan Estuary, juveniles were fairly evenly distributed throughout the estuary, but were most abundant in the deeper channels in winter and summer (Wilk et al., 1996).

EFH for adult windowpane flounder consists of bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border. Generally, the following conditions exist where windowpane flounder adults are found: water temperatures below 21°C, depths between 1–75 meters, and salinities between 5.5–36 ppt. Adult windowpane flounder are sensitive to hypoxic conditions and have been found to avoid conditions where DO levels were less than 3 ppm (Howell and Simpson 1994). During the summer, DO in the water column and bottom waters of the East River can be reduced to less than 3 ppm, making this unsuitable habitat for windowpane flounder.

Atlantic sea herring (Clupea harengus)

EFH for Atlantic herring larvae consists of pelagic waters in the Gulf of Maine, Georges Bank, and southern New England. Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16°C, water depths from 50–90 meters, and salinities around 32 ppt (NMFS, 1998e). The East River does not contain suitable depth or salinity for Atlantic herring larvae. Therefore, no significant adverse effects to Atlantic herring larvae EFH are anticipated as a result of the proposed project.

EFH for Atlantic herring juveniles and adults consists of pelagic waters and bottom habitats in the Gulf of Maine, Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Atlantic herring juveniles and adults are found: water temperatures below 10°C, water depths from 15–135 meters, and a salinity range from 26–32 ppt. The East River is on the low end of the preferred salinity for juvenile and adult Atlantic herring (NMFS, 1998e).

Atlantic herring juveniles and adults are known to occur in the Hudson-Raritan Estuary in winter and spring from bottom trawling surveys (Stevenson and Scott, 2005) and have been collected during entrainment studies at the Ravenswood power plant in Queens (Normandeau Associates, 1994). However, water temperatures in other seasons in the East River would likely be too high to support juvenile and adult Atlantic herring. Juvenile and adult Atlantic herring prefer DO in bottom habitats between 6–12 ppm. Water quality monitoring in the East River shows DO at the bottom of the East River is only suitable for Atlantic herring in the winter and spring (NYCDEP, 2015). Atlantic herring could potentially utilize the East River during winter and spring when DO and water temperatures are suitable.

Bluefish (Pomatomus saltatrix)

EFH for juvenile bluefish consists of pelagic waters over the continental shelf from Nantucket Island south to Key West, and estuaries from Penobscot Bay south to coastal Florida. Generally, juvenile bluefish prefer water temperatures between 19–24°C and salinities between 23–36 ppt (NMFS, 1998f). Trawl surveys in the Hudson-Raritan Estuary found juvenile bluefish throughout the area in all depths sampled during the summer and fall, and no occurrences of juvenile bluefish during the winter and spring (Fahay et al., 1999).

Adult bluefish EFH consists of pelagic waters over the continental shelf from Nantucket Island south through Key West, and estuaries from Penobscot Bay, Maine south to Key West, Florida. Generally, juvenile bluefish prefer water temperatures between 14–16°C and salinities greater than 25 ppt (NMFS, 1998f). Adult bluefish are highly migratory and occur seasonally in Mid-Atlantic estuaries from April to October (Fahay et al., 1999). Due to their migratory tendencies, any adult bluefish that occur in the East River would be anticipated to be transient individuals.

Atlantic butterfish (Peprilus triacanthus)

EFH for Atlantic butterfish larvae consists of pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras, and estuaries from Boston Harbor south to the Chesapeake Bay. Generally, the following conditions exist where Atlantic butterfish larvae are found: water temperatures between 9–19°C, salinities between 6.4–37 ppt, and water depths between than 10–1,829 meters (NMFS, 1998f).

Juvenile Atlantic butterfish EFH consists of pelagic waters over the continental shelf from the Gulf of Maine through Cape Hatteras, and estuaries from Boston Harbor south to the James River in Virginia. Generally, the following conditions exist where Atlantic butterfish juveniles are found: water temperatures between 3–28°C, salinities between 3–37 ppt, and water depths between 10–365 meters (though most are found at depths less than 120 meters) (NMFS, 1998f).

EFH for Atlantic butterfish adults consists of pelagic waters over the continental shelf from the Gulf of Maine through Cape Hatteras, and estuaries from Boston Harbor south to the James River in Virginia. Generally, the following conditions exist where Atlantic butterfish juveniles are found: water temperatures between 3–28°C, salinities between 4–26 ppt, and water depths between 10–365 meters (though most are found at depths less than 120 meters) (NMFS, 1998f). Adults are most common in the New York Harbor in the summer and have been found over shallow flats, estuaries, and may congregate on the bottom during the day.

In Hudson-Raritan trawl surveys, juvenile and adult Atlantic butterfish were collected at water temperatures ranging from 8–26ºC, depths ranging from 3–23 meters, salinities ranging from 19–32 ppt, and DO levels ranging from 3–10 ppm (Cross et al, 1999). Atlantic butterfish is primarily a pelagic species (Woodhead, 1990), and although Atlantic butterfish may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient.

Summer flounder (Paralicthys dentatus)

EFH for summer flounder larvae consists of pelagic waters over the continental shelf from the Gulf of Maine south to the east coast of Florida, and estuaries from the Waquoit Bay, Massachusetts south to the Indian River, Florida. Generally, the following conditions exist where summer flounder larvae are found: water temperatures between 9–12°C, salinities between 23–33 ppt, and water depths between 10–70 meters (NMFS, 1998f).

EFH for summer flounder juveniles consists of bottom habitat with mud or sand substrates in continental shelf waters from Gulf of Maine south to the east coast of Florida, and estuaries from the Waquoit Bay south to the Indian River. Generally, the following conditions exist where summer flounder juveniles are found: water temperatures greater than 11°C, salinities between 10–30 ppt, and water depths between 0.5–5 meters (NMFS, 1998f).

EFH for summer flounder adults consists of bottom habitat with mud or sand substrates in continental shelf waters from Gulf of Maine south to the east coast of Florida, and estuaries from the Buzzards Bay, Massachusetts south to the Indian River (NMFS, 1998f). Generally, adults are found at depths up to 25 meters and in temperatures ranging from 9–26°C in the autumn, 4–13°C in the winter, 2–20°C in the spring, and 9–27°C in the summer. Salinity is known to have minimal effect on distribution in comparison to substrate preference. Trawl surveys from 1992 to 1997 found adult summer flounder to be present in moderate numbers throughout the Hudson-Raritan Estuary in all seasons except winter (Packer et al., 1999; Zetlin et. al., 1999).

Black sea bass (Centropristus striata)

EFH for black sea bass juveniles consists of demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, and estuaries from Buzzards Bay south to the James River. Generally, juvenile black sea bass are found in waters warmer than 6°C with salinities greater than 18 ppt, and depths between 1–28 meters. Juvenile black sea bass are found in the estuaries in the summer and spring and overwinter offshore from New Jersey and south. Juvenile black sea bass require structural complexity in both offshore and inshore substrates including rough bottoms, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas. Offshore clam beds and shell patches may also be used during the wintering (NMFS, 1998h; Drohan et al., 2007). Black sea bass were captured during impingement and entrainment studies at the Ravenswood power plant in Queens (Normandeau Associates, 1994).

EFH for black sea bass adults consists of demersal waters over the continental shelf from the Gulf of Maine to Cape Hatteras, and estuaries from Buzzards Bay south to the James River. Black sea bass adults are generally found in estuaries from May through October and overwinter offshore south of New York to North Carolina from November through April. Generally, adult sea bass are found in waters warmer than 6°C with salinities greater than 20 ppt, and depths between 20–50 meters. Structured habitats (natural and man-made), sand and shell rocky reefs, cobble and rock fields, stone coral patches, exposed stiff clay, and mussel beds are usually the substrate preference (NMFS, 1998h; Drohan et al., 2007). Spawning occurs in the Mid-Atlantic Bight in April through October. Black sea bass are only present in the inshore areas of the New York Harbor in the winter months. Due to the preference of black sea bass for structured habitats, they are not uncommonly found underneath man-made structures such as docks and piers. Therefore, it is likely that black sea bass juvenile and adults are present in the study area.

King mackerel (Scomberomorus cavalla)

King mackerel are marine species of fish that can occur as far north as Rhode Island and south to Brazil. They are most common in warmer waters around the Chesapeake Bay southward. EFH for King mackerel eggs, larvae, juveniles, and adults consists of sandy shoals of capes and offshore bars, high profile rocky bottom and barrier-island ocean-side waters from the surf to the shelf break zone, from the Gulf Stream shoreward, including *Sargassum*, coastal inlets, and all state-designated nursery habitats of particular importance to coastal migratory pelagic species (NMFS, 1998i). King mackerel generally favor deeper and warmer waters than are typically found in the East River. Any king mackerel in the East River would be anticipated to be rare and transient individuals.

Spanish mackerel (Scomberomorus maculatus)

Spanish mackerel are marine species of fish that can occur as far north as Connecticut and south to the Yucatan Peninsula. They are most common between the Chesapeake Bay and the Gulf of Mexico. Spanish mackerel overwinter in waters off of south Florida. EFH for Spanish mackerel eggs, larvae, juveniles, and adults consists of sandy shoals of capes and offshore bars, high profile rocky bottom and barrier-island ocean-side waters from the surf to the shelf break zone, from the Gulf Stream shoreward, including *Sargassum*, coastal inlets, and all state-designated nursery habitats of particular importance to coastal migratory pelagic species (NMFS, 1998i). Spanish mackerel generally favor higher salinities (greater than 30 ppt) and warmer waters (18°C or more). Any Spanish mackerel in the East River would be anticipated to be rare and transient individuals.

Cobia (Rachycentron canadum)

Cobia is a large, highly migratory species that is known to occur from Cape Cod, Massachusetts to Argentina (ESS, 2013). EFH for cobia eggs, larvae, juveniles, and adults consists of sandy shoals of capes and offshore bars, high profile rocky bottom and barrier-island ocean-side waters from the surf to the shelf break zone, from the Gulf Stream shoreward, including *Sargassum*, coastal inlets, high-salinity bays, estuaries, and seagrass habitat. Information about the distribution of cobia lifestages on the East Coast is limited. However, cobia are most abundant in the Gulf of Mexico where they spawn and then leave the Gulf to commence extreme migrations. No cobia lifestages were documented in entrainment studies at the Ravenswood power plant (Normandeau Associates, 1994). Any cobia in the East River would be anticipated to be rare and transient individuals.

Atlantic mackerel (Scomber scombrus)

Atlantic mackerel are found in the western Atlantic Ocean from Laborador, Canada to Cape Lookout, North Carolina and is extremely common occurring in huge sholas in the pelagic zone down to about 200 meters (NOAA, 2019a). It spends the warmer months close to shore and near the ocean surface, appearing along the coast in spring and departing for deeper and more southern water in fall and winter. Its preferred water temperature is above 8°C. The Atlantic mackerel is an active fish that must keep in constant motion to bring in enough oxygen for survival. Atlantic mackerel are fast growers and can reach 16.5 inches and 2.2 pounds. There are two major spawning groups in the western Atlantic: the southern group spawns primarily in the Mid-Atlantic Bight, which includes the proposed project area, from April to May and the northern group spawns in the Gulf of St. Lawrence in June and July.

Scup (Stenotomus chrysops)

Scup is a migratory, schooling, coastal fish species that occurs from Nova Scotia to South Carolina, but is most common between Cape Cod, Massachusetts, and Cape Hatteras, North Carolina. Spawning occurs annually from May to August with a peak in June in deep parts of large bays and coastal areas between New Jersey and Massachusetts. Eggs are pelagic as are larvae in coastal waters. Scup settle to inshore bottom habitat during the late larval stage starting in early July. Juveniles reside in high salinity waters until the early fall. Juveniles and adults overwinter on the mid- and outer shelf between New Jersey and Cape Hatteras during which time, little is known about habitat preferences. During spring, juveniles and adults migrate north and inshore to coastal and estuarine areas where they use a variety of bottom types from open sandy areas to structured rocky or reef areas.

Little skate (Leucoraja erinacea)

The little skate is found only in the northwest Atlantic Ocean where it ranges from southeastern Newfoundland to the Scotian Shelf, the Bay of Fundy, and Georges Bank southward to North Carolina (Fisheries and Oceans Canada, 2019b). The little skate is sympatric with the winter skate sharing its distribution throughout its range. The little skate is a benthic species that lives primarily on the continental shelf over sand and gravel bottom often in shallow waters less than 111 meters. The little skate can tolerate a relatively wide range of temperatures (1.2–21°C). Little skate has been classified as “winter periodic,” moving inshore in the winter and offshore into deeper water in the summer.

The little skate is one of the fastest growing species of northwest Atlantic skates. Studies on age, growth, and maturity have demonstrated that this species matures at a smaller size and earlier age and is less long-lived than other species of skate that inhabit the northwest Atlantic Ocean. Little skate along the US northeast coast exhibit a partially defined annual reproductive cycle with peaks in reproductive activity and egg deposition in June-July and late October-January.

Clearnose skate (Raja eglanteria)

The clearnose skate is found in the northwest Atlantic Ocean where it ranges from Massachusetts to southern Florida and into the Gulf of Mexico from mid-Florida to eastern Texas (Miller 2019). The clearnose skate is a benthic species that lives primarily on the continental shelf over sand and gravel bottom often in shallow waters less than 111 meters. The little skate can tolerate a relatively wide range of temperatures (5–27°C) and salinities (12–35 ppt). Clearnose skate vary their habitat and water depth mainly to remain within their preferred temperature range moving inshore in the winter and offshore into deeper water in the summer.

Winter skate (Leucoraja ocellate)

The range of the winter skate is restricted to the northwest Atlantic Ocean (Fisheries and Oceans Canada, 2019a). The northern most limit of the winter skate is the south coast of New Foundland from which it ranges south into the Gulf of St. Lawrence along the Scotian shelf, the Bay of Fundy, and Georges Bank southward to Cape Hatteras, North Carolina. The winter skate is a benthic species living over sand or gravel bottoms usually in depths less than 111 meters. The preferred temperature range for winter skate is -1.2 to 15°C. In the southern parts of its range, the winter skate appears to move shoreward in autumn and offshore in the summer suggesting a preference for cooler temperatures (i.e., winter periodic). Winter skate eat mostly amphipods and polychaete worms but also consume fish, decapods, isopods, and bivalves.

Studies on age, growth, and maturity in winter skate have demonstrated that this species is a slow growing, late-maturing, and long-lived species. Of particular concern is the late age at maturity reached by females relative to the maximum observed age, leaving very few total lifetime spawning episodes for each individual female.

FISH AND WILDLIFE COORDINATION ACT SPECIES

The New York Harbor Estuary and the East River are highly productive habitat for a wide variety of NOAA trust resources covered by the FWCA many of which are listed in **Table 5.6-3**. NOAA NMFS has identified FWCA species that include the following forage species (see **Appendix G**):

River herring: Alewife (Alosa psuedoharengus) and Blueback herring (Alosa aestivalis)

Two species of fish—the alewife (*Alosa psuedoharengus*) and the blueback herring (*A. aestivalis*)—are known collectively as river herring. River herring are anadromous, meaning that they mature in the ocean and then migrate up coastal rivers to estuarine and freshwater rivers, ponds, and lake habitats to spawn. Adult river herring generally live in the ocean for two years (mid-Atlantic states) to four years (Northeast states) before returning to freshwater rivers to spawn (RiverHerring.com, 2018). While some adults die after spawning, most return to the ocean until the following year's spawning. Alewife and blueback herring can live up to eight years.

River herring spawn over a wide range of substrates such as gravel, sand, detritus, and submerged vegetation. In areas where alewife and blueback herring co-exist, blueback herring will exhibit more variety in spawning site selection including shallow areas covered in vegetation, swampy areas, and small tributaries upstream from the tidal zone. In the mid-Atlantic region, alewife herring spawn from late February through April, whereas blueback herring spawn from late March through mid-May (NOAA, 2009). Spawning is generally initiated when water temperatures reach approximately 5°C to 10°C and spawning generally takes place when water temperatures are between 16°C and 19°C (NOAA, 2009).

Silversides (Menidia spp.)

Atlantic silversides can be found along the Atlantic Coast of North America from the Gulf of St. Lawrence, Canada to the northeast part of Florida (Chesapeake Bay Program, 2019a). They can tolerate a wide range in salinities and can be found in dense feeding schools along the shoreline in summer or in beds of underwater grasses hiding from predators. In winter they migrate to deeper, warmer waters. Atlantic silversides are small fish that grow no bigger than six inches. They breed from May to July. Atlantic silversides eat algae and small invertebrates including crustaceans, polychaete worms, zooplankton, and fish. Predators of Atlantic silversides include large predatory fish such as bluefish, mackerel, and striped bass as well as shorebirds. Smaller fish like mummichog eat their eggs and larvae.

Killifish (Fundulus spp.)

Killifish are found on the Atlantic Coast of North America from Laborador, Canada, to Mexico (Chesapeake Bay Program, 2019b). They prefer muddy marshes, tidal creeks, and grass flats along sheltered shorelines in summer. During colder months they often retreat to deeper waters or burrow into bottom mud or silt. Killifish are opportunistic feeders eating a range of items including algae, plants, insects, insect larvae, worms, small crustaceans, mollusks, and other fish. Predators of killifish include larger fish, wading birds, and seabirds.

Menhaden (Brevoortia tyrannus)

Menhaden inhabit estuaries along the western Atlantic coast, forming large schools that swim just below the water's surface from spring through fall and then migrate to deeper, warmer waters in winter (Chesapeake Bay Program, 2019c). Spawning occurs over the mid-Atlantic continental shelf in spring and autumn. Eggs hatch at sea and larvae spend about two months there before drifting into estuaries. Larvae eventually move into brackish waters where they grow rapidly throughout the summer. Menhaden are an important source of food for larger predators, including bluefish, weakfish, striped bass, sharks, mackerels, and fish-eating seabirds and mammals.

Anchovies (Anchoa spp.)

Anchovies also inhabit estuaries along the western Atlantic coast, forming large schools and are generally abundant throughout the year (Chesapeake Bay Program, 2019d). They are an important food source for larger predators including bluefish, weakfish, striped bass, sharks, mackerels, and fish-eating seabirds and mammals.

American eel (Anguilla rostrate)

American eels can be found along the Atlantic coast from Greenland to northern South America. American eels spawn in the Sargasso Sea. After hatching, larvae float and drift for about a year until they develop into glass eels and migrate into fresh and brackish tributaries including rivers, streams, creeks, lakes, and ponds (Chesapeake Bay Program, 2019e). Once they reach freshwater, they develop pigment. Eels may spend anywhere from 10 to 40 years in freshwater before returning to the Sargasso Sea to spawn.

Striped bass (Morone saxatilis)

Striped bass range along the western Atlantic coast from the St. Lawrence River and southern Gulf of St. Lawrence, Canada to the St. Johns River, Florida (Atlantic States Marine Fisheries Commission, 2019a). In Atlantic coast rivers from Albermarle Sound, North Carolina north, many adult striped bass are migratory, travelling annually from the ocean to riverine spawning grounds and back again to the ocean. Upon returning to the ocean, they undertake a northern summer migration and southward winter migration. However, some adults in the Mid-Atlantic region remain in or near their areas of origin.

Young and juvenile fish are generally found over clean, sandy bottoms in shallow water with salinities between 0.2 and 16 ppt. Adults occur over a wide variety of substrates including rock, gravel, sand, submerged aquatic vegetation and mussel beds. Atlantic striped bass have formed the basis of one of the most important fisheries on the Atlantic coast for centuries. However, overfishing and poor environmental conditions lead to the collapse of the fishery in the 1980s.

Tautog (Tautoga onitis)

Tautog are found from Nova Scotia, Canada, to South Carolina but are most abundant from Cape Cod to the Chesapeake Bay (Atlantic States Marine Fisheries Commission, 2019b). Tagging studies show that tautog do not migrate north and south along the coast but make inshore/offshore seasonal migrations triggered by changes in bottom water temperatures. In late fall when water temperatures fall below 10°C, adult tautog migrate to deep (25 to 45 meters) offshore wintering areas. In spring when water temperatures warm to 11°C, they migrate inshore to spawn in the vicinity of estuaries and inshore marine waters. The most important habitat parameter affecting the distribution and abundance of juvenile and adult tautog is the availability of cover. They depend on shelter for protection from predation during the night when they are not foraging. Shelter may consist of rock reefs, rock outcrops, gravel, eelgrass beds, and kelp or sea lettuce beds.

Weakfish (Cynoscion regalis)

Weakfish are found along the western Atlantic coast from Massachusetts to southern Florida and are occasionally occurring up to Nova Scotia, Canada and into the eastern Gulf of Mexico (Atlantic States Marine Fisheries Commission, 2019c). They are most abundant from New York to North Carolina. Adults migrate both north and south and onshore/offshore seasonally along the Atlantic coast. Warming waters in spring keys migration inshore and northwards to bays, estuaries, and sounds. Weakfish spawn in estuarine and nearshore habitats throughout its range. Principal spawning areas are from North Carolina to Montauk, New York. Nursery habitat also includes estuarine and nearshore waters.

ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES

Requests for information regarding endangered, threatened, and special concern species were made to the NYNHP, USFWS, and NOAA NMFS (see **Table 5.6-5**). The NYNHP provided a record of peregrine falcons (*Falco peregrinus*; NYS Endangered) nesting on the Williamsburg Bridge (see **Table 5.6-5** and **Appendix H1**). Reconnaissance field surveys for peregrine falcons in the study area were conducted on June 19, 2015, and July 10, 2015 (see **Appendix F1**). USFWS protected species with the potential to occur in the study area were identified via their online Information for Planning and Consultation (IPaC) tool and produced a report with no federally listed endangered species within the project area (see **Appendix H2**).

Table 5.6-5
Endangered and Threatened Species with the Potential to Occur in the Study Area

Name (Common)	Name (Scientific)	Federal Status	State Status	Identifying Source
Peregrine Falcon	*Falco peregrinus*	Not Listed	Endangered	NYNHP
Atlantic sturgeon	*Acipenser oxyrhynchus oxyrhynchus*	Endangered	Endangered	NOAA NMFS
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered	Endangered	NOAA NMFS

The NOAA NMFS consultation indicated that federally listed shortnose sturgeon and Atlantic sturgeon have the potential to occur in New York Harbor (see **Appendix G**).

Peregrine falcons commonly nest on buildings and bridges in urban areas, including New York City, demonstrating a tolerance of human disturbance and an ability to exploit resources in human-modified environments (Cade et al. 1996, White et al. 2002). The closest nest site to the study area is on the Williamsburg Bridge. Peregrine falcons are aerial hunters, and in urban areas primarily feed on rock pigeons (*Columbia livia*; DeMent et al. 1986, Rejt 2001). Peregrine falcons associated with the nest site on the Williamsburg Bridge have the potential to pass briefly through the study area on occasion in pursuit of pigeons or other prey. No peregrine falcons were observed during targeted surveys of the species that were conducted within the study area on June 19, 2015, and July 10, 2015 (see **Appendix F1**).

Atlantic sturgeon belonging to the New York Bight Distinct Population Segment (DPS) spawn in freshwater sections of the Hudson River and overwinter throughout the Bight, off the south shore of Long Island, and throughout Long Island Sound (Bain 1997, Savoy and Pacileo 2003). Atlantic sturgeon are most abundant in these waters from late September to late March (Dunton et al. 2010). The Atlantic waters off of Rockaway Peninsula and Sandy Hook are a significant concentration area of wintering Atlantic sturgeon (Dunton et al. 2010), and transients moving between Hudson River spawning grounds and these overwintering areas must pass through Upper Bay and may pass through the East River. Telemetry receivers in the lower East River and on the east and west sides of Roosevelt Island have recently detected tagged Atlantic sturgeon moving through this area (Tomechik et al. 2015). Occurrences of Atlantic sturgeons in the East River are likely brief, as these individuals are strictly transients. Atlantic sturgeons prefer open, marine waters and greater water depths than those of the East River for overwintering (Hatin et al. 2002, 2007; Savoy and Pacileo 2003, Dunton et al. 2010).

The shortnose sturgeon is an anadromous fish that spawns, develops, and usually overwinters in the upper Hudson River. The Upper East River is at the extreme southern limit of this population's overwintering range (Dadswell et al. 1984, Jenkins et al. 1993). Waters below the Tappan Zee region of the river are suboptimal due to their high salinities (Bain 1997). Shortnose sturgeon, therefore, have limited potential to occur in the lower East River, and only on rare and brief occasions as transients emigrating from the Hudson River to more southerly populations (Waldman et al. 1996, Kynard 1997).

The Golden Eagle (*Aquila chrysaetos*), which was never believed to be common in the eastern United States, was extirpated from New York's breeding bird fauna in the 1970s mainly due to loss of habitat human persecution and chemical contamination (NYNHP 2019). The species, which prefers wild, remote mountainous areas with open habitat where small game is abundant and cliffs are available for nesting, is currently known only as a few scattered individuals during breeding season and in migration, and one consistently occupied winter territory in Duchess County. No Golden Eagle habitat is present within the study area and no records of its occurrence within the project area were returned by NYNHP or USFWS.

Similarly, although Bald Eagles (*Haliaeetus leucocephalus*) are known to breed throughout New York State and while populations have recently begun to increase, the species prefers relatively undisturbed, wooded areas near wetlands or large bodies of water with abundant fish (NYNHP 2019). No Bald Eagle habitat is present within the study area and no records of its occurrence within the project area were returned by NYNHP or USFWS.

TERRESTRIAL RESOURCES

WILDLIFE

The USFWS IPaC tool was also used to generate a list of 58 migratory birds that could potentially occur in the project area. This list includes birds that are on the USFWS Birds of Conservation Concern (BCC) or warrant special attention to the project location (see **Table 5.6-6**). Of the 58 migratory birds listed by IPaC, 4 species were observed and identified during the natural resource surveys that took place on June 19, 2015 and July 10, 2015 (see **Appendix F1**). Those species are Double-crested Cormorant (*Phalacrocorax auritus*), Great Black-billed Gull (*Larus marinus*), Herring Gull (*Larus argentatus*), and Ring-billed Gull (*Larus delawarensis*).

Table 5.6-6
USFWS List of Migratory Birds within the Study Area

Common Name	Scientific Name	Breeding Season
American Oystercatcher	*Haematopus palliatus*	Breeds Apr 15 to Aug 31
Bald Eagle	*Haliaeetus leucocephalus*	Breeds Oct 15 to Aug 31
Band-rumped Storm-petrel	*Oceanodroma castro*	Breeds elsewhere
Black Scoter	*Melanitta nigra*	Breeds elsewhere
Black Skimmer	*Rynchops niger*	Breeds May 20 to Sep 15
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Breeds May 15 to Oct 10
Bobolink	*Dolichonyx oryzivorus*	Breeds May 20 to Jul 31
Bonaparte's Gull	*Chroicocephalus philadelphia*	Breeds elsewhere
Bridled Tern	*Onychoprion anaethetus*	Breeds Apr 15 to Sep 20
Buff-breasted Sandpiper	*Calidris subruficollis*	Breeds elsewhere
Canada Warbler	*Cardellina canadensis*	Breeds May 20 to Aug 10
Cerulean Warbler	*Dendroica cerulea*	Breeds Apr 29 to Jul 20
Clapper Rail	*Rallus crepitans*	Breeds Apr 10 to Oct 31
Common Loon	*Gavia immer*	Breeds Apr 15 to Oct 31
Common Tern	*Sterna hirundo*	Breeds May 10 to Sep 10
*Double-crested Cormorant	*Phalacrocorax auritus*	Breeds Apr 20 to Aug 31
Dunlin	*Calidris alpina arcticola*	Breeds elsewhere
Eastern Whip-poor-will	*Antrostomus vociferous*	Breeds May 1 to Aug 20
Evening Grosbeak	*Coccothraustes vespertinus*	Breeds elsewhere
Golden Eagle	*Aquila chrysaetos*	Breeds elsewhere
Golden-winged Warbler	*Vermivora chrysoptera*	Breeds May 1 to Jul 20
*Great Black-backed Gull	*Larus marinus*	Breeds Apr 15 to Aug 20
*Herring Gull	*Larus argentatus*	Breeds Apr 20 to Aug 31
Hudsonian Godwit	*Limosa haemastica*	Breeds elsewhere
Kentucky Warbler	*Oporornis formosus*	Breeds Apr 20 to Aug 20
King Rail	*Rallus elegans*	Breeds May 1 to Sep 5
Leach's Storm-petrel	*Oceanodroma leucorhoa*	Breeds May 15 to Nov 20
Least Tern	*Sterna antillarum*	Breeds Apr 20 to Sep 10
Lesser Yellowlegs	*Tringa flavipes*	Breeds elsewhere
Long-eared Owl	*Asio otus*	Breeds elsewhere
Long-tailed Duck	*Clangula hyemalis*	Breeds elsewhere
Nelson's Sparrow	*Ammodramus nelsoni*	Breeds May 15 to Sep 5
Northern Gannet	*Morus bassanus*	Breeds elsewhere
Pomarine Jaeger	*Stercorarius pomarinus*	Breeds elsewhere
Prairie Warbler	*Dendroica discolor*	Breeds May 1 to Jul 31
Prothonotary Warbler	*Protonotaria citrea*	Breeds Apr 1 to Jul 31
Purple Sandpiper	*Calidris maritima*	Breeds elsewhere
Razorbill Red-breasted Merganser	*Alca torda* *Mergus serrator*	Breeds Jun 15 to Sep 10 Breeds elsewhere
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Breeds May 10 to Sep 10
Red-necked Phalarope	*Phalaropus lobatus*	Breeds elsewhere
Red-throated Loon	*Gavia stellata*	Breeds elsewhere
*Ring-billed Gull	*Larus delawarensis*	Breeds elsewhere
Roseate Tern	*Sterna dougallii*	Breeds May 10 to Aug 31
Royal Tern	*Thalasseus maximus*	Breeds Apr 15 to Aug 31
Ruddy Turnstone	*Arenaria interpres morinella*	Breeds elsewhere
Rusty Blackbird	*Euphagus carolinus*	Breeds elsewhere
Saltmarsh Sparrow	*Ammodramus caudacutus*	Breeds May 15 to Sep 5
Seaside Sparrow	*Ammodramus maritimus*	Breeds May 10 to Aug 20
Semipalmated Sandpiper	*Calidris pusilla*	Breeds elsewhere
Short-billed Dowitcher	*Limnodromus griseus*	Breeds elsewhere

Table 5.6-6 (cont'd)
USFWS List of Migratory Birds within the Study Area

Common Name	Scientific Name	Breeding Season
Snowy Owl	*Bubo scandiacus*	Breeds elsewhere
Sooty Tern	*Onychoprion fuscatus*	Breeds Mar 10 to Jul 31
Surf Scoter	*Melanitta perspicillata*	Breeds elsewhere
Whimbrel	*Numenius phaeopus*	Breeds elsewhere
White-winged Scoter	*Melanitta fusca*	Breeds elsewhere
Willet	*Tringa semipalmata*	Breeds Apr 20 to Aug 5
Wilson's Storm-petrel	*Oceanites oceanicus*	Breeds elsewhere
Wood Thrush	*Hylocichla mustelina*	Breeds May 10 to Aug 31

Notes:
* Birds observed during natural resource surveys on June 19, 2015 and July 10, 2015
Source:
United States Fish and Wildlife Service. Information for Planning and Consultation Tool. Accessed 1/30/2019 at https://ecos.fws.gov/ipac/

The New York State Breeding Bird Atlas was also consulted regarding the potential occurrence of breeding birds within the study area. The Breeding Bird Atlas is a comprehensive, statewide survey of the distribution of breeding birds in New York that was last updated in 2008. The study area is located in Block 5850A which includes the Lower East Side of Manhattan. Breeding birds that could potentially occur within the study area are provided in **Table 5.6-7**. Five of the breeding bird species listed by the Atlas were observed during the natural resource surveys conducted in 2015. Those species are Rock Pigeon (Clumba livia), Mourning Dove (Zenaida macroura), American Robin (Turdus migratorius), European Starling (*Sturnus vulgaris*), and House Sparrow (*Passer domesticus*).

Wildlife observed in the study area during site visits conducted on June 19, 2015, and July 10, 2015, consisted mostly of common or disturbance-tolerant species. Birds observed utilizing or flying through the study area included American robin (*Turdus migratorius*), barn swallow (*Hirundo rustica*), black-crowned night-heron (*Nycticorax nycticorax*), Canada goose (*Branta canadensis*), common grackle (*Quiscalus quiscula*), double-crested cormorant (*Phalacrocorax auritus*), European starling, gray catbird (*Dumetella carolinensis*), great egret (*Ardea alba*), house sparrow, laughing gull (*Leucophaeus atricilla*), mallard (*Anas platyrhynchos*), mourning dove (*Zenaida macroura*), red-tailed hawk (*Buteo jamaicensis*), ring-billed gull (*Larus delawarensis*), and rock pigeon. Other birds that were not observed in the study area but were documented by the 2000–2005 New York State Breeding Bird Atlas as breeding or potentially breeding in the census block in which the study area is located (5850A) include chimney swift (*Chaetura pelagica*), downy woodpecker (*Picoides pubescens*), northern mockingbird (*Mimus polyglottos*), and northern cardinal (*Cardinalis cardinalis*). Potential nesting habitat for these species occurs within the study area. As noted above, targeted surveys for peregrine falcons were conducted in the study area near the Williamsburg Bridge on June 19, 2015 and July 10, 2015. No peregrine falcons were observed.

Table 5.6-7
NYSDEC Breeding Bird Atlas Results within the Study Area

Common Name	Scientific Name	Behavior	NY Legal Status
Peregrine Falcon	*Falco peregrinus*	Confirmed – Nest and eggs, bird on nest or egg, or eggshells beneath nest.	Endangered
+ Rock Pigeon	*Columba livia*	Confirmed – Adults entering or leaving nest site indicating occupied nest.	Unprotected
+ Mourning Dove	*Zenaida macroura*	Confirmed – Recently fledged young	Protected
Chimney Swift	*Chaetura pelagica*	Probable – Pair observed in suitable habitat in breeding season	Protected
Downy Woodpecker	*Picoides pubescens*	Possible – Species seen in possible nesting habitat or singing male(s) present in breeding season.	Protected
+ American Robin	*Turdus migratorius*	Probable – Bird (or pair) apparently holding territory	Protected
Northern Mockingbird	*Mimus polyglottos*	Probable – Pair observed in suitable habitat in breeding season	Protected
+ European Starling	*Sturnus vulgaris*	Confirmed – Recently fledged young	Unprotected
Northern Cardinal	*Cardinalis cardinalis*	Probable – Bird (or pair) apparently holding territory	Protected
+ House Sparrow	*Passer domesticus*	Confirmed – Adults entering or leaving nest site indicating occupied nest	Unprotected

Notes:
+ Birds observed during natural resource surveys on June 19, 2015 and July 10, 2015
Source:
New York State Department of Environmental Conservation https://www.dec.ny.gov/animals/7312.html

Other wildlife observed in the study area included honey bees (*Apis mellifera*) and bumblebees (*Bombus spp.*) in low densities in East River Park and in high densities in Stuyvesant Cove Park, several unidentified species of dragonfly (*Odonata* spp.), an eastern tiger swallowtail (*Papilio glaucus*) butterfly in East River Park, and several monarch butterflies (*Danaus plexippus*) in Stuyvesant Cove Park. Stuyvesant Cove Park is planted with numerous species of plants that attract and are utilized by monarch butterflies. Stuyvesant Cove Park has been designated by the National Wildlife Federation (NWF) as a "Certified Wildlife Habitat" and by the Monarch Watch organization as a "Monarch Waystation." NWF is a non-governmental organization that advocates for and implements wildlife and habitat conservation and wildlife and habitat conservation policies. NWF "Certified Wildlife Habitat" is a program administered by NWF that will certify and track planted gardens that are designed to provide essential habitat features to wildlife such as food sources, water, cover, and nesting/mating areas. Monarch Watch is a non-governmental organization that educates, advocates, and implements programs for the conservation of the monarch butterfly and monarch butterfly habitat throughout its American migratory route, with a dedicated focus on planting milkweeds. Species of the milkweed family are obligate host plants for monarch butterfly feeding and reproduction. Monarch Watch "Monarch Waystations" are locations certified to contain suitable milkweed habitat for monarch butterflies.

The only mammal observed in the study area was eastern grey squirrel (*Sciurus carolinensis*). Other mammals common in New York City parks that are likely to occur in the study area include white-footed mouse (*Peromyscus leucopus*) and Norway rat (*Rattus norvegicus*).

PLANTS

Areas containing terrestrial resources in the study area include East River Park, Stuyvesant Cove Park, Asser Levy Playground and Murphy Brothers Playground. These areas, generally consisting of permeable surfaces, make up approximately 23 percent of the land cover in the study area. The terrestrial environment within the study area is heavily urbanized, and consists of recreational parks, infrastructure such as underground sewage pipes, steel railings, light posts, other appurtenances typical of City parks, transportation rights-of-way, and buildings. Impervious surfaces—such as asphalt, masonry, and iron or steel used for streets, infrastructure, and buildings—are generally devoid of natural resources aside from planted street trees and non-native wildlife species such as the rock pigeon, European starling (*Sterna vulgarus*), house sparrow (*Passer domesticus*), and Norway rat (*Rattus norvegicus*). East River Park, Stuyvesant Cove Park, Asser Levy Playground and Murphy Brothers Playground contain numerous vegetated areas that include landscaped planting beds, manicured lawns, ball fields, and trees (see Chapter 5.3, "Open Space," for complete description of these parks).

Landscaped planting beds in East River Park are typically lined with mulch and contain mostly ornamental plants with some native species such as seaside goldenrod (*Solidago sempervirens*), joe-pye-weed (*Eupatorium maculatum*), and black-eyed Susan (*Rudbeckia hirta*). Planting beds that line the primary waterfront promenade contain a mix of herbaceous and shrubby plants and trees. Common reed (*Phragmites australis*), a non-native, invasive species, occurs in small, isolated stands. Trees throughout the study area are varied and consist of native and ornamental species. The majority of the trees in the study area are shade trees. The most commonly found trees include pin oak (*Quercus palustris*), London plane tree (*Platanus × acerifolia*), and honey locust (*Gleditsia triacanthos*). See **Appendix I** for a complete list of trees surveyed in the study area. In total, 1,418 trees were inventoried during tree surveys conducted in 2015, 2017, and 2019.

Today, East River Park is susceptible to sea level rise, storm surge, and heavy rainfall. Storm surge from sporadic, severe events like hurricanes can overwhelm the park and the surrounding neighborhood, as happened in Hurricane Sandy. The threat from gradually accelerating sea level rise increases the risk of frequent flooding from every day storms or high tides. Flooding not only interrupts the recreational capacity of East River Park, the subsequent rise in water is also already exposing plant life to salt water inundation in ways that are detrimental to the existing ecology. In 2014 alone, NYC Parks removed 258 trees from East River Park due to salt water damage from Hurricane Sandy. A comparison of LIDAR data from 2010 (pre-Hurricane Sandy) and 2017 (post-Hurricane Sandy) showed a 30 percent reduction in tree canopy in East River Park, which can largely be attributed to removals and crown dieback of London plane trees that have a low tolerance to the effects of salt water inundation.

The current landscaping and planting within East River Park is reflective of the popular styles of the late 1930s, when the Park was designed and completed. The planting design is formal, with a focus on tree geometry and placement that maximizes open spaces for recreation. At the time, plant selection relied heavily on canopy trees, such as London plane trees, a non-native species, and oaks. Species diversity and ecology was not a priority in the planting palette composition; over half of the current tree canopy is comprised of just two species. London plane trees were particularly hard hit by salt inundation post Hurricane Sandy and have comprised most of the tree removals in East River Park post-2013. In Stuyvesant Cove Park, the landscaped beds primarily contain native plants that include wild bergamot (*Monarda fistulosa*), purple coneflower (*Echinacea purpurea*), switchgrass (*Panicum virgatum*), butterfly weed (*Asclepias tuberosa*), milkweed (*Asclepias syriaca*), seaside goldenrod, joe-pye-weed, eastern bluestar (*Amsonia* *tabernaemontana*), upland sea oats (*Chasmanthium latifolium*), black-eyed Susan, and others. The non-native Asiatic dayflower (*Commelina communis*) also occurs in this area. Of the native species observed, several are considered tolerant to salt. These species are pin oak, swamp white oak (*Quercus bicolor*), seaside goldenrod, and switchgrass.

F. ENVIRONMENTAL EFFECTS

A detailed description of the alternatives analyzed in this chapter is presented in Chapter 2.0, “Project Alternatives.”

NO ACTION ALTERNATIVE (ALTERNATIVE 1)

The No Action Alternative is the future condition without the proposed project and assumes that no new comprehensive coastal protection system is installed in the proposed project area.

NON-STORM

Under the No Action Alternative, natural resources within the study area are assumed to be generally unchanged from existing conditions. Trees identified for potential removal due to their condition are assumed to be removed and others would be pruned as needed. The projects identified in **Appendix A1** would be constructed as planned. These projects are not anticipated to alter the natural resources within the study area with the exception of the reconstruction of Pier 42 and eco-habitat restoration at Pier 35, which is expected to create new natural resources habitat.

As part of the Pier 42 project, the existing warehouse has been demolished and improvements are planned to be made to the bulkhead, lighting, and pathways and landscaping would be introduced. Under the Pier 35 project, the pier is being redeveloped into a landscaped, waterfront open space, with picnic seating, recreational areas, and an eco-habitat restoration area. Both projects would enhance ecological communities in the study area. Therefore, under the No Action Alternative, there would be minor improvements to terrestrial resource conditions in the study area, but no significant changes to other natural resources.

STORM

Under storm conditions, there would be no comprehensive flood protection system, and natural resources could experience effects similar to what was experienced during Hurricane Sandy. This includes damage to vegetation in landscaped beds and trees from high velocity winds and salt-water inundation. The threat from gradually accelerating sea level rise increases the risk of frequent flooding from every day storms or high tides. Flooding not only interrupts the recreational capacity of East River Park, the subsequent rise in water is also already exposing plant life to salt water inundation in ways that are detrimental to the existing ecology. In 2014, NYC Parks removed 258 trees from East River Park due to salt water damage from Hurricane Sandy and declining trees continue to be removed as needed. As a result, terrestrial resources would continue to be at-risk of inundation under the No Action Alternative.

Storm-related effects to terrestrial resources such as trees and landscaped spaces would be lessened or avoided at sites where there are currently planned or completed resiliency measures, such as the NYCHA properties. Effects to vegetation in the study area as a result of inundation would include potential erosion of soil and attendant destabilization of existing vegetation, including trees, and the removal of storm-related damage such as downed and/or damaged trees and vegetation to ensure public safety.

Under the No Action Alternative, excessive precipitation and storm surge waters have the potential to result in localized and temporary negative effects on the water quality of the East River. The protected area could be subject to overland flooding from storm surge and rainfall, and storm surge could prevent excess flows from being discharged from the combined sewers as combined sewer overflow, resulting in the potential for sewer infrastructure surcharge.[5] Under these conditions, there is the potential for surface flooding from this surcharge and stormwater runoff (overland flow) to collect in lower elevations and flow to the East River. As the surge recedes, the tide gates on the outfalls would be able to open, allowing combined flow that exceeds the capacity of the Manhattan Pump Station to outlet to the East River as designed. Once the surge recedes and the precipitation ceases, the sewer system would return to pre-storm operation and overland flow and CSOs would cease. Water quality would then gradually return to pre-storm conditions.

PREFERRED ALTERNATIVE (ALTERNATIVE 4): FLOOD PROTECTION SYSTEM WITH A RAISED EAST RIVER PARK

GEOLOGIC AND SOIL RESOURCES

Under non-storm conditions, the Preferred Alternative would not adversely affect geologic or soil resources. It is estimated that approximately 775,000 cubic yards of fill would be required to elevate East River Park. The sources of clean soils or fill materials to be used on the project site would be determined by the construction contractors and approved by the appropriate regulatory agencies, and are dictated by a number of factors, including composition, certification of suitability for intended use, availability, cost, and the proximity of the soil/clean fill provider's loading site to the project area. Soils would need to meet the required soil criteria included in the Soil and Groundwater Management Plan (SGMP), a plan that would be approved by DEP (see also Chapter 5.7, "Hazardous Materials"). During design storm conditions, East River Park and inland areas would be protected by the elevated bulkhead, landscape and other flood protection elements, which reduces the adverse effects of erosion from the design storm on geologic and soil resources. During design storm conditions, wave action and inundation has the potential to cause limited soil erosion in areas such as Stuyvesant Cove Park and unelevated portions of East River Park. The erosive potential within the project area would overall be greatly reduced compared to the No Action Alternative due to the elevation of the majority of East River Park. Operation of the proposed drainage management elements would consist largely of the collection and conveyance of storm water and sanitary waste through sewers and would not result in erosion, instability, or compositional changes to geology or soils. The Preferred Alternative would neither directly or indirectly cause a noticeable decrease in the ability of geologic and soil resources within the study area to serve designated functions. Therefore, the Preferred Alternative would not result in significant adverse effects to geologic and soil resources.

GROUNDWATER RESOURCES

The Preferred Alternative would not extract, convey, degrade, or otherwise utilize groundwater resources for potable or non-potable purposes. As under the No Action Alternative, during design storm conditions in which storm surge occurs, the inundation and rise in water levels may result in a temporary elevation of groundwater levels, which would return to typical levels after the storm. Drainage management elements would not discharge to or drain groundwater in the study area. The Preferred Alternative would not alter the function served by groundwater resources

[5] Surcharge refers to the condition in which combined sewer flow exceeds the capacity of sewer pipes and/or drainage infrastructure, potentially resulting in backups in sewer pipes and, ultimately, above-grade flooding.

within the study area. In sum, the quality, depth, and quantity of groundwater would not differ from the No Action Alternative and would therefore not be adversely affected as a result of the Preferred Alternative.

WETLAND RESOURCES

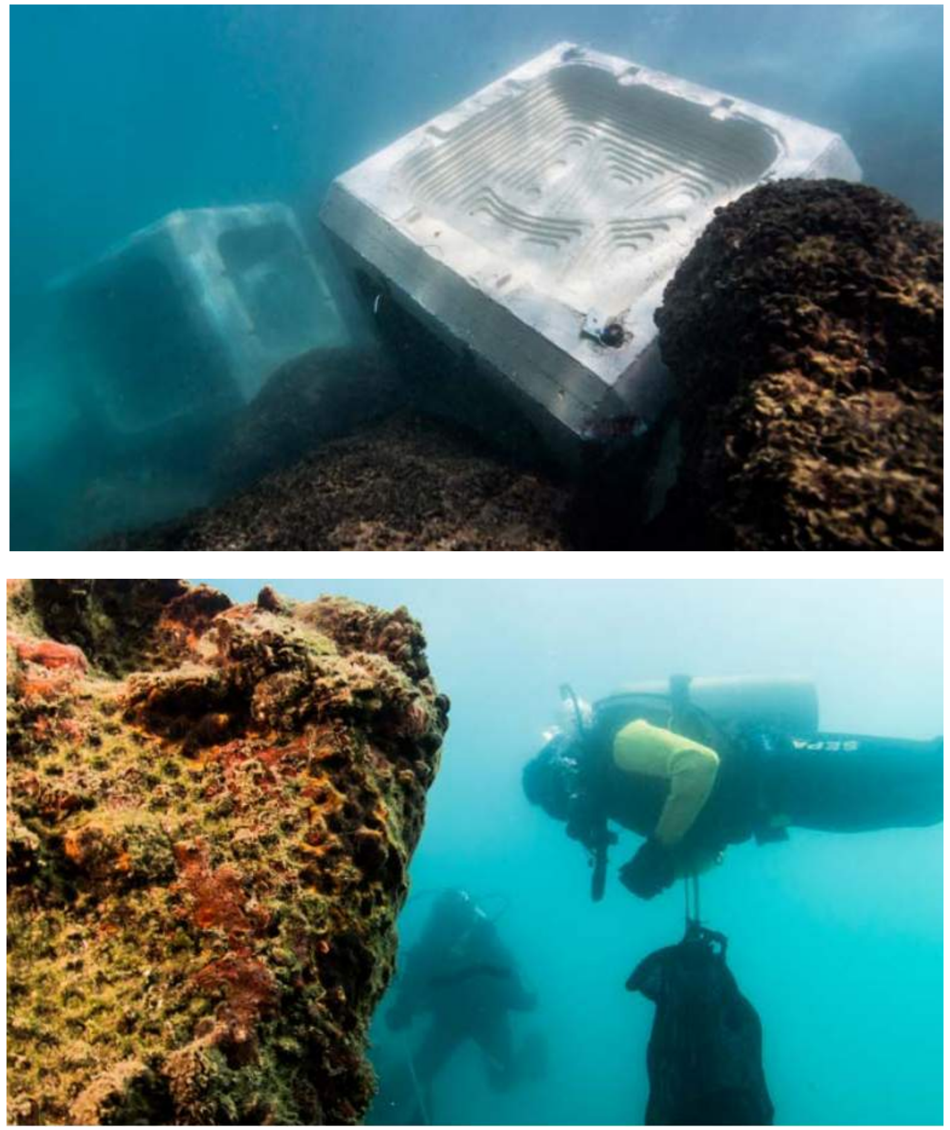
Under the Preferred Alternative, construction of the shared-use flyover bridge would require support shafts to be placed in the East River. The support shafts and associated concrete fill would result in adverse effects to 260 square feet of unvegetated and shaded littoral zone tidal wetland habitat (see **Table 5.6-8**). Some of the support shafts would be placed in a portion of the East River that is shaded by the East River Park Promenade and/or numerous other support shafts for existing infrastructure and would therefore not alter the operational character or habitat of these tidal wetlands. The support shafts would not affect tidal exchange or tidal patterns in the study area.

In addition, the two existing embayments would be filled and reconstructed elsewhere within the project area. Filling of the existing embayments and creation of the new embayments is necessary to increase community access to the water's edge, a principal objective of the Proposed Project, and provide adequate space to site heavily utilized active recreation facilities. Additional filling would be required at the location of the new embayments to allow for an Americans with Disabilities Act (ADA) accessible path to improve accessibility to the waterfront for all Park users. Filling of the existing embayment would permanently remove 26,732 square feet of unvegetated littoral zone tidal wetland habitat that consists largely of rip rap (see **Table 5.6-8**). However, the two proposed embayments would be comparable in size and would be similarly located within East River Park. As the proposed project design progresses, the proposed embayments would provide improved habitat type over what currently exists in the embayments that are to be filled by omitting bridges that shade aquatic habitat, which can reduce benthic productivity and biomass, and providing habitat enhancements designed for the recruitment of shellfish and other aquatic life. Design studies have focused on increasing the ecological benefits of tidal wetland habitat within the new embayments by incorporating the following elements:

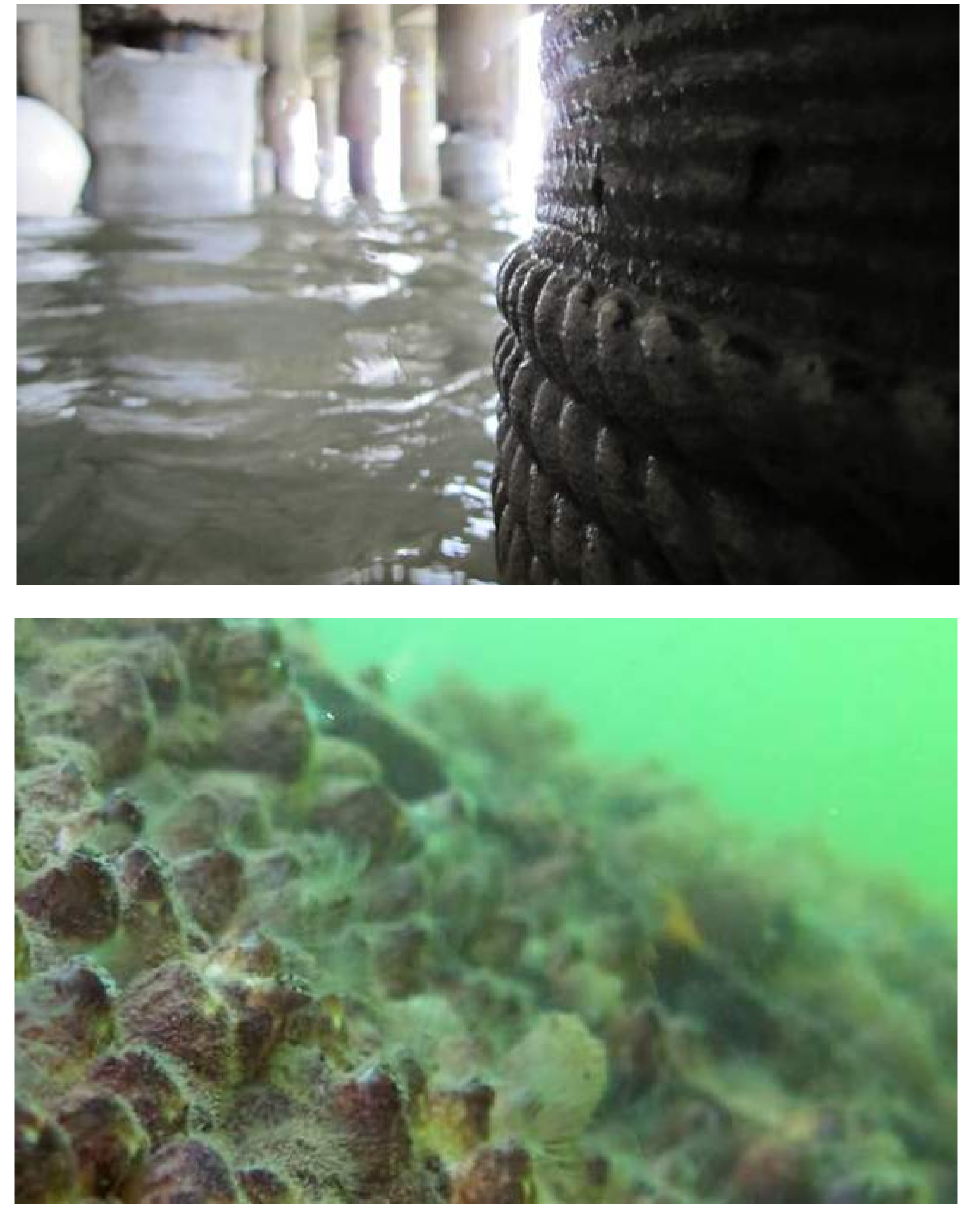
- Eliminating the pedestrian walkways over embayments
- Utilizing materials such as ECOncrete® to create intertidal tide pools
- Installation of subtidal ECOncrete® armor blocks to serve as a "breakwater" along the toe of the revetment of the southern embayment
- Leaving the steel piles of the existing esplanade exposed above the mudline at areas of proposed embayments and wrapping with ECOncrete® Pile Jackets

These products provide the necessary structural elements of an urban waterfront while also providing opportunities for flora and fauna to thrive (see **Figure 5.6-6**). The proposed tide pools would be installed within the intertidal zone of the proposed embayments in place of some of the rip rap, which will serve to stabilize the shoreline, a particularly useful ecological enhancement in a fast-flowing river such as the East River. A case study of the use of ECOncrete® Tide Pools at New York City's Brooklyn Bridge Park showed that after nine months, various algae, invertebrate taxa (including copepods, amphipods, isopods, and Sabellidae and Spirorbis worms), Harris mud crabs, and juvenile/post-larval fish had colonized the pools, whereas the surrounding rocky area was found to have very limited live cover and poor biological function.[6] Similarly, Tide Pool Armor and ECO Piles and Jackets utilize engineered concrete mix and surface design to promote biodiversity and would be used as a breakwater along the toe of the southern embayment revetment

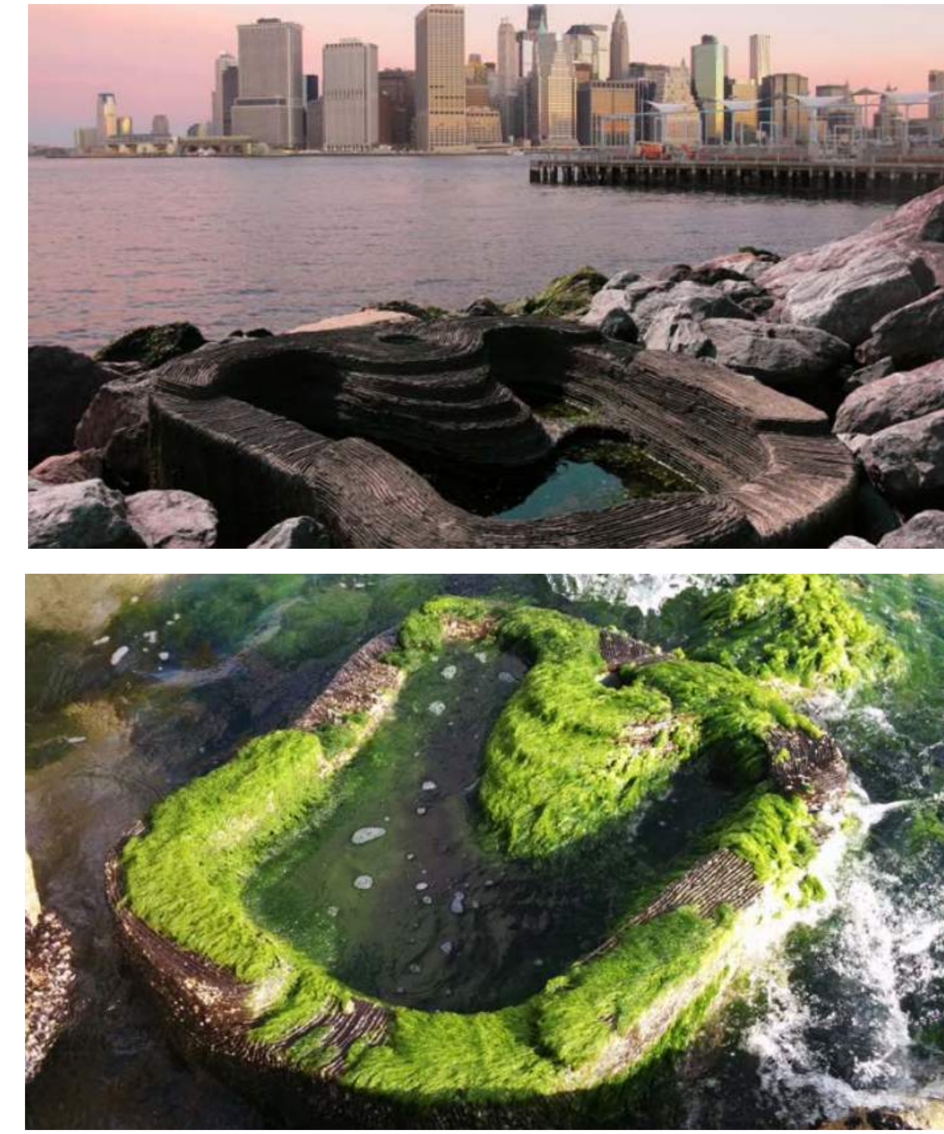
[6] https://econcretetech.com/wp-content/uploads/2018/05/ECOncrete_Case_Study_BBP_Tech_Jan_2018.pdf



ECOncrete® ECO Armor Blocks



ECOncrete® ECO Pile Jacket



ECOncrete® Tide Pool Armor

and to encase the existing steel pipe piles at the northern embayment, respectively. Moreover, the proposed embayments would include a shallower slope to allow for a more stratified transition from wetland to upland habitat, enriching the ecology of the landscape. Together, these elements create a stable habitat that provides shallow, water retaining, moist niches that are absent from standard coastal infrastructure. The ecological enhancements listed above are designed for the recruitment of shellfish and other aquatic life, which is consistent with New York City's WRP policies to protect and restore sensitive natural resources such as wetlands. The locations of fill associated with the flyover bridge shafts and embayment relocations are shown in **Figure 5.6-5**.

While this alternative would result in adverse effects to tidal wetland habitat, it would be mitigated for in accordance with all NYSDEC and USACE permit conditions which would conform with applicable regulations, including CWA, Section 10 of the Rivers and Harbors Act, ECL Article 25, NYCRR Part 661, and ECL Article 15, NYCRR Part 608. This mitigation would include in-kind, on-site replacement of improved habitat as well as the purchase of credits from the Saw Mill Creek Wetland Mitigation Bank or the creation of new tidal wetland habitat off-site. Details of the proposed mitigation are provided in Section G, "Mitigation" below.

A detailed analysis of the proposed project's compliance with Executive Order 11990 – Protection of Wetlands as determined by the Eight-Step Decision Making Process is located in **Appendix L**. That analysis concludes that the proposed project would be in compliance with Executive Order 11990. In addition, the adverse effects would not affect the classification of the East River; would likely not diminish the habitat for a resident or migratory endangered, threatened or rare animal or plant species or species of special concern; would not contribute to a cumulative loss of habitat or function which diminishes the ability of littoral zone habitat to perform its primary function; would not affect a resources that is large, unusual or singular; or noticeably decrease this resource's ability to serve its various functions. Therefore, the Preferred Alternative would not result in significant adverse effects to tidal wetland resources.

Table 5.6-8
Adverse Effects to Tidal Wetlands under the Preferred Alternative

Project Component	Total #	Adverse Effects (square feet)	Volume of Fill (cubic yards)
Flyover Bridge Substructure (shafts)	26	260	1,008
Filling Northern Embayment	1	16,692	6,186
Filling Southern Embayment	1	10,040	3,721
Filling Behind Cutoff Wall for New Embayments (Existing Esplanade)	2	2,833	1,406
Total	**30**	**29,825**	**12,321**

Note:
* This table has been updated for the FEIS.

SPECIAL FLOOD HAZARD AREA

The Preferred Alternative would install new flood protection structures to the SFHA that would not be introduced under the No Action Alternative. No residential or commercial structures would be introduced to the SFHA. While the proposed project includes construction of two new, one-story industrial structures for the operation and maintenance of certain drainage components, these structures would be located behind the flood protection alignment and along City right-of-way.

These industrial structures would therefore neither increase potential for damages to these buildings due to flooding nor reduce the capacity of the floodplain to manage storms. The structures proposed under the Preferred Alternative are designed to reduce the risk of flood loss; to minimize the effect of floods on human safety, health, and welfare; and to preserve the beneficial value of the existing floodplain as determined by the Eight-Step Decision Making Process, which is consistent with Executive Order 11988 – Floodplain Management (**see Appendix L**). This alternative would protect East River Park from impacts from design storm events in addition to inundation from sea level rise, reducing the risk of flood loss compared to the No Action Alternative. Similarly, the proposed project would be consistent with the City's WRP as discussed in Chapter 5.1, "Land Use, Zoning, and Public Policy," and documented in **Appendix D**. Specifically, as documented in the WRP, physical and recreational access to the waterfront would be provided along the esplanade with stepped seating areas to offer additional locations for passive recreation and waterfront views. Improving the resiliency of the park, coupled with expanded public access, furthers the enhancement of East River Park for public access, operations, functionality, and usability during pre- and post-storm periods. The addition of resiliency measures to park amenities and facilities proposed under this alternative would reduce impacts to East River Park as a result of design storm events and sea level rise, and be consistent with the policy goals to preserve, maintain, and protect existing physical and recreational access to the waterfront. As such, the Preferred Alternative would not be likely to cause, either directly or indirectly, a noticeable decrease in the SFHA's ability to serve its primary function. Therefore, the Preferred Alternative would not result in significant adverse effects to the 100-year FEMA-designated SFHA.

SURFACE WATER RESOURCES

The Preferred Alternative would not adversely affect surface water resources or water quality in the study area. The flood protection elements of the Preferred Alternative would not result in changes to overland flow into the East River. The flyover bridge would represent new impervious surface in the study area that would drain to East River Park and eventually into the East River. As currently contemplated, the proposed flyover bridge would be a steel thru-truss superstructure supported on footings and shafts placed adjacent to the eastern edge of the northbound FDR Drive lanes, within the limits of the existing East River Bikeway (see Figures 2.0-8 and 2.0-9 and **Appendix C1b**). The proposed flyover bridge would cantilever over the northbound FDR Drive. The thru truss bridge would be approximately 15 feet wide and approximately 19 feet tall from the surface of the bridge deck to the top of the truss. The flyover bridge would slope down to connect to East River Park on the south and to Captain Patrick J. Brown Walk near East 16th Street on the north. The new impervious surface would be approximately 15,000 square feet; however, this represents a small increase in impervious area within the study area and there would be no vehicular traffic and therefore no associated contaminants to be mobilized by stormwater runoff; therefore, no significant adverse effects on the water quality of the East River are expected.

In addition, under this alternative, the existing sewer infrastructure would be modified to reduce or eliminate flow into the protected area from the East River and the larger sewershed during design storm events, as described in Chapter 5.8, "Water and Sewer Infrastructure." Under non-storm conditions, implementation of the Preferred Alternative would not alter the normal function and performance of the combined sewer system. The large interceptor gates and the isolation gate valve in regulator M-39 would remain open. However, under rainfall events or periods of high sewer flow, combined sewer flow would be conveyed to the interceptor via both the existing branch interceptors and the parallel conveyance. During rainfall events that result in CSOs, there is a potential for redistribution of overflows across the outfalls in the study area due to the modifications described above. However, the overall volume of CSO would not vary substantially from existing conditions and is not anticipated to impact water quality in the East River. A hydraulic model simulation indicated that with the proposed parallel conveyance in place, CSOs from outfalls within the project area would decrease compared to the No Action Alternative, while CSOs from outfalls upstream of the project area would increase by approximately the same volume. While the annual CSO volumes would vary depending on annual rainfall and tidal conditions, this model simulation indicates no anticipated increase in total CSO volume from the study area as a result of constructing the proposed parallel conveyance. During wet weather events, storm water that flows into the reconfigured storm drainage system on the unprotected side of the flood protection system would flow to the outfalls, instead of to the combined sewer system as it does under existing conditions. This increase in storm water flows to the outfalls would not increase the volume of CSO from the outfalls.

Under design storm conditions, the outfalls along the river would be closed as a result of increased surge height. In contrast to the No Action Alternative, the Preferred Alternative would provide drainage isolation elements, such as interceptor gates and an isolation gate valve that would be operated to shield the protected area sewer system from storm surge inundation in the larger sewershed. The Preferred Alternative would also manage the increased combined sewer flow within the protected area while the outfall tide gates are closed, and isolation elements are activated. Drainage management elements (i.e., parallel conveyance and upsized sewers) would be installed and deployed under the Preferred Alternative. Use of these drainage management elements would allow combined flow from the protected area to be directed to the Manhattan Pump Station and then to the Newtown Creek WWTP in Brooklyn, New York. These drainage management elements would reduce the potential for sewer surcharge in the protected area. As the storm surge recedes, the tide gates on the outfalls would reopen, allowing combined flow that exceeds the capacity of the pump station to outlet to the East River. Under the Preferred Alternative, the combined sewer system within the study area would continue to comply with conditions set by the Newtown Creek WWTP SPDES permit and be consistent with the CWA, CSO Control Policy, and the CSO Abatement Program and CSO Long-Term Control Plan. The Preferred Alternative would therefore not affect the use classification or function of the East River, or directly or indirectly affect a significant, sensitive, or designated resource which is consistent with the City's WRP policies regarding protection of water quality. Therefore, no significant adverse effects to surface water resources are anticipated.

AQUATIC RESOURCES

Phytoplankton, Benthic Algae, Zooplankton, and Benthic Invertebrates

As described above in "Wetland Resources," the Preferred Alternative would result in adverse effects to 29,825 square feet of littoral zone tidal wetland habitat from the installation of the permanent support structures for the shared use flyover bridge and fill placed within the existing embayments and at the edges of the proposed embayments. This area of benthic habitat would not be available in the future for invertebrates and other organisms. The existing embayments that are proposed to be filled would be replaced with comparably sized embayments (24,868 square feet). The new embayments would provide improved habitat type that eliminates bridges that shade aquatic habit, which can reduce benthic productivity and biomass, and provides habitat enhancements designed for the recruitment of shellfish and other aquatic life within the project area. The lack of sunlight in this area of benthic habitat limits the amount of ecological activity that would typically be anticipated to occur in East River tidal wetlands and inhibits the growth of SAV. Additionally, off-site wetland mitigation will be sought out to fulfill the requirements of the

USACE and NYSDEC permits as described in Section G, "Mitigation" below. The area of benthic habitat that would be lost represents a small fraction (<0.1 percent) of the overall benthic habitat available in the New York Harbor Estuary. Therefore, the Preferred Alternative would not result in significant adverse effects to phytoplankton, benthic algae, zooplankton, and benthic invertebrates which is consistent with the City's WRP policies of protecting the aquatic environment.

Fish and Essential Fish Habitat

A consultation with NOAA NMFS has been reinitiated for the Preferred Alternative (see **Appendix G**). NOAA NMFS did not identify potential impacts or required conservation measures associated with the Preferred Alternative once construction is complete. Recommended conservation measures specific to the construction of the Preferred Alternative are discussed in Chapter 6.5, "Construction—Natural Resources."

Essential Fish Habitat Species

The Preferred Alternative has the potential to result in adverse effects to EFH from the installation of the permanent support structures for the shared use flyover bridge, and fill placed within the existing embayments and at the edges of the proposed embayments, as described above; however, these adverse effects are not anticipated to rise to the level of significant. With this alternative, the existing habitat would no longer support benthic organisms that may provide a foraging habitat for certain fish. However, the study area constitutes a very small portion of the available EFH for these species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park is also being explored. Specific elements of the new embayments include ECOncrete® tidal pools, ECOncrete® pile jackets installed on the existing steel esplanade piles, as well as an ECOncrete® armor block breakwater at the southern embayment, as described above. As a result, these effects to EFH would not be substantial for one or more lifestages of winter flounder, windowpane flounder, summer flounder, Atlantic herring, scup, black sea bass, clearnose skate, little skate, and winter skate. Several species (cobia, Spanish mackerel, king mackerel, Atlantic mackerel, bluefish, Atlantic butterfish) listed as potentially occurring in the study area are either at the extreme limit of their known range or are highly migratory and are therefore anticipated to occur in the East River only as uncommon or transient individuals. The remaining species evaluated (red hake) would not be anticipated to be found in the East River due to unsuitable environmental conditions, unsuitable depths, and unsuitable substrates or other habitat features. These conclusions are summarized in **Table 5.6-9**. A consultation with NOAA NMFS has been reinitiated for the Preferred Alternative (see **Appendix G**). Recommended conservation measures specific to the construction of the Preferred Alternative are discussed in Chapter 6.5, "Construction—Natural Resources."

Red hake (Urophycis chuss)

High-quality EFH for larval and juvenile red hake is not found in the East River, and red hake larvae and juveniles that occur in the East River are most likely transient. Adult red hake are known to occur in the East River from impingement and entrainment studies conducted at the Ravenswood Power Plant on the Queens side of the East River (Normandeau Associates, 1994). However, adult red hake are not abundant in the Hudson-Raritan Estuary during any season (Stiemle et al., 1999a). Therefore, spawning and non-spawning adult red hake have the potential to occur in the East River but would most likely be transient individuals. Adult red hake would not be anticipated to be found in the East River during the summer when DO is periodically low. Therefore, no significant adverse effects to adult red hake or spawning red hake EFH are anticipated as a result of the Preferred Alternative.

Winter flounder (Pleuronectes americanus)
While the EFH for this species includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom waters with a substrate of sand, muddy sand, mud and/or gravel in addition to pelagic waters), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, design possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for any lifestage of winter flounder are anticipated as a result of the Preferred Alternative.

Windowpane flounder (Scopthalmus aquosus)
As with winter flounder, the windowpane flounder is a bottom-dwelling species that has the potential to be affected by the Preferred Alternative. While the EFH for this species includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom habitats with a substrate of mud or fine-grained sand), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). Moreover, adult windowpane flounder are sensitive to hypoxic conditions and have been found to avoid conditions where DO levels were less than 3 ppm (Howell and Simpson 1994). During the summer, DO in the water column and bottom waters of the East River can be reduced to less than 3 ppm, making this unsuitable habitat for windowpane flounder. In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, design possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for any lifestage of windowpane flounder are anticipated as a result of the Preferred Alternative.

Atlantic herring (Clupea harengus)
Water quality monitoring in the East River shows DO at the bottom of the East River is only suitable for Atlantic herring in the winter and spring (NYCDEP, 2015). Atlantic herring could potentially utilize the East River during winter and spring when DO and water temperatures are suitable. While the EFH for this species includes habitat with the potential to be affected by the Preferred Alternative (i.e., pelagic waters and bottom habitats), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). Moreover, the East River is on the low end of the preferred salinity for juvenile and adult Atlantic herring (NMFS, 1998e). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, design possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored.

Therefore, no significant adverse effects to EFH for any lifestage of Atlantic herring are anticipated as a result of the Preferred Alternative.

Bluefish (Pomatomus saltatrix)
Due to their migratory tendencies, any adult bluefish that occur in the East River would be anticipated to be transient individuals. Bluefish are also not a bottom dwelling species so filling of the existing embayments would be unlikely to affect this species. Overall, the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). Therefore, no significant adverse effects to EFH for any lifestage of bluefish are anticipated as a result of the Preferred Alternative.

Atlantic butterfish (Peprilus triacanthus)
Atlantic butterfish is primarily a pelagic species (Woodhead, 1990), and although Atlantic butterfish may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of Atlantic butterfish.

Summer flounder (Paralicthys dentatus)
As with the winter flounder and windowpane flounder described above, the summer flounder is a bottom dwelling species that has potential to be affected by the Preferred Alternative due to filling associated with relocating the embayments as well as the installation of the shared use flyover bridge shafts. While the EFH for this species during juvenile and adult lifestages includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom waters with a substrate of mud or sand), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for the larvae, juvenile and adult lifestages or the fishery of summer flounder are anticipated as a result of the proposed project.

Black sea bass (Centropristus striata)
Due to the preference of black sea bass for structured habitats, they are not uncommonly found underneath man-made structures such as docks and piers. Therefore, it is likely that black sea bass juvenile and adults are present in the study area. The removal of the existing pedestrian bridges and their associated piles in the vicinity of the embayments could constitute a loss of habitat for this species. However, this is a small portion of the habitat created by the esplanade within the study area, which would largely remain under the Preferred Alternative. In addition, the shafts associated with the shared use flyover bridge would potentially allow for additional habitat. Overall, the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of black sea bass.

King mackerel (Scomberomorus cavalla)
King mackerel generally favor deeper and warmer waters than are typically found in the East River. Any king mackerel in the East River would be anticipated to be rare and transient individuals. Therefore, no significant adverse effects to EFH for any lifestage of king mackerel are anticipated as a result of the proposed project.

Spanish mackerel (Scomberomorus maculatus)
Spanish mackerel EFH is limited within the study area, and the species generally favor higher salinities (greater than 30 ppt) and warmer waters (18 °C or more) than are found within the East River. Any Spanish mackerel in the East River would be anticipated to be rare and transient individuals. Therefore, no significant adverse effects to EFH for any lifestage of Spanish mackerel are anticipated as a result of the proposed project.

Cobia (Rachycentron canadum)
Cobia is a large, highly migratory species whose EFH is limited within the study area. Information about the distribution of cobia lifestages on the East Coast is limited. However, cobia are most abundant in the Gulf of Mexico where they spawn and then leave the Gulf to commence extreme migrations. No cobia lifestages were documented in entrainment studies at the Ravenswood power plant (Normandeau Associates, 1994). Any cobia in the East River would be anticipated to be rare and transient individuals. Therefore, no significant adverse effects to EFH for any lifestage of cobia are anticipated as a result of the proposed project.

Atlantic mackerel (Scomber scombrus)
Although Atlantic mackerel may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of Atlantic mackerel.

Scup (Stenotomus chrysops)
While the EFH for this species includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom waters with a substrate of sand and mud substrates), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for any lifestage of winter flounder are anticipated as a result of the Preferred Alternative.

Little skate (Leucoraja erinacea)
As with the flounders, the little skate is a bottom dwelling species that has potential to be affected by the Preferred Alternative due to filling associated with relocating the embayments as well as the installation of the shared use flyover bridge shafts. While the EFH for this species during juvenile and adult lifestages includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom waters with a substrate of mud or sand), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement

over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for the larvae, juvenile and adult lifestages or the fishery of little skate are anticipated as a result of the proposed project.

Clearnose skate (Raja eglanteria)
As with the flounders, the clearnose skate is a bottom dwelling species that has potential to be affected by the Preferred Alternative due to filling associated with relocating the embayments as well as the installation of the shared use flyover bridge shafts. While the EFH for this species during juvenile and adult lifestages includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom waters with a substrate of mud or sand), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for the larvae, juvenile and adult lifestages or the fishery of clearnose skate are anticipated as a result of the proposed project.

Winter skate (Leucoraja ocellate)
As with the flounders, the winter skate is a bottom dwelling species that has potential to be affected by the Preferred Alternative due to filling associated with relocating the embayments as well as the installation of the shared use flyover bridge shafts. While the EFH for this species during juvenile and adult lifestages includes habitat with the potential to be affected by the Preferred Alternative (i.e., bottom waters with a substrate of mud or sand), the study area constitutes a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent). In addition, the installation of new embayments may constitute an improvement over the existing embayments. The proposed embayments would be of comparable size with improved habitat conditions, including the elimination of bridges that shade aquatic habitat, which can reduce benthic productivity and biomass. In addition, possibilities that seek to specifically improve the provision of habitat enhancements designed for the recruitment of shellfish and other aquatic life along East River Park are also being explored. Therefore, no significant adverse effects to EFH for the larvae, juvenile and adult lifestages or the fishery of winter skate are anticipated as a result of the proposed project.

Fish and Wildlife Coordination Act Species

Under the Preferred Alternative, there would be adverse effects to trust resources covered by the FWCA resulting from the installation of the permanent support structures for the shared use flyover bridge, fill placed within the existing embayments, and at the location of the new embayments as described above. With this alternative, this habitat would no longer support benthic organisms that may provide a foraging habitat for certain FWCA fish. However, the majority of these species (river herring, silversides, killifish, menhaden, anchovies, American eel, striped bass, and weakfish) listed as potentially occurring in the study area are either at the extreme limit of their known range or are highly migratory and are therefore anticipated to occur in the East River only as uncommon or transient individuals. The removal of potential habitat for the remaining species—tautog—would constitute a very small portion of the available EFH for this species within the New York Harbor Estuary waters (<0.1 percent), and new habitat would be created through the installation of shafts for the shared use flyover bridge. Therefore, these effects would not be considered substantial for FWCA trust species. These conclusions are summarized in **Table 5.6-9**. A consultation with NMFS has been reinitiated for the Preferred Alternative (see **Appendix G**). NOAA NMFS did not identify potential impacts or required conservation measures associated with the Preferred Alternative once construction is complete. Recommended conservation measures specific to the construction of the Preferred Alternative are discussed in Chapter 6.5, "Construction—Natural Resources."

River herring: Alewife (Alosa psuedoharengus) and Blueback herring (Alosa aestivalis)
Although river herring may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of river herring.

Silversides (Menidia spp.)
Although silversides may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of silversides.

Killifish (Fundulus spp.)
Although killifish may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Additionally, the East River does not provide optimum habitat for killifish. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of killifish.

Menhaden (Brevoortia tyrannus)
Although menhaden may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of menhaden.

Anchovies (Anchoa spp.)
Although anchovies may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of anchovies.

American eel (Anguilla rostrate)
Although American eel may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing EFH proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of American Eel.

Striped bass (Morone saxatilis)
Although striped bass may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing habitat proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of striped bass.

Tautog (Tautoga onitis)
Tautog may occur in the East River in spring when water temperatures warm as they migrate inshore to spawn in the vicinity of estuaries and inshore marine waters. The most important habitat parameter affecting the distribution and abundance of juvenile and adult tautog is the availability of cover. They depend on shelter for protection from predation during the night when they are not foraging. Shelter may consist of rock reefs, rock outcrops, gravel, eelgrass beds, and kelp or sea lettuce beds. Therefore, it is likely that tautog juvenile and adults may present in the study area. The removal of the existing pedestrian bridges and their associated piles in the vicinity of the embayments could constitute a loss of habitat for this species. However, this is a small portion of the habitat created by the esplanade within the study area, which would largely remain under the Preferred Alternative. In addition, the shafts associated with the shared use flyover bridge would potentially allow for additional habitat. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing habitat habitat proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of tautog.

Weakfish (Cynoscion regalis)
Although weakfish may be present in the East River, it is primarily anticipated to use the East River as a migratory route and therefore their presence would be transient. Overall, the study area constitutes a very small portion of the available habitat for this species within the New York Harbor Estuary waters (<0.1 percent). As such, the modifications to existing habitat proposed under the Preferred Alternative would not be expected to significantly adversely affect any lifestage of weakfish.

Table 5.6-9
Potential Effects to EFH and FWCA Species under the Preferred Alternative

Common Name	Scientific Name	Potential for Occurrence within Study Area	Analysis of Potential Effect	Conclusion of Potential Effects*
EFH Species				
Red hake	*Urophycis chuss*	Transient	High-quality EFH for larval and juvenile red hake is not found in the East River.	No effect
Winter flounder	*Pseudopleuronectes americanus*	Bottom-dwelling species with potential to occur	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Windowpane flounder	*Scophthalmus aquosus*	Bottom-dwelling species with potential to occur; DO in East River in summer months can be reduced to unacceptable levels	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Atlantic herring	*Clupea harengus*	The East River does not contain suitable depth or salinity for Atlantic herring larvae, and is on the low end of the preferred salinity for juvenile and adult Atlantic herring	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Bluefish	*Pomatomus saltatrix*	Transient	Habitat unlikely to be affected as bluefish is not a bottom-dwelling species.	No effect
Atlantic butterfish	*Peprilus triacanthus*	Transient	Habitat unlikely to be affected as Atlantic butterfish is not a bottom-dwelling species.	No effect
Summer flounder	*Paralichthys dentatus*	Bottom-dwelling species with potential to occur	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat	Not substantial
Black sea bass	*Centropristis striata*	Likely to occur under docks, piers	Affected area is <0.1 percent of EFH within NY Harbor Estuary; installation of shafts for shared-use flyover bridge could be new habitat	Not substantial

Table 5.6-9 (cont'd)
Potential Effects to EFH and FWCA Species under the Preferred Alternative

Common Name	Scientific Name	Potential for Occurrence within Study Area	Analysis of Potential Effect	Conclusion of Potential Effects*
EFH Species (cont'd)				
King mackerel	*Scomberomorus cavalla*	Rare and transient	Generally, favors deeper and warmer waters than are typically found in the East River	No effect
Spanish mackerel	*Scomberomorus maculatus*	Rare and transient	Limited EFH within study area; generally, favors higher salinities and warmer waters than found in the East River	No effect
Cobia	*Rachycentron canadum*	Rare and transient	No cobia lifestages documented within East River; limited EFH within study area	No effect
Atlantic mackerel	*Scomber scombrus*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Scup	*Stenotomus chrysops*	Bottom-dwelling species with potential to occur	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Little skate	*Leucoraja erinacea*	Bottom-dwelling species with potential to occur	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat	Not substantial
Clearnose skate	*Raja eglanteria*	Bottom-dwelling species with potential to occur	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat	Not substantial
Winter skate	*Leucoraja ocellata*	Bottom-dwelling species with potential to occur	Affected area is <0.1 percent of EFH within NY Harbor Estuary; new embayments likely to result in improved habitat	Not substantial
FWCA Species				
Alewife	*Alosa psuedoharengus*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Blueback herring	*Alosa aestivalis*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial

Table 5.6-9 (cont'd)
Potential Effects to EFH and FWCA Species under the Preferred Alternative

Common Name	Scientific Name	Potential for Occurrence within Study Area	Analysis of Potential Effect	Conclusion of Potential Effects*
FWCA Species (cont'd)				
Silversides	*Menidia spp.*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Killifish	*Fundulus spp*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Menhaden	*Brevoortia tyrannus*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
American eel	*Anguilla rostrate*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Striped bass	*Morone saxatilis*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial
Tautog	*Tautoga onitis*	Likely to occur under docks, piers	Affected area is <0.1 percent of habitat within NY Harbor Estuary; installation of shafts for shared-use flyover bridge could be new habitat	Not substantial
Weakfish	*Cynoscion regalis*	Transient	Affected area is <0.1 percent of habitat within NY Harbor Estuary; new embayments likely to result in improved habitat.	Not substantial

Note:
* This table has been revised for the FEIS.

ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES

The Preferred Alternative is not anticipated to have significant adverse effects to endangered, threatened, or special concern species. Atlantic sturgeon that use the East River would be expected to be transient individuals. For shortnose sturgeon, the Upper East River is at the extreme southern limit of the population's overwintering range and waters in the vicinity of the project area are suboptimal due to their high salinities. Shortnose sturgeon, therefore, have limited potential to occur in the lower East River. Therefore, the presence of the support structures and placement of fill would not adversely affect their migratory patterns or wellness. A consultation with NOAA NMFS has been reinitiated for the Preferred Alternative and the agency concurred with the conclusion that the proposed project is not likely to adversely affect any ESA-listed species (see **Appendix G**).

This alternative would not result in any adverse effects to currently existing habitat for peregrine falcons (i.e., the Williamsburg Bridge). The falcons that nest on the Williamsburg Bridge are likely to range over large portions of Manhattan, Queens, and Brooklyn on a daily basis, as peregrine falcons have home-ranges that typically span more than 50 square kilometers and will commonly hunt for prey dozens of kilometers away from their nest (Enderson and Craig 1997, Jenkins and Benn 1998). They have the potential to briefly perch in a tree, or on a lamppost or other such structure in East River Park on occasion, as they do just about anywhere within their large home-range. The bridge will not be altered with the implementation of the proposed project. There would be no change in the likelihood that peregrine falcons would continue to nest on the Williamsburg Bridge, and no change in their condition, survival, or reproductive productivity. Therefore, the Preferred Alternative would not be in conflict with the 6NYCRR Part 182, and no significant adverse effects to New York State listed threatened, endangered, or special concern species or habitats are anticipated for operation of the proposed project under the Preferred Alternative.

TERRESTRIAL RESOURCES

Wildlife

While the initial loss of tree canopy may represent a loss of habitat for migratory birds and other wildlife found in the parks, the project area does not contain a unique habitat in the region, and migratory birds would be expected to seek out similar resources in the area. Additionally, there is no habitat in the project area to support any bird species that are associated with the forest understory or forest floor, or other habitat types such as shrubland, wetland, or grassland/old field. Further, nearly half of the trees are non-native species and therefore unlikely to provide an abundance of arthropods or quality fruits needed by arboreal bird species for stopover refueling (Smith et al. 2007, Tallamy 2009).

A desktop analysis using high-resolution land cover data revealed that, within a half-mile of the project area, a total of 183 acres of tree canopy cover would be available for birds and other wildlife to seek temporary replacement habitat. Within the 183 acres, 5.6 acres is made up of community gardens, which provide diverse plant life and suitable habitat for insects, including monarch butterflies and bumblebees. As detailed in the plants discussion below, over time, the tree canopy would mature and fill in and provide an improved habitat over existing conditions, with a planting plan that includes more diverse plant species and habitats for wildlife.

Plants

Construction of the Preferred Alternative would temporarily disturb lawn and landscaped areas within East River Park, Stuyvesant Cove Park, including the National Wildlife Federation (NWF)-designated "Certified Wildlife Habitat" and the Monarch Watch designated "Monarch Waystation," and other upland spaces such as Murphy Brothers Playground and Asser Levy Playground. These disturbed areas would be restored in accordance with a pre-approved NYC Parks landscape restoration plan. The pre-approved landscape restoration plan would include plantings that would support typical urban wildlife upon completion of construction, including four different milkweed species that attract and support monarch butterflies. Additionally, by raising the park and its recreational fields, passive use lawns, and other permeable park surfaces such as the esplanade, flooding of the park is eliminated or greatly reduced in the event of a design storm, as is scouring, erosion, and sediment transport to the East River, thereby improving the resiliency and long-term health of the terrestrial habitat.

As shown in **Table 5.6-10**, a total of 991 trees (70 percent of trees surveyed) would be removed with implementation of the Preferred Alternative. An additional 79 trees would be potentially removed due to poor conditions, and 348 trees would be retained. Of the 991 trees expected to be removed for project implementation, trees in excellent condition measuring up to 7 inches dbh would be considered potential transplant candidates and may reduce the total number of trees to be removed. As part of the proposed replanting plan, there would be approximately 1,815 trees planted in the project areas (see **Appendix C1o** and **Figure 5.6-7**). Thus, the net change in overall tree numbers would be an increase of 745 trees.

Table 5.6-10
Summary of Tree Effects under the Preferred Alternative

Category	Trees
Existing Trees	1,418
Total Tree Removals with Project Implementation	**-991**
Tree Removals Due to Condition	-79
Total Tree Removals	**-1,070**
Trees Retained	348
Trees to be Planted	+1,815
Net Change	**+745**
Note: * This table has been revised for the FEIS.	

As shown in **Table 5.6-11**, the total numbers of trees to be removed as a result of the Preferred Alternative would be 991, which is a combination of 819 trees from East River Park, 10 trees from Corlears Hook Park, 48 trees from Stuyvesant Cove Park, 16 trees from Murphy Brothers Playground, 31 trees from Asser Levy Playground, and 67 trees from the remainder of the project area vicinity. Trees to be removed would be topped, limbed, felled, and chipped by experienced workpeople, and would be disposed of off-site. The tree removals from East River Park represent 83 percent of the total tree removals with the Preferred Alternative project implementation.

Table 5.6-11
Tree Removals by Location under the Preferred Alternative

Location	Trees
East River Park	-819
Corlears Hook Park	-10
Stuyvesant Cove Park	-48
Murphy Brothers Playground	-16
Asser Levy Playground	-31
Project Area Vicinity	-67
Total Tree Removals with Project Implementation	**-991**
Note: * This table has been revised for the FEIS.	

Overall, the loss of these trees would temporarily remove habitat from the study area resulting in the loss of other benefits provided by trees such as air quality improvements, carbon sequestration, and visual aesthetics. The Preferred Alternative would include a NYC Parks approved landscape restoration plan, which is comprised of a several elements. First, to the extent practicable, the City would transplant existing park trees that are in excellent condition and, based on prior NYC Parks arborist experiences and approvals, are suitable for a successful transplanting. Second, approximately 1,815 trees are proposed to be planted as part of the landscape design within the

Proposed Planting Plan
Figure 5.6-7

project areas, which would result in a net increase of 745 trees over the existing conditions. The value of this restoration plan, in combination with approximately $32.9 million of restitution, would be in compliance with Chapter 5 of Title 56 of the Rules of New York (NYC Department of Parks and Recreation Rules) and Local Law 3 of 2010. The restitution funds would be used towards targeted tree planting and urban forest enhancements throughout the adjacent communities, including the Lower East Side greening program, which proposes to plant up to 1,000 trees in parks and streets, and create up to 40 bioswales starting in fall of 2019.

The landscape restoration plan would include salt tolerant native species, among a diverse selection of 52 tree species. Trees and plant material would be covered under a guarantee period, as stipulated by contract specifications, such that any tree that is dead, in an unhealthy or unsightly condition, or has lost its natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, vandalism or other causes, would be replaced during the following planting season without additional cost to the City. The landscape restoration plan will also aim to improve ecological habitat and be resistant to the effects of salt spray and wind using the concept of different spatial planting concepts, which will be featured in an ecological mosaic throughout the project areas. **Figure 5.6-8** displays the planting key plan for East River Park and **Figure 5.6-9** shows the corresponding spatial concepts. The landscape restoration plan will incorporate these planting concepts with a diverse mix of tree species, shrubs, and groundcover for ecology, shade, and resiliency and will depart from the existing formal landscape to allow the park user to experience an escape from the hard surfaces of the urban landscape (see **Figure 5.6-10**). The proposed raised elevation of the East River Park in the Preferred Alternative would also reduce inundation related effects to trees in East River Park in the event of a design storm and is expected to potentially significantly reduce damage to terrestrial resources overall and allow the park to more rapidly return to pre-storm conditions. Additionally, compared to Alternatives 2, 3 and 5, the accelerated construction schedule of the Preferred Alternative would allow trees to be planted and become established earlier, reducing the amount of time with limited canopy coverage and habitat. Therefore, the Preferred Alternative would result in temporary adverse effects to trees in the study area.

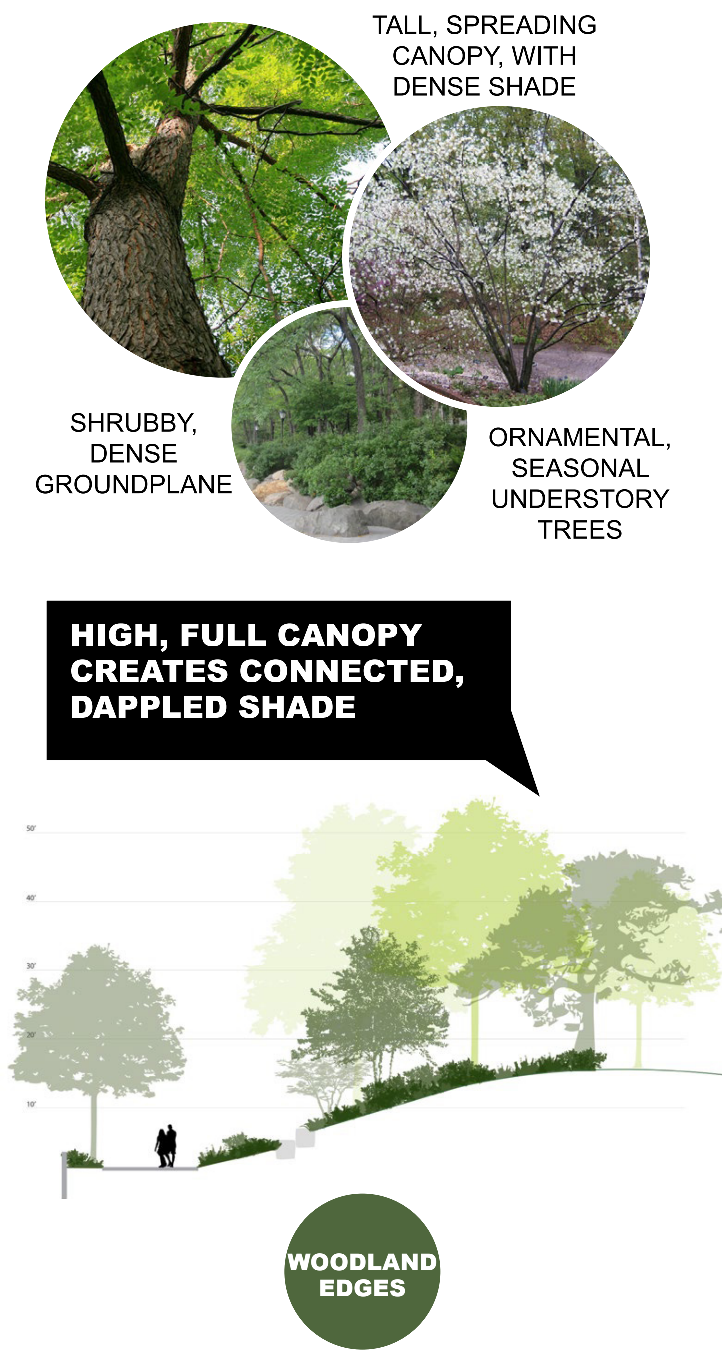
OTHER ALTERNATIVE (ALTERNATIVE 2): FLOOD PROTECTION SYSTEM ON THE WEST SIDE OF EAST RIVER PARK – BASELINE

The anticipated effects to groundwater resources, wetland resources, SFHA, surface water resources, aquatic resources, and endangered, threatened, and special concern species would be similar to or less than the Preferred Alternative; therefore, those analyses are not repeated here.

GEOLOGIC AND SOIL RESOURCES

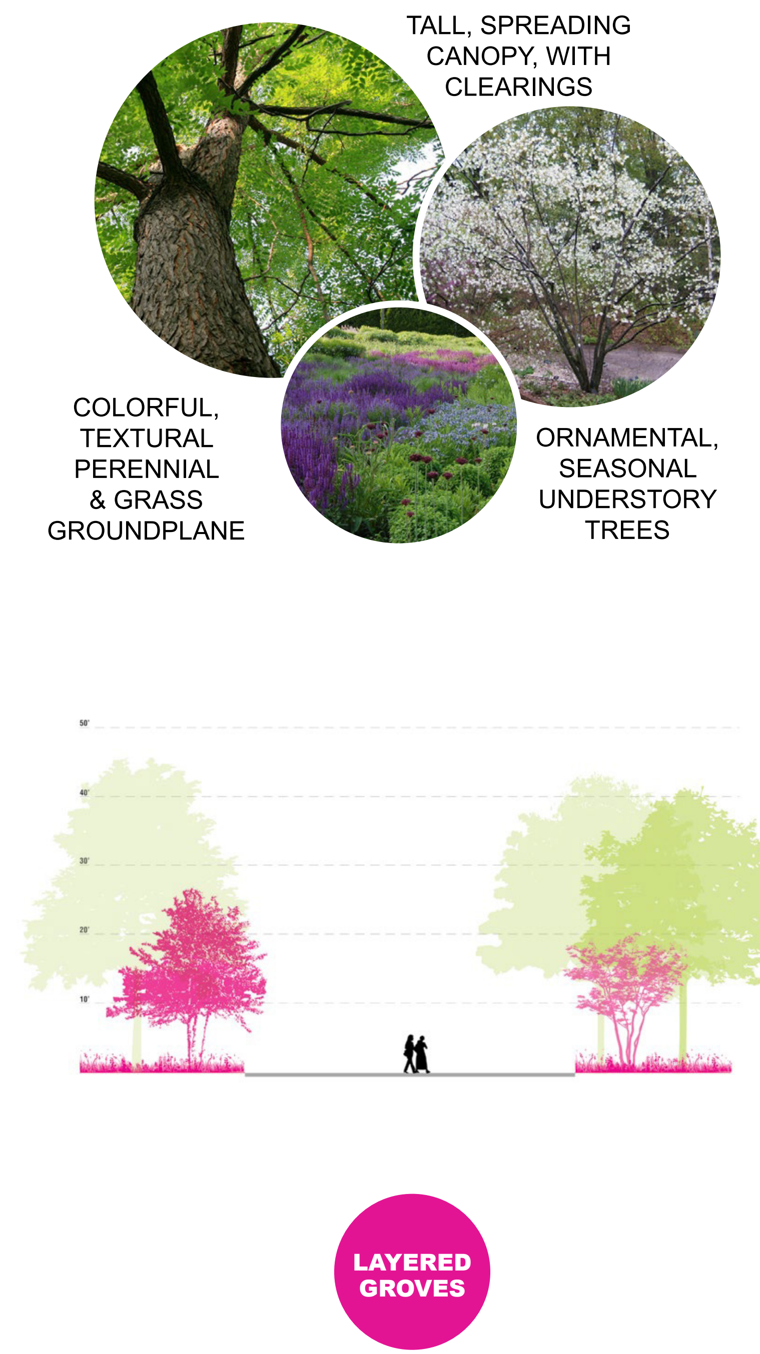
Under non-storm conditions, Alternative 2 would not cause erosion, instability, or compositional changes to geologic or soil resources. During design storm conditions, wave action and inundation has the potential to cause erosion of park surfaces and the levees, although the levees have been designed to withstand tidal effects to the greatest extent practicable with a compacted clay layer. Soil erosion within the areas on the unprotected side of the flood protection alignment would be greater than the Preferred Alternative as more of East River Park would be susceptible to the effects of wave action and inundation. Slopes, when vegetated, would be stabilized with grass. Operation of the proposed drainage management elements would consist largely of the collection and conveyance of storm water and sanitary waste through sewers and would not result in erosion, instability, or compositional changes to geology or soils. Alternative 2 would neither directly or indirectly cause a noticeable decrease in the ability of geologic and soil resources within the study

Planting Key Plan
Figure 5.6-8



- Location: Western urban edge of park. Ornamental understory trees, conifers, shrubs, and perennials provide visual interest along paths and slopes while buffering views
- Maintenance: Trees, shrubs, groundcovers

- Location: Open lawns and spectator areas
- Lawn groundplane maintains open sight lines and open circulation
- Maintenance: Trees, lawn



- Location: Clearing edges and special areas
- Ornamental understory trees and a low perennial groundplane maintain veiled, eye-level sight lines
- Maintenance: Trees, garden beds

- Location: Maritime edges of open spaces and esplanade
- Mid and Understory trees, maritime evergreens, shrubs, and grasses provide shade and interest along the river edge
- Maintenance: Trees, shrubs, grasses

For Illustrative Purposes Only

Planting Concept Rendering
Figure 5.6-10

area to serve designated functions. Therefore, this alternative would not result in significant adverse effects to geologic and soil resources.

TERRESTRIAL RESOURCES

Construction of Alternative 2 would require the removal of trees within the project area, which would constitute a temporary adverse effect, similar to the Preferred Alternative. As shown in **Table 5.6-12**, a total of 265 trees (19 percent of the trees surveyed) would be removed with Alternative 2 project implementation. An additional 79 trees would be potentially removed due to poor conditions, and 1,074 trees would be retained. Of the 265 trees expected to be removed with project implementation, trees in excellent condition measuring up to 7 inches dbh would be considered potential transplant candidates and may reduce the total number of trees to be removed under Alternative 2.

Table 5.6-12
Summary of Tree Effects under Alternative 2

Category	Trees
Existing Trees	1,418
Total Tree Removals with Project Implementation	**-265**
Tree Removals Due to Condition	-79
Total Tree Removals	**-344**
Trees Retained	1,074

Note:
* This table has been revised for the FEIS.

As shown in **Table 5.6-13**, the total numbers of trees to be removed as a result of the Alternative 2 would be 265, which is a combination of 111 trees from East River Park, 43 trees from Stuyvesant Cove Park, 13 trees from Murphy Brothers Playground, 15 trees from Asser Levy Playground, and 83 trees from the remainder of the project area vicinity. The tree removals from East River Park represent 42 percent of the total tree removals with Alternative 2 project implementation.

Table 5.6-13
Tree Removals by Location under Alternative 2

Location	Trees
East River Park	-111
Stuyvesant Cove Park	-43
Murphy Brothers Playground	-13
Asser Levy Playground	-15
Project Area Vicinity	-83
Total Tree Removals with Project Implementation	**-265**

Implementation of Alternative 2 would require a NYC Parks approved landscape restoration plan to address the proposed tree removal. Replacement for tree removal would need to be provided in compliance with Chapter 5 of Title 56 of the Rules of New York (NYC Department of Parks and Recreation Rules) and Local Law 3 of 2010. This alternative would provide no protection to natural resources within East River Park from the threat of gradually accelerating sea level rise, which increases the risk of frequent flooding from every day storms or high tides. Flooding not only interrupts the recreational capacity of East River Park, the subsequent rise in water is also already exposing plant life to salt water inundation in ways that are detrimental to the existing ecology.

Under storm conditions, operation of Alternative 2 would protect upland areas and limit the design storm surge to the unprotected areas in East River Park and Stuyvesant Cove Park on the riverside of the flood protection system. This would result in inundation of East River Park and, to a lesser degree, Stuyvesant Cove Park, much of which would be elevated as a raised landscape. Thus, the effects of inundation on East River Park would be similar to the No Action Alternative, and 1,074 existing trees and other terrestrial resources would remain vulnerable and could be anticipated to be significantly damaged, requiring extended periods of post-storm tree removals for damaged or dying trees. Landscaped areas in these parks would be impacted from debris, inundation, salt damage, or wind and effects to terrestrial resources in East River Park and, to a lesser degree, Stuyvesant Cove Park. However, these effects would be experienced under the No Action Alternative, as well. Therefore, there could be potentially adverse effects to terrestrial resources during storm conditions as a result of Alternative 2.

OTHER ALTERNATIVE (ALTERNATIVE 3): FLOOD PROTECTION SYSTEM ON THE WEST SIDE OF EAST RIVER PARK – ENHANCED PARK AND ACCESS

The effects to groundwater resources, wetland resources, special flood hazard area, surface water resources, aquatic resources, and endangered, threatened, and special concern species would be similar to the Preferred Alternative and the effects to geologic and soil resources would be similar to Alternative 2; therefore, those analyses are not repeated here. No significant adverse effects to these resources are anticipated as a result of Alternative 3.

As shown in **Table 5.6-14**, a total of 776 trees (55 percent of the trees surveyed) would be removed with Alternative 3 project implementation. An additional 79 trees would be potentially removed due to poor conditions, and 563 trees would be retained. Of the 776 trees expected to be removed for project implementation, trees in excellent condition measuring up to 7 inches dbh would be considered potential transplant candidates and may reduce the total number of trees to be removed under Alternative 3. As part of the proposed design landscape restoration plan, there would be approximately 1,180 trees planted in the project areas. Thus, the net change in overall tree numbers would be an increase of 325 trees.

Table 5.6-14
Summary of Tree Effects under Alternative 3

Category	Trees
Existing Trees	1,418
Total Tree Removals with Project Implementation	**-776**
Tree Removals Due to Condition	-79
Total Tree Removals	**-855**
Trees Retained	563
Trees to be Planted	+1,180
Net Change	**+325**

Note:
* This table has been revised for the FEIS.

As shown in **Table 5.6-15**, the total numbers of trees to be removed as a result of the Alternative 3 would be 776, which is a combination of 590 trees from East River Park, 45 trees from Stuyvesant Cove Park, 18 trees from Murphy Brothers Playground, 22 trees from Asser Levy Playground, and 101 trees from the remainder of the project area vicinity. The tree removals from

East River Park represent 76 percent of the total tree removals with Alternative 3 project implementation.

Table 5.6-15
Tree Removals by Location under Alternative 3

Location	Trees
East River Park	-590
Stuyvesant Cove Park	-45
Murphy Brothers Playground	-18
Asser Levy Playground	-22
Project Area Vicinity	-101
Total Tree Removals with Project Implementation	**-776**

Implementation of Alternative 3 would also require a NYC Parks approved landscape restoration plan to address the proposed tree removal. Replacement for tree removal would need to be provided in compliance with Chapter 5 of Title 56 of the Rules of New York (NYC Department of Parks and Recreation Rules) and Local Law 3 of 2010. This alternative would not provide protection to natural resources within East River Park from the threat of gradually accelerating sea level rise, which increases the risk of frequent flooding from every day storms or high tides. Flooding not only interrupts the recreational capacity of East River Park, the subsequent rise in water is also already exposing plant life to salt water inundation in ways that are detrimental to the existing ecology.

Under storm conditions, operation of Alternative 2 would protect upland areas and limit the design storm surge to the unprotected areas in East River Park and Stuyvesant Cove Park on the riverside of the flood protection system. This would result in inundation of East River Park and, to a lesser degree, Stuyvesant Cove Park, much of which would be elevated as a raised landscape. Thus, the effects of inundation on East River Park would be similar to the No Action Alternative, and 563 existing trees and other terrestrial resources would remain vulnerable and could be anticipated to be significantly damaged, requiring extended periods of post-storm tree removals for damaged or dying trees. Landscaped areas in these parks would be impacted from debris, inundation, salt damage, or wind and effects to terrestrial resources in East River Park and, to a lesser degree, Stuyvesant Cove Park. However, these effects would be experienced under the No Action Alternative, as well. Therefore, there would be no significant adverse effects to terrestrial resources as a result of Alternative 3.

OTHER ALTERNATIVE (ALTERNATIVE 5): FLOOD PROTECTION SYSTEM EAST OF FDR DRIVE

Alternative 5 would be the same as the Preferred Alternative except for the portion of Project Area Two where the northbound lane of the FDR Drive would be elevated. This would necessitate an additional 157 square feet of disturbance to littoral zone wetlands, for a total of 29,982 square feet. As with the Preferred Alternative, adverse effects to wetland resources would be mitigated for in accordance with USACE and NYSDEC permit requirements, including both in-kind~~,~~ on-site wetland restoration, and purchase of credits from a wetland mitigation bank or off-site tidal wetland restoration. The effect of Alternative 5 on other natural resources would be the same as described for the Preferred Alternative, and no significant adverse effects are anticipated.

G. MITIGATION

This section presents the proposed mitigation for the adverse effects to natural resources associated with the Preferred Alternative. Mitigation measures fall under the general categories of avoidance, minimization, restoration, and compensation. Where possible, the Preferred Alternative has been designed to avoid and minimize adverse effects to natural resources to the greatest extent practicable. The esplanade elevation and reconstruction work is largely replacement in-kind that utilizes existing piles and sheetpile walls instead of extending the bulkhead eastward with bulk fill of tidal wetlands. In addition, the footprint of the flyover bridge shafts would be minimized to the maximum extent practicable as design progresses.

The Preferred Alternative would result in temporary adverse effects to terrestrial resources with the removal of 991 trees within the study area. Mitigation for the temporary adverse effects to terrestrial resources will be provided through the implementation of a landscape restoration plan, which is comprised of several elements. First, to the extent practicable, the City would transplant existing park trees that are in excellent condition and, based on prior NYC Parks arborist experiences and approvals, are suitable for a successful transplanting. Second, approximately 1,815 replacement trees are proposed to be planted as part of the landscape design within the project areas, which would result in a net increase of 745 trees over the existing conditions. The value of this restoration plan, in combination with approximately $32.9 million of restitution, would be in compliance with Chapter 5 of Title 56 of the Rules of New York (NYC Parks Rules) and Local Law 3 of 2010 (see **Appendix C1o** and **Figure 5.6-7**). The restitution funds would be used towards targeted tree planting and urban forest enhancements throughout the adjacent communities, including the Lower East Side greening program, which proposes to plant up to 1,000 trees in parks and streets, and create up to 40 bioswales starting in fall of 2019.

The landscape restoration plan includes over 50 different species, reflecting research around the benefits of diversifying species to increase resilience and adaptive capacity in a plant ecosystem and also pays special attention to species that can handle salt spray, strong winds, and extreme weather events. The design also focuses on creating a more layered planting approach, allowing for informal planting areas that layer plant communities together to express ecological richness. A more diverse native plants palette has the ability to better adapt to climate change stressors. Once planted and established, the new landscape would represent an improvement in ecological sustainability, habitat creation, and adaptability in the face of a changing climate.

The removal of trees would occur principally within the waterfront parks and is not expected to result in any disproportionately high or adverse effects on minority and low-income populations within the inland neighborhoods. Over a period of years to decades, depending on many factors such as tree specific growth rates and climatological factors such as drought and seasonal temperature variations, the new tree canopy, comprised of diverse and resilient species, would mature and fill in, and would represent an improved habitat over the existing conditions (see **Figure 5.6-9**).

Temporarily disturbed lawn and landscaped areas within East River Park, Stuyvesant Cove Park, including the National Wildlife Federation (NWF)-designated “Certified Wildlife Habitat” and the Monarch Watch designated “Monarch Waystation,” and other upland spaces such as Murphy Brothers Playground and Asser Levy Playground would also be restored with the landscape restoration plan and would include plantings that would support typical urban wildlife upon completion of construction, including four different milkweed species that attract and support monarch butterflies.

The Preferred Alternative would result in a total of 29,825 square feet of adverse effects to tidal wetland habitat, which would require 59,650 square feet of tidal wetland mitigation under general 2:1 ratio recommendations for unvegetated tidal wetland impacts. Continued coordination with NYSDEC will determine the total extent of mitigation required for the Proposed Project. On-site, in-kind tidal wetland mitigation would consist of constructing two new embayments within the project area which would restore 24,868 square feet of the adversely affected tidal wetlands. The remaining 34,782 square feet of required mitigation would be accomplished through the purchase of tidal wetland mitigation bank credits or with off-site tidal wetland restoration or creation. The New York City Economic Development Corporation (EDC) operates the Saw Mill Creek Wetland Mitigation Bank in Staten Island, NY, where credits may be purchased to mitigate adverse effects to tidal wetlands. As the proposed project is within the Primary Service Area for the mitigation bank, this option is being explored to fulfill the tidal wetland mitigation requirements. NYC Parks has also identified potential tidal wetland restoration sites. Selection and implementation of off-site tidal wetland mitigation will be coordinated with EDC, NYC Parks, and other involved agencies. It is anticipated that the design and construction of both the on-site and off-site tidal wetland mitigation would be completed by the proposed construction end date of 2023.

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