A. INTRODUCTION

This chapter assesses the potential impacts on terrestrial and aquatic natural resources[1] and floodplains from the Proposed Action.

The purpose of this chapter is to:

- Describe the regulatory programs that protect floodplains, wildlife, threatened or endangered species, aquatic resources, or other natural resources within the project site;
- Describe the current condition of the floodplain and natural resources within the project site, including:
  - Water and sediment quality; and
  - Biological resources, including: aquatic biota; terrestrial biota; and threatened or endangered species and species of special concern.
- Assess future floodplain, water quality and natural resources conditions without the Proposed Action;
- Assess the potential impacts of the proposed project on floodplain, water quality, and natural resources; and
- Develop measures, as necessary, to mitigate and/or reduce any potential significant adverse effects on water quality and natural resources.

The Proposed Action would improve a two-mile-long, City-owned public open space connecting Whitehall Ferry Terminal and Peter Minuit Plaza in the south to East River Park in the north. The project is intended to allow connections to upland neighborhoods, increase public access to the waterfront, create a vibrant, active, and welcoming water's edge, replace the outmoded New Market Building and pier, and improve access to and around the Battery Maritime Building (BMB). The purpose of the project is not only to provide these connections but also to provide amenities—open space as well as up to 14 pavilions for appropriate retail, cultural, and community uses—to facilitate use of the waterfront by adjacent communities and neighborhoods.

The Proposed Action would generally encompass the waterfront, the upland area adjacent to and under the elevated Franklin D. Roosevelt (FDR) Drive and South Street extending from the Whitehall Ferry Terminal and Peter Minuit Plaza to East River Park, and Pier 15, the New Market Building pier, Pier 35, a portion of Pier 36, and Pier 42 (see Figures 1-1 through 1-4 of

[1] Natural resources are defined as "plant and animal species and any area capable of providing habitat for plant and animal species or capable of functioning to support ecological systems and maintain the city's environmental balance" (*City Environmental Quality Review (CEQR) Manual*, City of New York, 2001).

Chapter 1, "Project Description"). The Proposed Action is being designed with no net increase in the amount of overwater coverage that is not associated with water-dependent activities such as a marina or other recreational boating activities, and to minimize potential adverse impacts on existing marine resources. Proposed improvements to the waterfront include the following actions.

- Construction of a new pedestrian plaza in front of the BMB at the southern end of the project area and extension of the Battery Park Underpass (BPU) by 350 feet to the northeast to facilitate the relocation of the entrance to the BPU and provide sufficient above-ground space for the plaza. This effort would also include the relocation of a Combined Sewer Overflow (CSO), from its current location at the terminus of Broad Street, to the northeast close to Pier 6, and the cooling water intake and outflow structures and pipes for One New York Plaza. The One New York Plaza cooling water system has a flow rate of 26,000 gallons per minute (gpm). The State Pollution Discharge Elimination System (SPDES) permit for the system expires on July 31, 2010. Any changes to the intake and outflow structures and pipes for One New York Plaza in connection with the BMB Plaza would be undertaken pursuant to all applicable local, state, and federal regulations. These activities are expected to last approximately 27 months.
- Construction of approximately 14 pavilions (community, cultural, and commercial uses) totaling up to 150,000 square feet (approximately 3.4 acres) under the FDR Drive in the area between Old Slip and Rutgers Street.
- Transition from the existing 8-foot-wide esplanade at the BMB to a 20-foot-wide, 480-foot-long fixed-trestle overwater walkway (the archipelago) on piles with 25-foot bent spacing (spacing between sets of piles oriented transverse to a structure) that extends over the water from the shoreline and arcs back toward the shoreline at Pier 6 to connect to the proposed approximately 35-foot-wide expanded esplanade that would begin at Pier 6. The increase in overwater coverage due to the archipelago is expected to be 16,400 square feet (0.38 acres).
- Expansion of the existing 8-foot-wide esplanade between Pier 6 and Pier 11/Old Slip (approximately 900 feet long) to approximately 35 feet (15- to 25-foot expansion) by constructing an independent structure over the water on pilings with 25-foot bent spacing. The increase in overwater coverage due to the esplanade expansion is expected to be approximately 18,000 square feet (0.41 acres). Development of the archipelago and esplanade is expected to require approximately 200 piles (assumed to be 18- to 24-inch concrete piles). Construction of the esplanade and pavilions is expected to take about 18 months.
- Addition of larger plants and trees in planter boxes interspersed between benches on the existing approximately 58-foot-wide esplanade between Pier 11/Old Slip and Fulton Street.
- Reconstruction of Pier 15 (demolished in 2002-2003) within the original footprint (approximately 560 feet long and 82 feet wide) as permitted by the New York State Department of Environmental Conservation (DEC) and the U.S. Army Corps of Engineers (USACE) in 2000/2001. The four remaining piles marking the pier footprint would be cut at the mud line. The reconstructed pier would have wider spacing between piles (20-foot bent spacing) than the original structure in order to enhance water flow and reduce sediment deposition between the piles. Approximately 370 piles (assumed to be 18- to 24-inch concrete piles) would be required for the reconstruction of Pier 15. The pier could support a two-level enclosed structure and could be designed to allow vessels to dock along both sides. As part of the Proposed Action, the historic vessel the *Wavertree* would be removed

from its current location, which is within the area that will be the north berth for the reconstructed Pier 15, and temporarily relocated during the reconstruction of Pier 15. The *Wavertree* would be moored at either the north or south berth of the Pier 15 when the reconstruction is completed. The other berth at the reconstructed Pier 15 would be used for temporary (less than six months) mooring of attraction vessels. Because the reconstruction of Pier 15 has already undergone environmental permitting and review, it is not considered to be new overwater coverage but its use is included as part of the overall project concept and design. The final design plans for the pier will be submitted to DEC and USACE for review. Dredging would be required at the reconstructed Pier 15 to temporarily relocate the *Wavertree* and prepare the berths for use (maximum volume of approximately 15,000 cubic yards on the north side and maximum volume of approximately 21,000 cubic yards on the south side). Reconstruction is expected to take 12 months.

- Demolition of the existing New Market Building and pier north of Pier 17. The deck of the existing New Market Building pier will be removed and the piles cut at the mud line. The pier will be reconstructed within the original footprint, and will have wider pile spacing (20 to 25-foot bent spacing) than the original structure to enhance water flow and reduce sediment deposition between the piles. Approximately 96 piles (assumed to be 18-inch-diameter concrete piles) would be required for the reconstruction of the New Market Building Pier. A new structure (40,000 square feet) would be constructed atop the pier to house a mix of uses. A marina would be constructed within an area extending from the outboard edge of the pier north toward the Brooklyn Bridge for a distance of approximately 620 feet (see Figure 1-2 in Chapter 1). Within this area, the marina would extend from the shoreline out toward the pierhead line for a distance of approximately 400 feet. The marina is intended to provide opportunities for mooring of up to 98 vessels, with about half of the berths for transient and half for longer term rentals. The berths would be designed to accommodate vessel lengths of 35, 45, 55, 65, 95 and 125 feet, with the majority of the berths in the 35 and 45-foot range. Marina platform widths would range from 5 to 8 feet for the finger piers, and 8 to 12 feet for the main docks. Approximate overwater coverage associated with the marina finger piers, main docks, and gangways is 34,483 square feet (0.79 acres). The floating wave attenuation element on the outboard side of the marina, parallel to the river, is expected to be approximately 12 feet wide and have a draft of approximately 5 feet. Approximate overwater coverage associated with the floating wave attenuator is 6,000 square feet (0.14 acres). The breakwater on the north side of the marina, perpendicular to the shoreline, is expected to be a pile-supported wall-type breakwater comprising wave boards with gaps to create a semi-permeable screen. The width of this breakwater would be approximately 15 feet. Approximate overwater coverage associated with the breakwater is 6,000 square feet (0.14 acres). The marina will provide sewage pumpout but no fueling facilities. Development of the marina will require approximately 350 piles (assumed to be 18- to 24-inch concrete piles) to moor the marina platforms, floating wave attenuator, and breakwater. Work at the New Market Building pier and marina is expected to take 18 months.
- Enhancement of the existing 24-foot-wide esplanade between the Brooklyn Bridge and Pier 35 through the placement of benches, planters, and other features.
- Development of a two-tiered open space on the existing Pier 35 platform. The multilevel landscape would be designed to enhance the open space and block the view of the building on the adjacent Pier 36 (used by the New York City Department of Sanitation) and provide

passive recreational opportunities. Pile encasement would be performed as necessary. Work at Pier 35 is expected to take 12 months.

- Public open space would be created at the northern end of Pier 36.
- Creation of a cove through removal of a portion of the southern end of Pier 42 (approximately 20,000 square feet [0.46 acres]). Also at Pier 42, a small craft launch area (kayaks, canoes, paddle boats, etc.) would be created at the northern edge of the pier. In order to provide a suitable environment for the operation of the intended small crafts, a wave attenuator and/or breakwater would be installed. The wave attenuator and/or breakwater is expected to be up to 15 feet wide, and require approximately 80 piles (assumed to be 18- to 24-inch concrete piles). Approximate overwater coverage associated with the wave attenuator and/or breakwater is 5,000 square feet. The creation of the cove through removal of a portion of Pier 42 decking and piles would offset some of the overwater coverage that would be added as a result of the Proposed Action for structures wider than 15 feet and are not associated with water-dependent activities such as a marina or boating—the expanded esplanade and archipelago. Additional areas of overwater coverage would be removed within the project area to offset the remaining area of new overwater coverage associated with the expanded esplanade and archipelago not offset by the creation of the cove. Development of the cove and small craft launch area is expected to take 12 months.
- Removal of the Pier 42 pier shed and reinforcing the existing pier. The shed would be replaced by a new "urban beach" with vegetated berms separating the "beach" from the esplanade. Pile encasement would be performed as necessary. Work at Pier 42 is expected to take 12 months.

PRINCIPAL CONCLUSIONS

The Proposed Action is not expected to result in any significant adverse impacts on water quality or natural resources because:

- During grading and excavation activities associated with the construction of the Proposed Action, any hazardous materials encountered would be handled in accordance with City, State, and federal requirements to minimize potential impacts on groundwater. Furthermore, because groundwater is not used as a potable water supply in Manhattan, the Proposed Action would not have the potential to affect drinking water supplies.
- Construction and operation of the Proposed Action would not be expected to result in adverse impacts on the 100-year floodplain. Although the entire project site is within the 100-year floodplain, the construction of the archipelago and the expanded esplanade on piles between the BMB and Pier 11, and the other elements of the Proposed Action, would not be expected to affect the floodplain's ability to contain flood waters and would not exacerbate flooding conditions within or adjacent to the project site because the floodplain is affected by tidal flooding. Additionally, the Proposed Action will comply with applicable New York City Building Codes and Federal Emergency Management Agency (FEMA) requirements regarding non-residential structures within the 100-year floodplain to reduce exposure to flood hazards.
- In-water construction activities such as pile driving for the archipelago and expanded esplanade, reconstruction of Pier 15 and the New Market Building pier, and the marina; pile encasement activities at Pier 35 and Pier 42; and dredging at the north and south sides of Pier 15 to facilitate the temporary relocation of the *Wavertree* during reconstruction of Pier 15, and mooring of the *Wavertree* and attraction vessels at Pier 15 once reconstruction is

complete, may result in a small loss of DEC littoral zone tidal wetlands within the footprint of the individual piles, area disturbed through pile encasement, and in the vicinity where dredging will occur. However, this small loss would not be expected to result in significant adverse impacts on DEC littoral zone tidal wetlands resources within the project area or the East River. No construction activities would occur within the beach area located under the Brooklyn Bridge. The wider pile spacing, 20 feet for the reconstructed Pier 15, and 25 feet for the reconstructed New Market Building pier, archipelago, and esplanade expansion between the BMB and Pier 11, would be designed to minimize the potential for sediment deposition and the potential for adverse impacts on littoral zone wetlands.

- Implementation of erosion and sediment control measures and stormwater management measures during construction of the Proposed Action would minimize potential impacts on water quality and aquatic biota of the East River associated with stormwater runoff during land disturbing activities that would occur in upland areas and on the piers. Any hazardous materials encountered during these construction activities would be handled and removed in accordance with City, State, and federal requirements to minimize potential adverse impacts on water quality. Any groundwater recovered through dewatering activities would be treated, as necessary, prior to discharge to the combined sewer system and would not be expected to result in adverse impacts on surface water quality.
- In-water construction activities that would result in sediment disturbance include pile driving (370 18- to 24-inch concrete piles) for Pier 15, approximately 200 18- to 24-inch concrete piles for the expanded esplanade and archipelago, 96 18-inch-diameter piles for the reconstructed New Market Building pier and approximately 350 18- to 24-inch concrete piles for the proposed marina, and approximately 80 18- to 24-inch concrete piles for the wave attenuator and/or breakwater associated with the small craft launch area), pile encasement activities at Piers 35 and 42; and dredging to facilitate the temporary relocation of the *Wavertree* during reconstruction of Pier 15, and mooring of the *Wavertree* and attraction vessels at Pier 15 once reconstruction is completed (an approximately 12,170-square-foot area on the north side of Pier 15 and a 13,070-square-foot area on the south side of Pier 15). Relocation of the CSO and the One New York Plaza cooling water intake and outfall structures also has the potential to result in bottom disturbance associated with the construction of these structures within the existing bulkhead. The relocation of the CSO and the intake and outflow structures would be undertaken pursuant to all applicable local, state, and federal regulations. No in-water activities would be conducted during the period established by regulatory agencies to protect certain species of overwintering fish within the East River (typically mid-November through mid-April). While disturbance of sediment has the potential to result in increased suspended sediment in the water column and resuspension and redeposition of contaminants, these temporary effects would be localized and confined to the immediate vicinity of pile driving and dredging activities. Any increase in suspended sediment would move away from the area of in-water construction and would be expected to dissipate shortly after the completion of these activities, and would not be expected to result in significant long-term adverse impacts on water quality or aquatic biota. Similarly, any contaminants released to the water column as a result of sediment disturbance would be expected to dissipate rapidly and would not be expected to result in significant long-term impacts on water quality or aquatic biota.
- The operation of the proposed archipelago, esplanade, pavilions and refurbished piers would not be expected to result in increased stormwater runoff and may result in a reduction of stormwater flow to the river with the introduction of pervious surfaces on Piers 35 and 42,

and the BMB Plaza. The operation of the pavilions would result in minimal increase in discharges to the municipal combined sewer system, and therefore, would not be expected to result in adverse impacts on water quality due to increased CSOs or discharges from the water pollution control plant. The relocation of the Broad Street CSO to the northeast, closer to Pier 6, as part of the extension of the BPU by 350 feet to the northeast would not result in additional CSOs to the East River and would not be expected to result in significant adverse impacts on water quality. The relocation of this CSO closer to Pier 6 has the potential to improve water quality as a result of greater flushing expected to occur near Pier 6, compared with the current location adjacent to a wall that extends down to the mud line. The operation of the relocated One New York Plaza cooling water intake and outflow structures would be in accordance with the current SPDES permit and would not be expected to result in significant adverse impacts on water quality or aquatic biota. Additionally, the proposed reconstruction of Pier 15 and the New Market Building pier, the archipelago, expanded esplanade, and the pile encasement at Piers 35 and 42 would not be expected to impair the movement of tidal waters or the designated use of the East River within the project area.

- The operation of the marina and small craft launch area north of Pier 42 would not be expected to result in any significant adverse impacts on water quality, fish, or macroinvertebrates within the project area. Water depths within the proposed marina area are sufficient to minimize the potential for increased suspended sediment from boat activity. Although marina activities present a small increase in the potential for accidental petroleum or sewage spills to the river, because there would be no fueling facilities at the marina, the likelihood of a large-scale accidental discharge is small. The marina and small craft launch area will be designed to allow sufficient flushing to occur to minimize potential water quality impacts. Therefore, the operation of the marina and small craft launch area would not be expected to result in significant adverse impacts on water quality or aquatic biota.
- Pile driving would not be expected to result in significant adverse impacts on aquatic biota. It would be limited to the reconstruction of Pier 15 and the New Market Building pier, construction of the archipelago, the expanded esplanade between the BMB and Old Slip, and the marina at the New Market Building pier, and the small craft launch area north of Pier 42. Pile driving would not be conducted during the period established by regulatory agencies to protect certain species of overwintering fish within the East River. The permanent loss of benthic habitat and some macroinvertebrates within the pile footprints, within the footprint of pile encasement conducted at selected piles for Piers 35 and 42, as well as the loss of macroinvertebrates within the area to be dredged, would not significantly impact the food supply for fish foraging in the area. Additionally, the new piles would provide additional attachment sites for algae and sessile invertebrates, and some piles may provide suitable refuge to fish.
- The Proposed Action is being designed with no net increase in the amount of overwater coverage that is not associated with water-dependent activities such as the marina or small boat basin (i.e., the approximately 34,400 square feet (0.79 acres) of overwater coverage due to the archipelago and expansion of the esplanade), to minimize potential adverse impacts on existing marine resources due to shading. In order to achieve this, the proposed cove between Piers 36 and 42 would be developed through the removal of approximately 20,000 square feet (0.46 acres) of the southern portion of Pier 42. The remaining area of overwater coverage to be removed to complete the offset for the overwater coverage added for the archipelago and expansion of the esplanade (approximately 14,400 square feet [0.33 acres]) will also be located within the project area. Therefore, the Proposed Action would not be

expected to result in significant adverse impacts on aquatic habitat due to shading. Furthermore, many of the overwater structures associated with the water-dependent recreational activities that would be added as a result of the Proposed Action (i.e., marina finger piers, docks, gangways, floating wave attenuator, and breakwater; and small craft launch area wave attenuator/breakwater) are narrow (less than 15 feet wide) and would permit some light to reach the water under them. Therefore, these narrow water-dependent structures would not be expected to result in significant adverse impacts on aquatic habitat due to shading.

- Neither Essential Fish Habitats nor the endangered shortnose sturgeon (*Acipenser brevirostrum*) would be adversely affected by the Proposed Action. Shortnose sturgeon are only expected to occur in the area as occasional transients and prefer the deeper water habitat of the navigation channel, which would not be affected by the Proposed Action.
- The four species of marine turtle (loggerhead, green, Kemp's ridley, and leatherback) would not be expected to occur within the project area except as transient individuals. Because they neither nest nor reside in the area year-round, and are only rarely observed in this portion of the estuary, they would not be expected to be impacted by the construction or operation of the Proposed Action.
- The Proposed Action would not affect the availability of the state-endangered peregrine falcon nesting locations that are at least 500 feet from the project site. Construction activities would not be expected to affect nesting success at these locations.
- No significant adverse impacts on terrestrial resources are anticipated as a result of construction of the Proposed Action. Existing wildlife habitats within the project site and vicinity are limited to the wading bird and waterfowl foraging habitat found within the beach area under the Brooklyn Bridge, and the low-quality terrestrial habitat found under the FDR Drive and the existing portions of the esplanade. Adverse impacts would occur to some individual birds and other wildlife currently using this limited wildlife habitat if construction activities cause them to leave the project area and there are no suitable habitats that are available nearby. However, the wildlife species found within the project area are common to urban areas, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the New York City region. Landscaping plants proposed as part of the Proposed Action would provide structural habitat as well as increased forage (seeds, berries and insects attracted to the plants) that would benefit wildlife.

B. METHODOLOGY

This section presents the methodology used to describe natural resources within the project area under existing and future conditions, and to assess potential impacts on these resources from the Proposed Action. For terrestrial resources and floodplains, the study area was restricted to the project site and the immediate vicinity. An exception was made for the identification of threatened or endangered species which were evaluated for a distance of at least 0.5 miles from the project area. The study area for water quality and aquatic resources included the overall aquatic resources within the East River, and the aquatic resources within the waterfront portion of the project site. Therefore, for aquatic resources, the project area refers to the portion of the East River extending from near the BMB to near the southern end of East River Park (north of Pier 42) out to the channel, including the in-water portions of the project site and adjacent areas.

The analysis of potential impacts on natural resources from the Proposed Action considered the potential effects for a Build year of 2009. Construction is expected to begin in 2007.

EXISTING AND FUTURE CONDITIONS

Existing conditions for floodplain, water quality, and natural resources within the project area were summarized from:

- Existing information identified in literature and obtained from governmental and non-governmental agencies such as: New York City Department of Environmental Protection (DEP) Harbor Water Quality Survey (DEP 2003a); U.S. Environmental Protection Agency (EPA) National Sediment Quality Survey Database, 1980-1999 (EPA 2001); New York/New Jersey Harbor Estuary Program; EPA Regional Environmental Monitoring and Assessment Program (R-EMAP), FEMA, and USACE studies conducted as part of the New York and New Jersey Harbor Navigation Project.
- On-site observations.
- Requests for information on rare, threatened or endangered species in the vicinity of the project area were submitted to the U.S. Fish and Wildlife Service (USFWS) (NY office), National Marine Fisheries Service (NMFS), and the New York Natural Heritage Program (NYNHP). NYNHP, a joint venture of DEC and The Nature Conservancy (TNC) since 1985, maintains an ongoing, systematic, scientific inventory on rare plants and animals native to New York State. DEC maintains the NYNHP files. The NYNHP database is updated continuously to incorporate new records and changes in the status of rare plants or animals. In addition to the state program, the USFWS maintains information for federally listed threatened or endangered freshwater and terrestrial plants and animals, and NMFS for federally listed threatened or endangered marine organisms.
- Results of bathymetric and hydrographic studies conducted within the project area. Field surveys were conducted in 2004 within the East River to collect data on bathymetry, current velocity, and tidal height within the project area. Current profiles extending from the near shore areas to offshore of the project area were collected along three transects running perpendicular to the local shoreline: one between Pier 17 and the Brooklyn Bridge, a second between the Brooklyn Bridge and the Manhattan Bridge, and a third between the Manhattan Bridge and Pier 35. Data were collected using an Acoustic Doppler Current Profiler (ADCP) during maximum flood and maximum ebb tides.

The future without the Proposed Action was assessed by determining:

- Potential effects of proposed development in the vicinity of the project area on water quality and natural resources; and
- Potential effects of proposed or ongoing improvements in the vicinity of the project area on water quality and natural resources.

ASSESSMENT OF IMPACTS FROM THE PROPOSED ACTION

Project elements having the potential to impact natural resources include: changes to overwater coverage associated with the overwater structures not associated with water-dependent activities, such as the archipelago and expansion of the esplanade, narrow overwater structures associated with water-dependent uses such as the marina and small craft launch area, physical habitat disruption associated with the reconstruction of Pier 15 and dredging on the north and south side of the reconstructed pier, the extension of the BPU approximately 350 feet to the east and the

associated relocation of the CSO, the relocation of the One New York Plaza cooling water intake and outflow structures, the reconstruction of the New Market Building pier and construction and operation of the marina with floating wave attenuator and breakwater, construction and operation of the small craft launch area with wave attenuator and/or breakwater, and removal of a portion of the Pier 42 decking to create the cove.

Potential impacts on the floodplain, wetlands, aquatic, and terrestrial resources from the Proposed Action were assessed using an approach that considered the following:

- The existing water quality and natural resources within the project area;
- Temporary impacts on water quality and aquatic organisms during construction of in-water components, such as piling installation/removal for pier rehabilitation/reconstruction. In-water construction of these project elements has the potential to result in the following:
  - Temporary increases in suspended sediment and release of contaminants during sediment disturbance; and
  - Temporary loss of fish breeding, nursery, or foraging habitat, or Essential Fish Habitat (EFH) identified by the NMFS, from temporary water quality changes and impacts associated with pile driving;
- Temporary impacts on water quality and aquatic biota from the discharge of stormwater during construction of the upland components of the Proposed Action;
- Temporary impacts on water quality and aquatic biota from the discharge of groundwater recovered during dewatering activities associated with the extension of the BPU;
- Temporary impacts on terrestrial resources associated with land clearing, grading, and other upland activities associated with construction of the Proposed Action;
- Potential beneficial aquatic habitat improvements from decreased piling density under Pier 15 and reconstructed New Market Building pier, and the removal of northern and southern portions of Pier 42 to create the cove next to Pier 36, and the small craft launch area at the northern end of the project area;
- Potential beneficial aquatic habitat improvements from decreased piling density under Pier 15 and reconstructed New Market Building pier, the removal of a portion of the southern end of Pier 42 to create the cove next to Pier 36 to offset some of the overwater coverage added due to the archipelago and expanded esplanade, and the removal of additional areas of overwater coverage from within the project area to complete the offset for the archipelago and expanded esplanade;
- Potential long-term impacts on fish and benthic macroinvertebrate habitat within the project area as a result of shading from new overwater structures such as the archipelago and expanded esplanade, walkways, floating boat docks and slips for the marina, and the mooring of the *Wavertree* and attraction vessels on the north and south sides of Pier 15;
- Potential long-term impacts on water quality and aquatic biota resulting from the operation of the marina adjacent to the New Market Building pier, and transient mooring of small vessels in the proposed cove between Pier 36 and Pier 42, small craft launch area at the northern end of Pier 42, and other effects such as bottom disturbance by boat motors, shoreline erosion, increased suspended sediment, and accidental petroleum and/or sewage discharges from the mostly small to mid-size vessels using the mooring facilities to be constructed as part of the Proposed Action. The existing beach beneath the Brooklyn Bridge

could also be susceptible to erosion caused by boating activities associated with the Proposed Action; and

- Impacts on terrestrial plants and wildlife associated with land-clearing activities during construction of the Proposed Action, and potential long-term beneficial impacts on plants and wildlife from the proposed landscaping on the esplanade, Pier 35, and the proposed urban beach at Pier 42.

C. REGULATORY CONTEXT

In-water activities associated with the Proposed Action such as: pier/pile repair or replacement; construction of an esplanade extension and marina; discharge of stormwater; and activities within the New York State Coastal Zone will require compliance with federal and state legislation and regulatory programs that pertain to activities in coastal areas, surface waters, floodplains, wetlands, and the protection of species of special concern.

FEDERAL

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

The objective of the Clean Water Act, also known as the Federal Water Pollution Control Act, is to restore and maintain the chemical, physical, and biological integrity of U.S. waters. It regulates point sources of water pollution such as discharges of municipal sewage and industrial wastewater, the discharge of dredged or fill material into navigable waters and other waters of the United States, and non-point source pollution such as runoff from streets, agricultural fields, construction sites, and mining that enter waterbodies from other than the end of a pipe.

Under Section 401 of the Act, any applicant for a federal permit or 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 New York must obtain a Water Quality Certification from DEC.

Section 404 of the Act requires authorization from the Secretary of the Army, acting through USACE, for the permanent or temporary discharge of dredged or fill material into navigable waters and other waters of the United States. Waters of the United States is defined in 33 CFR 328.3 and includes wetlands, mudflats, and sandflats that meet the specified requirements in addition to streams and rivers that meet the specified requirements. Activities authorized under Section 404 must comply with Section 401 of the Act.

RIVERS AND HARBORS ACT OF 1899

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through USACE, for the construction of any structure in or over any navigable water of the United States, the excavation from or deposition of material in these waters, or any obstruction or alteration in navigable water of the United States. The purpose of this Act is to protect navigation and navigable channels. Any structures placed in navigable waters, such as pilings, piers, or bridge abutments up to the mean high water line, would be regulated pursuant to this Act. USACE must evaluate the probable impacts, including cumulative impacts of the

proposed activity on the public interest (benefits of the proposed activity versus potential detriments).

COASTAL ZONE MANAGEMENT ACT OF 1972 (16 USC §§ 1451 TO 1465)

The Coastal Zone Management Act of 1972 established a voluntary participation program to encourage coastal states to develop programs to manage development within the state's designated coastal areas to reduce conflicts between coastal development and protection of resources within the coastal area. Federal permits issued in New York must be accompanied by a Coastal Zone Consistency Determination that evaluates consistency with New York's federally approved coastal zone management program.

MAGNUSON-STEVENS ACT (16 USC §§ 1801 TO 1883)

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

Adverse impacts on EFH, as defined in 50 CFR 600.910(A), include any impact that reduces the quality and/or quantity of EFH. Adverse impacts may include:

- Direct impacts such as physical disruption or the release of contaminants;
- Indirect impacts such as the loss of prey or reduction in the fecundity (number of offspring produced) of a managed species; and
- Site-specific or habitat-wide impacts that may include individual, cumulative, or synergetic consequences of a Federal action.

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

The Endangered Species Act of 1973 recognizes that endangered species of wildlife and plants are of aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. The Act prohibits the importation, exportation, taking, possession, and other activities involving illegally taken species covered under the Act, and interstate or foreign commercial activities. The Act also provides for the protection of critical habitats on which endangered or threatened species depend for survival.

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

The Fish and Wildlife Coordination Act entrusts the Secretary of the Interior with providing assistance to, and cooperation with, federal, state, and public or private agencies and organizations, to ensure that wildlife conservation receives equal consideration and coordination with other water-resource development programs. These programs can include the control (such as a diversion), modification (such as channel deepening), or impoundment (dam) of a body of water.

NEW YORK

PROTECTION OF WATERS, ARTICLE 15, TITLE 5, ECL, IMPLEMENTING REGULATIONS 6 NYCRR PART 608.

DEC is responsible for administering Protection of Waters regulations to prevent undesirable activities on surface waters (rivers, streams, lakes, and ponds). The Protection of Waters Permit Program regulates five different categories of activities: disturbance of stream beds or banks of a protected stream or other watercourse; construction, reconstruction, or repair of dams and other impoundment structures; construction, reconstruction, or expansion of docking and mooring facilities; excavation or placement of fill in navigable waters and their adjacent and contiguous wetlands; and Water Quality Certification for placing fill or other activities that result in a discharge to waters of the United States in accordance with Section 401 of the Clean Water Act.

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM (SPDES) (N.Y. ENVIRONMENTAL CONSERVATION LAW [ECL] ARTICLE 3, TITLE 3; ARTICLE 15; ARTICLE 17, TITLES 3, 5, 7, AND 8; ARTICLE 21; ARTICLE 70, TITLE 1; ARTICLE 71, TITLE 19; IMPLEMENTING REGULATIONS 6 NYCRR ARTICLES 2 AND 3)

Title 8 of Article 17, ECL, Water Pollution Control, authorized the creation of SPDES to regulate discharges to the state's waters. Activities requiring a SPDES permit include point source discharges of wastewater into surface or groundwaters of the State, including the intake and discharge of water for cooling purposes; constructing or operating a disposal system (sewage treatment plant); discharge of stormwater; and construction activities that disturb one acre or more.

WATERFRONT REVITALIZATION OF COASTAL AREAS AND INLAND WATERWAYS ACT (SECTIONS 910-921, EXECUTIVE LAW, IMPLEMENTING REGULATIONS 6 NYCRR PART 600 ET SEQ.)

Under the Waterfront Revitalization of Coastal Areas and Inland Waterways Act, the New York State Department of State (NYSDOS) is responsible for administering the Coastal Management Program (CMP). The Act also authorizes the State to encourage local governments to adopt Waterfront Revitalization Programs (WRP) that incorporate the state's policies. New York City has a WRP administered by the Department of City Planning.

TIDAL WETLANDS ACT, ARTICLE 25, ECL, IMPLEMENTING REGULATIONS 6 NYCRR PART 661.

Tidal wetlands regulations apply anywhere tidal inundation occurs on a daily, monthly, or intermittent basis. In New York, tidal wetlands occur along the salt-water shore, bays, inlets, canals, and estuaries of Long Island, New York City and Westchester County, and the tidal waters of the Hudson River up to the salt line. DEC 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 wetlands or the adjacent areas (up to 300 feet inland from wetland boundary, or up to 150 feet inland within New York City).

FLOODPLAIN MANAGEMENT CRITERIA FOR STATE PROJECTS (6 NYCRR 502)

Under 6 NYCRR 502, all state agencies are to ensure that the use of state lands, and the siting, construction, administration and disposition of state-owned and state-financed projects involving

any change to improved or unimproved real estate are conducted in ways that would minimize flood hazards and losses. Projects are to consider alternative sites on which the project could be located outside the 100-year floodplain. Projects to be located within the floodplain are to be designed and constructed consistent with the need to minimize flood damage within the 100-year floodplain and include adequate drainage to reduce exposure to flood hazards. All public utilities and facilities associated with the project are to be located and constructed to minimize or eliminate flood damage. The regulations specify that for nonresidential structures, the lowest floor should be elevated or flood-proofed to not less than one foot above the base flood level so that below this elevation the structure, together with associated utility and sanitary facilities, is watertight, with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. No project may be undertaken unless the cumulative effect of the proposed project and existing developments would not cause material flood damage to the existing developments.

ENDANGERED AND THREATENED SPECIES OF FISH AND WILDLIFE; SPECIES OF SPECIAL CONCERN (ECL, SECTIONS 11-0535[1]-[2], 11-0536[2], [4], IMPLEMENTING REGULATIONS 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.

D. EXISTING CONDITIONS

This section describes existing natural resource conditions within the project area.

SETTING

GEOLOGICAL CONDITIONS

The substrate underlying Manhattan consists of three prominent geological formations: Manhattan Schist, Inwood Marble, and Fordham gneiss, all of which are highly folded, faulted, and metamorphosed rocks. Much of lower Manhattan consists of historic fill material used to expand shoreline development. Although the proposed East River Esplanade and Piers project is confined to urbanized areas constructed on fill of unknown origin, these regional geological formations contribute to materials forming river bottom substrates and habitat. The lower East River primarily has a hard, rock bottom consisting of gravel, cobble, rocks, and boulders covered with a shallow layer of sediment.

GROUNDWATER

Groundwater in the vicinity of the project site is generally found at approximately 5 to 10 feet below project grade and may be influenced by the East River tidal cycle. Within the project site, groundwater generally flows toward the East River. Groundwater quality may be affected by past and current land use and the fill material of unknown origin used make the upland portions of the project area. Manhattan's groundwater is not used for potable water supply, and non-potable use is limited.

FLOODPLAINS AND WETLANDS

Figure 9-1 presents the 100-year floodplain (area with a 1 percent chance of flooding each year) and 500-year floodplain (area with a 0.2 percent chance of flooding each year) boundaries within the project site. As presented in Figure 9-1, all of the project area is within the 100-year floodplain. The 100-year flood elevation is 10 feet above National Geodetic Vertical Datum (NGVD), which approximates mean sea level.

The entire shoreline within the project area is engineered with bulkhead or riprap that limits the potential for tidal marsh plants or submerged aquatic vegetation with the exception of a sand/gravel beach directly beneath the Brooklyn Bridge. The USFWS National Wetlands Inventory (see Figure 9-2) classifies the waters in the project area as estuarine subtidal wetlands with unconsolidated bottom (E1UBL). Subtidal estuarine wetlands are continuously submerged areas with low energy and variable salinity, influenced and often enclosed by land. Unconsolidated bottoms have at least 25 percent cover of particles smaller than 6 or 7 cm, and less than 30 percent vegetative cover. Because the waters within the project area do not contain tidal wetland plants, USACE would likely regulate them as waters of the U.S. and would not be likely to classify portions of the project area as wetlands.

DEC designates the East River as littoral zone (shallow waters six feet or less in depth that are not included in other DEC tidal wetland categories) (Figure 9-3). However, DEC regulations state that *actual* water depths determine whether or not an area is a littoral zone. Water depths recently recorded within the project area range from approximately 6 feet or less (2 meters or less) to approximately 40 feet (12.5 meters) at mean low water (MLW). Areas with water depths at or shallower than 6 feet at MLW that may be classified as littoral wetland by DEC occur near the shoreline immediately north of the BMB, in isolated areas between Piers 6 and 11, and along the shoreline from the New Market Building north to approximately Catherine Street. This latter area includes the beach beneath the Brooklyn Bridge. There is also an area with water depths less than 6 feet MLW immediately north of the project area.

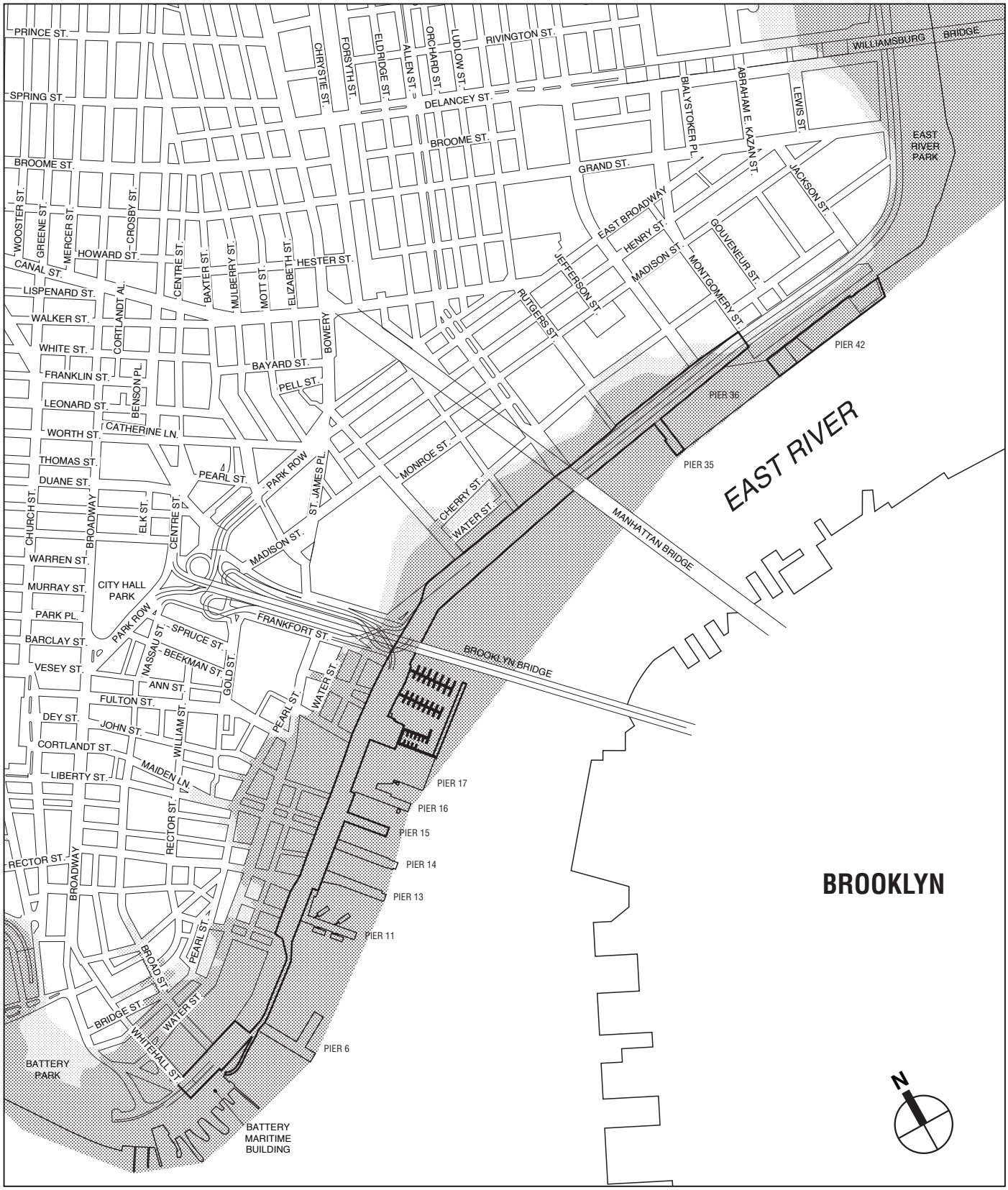
AQUATIC RESOURCES

SURFACE WATER RESOURCES IN THE PROJECT AREA

The project area is located along the western shore of the lower East River, a tidal strait that connects New York Harbor with the western end of Long Island Sound. The East River's circulation and salinity structure are largely determined by conditions in the Upper Harbor and the sound. The river is approximately 16 miles long (26 kilometers [km]) and generally ranges from 600 to 4,000 feet wide (183 to 1,219 meters [m]). Water depth in the federal navigation channel is maintained to 40 feet (12 meters below MLW) from the Battery to the former Brooklyn Navy Yard, and 35 feet (about 11 m) at MLW from that point to the Throgs Neck Bridge. In reality, the channel is much deeper in places than the maintained depth, reaching up to 100 feet deep (about 30 m) in areas just north of Hell Gate.

During the early flood cycle of the East River, Hudson River water flows in via the Battery, and during the entire flood cycle, Hudson River water enters through the Harlem River. The mean tidal range is considerable, approximately 4.3 feet (1.3 m) at the Battery, 5.1 feet (1.5 m) at Hell Gate east of the project area, and increasing to 7.2 feet (2.2 m) at Willets Point, the entrance to the Long Island Sound. The phase of the tide at Willets Point lags the Battery by about 3 hours. This phase difference, and the difference in resulting water elevations between the Battery and Willets Point, is chiefly responsible for the rapid tidal currents in this water body (Hazen and

4.27.07



Project Site

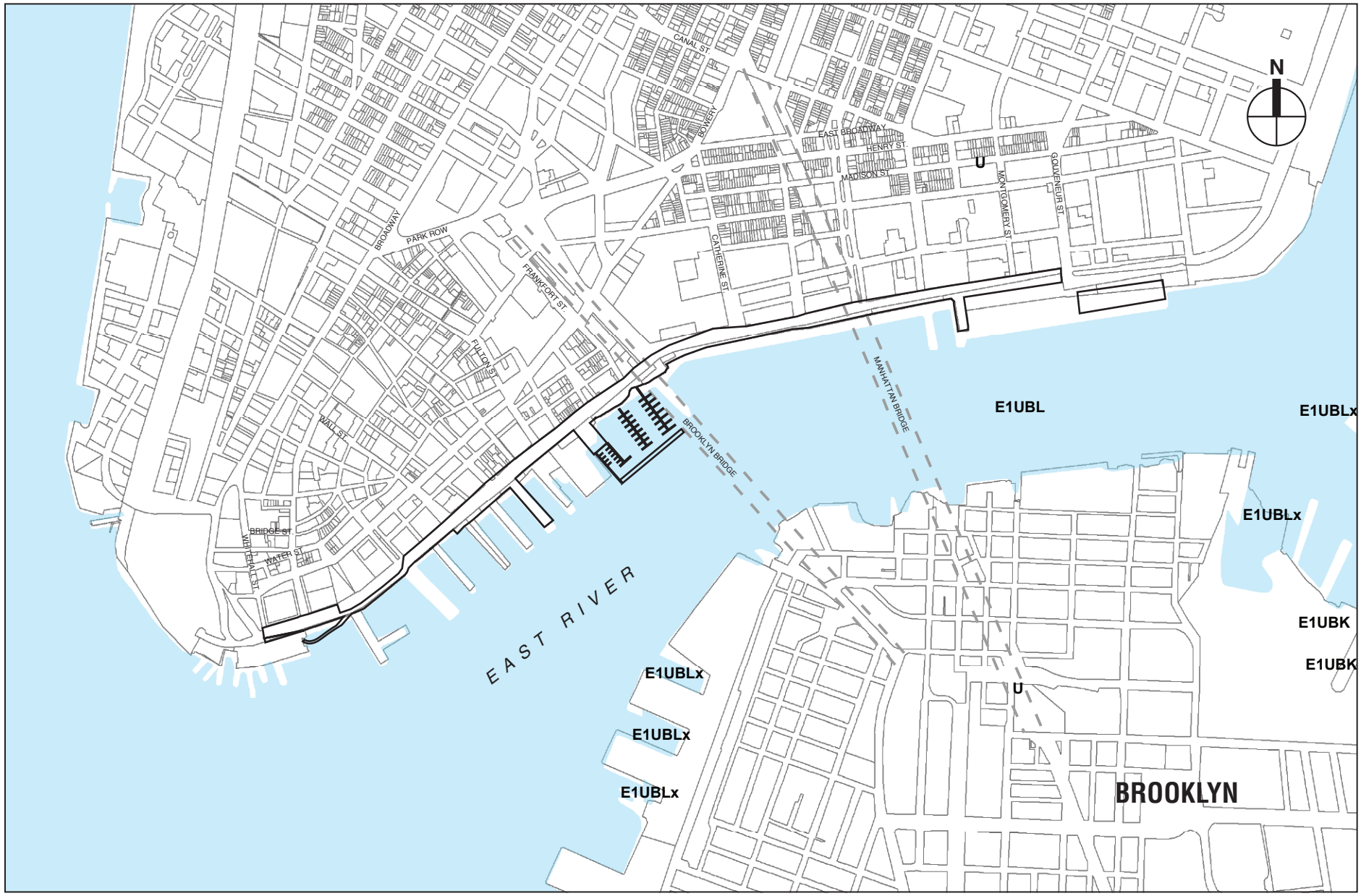
100-Year Floodplains

500-Year Floodplains

100-Year Floodplains

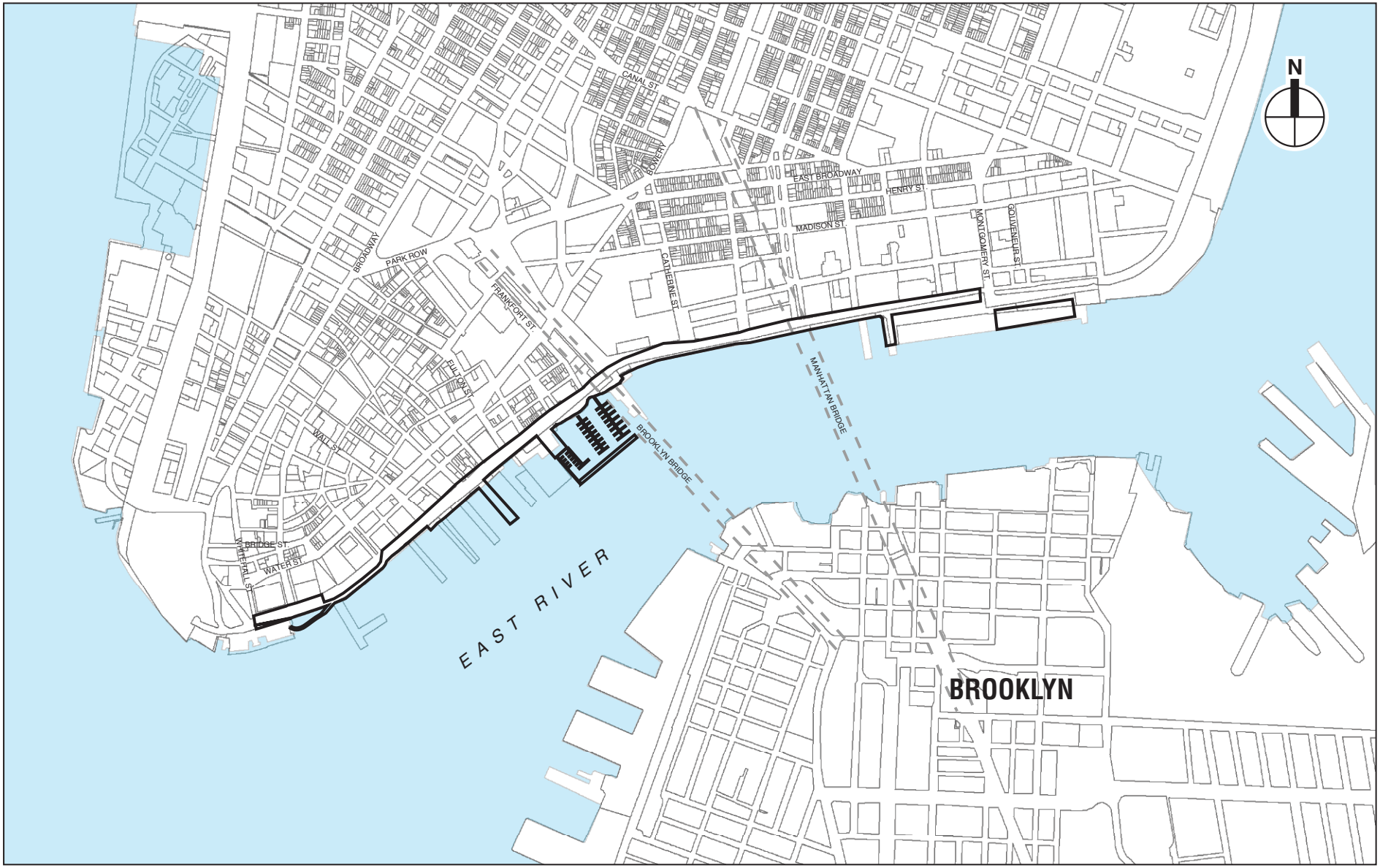
Figure 9-1

5.9.07



NWI Wetlands

Figure 9-2



NYSDEC Wetlands

Figure 9-3

Sawyer 1983). Maximum current velocity measurements have been reported by several investigators. In 1994 and 1995, Blumberg et al (1999) reported maximum velocities in the East River approaching 3.2 ft/sec at College Point, 6.0 ft/sec at Red Hook, and 1.6 ft/sec at the Battery. USACE reported velocities ranging from 2.0 to 7.9 ft/sec in the Lower East River (USACE 1998) and average maximum velocities of 4.7 and 2.9 ft/sec at the Brooklyn Bridge and Hunts Point, respectively.

As discussed above, recent hydrologic data collected within the project area agree closely with the velocities reported in literature. In general, current velocities measured within the project site during periods of maximum current velocity were lower in near shore regions (ca. 1–3 ft/sec) and increased to 6 ft/sec or more in the channel. The NOAA tide predictions for the Battery agreed closely with measured velocities and tide heights on the survey dates, and serve to validate the model.

Sources of freshwater flow to the East River include the Bronx River, Westchester Creek, Hudson River, CSOs, and wastewater point sources (e.g., Newtown Creek and Red Hook wastewater treatment facilities). There are over 100 CSO outfalls on the East River in the stretch from the Triborough Bridge to the Battery. Approximately 28 CSO outfalls are present on the stretch of river between the Williamsburg Bridge and the Battery (IEC 2002). Regional surface water run-off also contributes to freshwater input.

WATER QUALITY

Title 6 of the NYCRR Part 703 includes surface water standards for each Use Class of New York surface waters. The lower East River is Use Classification I. The best usages for Class I waters are as secondary contact recreation and fishing. Water quality should be suitable for fish propagation and survival. Water quality standards for fecal and total coliform, DO, and pH for Use Class I waters are as follows. (There are no New York State standards for chlorophyll *a* or water clarity.)

- Fecal coliform—Monthly geometric mean less than or equal to 2,000 colonies/100mL from 5 or more samples.
- Total coliform—The monthly geometric mean from a minimum of 5 examinations shall not exceed 10,000 colonies/100 milliliters (mL).
- Dissolved oxygen (DO)—Never less than 4 milligrams per liter (mg/L).
- pH—The normal range shall not be extended by more than 0.1 of a pH unit.

The City of New York has monitored New York Harbor water quality for over 90 years through the Harbor Survey. 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 2002). The Proposed Action is in the Inner Harbor Area, which includes the lower East River to the Battery.

Temperature and salinity influence several physical and biological processes within the Harbor and the lower East River. Temperature has an effect on the spatial and seasonal distribution of aquatic species and affects oxygen solubility, respiration, and other temperature-dependent water column and sediment biological and chemical processes. Salinity fluctuates in response to tides and freshwater discharges. Salinity and temperature largely determine water density and can affect vertical stratification of the water column. Salinity is also an important habitat variable as most aquatic species have salinity tolerances within particular ranges.

Average temperatures within the Upper Bay range from about 3.7 to 23.8°C (38.7 to 74.8°F) (USACE 1999a). Within the Upper New York Harbor, higher salinity bottom waters tend to be somewhat warmer than the less saline surface waters during the winters months, with the opposite being true during the summer. Temperatures in the lower East River measured near the project area during the 1995–2002 Harbor Survey ranged from approximately 1.8 to 25.5°C (35 to 77°F) (DEP 2003a).

Salinity varies spatially within the Harbor Estuary depending on the amount of freshwater flow. Within the New York-New Jersey Harbor Estuary system, average salinity values are highest in the Lower New York Harbor and Raritan Bay, and decrease moving up-estuary to the Upper New York Harbor, the Lower Hudson River, and the Lower East River. The Upper New York Harbor is partially stratified—higher salinity water originating from the Atlantic Ocean at the mouth of the estuary tends to remain near the bottom, while freshwater from the rivers draining to the estuary remain toward the surface. Average salinity differences throughout the water column in the harbor are generally between 1 and 3 parts per thousand (ppt) (USACE 1999a). However, the swift tidal currents and limited freshwater inflow result in vertical mixing that prohibits the formation of large salinity gradients in this part of the river.

Salinity measurements taken in the lower East River near the project area between 1995 and 2002 generally ranged from about 10 to 29 ppt, with bottom water salinity generally only slightly greater than surface water salinity. Periodic high freshwater flows in extremely wet years can occasionally create oligohaline conditions (salinity less than 5 ppt) for relatively short periods. Salinity data collected as part of the Westway study in the vicinity of the Williamsburg Bridge indicated mean salinities of 15.3 ppt in winter and 23.8 ppt in early spring (USACE 1984).

The results of recent Harbor Surveys (DEP 2001, 2002, 2003b) show that the water quality of New York Harbor has improved significantly since the 1970s as a result of measures undertaken by the City. 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 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).

Survey data from a Harbor Survey station close to the project area, mid-stream off of Pier 10 in Brooklyn, indicate that the water quality in this part of the lower East River is generally good. The following section provides a summary of the water quality conditions in the sampling region (Inner Harbor Area) of the Harbor Survey that includes the project area. Table 9-1 presents a summary of water quality measurements at the Brooklyn Pier 10 station in 2002.

Table 9-1
2002 DEP Water Quality Data for the Brooklyn Pier 10 Sampling Station

Parameter	Top Waters			Bottom Waters		
	Low	High	Avg	Low	High	Avg
Total Fecal Coliform (per 100 mL)	7.4	7.8	7.5	NM		
Dissolved Oxygen (mg/L)	4.4	14.0	8.5	4.3	10.8	6.0
Secchi Transparency (ft)	2.0	6.0	4.3	NM		
Chlorophyll *a* (µg/L)	0.8	8.5	3.0	NM		

Notes: NM = not measured; chlorophyll *a* measurements are for the East 23rd Street Station.
Source: DEP 2003a.

The presence of coliform bacteria in surface waters indicates potential health impacts from human or animal waste, and elevated levels of coliform can result in the closing of bathing beaches and shellfish beds. According to the 1999, 2000 and 2001 New York Harbor Water Quality Regional Summaries (DEP 2000, 2001, 2002), the waters of the Inner Harbor Area, which includes the lower East River, meet the fecal coliform standard for Use Class I waters at most sampling locations. Temporary increases in fecal coliform concentrations may occur during wet weather due to increased fecal coliform loadings 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). In 2002, fecal coliform concentrations near the project area were below 8 colonies/100mL. Further upstream at the East 23rd Street station, fecal coliform bacteria concentrations peaked as high as 830 colonies/100 mL, but generally remained below 200 colonies/100 ml (DEP 2003a).

DO in the water column is necessary for respiration by all aerobic forms of life, including fish, invertebrates such as crabs and clams, and zooplankton. The bacterial breakdown of high organic loads from various sources can deplete DO to low levels. Persistently low DO can degrade habitat and cause a variety of sublethal or, in extreme cases, lethal effects. Consequently, DO is one of the most universal indicators of overall water quality in aquatic systems. DO concentrations in the Inner Harbor Area have increased over the past 30 years from an average that was below 3 mg/L in 1970 to above 5 mg/L in 2001, a value fully supportive of ecological productivity (DEP 2002). In 2002, DO concentrations near the project area (Station E1) were above the 4 mg/L standard for Use Class I waters (DEP 2003a). All pH levels in the New York Harbor Area are in attainment.

High levels of nutrients can lead to excessive plant growth (a sign of eutrophication) and depletion of dissolved oxygen. 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. 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. Upgrades to the Newtown Creek treatment plant, which discharges to the East River upstream of the project area, are expected to be completed in 2007. In 2000, the last year for which there is chlorophyll *a* data for the Pier 10 station, the average concentration was 1.3 µg/L and never exceeded 20 µg/L. In 2002, concentrations at East 23rd Street averaged 3.0 µg/L and never exceeded 20 µg/L (DEP 2003a).

Secchi transparency is a measure of the clarity of surface waters. Transparency greater than 5 feet (1.5 meters) indicates relatively clear water. Decreased clarity can be caused by high suspended solid concentrations or blooms of plankton. Secchi transparencies less than 3 feet (0.9 meters) may be considered 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 (1 to 1.7 meters). Average Secchi transparency near the project area in 2002 was 4.3 feet (1.3 meters). Two of the 10 measurements taken in 2002 were less than 3 feet (0.9 meters), indicating that water quality in this area is periodically impaired by reduced water transparency (DEP 2003a).

DEC is leading a collaborative effort to reduce toxic chemicals in New York Harbor. This work is being done under the Contamination Assessment and Reduction Project (CARP). DEC developed a comprehensive, multi-media contaminant identification and trackdown program

simultaneously with New Jersey and the CARP Work Group (a group of government, academic, and consultant experts). The states together with the work group 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. 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).

Two CARP sampling areas are near the project area: Lower East River (LER) near the Navy Ship Yard, and at the outfall of the Red Hook Sewage Treatment Plant (RHSTP) just to the north of the project area. A trace organics platform sampler (TOPS) was used in 1998 and 1999 to sample the water column for trace organics (pesticides, dioxin, methyl mercury, PAHs) (Donlon et al. 1999). Samples from the LER sampling area exceeded the NYS water quality standards for benzo(b,k)fluoranthene and benzo(a)pyrene in 1998, but not in 1999 (Litten et al. 1999). Total PCBs were the only other trace contaminant reported in samples from the LER site (Litten and Fowler 1999). Samples from the RHSTP contained measurable concentrations of three pesticides (DDT, chlordane, and mirex), methyl mercury, and dissolved mercury (Litten and Fowler 1999, Litten et al. 1999).

SEDIMENT QUALITY

Upper New York Bay has a complex distribution of sediments in the area because of variable currents and a high degree of sediment input due to natural and human actions. USACE (1999a) reports that sediments in Upper New York Bay vary from coarse sands and gravels in high-energy (i.e. strong wave action or current) areas to fine-grained silts and clays in low-energy areas. The lower East River primarily has a hard, rock bottom consisting of gravel, cobble, rocks, and boulders covered with a shallow layer of sediment. The shallow sediment cover is affected by strong tidal currents in the river.

Typical of any urban watershed, New York Harbor Estuary sediments, including the lower East River, have been contaminated due to a history of industrial uses in the area. Contaminants found throughout the New York Harbor Estuary included pesticides such as chlordane and DDT, metals such as mercury and copper, and various polycyclic aromatic hydrocarbons. Adams et al. (1998) found the mean sediment contaminant concentration for 50 of 59 chemicals measured to be statistically higher in the Harbor Estuary than other coastal areas on the East Coast. Within the New York Harbor Estuary, Adams et al. (1998) ranked Newark Bay as the most degraded area on the basis of sediment chemistry, toxicity, and benthic community, followed by the Upper Harbor, Jamaica Bay, Lower Harbor, Western Long Island Sound and the New York Bight Apex. Biological effects, identified based upon the benthic invertebrate community, were found to be associated with the chemical contamination. While the sediments of the New York Harbor Estuary are contaminated, the levels of most sediment contaminants (e.g., dioxin, DDT, and mercury) have decreased on average by an order of magnitude over the past 30 years (Steinberg et al. 2002). Between 1993 and 1998 the percentage of sediment sampling locations with benthic macroinvertebrate communities considered impacted, or of degraded quality, decreased throughout the New York/New Jersey Harbor Estuary. Within the Upper Harbor, the percentage of benthic communities considered impacted decreased from 75 percent in 1993 to 48 percent in 1998 (Steinberg et al. 2004).

Sediments sampled in 2002 near Pier 6 on the Manhattan side of the East River (within the project area) contained elevated levels of PAHs, Aroclor 1248 (a commercial PCB mixture), and some heavy metals (AKRF 2002). Isomers of the pesticide DDT were not detected at this location. Some PAHs and three metals (lead, mercury, and silver) were present at concentrations that may pose a risk to aquatic organisms.

In August 1993, sediments were sampled in the East River/Upper Harbor across the river from the project area between Piers 8 and 9A in Brooklyn as part of the USEPA Regional Environmental Monitoring and Assessment Program (R-EMAP) (USEPA 2001). The sediments sampled at this location contained elevated levels of some heavy metals, PAHs, total PCBs, and isomers of the pesticide DDT (DDE and DDD). Two metals (lead and mercury) and a few PAHs were present at concentrations that would be likely to pose a risk to aquatic organisms such as benthic invertebrates.

AQUATIC BIOTA

The hydrodynamic and estuarine character of the East River, coupled with the numerous municipal and industrial discharges that have occurred in the river over many years, make this river a physically harsh environment; therefore, many of the species using the area must be tolerant of highly variable conditions.

Aquatic habitats within the project area include under-pier areas for Piers 6, 11, 13, 14, 16, 17, 35, 36, and 42, and the New Market Building pier, inter-pier areas from the BMB and Pier 17, and open water between the New Market Building pier and Pier 35.

Water depths in under-pier areas are shallower near the shoreline and deepen toward the pierhead line, ranging from approximately 6 feet or less (ca. 2 meters or less) MLW at the shoreline to approximately 44 feet (7.8 meters) MLW for the pierhead of Pier 16. Water depths in the interpier areas are also shallower near the shoreline and deepen toward the pierhead line, generally ranging from approximately 8 feet (2.6 meters) MLW to 40 feet (12.5 meters) MLW near the pierhead line. Water depths in the open water habitat between the two bridges range from less than one foot at the shoreline to approximately 35 feet approaching the channel. The only intertidal habitat present within the project area is associated with the existing beach beneath the Brooklyn Bridge.

The following sections provide a description of the aquatic biota found in the lower East River.

Primary Producers

Phytoplankton. Phytoplankton are microscopic plants whose movements within the system are largely governed by prevailing tides and currents. Light penetration, turbidity and nutrient concentrations are important factors in determining phytoplankton productivity and biomass. While nutrient concentrations in most areas of New York Harbor are very high, rapid light attenuation has often limited the occurrence of phytoplankton blooms. Because of the strong currents and high rate of tidal exchange, planktonic organisms found in western Long Island Sound, the lower Hudson River, and Upper New York Harbor would also be expected to occur in the East River.

A recent survey of phytoplankton conducted within the project area (South Street Seaport) and the lower Hudson River during the period 1996–2003 assessed the presence or absence of 29 taxa of phytoplankton along with various water quality parameters with respect to temporal distribution patterns (Levandowsky et al. 2004). While not a comprehensive survey of

phytoplankton species, the study allowed investigators to discern relationships between the presence or absence of any of the 29 taxa evaluated and water quality parameters such as temperature and salinity. Weekly plankton samples were collected with a 10-micron mesh from the upper meter of the water column. Using correspondence analysis (CCA), the study demonstrated that the lower Hudson River phytoplankton community is generally more structured (i.e., phytoplankton monitored exhibited consistent temporal and spatial distribution, possibly due to the stratified nature of the Hudson River) when compared with the phytoplankton community of the East River which was more variable with respect to time and location (possibly due to the well-mixed nature of the East River).

In other surveys focusing on the East River, investigators collected 77 phytoplankton genera, several of which were represented by a number of different species. Diatoms are generally the most widely represented class of phytoplankton, accounting for over 90 percent of the different taxa collected in one 1983 survey; the green alga *Nannochloris* was the most abundant single taxa identified in this area (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 *Nannochloris 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, and species move quickly through the system. 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 the sound and New York Harbor than by localized water quality conditions (Con Edison 1982).

Submerged Aquatic Vegetation and Benthic Marine Algae.

Submerged aquatic vegetation (SAV) are vascular 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 algae that are important primary producers in the aquatic environment. They are often observed attached to 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 factors in determining SAV and benthic algae productivity and biomass.

None of the studies reviewed as part of this assessment reported the presence of SAV in the lower East River. The extensively developed shoreline, swift currents, and steeply sloped engineered shorelines severely limit potential inhabitation of this area by SAV.

Common macro-algae known to occur within the East River include the Phaeophyte species *Fucus vesiculosus* and the Chlorophyte species *Ulva lactuca*, and *Enteromorpha* species (Perlmutter 1971). These species have a particular affinity for hard substrates within the photic zone, and are frequent colonists of pilings, rocks, bulkheads, and other structures.

Zooplankton

Zooplankton is an integral component of aquatic food webs. Zooplankters typically are the principal grazers on phytoplankton and detritus material, and are themselves consumed by organisms at higher trophic levels. The higher level consumers of zooplankton generally include forage fish, such as bay anchovy (*Anchoa mitchilli*), as well as commercially and recreationally important species, such as striped bass (*Morone saxatilis*) and white perch (*M. americana*)

during their early life stages. Predacious zooplankton species can consume eggs and larvae, and 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*, with each species being prevalent in certain seasons (Stepien et al. 1981, Lonsdale and Cosper 1994, Perlmutter 1971, Lauer 1971, Hazen and Sawyer 1983). The data suggest that the copepods collected in the East River are extensions of populations present in Long Island Sound and New York Harbor.

Benthic Invertebrates

Invertebrate organisms that inhabit river bottom sediments and the surfaces of submerged objects (such as rocks, pilings, or debris) are commonly referred to as benthic invertebrates. These organisms are important to an ecosystem's energy flow because they convert detrital and suspended organic material into living tissue; moreover, they are also integral components of the diets of ecologically and commercially important fish and waterfowl species. Benthic invertebrates are also essential in promoting the exchange of nutrients between the sediment and water column. Benthic invertebrates include those specimens that can be retained on a 0.5 mm screen (defined as macroinvertebrates) as well as smaller forms, such as nematodes (a class of roundworm) and harpacticoid copepods (order of copepods that are primarily benthic), collectively called meiofauna. Some of these animals live on top of the substratum (epifauna) and some within the substratum (infauna). Substrate type (rocks, pilings, sediment grain size, etc.), salinity, and DO levels are important factors influencing benthic invertebrate communities; other factors include currents, reproductive success, larval distribution, wave action, predation, succession, and disturbance.

Over 100 benthic invertebrate taxa (mostly crustaceans or polychaete worms) have been identified in the East River (Coastal Environmental Services 1987). Within the portion of the Harbor Estuary comprising the Hudson River, East River and Upper New York Harbor, common infaunal macroinvertebrates include oligochaete worms, polychaetes, gastropod and bivalve mollusks, barnacles, cumaceans, amphipods, isopods, crabs, and shrimp. Epifauna include hydrozoans, sea anemones, flatworms, oligochaete worms, polychaetes, bivalves, barnacles, gammaridean and caprellid amphipods, isopods, tunicates, hermit crabs, rock crabs, grass shrimp, sand shrimp, blue crabs, mud dog whelks, mud crabs, horseshoe crabs, blue mussels, soft-shell clams, and nudibranchs (EA Engineering, Science, and Technology 1990, Able et al. 1995, New York City Department of Parks and Recreation (DPR) 1994, PBS&J 1998).

Two separate but intermingled benthic invertebrate subcommunities have been identified in the East River on the basis of sediment 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. Other species of polychaetes and amphipods also occur on the hard bottom surfaces, and several species utilize the East River's hard bottoms and rapid currents by colonizing the abandoned tubes or shells 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, lower velocity areas near piers and pilings. Common soft substrate organisms include oligochaete worms, the soft-shelled clam *Mya arenaria*, and a variety of flatworms, nemerteans, polychaetes, and crustaceans (Hazen and Sawyer 1985).

A benthic macroinvertebrate sampling program conducted in July 2002 between Piers 6 and 9 on the Manhattan shoreline of the East River (within the project area) also found large numbers of pollution-tolerant benthic invertebrate (primarily polychaetes in the families Capitellidae and Spionidae) (AKRF 2002). However, pollution-sensitive benthic invertebrate species (e.g., *Ampelisca* sp.) were also collected at this location. Five pollution-sensitive species were collected: a snail, an amphipod, two polychaetes, and a clam. Other invertebrates collected were mussels, crabs, shrimp, isopods, nematodes, and several species of polychaete. Analysis of benthic macroinvertebrate sampling data conducted in 1993-1994 across the East River from the project area between Brooklyn's Piers 8 and 9A suggested that the benthic community was highly impacted, consisting primarily of pollution-tolerant organisms (Adams et al. 1998).

Benthic macroinvertebrate sampling conducted between Brooklyn Piers 1 and 2 in 1986-1987 identified a total of 22 taxa (EEA 1989). Abundance was highest in late summer (27,907 individuals per square meter) and lowest in the spring (847 individuals per square meter) when water dissolved oxygen levels were relatively low. The high summer abundance can be attributed almost entirely to a single species, *Streblospio benedicti*, a pollution-tolerant oligochaete.

Benthic macroinvertebrates collected by USACE (1999b) at interpier locations within the Bush Terminal on the Brooklyn waterfront near the project area found benthic macroinvertebrates to be similar between interpier areas and navigation channels of the New York-New Jersey Harbor Estuary. The dominant species collected were similar to those reported in other studies within the Harbor Estuary. Samples collected in November and February were dominated by a few species of polychaete worms, primarily *Streblospio benedicti* followed by *Nereis* spp, and members of the family Paraonidae. Oligochaetes and the bivalve *Lacuna vincta* were also present. By May, mollusks became the dominant group, comprising primarily *Mulinia lateralis*. Sea grapes (*Molgula manhattensis*) and little surf clam (*Mulinia lateralis*) dominated the samples collected in August, followed by oligochaetes and the polychaete worms *Leitoscoloplos fragilis* and *Tellina* species. Crabs collected in the interpier areas were similar to those collected in the navigation channel, although horseshoe crab (*Limulus polyphemus*) and mud crab (*Panopeus* spp.) were collected more frequently in the interpier areas than the channels, fiddler crab were only collected at the interpier stations, and rock crab and green crab were generally less abundant in the interpier areas than the navigation channels.

Fish

New York City is located at the confluence of several major river and estuarine systems, all of which discharge to the New York Bight of the Atlantic Ocean. This convergence has resulted in a mixture of habitats in the East River that supports marine fish, estuarine fish, anadromous fish (fish that migrate up rivers from the sea to breed in freshwater), and catadromous fish (fish that live in freshwater but migrate to marine waters to breed). Table 9-2 lists fish that may be seasonally abundant in the East River.

Despite the relatively low value of the East River as residential fish habitat, the waterway serves as a major migratory route from the Hudson River to the Long Island Sound. Harsh conditions within the lower East River, including its swift currents, lack of shoals and protected habitat, and reduced water quality partly explain why the East River experiences only limited utilization by fish at various times of the year. The swift currents act to scour the river bottom and prevent accumulation of sediment. Consequently, the benthic community in deeper channel areas is characterized by attached rather than infaunal species. During the summer months, diminished water quality—particularly low levels of dissolved oxygen—can also limit fish presence (PAS

1985). In addition, many species encountered in the East River are only seasonably abundant due to their natural migratory patterns or life history strategies.

Table 9-2
List of Fish Species Common in the East River

Common Name	Scientific Name
Alewife	*Alosa pseudoharengus*
American eel	*Anguilla rostrata*
American shad	*Alosa sapidissima*
Atlantic herring	*Clupea harengus*
Atlantic silverside	*Menidia menidia*
Atlantic tomcod	*Microgadus tomcod*
Bay anchovy	*Anchoa mitchilli*
Bluefish	*Pomatomus saltatrix*
Butterfish	*Peprilus triacanthus*
Mummichog	*Fundulus heteroclitus*
Northern searobin	*Prionotus carolinus*
Scup	*Stenotomus chrysops*
Striped bass	*Morone saxatilis*
Summer flounder	*Paralichthys dentatus*
White perch	*Morone americana*
Winter flounder	*Pseudopleuronectes americanus*
Sources: Woodhead 1990; EEA 1988; EA Engineering, Science & Technology 1990; LMS 1994, 1999, 2002, 2003a, 2003b; Able et al. 1995.	

The following narratives provide a description of the general East River fish community, followed by a description of the fish community known or expected to occur in the interpier and open water habitats that occur within the project area.

Marine Species. Winter flounder, scup, and bluefish are marine species present in the East River. Winter flounder is an important commercial and recreational fish species that prefers cold water. Adults have a short migration pattern, moving offshore a short distance in spring and returning to shallow inshore or estuarine waters in late fall (Bigelow and Schroeder 1953). Winter flounder spawn in the lower estuary during winter and early spring and prefer sandy bottoms in shallow water where freshwater from the estuary dilutes salinities to slightly below full ocean concentration (Pereira et al. 1999). Capture of adult-size winter flounder during the winter months in the lower East River indicates possible spawning activity (PAS 1985); however, winter flounder are most likely utilizing the lower East River as residents during the winter months. Winter flounder have a varied diet of small invertebrates and fish fry (Grimes et al. 1989).

Scup, or porgy, is a marine species that migrates inshore during late spring. It tends to remain close to the coast during the summer months before moving offshore during the fall to deeper waters. Scup are bottom feeders that spawn from May through August (Bigelow and Schroeder 1953).

Bluefish were reported as an abundant species captured in the East River during the USACE Westway Study. Bluefish is a pelagic species whose young migrate into estuaries and harbors along the coast during late spring or early summer. The major spawning grounds of the bluefish are located on the outer continental shelf, and the resulting young move inshore in the late summer to forage (Bigelow and Schroeder 1953). Incidence of young bluefish in the East River is related to this migration pattern (PAS 1985).

Estuarine Species. Species that have been found in abundance within the East River are the resident fish bay anchovy, Atlantic silverside, striped and common killifish/mummichog (*Fundulus majalis* and *Fundulus heteroclitus*, respectively), and white perch. These species are important as forage species for larger predator fish and are commonly used as bait by fishermen. White perch is a popular estuarine panfish.

Bay anchovy are found in salinities ranging from fresh to seawater. This species is common in its range and may be the most abundant species in the western north Atlantic (McHugh 1967 in Vougilitois et al. 1987). Bay anchovy use the Harbor Estuary extensively for spawning, embryonic development, and hatching. Spawning in the New York Bight occurs from about May through September, and females spawn many times per year (Houde and Zastrow 1991). The yolk sac stage typically lasts less than one day. The peak abundance of post-yolk sac larvae bay anchovy is in June and July. Juveniles occur from mid-August through October. Trawl data indicate that north of Delaware Bay, bay anchovy move out of estuaries and southward during the fall and are virtually absent from the inshore continental shelf of New York during the winter months (ASA 2001).

Atlantic silversides are small fish that school in shallow water and are permanent residents of the estuary. They spawn in May through early July and mature in one year. Atlantic silversides are omnivorous and feed chiefly on copepods, mysids, shrimp, amphipods, cladocerans, fish eggs, young squid, annelid worms, and mollusk larvae (Bigelow and Schroeder 1953).

Common killifish spawn primarily in fresh or brackish water, usually from spring to late summer or early autumn. Adults generally mature during their second year. Striped killifish spawn in shallow water close to shore from June through August, and again mature in their second year. Both species feed primarily on crustaceans and polychaetes (Abraham 1985).

White perch is an additional estuarine species that has been found in the East River. Adult white perch migrate to shallow fresh and slightly brackish water in the spring and early summer to spawn, after which they return to the lower estuary. The demersal eggs hatch in 3 to 5 days, and after approximately one month they begin to look like small adults. The juveniles inhabit creeks and inshore areas until they are about a year old (Heimbuch et al. 1994). Small white perch primarily eat invertebrates. Larger white perch in salt and brackish water eat small fish fry, crabs, shrimp, and other invertebrates. White perch of more than 200 mm in length eat mostly fish (Stanley and Danie 1983).

Anadromous Species. Anadromous species that use the East River include striped bass, tomcod, and members of the herring family. Striped bass use the East River for migration from fall through spring (PAS 1985). Mature striped bass return from marine waters to fresh water to spawn before migrating back to salt waters. The young then use the brackish waters as nursery and wintering area. Juvenile striped bass migrate to marine waters when nearing maturity. The majority of adults then spend much of their time in coastal, bay, and river mouth waters before returning to spawn in the spring each year (Bigelow and Schroeder 1953). Juvenile striped bass eat a variety of invertebrates, and adults eat a variety of fish and may also eat shrimp. Young-of-the-year and older striped bass have been shown to overwinter in large numbers in the lower Hudson River estuary. They feed primarily on invertebrates; as they grow, striped bass feed primarily on fish (Fay et al. 1983).

Tomcod is an inshore species of cod that is distributed from southern Labrador to Virginia along the Atlantic Coast. Adults may spawn in marine waters but are typically anadromous and migrate into rivers and estuaries during late fall and winter to spawn. In New York waters, the

adult tomcod move out from shore to cooler waters in the spring. These fish feed mainly on small crustaceans (Bigelow and Schroeder 1953).

Two of the common anadromous species are members of the herring family—alewife and American shad. These species live in the ocean as adults and move into estuaries in spring on their spawning migrations. Both spawn in freshwater. Juveniles migrate from the estuaries in their first year primarily in the fall. These species primarily eat small planktonic crustaceans and other invertebrates (Bigelow and Schroeder 1953).

Catadromous Species. The single catadromous species common to the East River is American eel. Eels spawn in the Atlantic Ocean and the young move into the estuary as elvers in the spring, typically in February and March (Fahay 1978). American eels are opportunistic feeders, and juveniles eat crustaceans, polychaetes, bivalves, and fish. They grow slowly and at sexual maturity move down the estuary in the fall and out to sea (Bigelow and Schroeder 1953).

Interpier/Shoal Fish Community. Fish sampling was conducted across the river from the project area between Piers 1 and 2 in Brooklyn in 1986 and 1987 (EEA 1989). Sampling was conducted twice per month for one year using a 30-foot otter trawl. The most abundant species collected was alewife, followed by striped bass and winter flounder. Other species collected included: Atlantic silverside, summer flounder, Atlantic herring, Atlantic tomcod, white perch, northern searobin, butterfish, and bluefish.

USACE conducted a sampling program at two New York Harbor berthing areas and marine terminals from October 1998 through September 1999, to obtain information on the relative distribution and seasonal use of these areas by demersal fish (collected with bottom trawl) and benthic macroinvertebrates. Two representative areas were selected for sampling, a New Jersey site, and the Bush Terminal, called the South Brooklyn Site. The South Brooklyn Site was considered characteristic of the Red Hook and Brooklyn Marine Terminals located along the Brooklyn waterfront across the East River from the project area. Depths at the locations sampled are comparable to those in the project area with nominal depths at the interpier locations ranging from 24 to 29 feet. The channel station had a nominal depth of 41 feet (USACE 1999a). While these samples were collected at an active marine terminal, the habitat would be expected to be similar to that present in the interpier areas within the project area.

Winter flounder was the dominant species collected by USACE at the interpier stations during the late fall and early winter, in contrast to the dominance by bay anchovy and weakfish in sampling conducted within navigation channels during this same period. Other abundant species in the interpier area included black sea bass, bay anchovy, and striped bass. Striped bass accounted for over 60 percent of the fish collected in the interpier locations in November but were absent from samples collected in the approach channel. Most of the individuals collected were within the size range for young-of-the-year, which are known to overwinter in the lower Hudson River Estuary.

From December through March the number of individuals collected by USACE in the interpier locations appeared to decrease, with winter flounder and Atlantic silverside being the most abundant species. The number of individuals collected increased again in April and May, with large catches of striped bass and anadromous herring (alewife and blueback herring [*Alosa aestivalis*]). Striped bass and weakfish were the dominant species collected in July. Bay anchovy were found from early summer through September, and were the dominant species collected in August and September. Other species collected in large numbers in the interpier areas in August and September included Atlantic silverside, alewife, scup, and butterfish (USACE 1999b). Subsequent sampling conducted by USACE to assess winter flounder distribution in the Harbor

Estuary during the spawning period found adult winter flounder in the Upper Bay areas to be more common in navigation channel habitat from December through April, with a shift toward higher abundance in shallow/shoal areas in May and June. Winter flounder spawning appeared to be most prevalent in the Lower Bay in areas of coarse (gravel/sand) substrate. Fine sediment substrates are more common in the Upper Bay and are more characteristic of low energy or low velocity areas that may not promote sufficient aeration of demersal eggs (those attached to the bottom), such as those produced by winter flounder. Winter flounder juveniles, on the other hand, were more prevalent in the Upper Bay and Arthur Kill/Newark Bay areas, away from the apparent spawning areas (LMS 2003a and b).

Ichthyoplankton abundance and species composition of samples collected by USACE in the interpier areas followed a seasonal pattern and was similar to that observed in samples collected in navigational channels in the New York-New Jersey Harbor Estuary. Post-yolk sac larvae of Atlantic herring, American sand lance, and winter flounder were collected in February. Eggs began to appear in March, comprising fourbeard rockling (*Enchelyopus cimbrius*), winter flounder, and sculpins. Winter flounder eggs peaked in April, when Atlantic menhaden eggs were also collected. Weakfish and tautog (*Tautoga onitis*) eggs became abundant in May and June. Post yolk-sac larvae were most abundant in May and June, dominated by Atlantic menhaden, windowpane flounder, and bay anchovy. Overall, weakfish was the most abundant species collected, followed by tautog, Atlantic menhaden, bay anchovy, fourspot flounder (*Paralichthys oblongus*), hogchoker (*Trinectes maculatus*), and winter flounder. Eggs were the dominant life stage collected and abundance was greatest in May and June (USACE 1999b).

ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES

Requests for information on rare, threatened or endangered species within the immediate vicinity of the project site were submitted to USFWS (NY office), NMFS, and the DEC NYNHP. No records of rare, threatened or endangered species or sensitive habitats were reported by the USFWS (Sinkevich 2006). The NYNHP records indicate that the peregrine falcon (Falco pereginus - New York State endangered) has nested near the project site within the last 10 years (Seoane 2006). Peregrines nest on ledges and small shallow caves on high cliff walls, man-made platforms, or in urban areas on bridges and tall buildings. In the New York City area, courtship occurs in February and March with egg laying in April and May. They typically return to the same nest every year. However, records for the locations in and near the project site do not indicate that these birds nest there every year. Since 1995, three peregrine falcon nesting locations have been reported within 500 to 1,000 feet of the project site (Seoane 2006).

The NMFS indicated that the federally listed and state-listed endangered shortnose sturgeon (Acipenser brevirostrum) and four species of marine turtle (loggerhead, green, Kemp's ridley, and leatherback) may be present in the project area as seasonal transients (Colligan 2006). Shortnose sturgeon is an anadromous bottom-feeding fish that can be found throughout the Hudson River system but spawns, develops, and overwinters well north of the project area in the Hudson River. All life stages prefer colder, deeper waters. The Hudson River below Tappan Zee is not considered optimal shortnose sturgeon habitat (Bain 2004), and sturgeon would be expected to occur rarely south of the southern tip of Manhattan (Bain 1997). Therefore, individuals are only expected to use the Upper Harbor and East River when traveling to or from the upriver spawning, nursery and overwintering areas in the Hudson River. Hudson River shortnose sturgeon would not be expected to migrate from the Harbor Estuary through the East River to Long Island Sound because this species generally only uses marine waters associated with the estuary of the river in which it spawns (Bain 1997), in this case the Hudson River. Fish

that may pass through the lower East River would be expected to use the deeper channel areas as opposed to the near-shore areas in the project area.

The Hudson River shortnose sturgeon population was recently estimated to contain approximately 61,000 fish (Peterson and Bain 2002). These studies show that the population has increased approximately 450 percent since the 1970s. Size and body condition of the fish caught in these studies indicate the population is primarily healthy, long-lived adults. Although larvae can be found in brackish areas of the river, the juveniles (fish ranging from 2 to 8 years old) are predominately confined to freshwater reaches. The primary summer habitat for shortnose sturgeon in the middle section of the Hudson River Estuary is the deep river channel (13 to 42 meters deep, 43 to 138 feet) (Peterson and Bain 2002).

Four species of marine turtles, all state and federally listed, can occur in New York Harbor. Juvenile Kemps ridley (*Lepidochelys kempii*) and large loggerhead (*Caretta caretta*) turtles regularly enter the New York Harbor and bays in the summer and fall. The other two species, green sea turtle (*Chelonia mydas*) and leatherback sea turtle (*Dermochelys coriacea*), are usually restricted to the higher salinity areas of the Harbor (USFWS 1997). However, these four turtle species mostly inhabit Long Island Sound and Peconic and Southern Bays. They neither nest in the New York Harbor Estuary, nor reside there year-round (Morreale and Standora 1995). Turtles leaving Long Island Sound for the winter usually do so by heading east to the Atlantic Ocean before turning south (Standora et al. 1990). It is unlikely that these turtle species would occur in the project area in the lower East River except as occasional transients.

ESSENTIAL FISH HABITAT

The project area on the East River is within a portion of the Hudson River Estuary EFH that is situated in the NOAA/NMFS 10' x 10' square with coordinates (North) 40°50.0' N, (East) 74°00.0' W, (South) 40°40.0' N, (West) 74°10.0' W, which includes Atlantic Ocean waters within the square affecting the following: the Hudson River and Bay from Guttenberg, NJ, south to Jersey City, NJ, including the Global Marine Terminal and the Military Ocean Terminal, Bayonne, NJ, Hoboken, NJ, Weehawken, NJ, Union City, NJ, Ellis Island, Liberty Island, Governors Island, the tip of Red Hook Pt. on the west tip of Brooklyn, NY, and Newark Bay. The area of the East River containing the East River Esplanade and Pier project area has been identified as EFH for 18 species of fish. Table 9-3 lists the species and life stages of fish identified as having EFH in the East River.

Table 9-3
Essential Fish Habitat Designated Species for the East River

Species	Eggs	Larvae	Juveniles	Adults
Red hake (*Urophycis chuss*)		X	X	X
Winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X
Windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
Atlantic herring (*Clupea harengus*)		X	X	X
Bluefish (*Pomatomus saltatrix*)			X	X
Atlantic butterfish (*Peprilus triacanthus*)		X	X	X
Atlantic mackerel (*Scomber scombrus*)			X	X
Summer flounder (*Paralicthys dentatus*)		X	X	X
Scup (*Stenotomus chrysops*)	X	X	X	X
Black sea bass (*Centropristus striata*)	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
Clearnose skate (*Raja eglanteria*)			X	X
Little skate (*Leucoraja erinacea*)			X	X
Winter skate (*Leucoraja ocellata*)			X	X
Sand tiger shark (*Odontaspis taurus*)		X[(1)]		
Sandbar shark (*Charcharinus plumbeus*)		X[(1)]		X

Notes: [(1)] Neither of these species have a free-swimming larval stage; rather they are live bearers that give birth to fully formed juveniles. For the purposes of this table, "larvae" for sand tiger and sandbar sharks refers to neonates and early juveniles.
Source: National Marine Fisheries Service. "Summary of Essential Fish Habitat (EFH) Designation" posted on the internet at http://www.nero.noaa.gov/ro/STATES4/new_jersey/40407400.html.

TERRESTRIAL RESOURCES

From a natural resources perspective, the majority of the proposed East River Esplanade and Piers project site is located within disturbed, urban areas where either no vegetation exists, ornamental vegetation (e.g., contained plantings) exist in limited areas, or sparsely distributed but highly invasive species exist. This is particularly true for areas of the project located under the elevated portions of the FDR Drive. Most of the project site is completely dominated by paved or otherwise impervious surface. As a result, plants and terrestrial and avian wildlife present in and in the vicinity of the project site is generally limited to species tolerant of urban conditions and human activity. In addition, a few landscaped and/or planted areas are present near the Brooklyn Bridge. Edinger et al. describe such communities occupying highly urbanized areas as Urban Structure Exterior communities (Edinger et al. 2002). Dominant plants may include terrestrial algae, lichens and mosses, as well as colonizing vascular plants capable of exploiting cracks and intertices in available structure.

The bulkheaded shorelines and piers would be expected to provide resting and perching habitats for waterfowl and shorebirds. The beach area under the Brooklyn Bridge would also be expected to provide resting and feeding habitat for waterfowl and shorebirds. Waterfowl known to occur along the East River during the spring and fall migratory periods include American black duck (*Anas rubripes*), American widgeon (*Anas americana*), bufflehead (*Bucephala albeola*), canvasback (*Aythya valisineria*), greater scaup (*Aythya marila*), green-winged teal (*Anas carolinensis*), hooded merganser (*Lophodytes cucullatus*), lesser scaup (*Aythya affinis*), mallard

(*Anas platyrhynchos*), northern shoveler (*Anas clypeata*), red-breasted merganser (*Mergus serrator*), and ruddy duck (*Oxyura jamaicensis*) (NOAA 2001). Wading birds such as herons and egrets, and shorebirds such as sandpipers and gulls, might be expected to occur in the existing cove area. Peregrine falcons have been recorded nesting near the project site within the last 10 years. Structural elements of the FDR Drive overpass may provide nesting and perching opportunities for passerine bird species such as chimney swifts (*Chaetura pelagica),* pigeons (most commonly the feral rock dove, or *Columba livia*), mourning doves (*Zenaida macroura*), and other species known for their propensity to inhabit heavily urbanized areas. Mammalian wildlife within the project site is also expected to be limited to species tolerant of urbanized areas, such as mice (*Mus musculus*) and other small rodents.

E. THE FUTURE WITHOUT THE PROPOSED ACTION

PROJECT SITE

Absent the Proposed Action, there would be no changes or improvements on the project site. It is assumed that without approval of the Proposed Action the current mix of commercial and parking uses, public space, vacant piers and structures, and natural resources would remain unchanged from the existing condition

OUTSIDE THE PROJECT SITE

As described in Chapter 2, "Methodology," and Chapter 3, "Land Use, Zoning, and Public Policy," there are a number of independent projects that would be developed near the project site by or before 2009 without the Proposed Action. These projects include the following:

- Creation of Basketball City (courts, workout room, locker rooms, offices, parking area and outdoor court) on a portion of Pier 36;
- Adaptive reuse of the BMB;
- Removal of Piers 13 and 14 as part of other planning initiatives;
- Improvements to Peck, Catherine, Rutgers and Montgomery Slips; and
- Reconstruction of South Ferry Terminal in Peter Minuit Plaza.

In general, these projects would result in changes to currently fully developed portions of the study area and would not be expected to result in significant adverse impacts on natural resources. Any landscaping installed in association with these independent projects would also have the potential to benefit natural resources by increasing the diversity of wildlife habitat present within the area surrounding the project site.

In addition to the aforementioned land development projects, there are proposed and ongoing projects aimed at improving water quality and aquatic resources in the New York/New Jersey Harbor Estuary, which have the potential to result in water quality and aquatic habitat improvements in the Upper Harbor and East River in the vicinity of the project area. These projects are independent of the Proposed Action. Improvements that result from these projects would occur without the Proposed Action, and are expected to continue through the construction and operation of the East River Esplanade and Piers. The following sections summarize these ongoing water quality and aquatic habitat improvement projects.

NY/NJ HEP PROJECTS

Several of the future water quality improvement efforts in the Lower Hudson River Estuary would be coordinated by the New York/New Jersey Harbor Estuary Program (HEP). The Final Comprehensive Conservation and Management Plan (CCMP) for the HEP (NY/NJ HEP 1996) included a number of goals to improve water quality and aquatic resources in the area. The CCMP outlines objectives for the management of toxic contamination, dredged material, pathogenic contamination, floatable debris, nutrients and organic enrichment, and rainfall-induced discharges. The HEP Habitat Workgroup has developed watershed-based priorities for identifying acquisition, protection, and restoration sites for the preservation and enhancement of tidal wetlands that would provide improved habitat for fish and macroinvertebrates as well as the birds, mammals, and reptiles that depend on these habitats. No NY/NJ HEP Acquisition and Restoration Sites have been identified in the vicinity of the project area. NY/NJ HEP Acquisition and Restoration Sites in closest proximity to the Upper Bay are listed below. NY/NJ HEP actions taken with respect to these sites would occur with or without the Proposed Action.

- *Liberty State Park*—Located in the Upper New York Bay, it has been identified for restoration, including permanent protection of natural areas, enhancement of emergent habitat, and restoration of oyster beds.
- *Bush Terminal*—Located in Upper New York Bay on the Brooklyn shoreline, it was chosen as a priority restoration site for salt marsh restoration.

The Contamination Assessment and Reduction Project (CARP), sponsored by the Port Authority of New York and New Jersey (PANYNJ), is a component of HEP focused on understanding the fate and transport of contaminants discharged to the estuary, and using this information to develop measures that may be necessary to reduce sediment contamination. The principal chemicals of concern include dioxins/furans, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), metals (mercury, cadmium, and lead), and pesticides (dieldrin and chlordane). Continued research and monitoring programs are anticipated to play a role in the development of future management strategies for Harbor sediments (NY/NJ HEP undated, USACE 1999a).

STATE AND REGIONAL PROJECTS

The Hudson-Raritan Estuary Ecosystem Restoration Project is a cooperative project being led by USACE that was funded by a House of Representatives Resolution on 15 April 1999. PANYNJ is a co-sponsor of this project. Other agencies involved in this project include EPA, USFWS, NOAA, National Resource Conservation Service, New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Transportation (Office of Maritime Resources), DEC, NYSDOS, DEP, DPR, and New Jersey Meadowlands Commission. The focus of the study is to identify the actions needed to restore the Hudson-Raritan Estuary and develop a plan for their implementation. The study area for the program includes all the waters of the New York and New Jersey Harbor and the tidally influenced portions of all rivers and streams that empty into the Harbor and ecologically influence the Harbor. The program would identify measures and plans to restore natural areas within the estuary and enhance their ecological value, and address habitat fragmentation and past restoration and mitigation efforts that were piecemeal in nature. Thirteen initial representative restoration sites in New York and New Jersey have been targeted as the first sites for inclusion as potential restoration projects for feasibility level analysis. It is anticipated that expedited restoration of these representative restoration sites would provide substantial immediate value to the ecosystem. None of these sites occur in the vicinity of

the project area. Therefore, actions taken by the Hudson-Raritan Estuary Ecosystem Restoration Project with respect to these sites would occur with or without the Proposed Action.

The sites in closest proximity to the Upper Bay and the project area include:

- Newtown Creek (a tributary to the lower East River); and
- Liberty State Park (on western Upper New York Bay).

In addition to the 13 representative sites, three spin-off sites have been identified. These are restoration sites being evaluated parallel to the representative sites. They include the Lower Passaic River and Hackensack Meadowlands in New Jersey, and Gowanus Canal in New York (a tributary to the Upper New York Bay). Another potential restoration site identified by the Hudson-Raritan Estuary Ecosystem Restoration Project is the cove located between the Brooklyn and Manhattan Bridges on the Brooklyn shoreline of the East River.

The Comprehensive Port Improvement Plan (CPIP), sponsored by PANYNJ, is a multi-agency plan for implementing economic development and environment improvement decisions for the Port of New York and New Jersey. Among the priority objectives for the CPIP are the identification and protection of significant habitats, the investigation of innovative best management practices for reduction of non-point sources of water pollutants, and the incorporation of green technologies in port improvement projects.

DEC and NJDEP, in coordination with the Interstate Environmental Commission (IEC), would continue to develop total maximum daily loads (TMDLs) and to identify priority waterbodies in bi-annual 305(b) reports to EPA. TMDLs, once implemented, would reduce the daily inputs of various contaminants in an effort to improve water quality. New York State provided $255 million to implement wastewater improvements, nonpoint source abatement and aquatic habitat restoration projects in 1998. The State intends to continue water quality improvement projects in the Harbor for the foreseeable future.

NEW YORK CITY PROJECTS

EPA's National CSO Strategy of 1989 requires states to eliminate dry weather overflows of sewers, meet federal and state water quality standards for wastewater discharges, and minimize impacts on water quality, plant and animal life, and human health. CSOs are the largest single source of pollutants and pathogens to the New York Harbor Estuary. DEP has taken several steps in recent years to mitigate discharges from CSOs, which, in combination with improvements that have been made to water pollution control plants (WPCPs), are expected to result in future improvements in coliform, dissolved oxygen, and floatables levels in the New York Harbor area. Improvements have included replacing deteriorating and obsolete equipment and pilot-testing new technologies (IEC 2005). These improvements have led to increased wet-weather capture and treatment at WPCPs from just 18 percent in 1989 to 72 percent in 2003 (DEP 2004). The introduction of secondary treatment to the Newtown Creek WPCP, the last of the 14 New York City facilities to be upgraded to secondary treatment, is expected to be completed in 2007 (IEC 2005). New York City committed $1.5 billion for construction of CSO abatement facilities over the period 1998-2008. This should result in some improvement in coliform, DO, nutrients, and floatables in the East River and the rest of the Harbor Estuary.

F. PROBABLE IMPACTS OF THE PROPOSED ACTION

GROUNDWATER

Significant adverse impacts on groundwater would not be expected to occur as a result of construction or operation of the Proposed Action. Because groundwater is not used as a potable water supply in Manhattan, the Proposed Action would not have the potential to affect drinking water supplies. During grading and excavation activities associated with the construction of the 14 pavilions under the FDR Drive, any hazardous materials encountered would be handled and removed in accordance with DEP, DEC, U.S. Occupational Safety and Health Administration (OSHA), and EPA requirements, and a construction health and safety plan (CHASP) (see Chapter 10, "Hazardous Materials").

FLOODPLAINS AND WETLANDS

CONSTRUCTION

All of the project site is within the 100-year floodplain. The removal of the existing pavement under the FDR Drive to construct the pavilions and any resurfacing of the esplanade would not result in a change to the existing primarily impervious surface within the project site and would not be expected to affect the 100-year floodplain. The construction of the archipelago and expanded esplanade on piles between the BMB and Pier 11, and the other elements of the Proposed Action would not be expected to affect the floodplain's ability to contain flood waters and would not exacerbate flooding conditions within the project site or its immediate vicinity. The floodplain within and adjacent to the project site is affected by tidal flooding originating from either Long Island Sound or New York Harbor (FEMA 2001), and therefore, would not be affected by construction of the Proposed Action.

While estuarine wetlands are identified on the NWI map that includes the project area (see Figure 9-2), these areas are unvegetated and would not be regulated by USACE as wetlands but would be regulated as waters of the United States. The results of the recent bathymetric study suggest that areas where water depths are 6 feet or less at MLW may occur within the project area near the shoreline, particularly immediately north of the BMB, in an area between Piers 6 and 11, and along the shoreline from the New Market Building pier to approximately Catherine Street (including the intertidal beach area beneath the Brooklyn Bridge). Activities likely to occur within areas considered DEC littoral zone tidal wetlands include the following:

- Driving of approximately 200 18- to 24-inch concrete piles needed to support the archipelago and expanded esplanade platform between the BMB and Pier 11;
- Driving of approximately 370 18- to 24-inch concrete piles for the reconstruction of Pier 15;
- Driving of approximately 96 18-inch-diameter concrete piles for the reconstruction of the New Market Building pier and approximately 350 18- to 24-inch concrete piles to support the marina, floating wave attenuator, and breakwater;
- Driving of approximately 80 18- to 24-inch concrete piles for the wave attenuator and/or breakwater associated with the small craft launch area at the northern end of Pier 42;
- Pile encasement at Piers 35 and 42; and

- Dredging (maximum of approximately 15,000 cubic yards) to facilitate the relocation (Pier 15) of the *Wavertree*, and the temporary mooring of attraction vessels (less than 6 months) on the south side of Pier 15 (maximum of approximately 21,000 cubic yards).

The driving of new piles would result in the permanent loss of DEC littoral zone tidal wetlands within the footprint of the piles. This small loss of littoral zone tidal wetlands due to pile driving would not be expected to result in significant adverse impacts on tidal wetlands resources within the project area or the East River.

No construction activities have been proposed within the beach under the Brooklyn Bridge. Additionally, the reconstruction of New Market Building pier would not be expected to affect this beach area.

OPERATION

The Proposed Action will comply with applicable New York City Building Codes (Title 27, Subchapter 4, Article 10) and FEMA requirements regarding non-residential structures within the 100-year floodplain to reduce exposure to flood hazards. The City, in compliance with applicable laws and regulations, would design and construct the Proposed Action to minimize or eliminate risk of flood damage to the project components.

Pile spacing for the reconstructed Pier 15 and New Market Building pier, the archipelago between the BMB and Pier 6, and the esplanade expansion between Pier 6 and Pier 11 would be designed to minimize the potential for sediment deposition and the potential for adverse impacts on littoral zone wetlands. Additionally, the proposed reconstruction of Pier 15 and the New Market Building pier would not be expected to result in significant changes to existing sedimentation/scouring patterns or impair the movement of tidal waters within the project area that would affect the stability of littoral zone wetland areas. The breakwater associated with the marina and wave attenuator and/or breakwater associated with the small craft launch area at the northern end of Pier 42, and operation of the marina and small craft launch area, would not be expected to result in significant adverse impacts on tidal wetlands. Therefore, significant adverse impacts would not be expected to occur to littoral zone tidal wetlands from the operation of the Proposed Action.

AQUATIC RESOURCES

WATER QUALITY

Construction

Implementation of erosion and sediment control measures, and stormwater management measures during construction of the Proposed Action would minimize potential impacts on water quality of the East River associated with stormwater runoff during land disturbing activities that would occur in upland areas and on the piers. These activities would include demolition of existing structures, removal of the existing impervious surface within the esplanade and pavilion area, relocation of a CSO (installation of new sewer line and relocation of outfall), relocation of One New York Plaza's cooling water intake and outfall structures and pipes, debris removal, excavation and grading. The relocated CSO and One New York Plaza cooling water outfall would be constructed within existing bulkhead and would not require in-water construction activities. The relocated One New York Plaza cooling water intake is expected to be constructed within the existing bulkhead below MHW, approximately 350 feet east of the existing location. The construction of the relocated cooling water intake has the

potential to result in sediment disturbance. The relocation of the intake and outflow structures would be undertaken pursuant to all applicable local, state, and federal regulations. During these activities, any hazardous materials encountered would be handled and removed in accordance with DEP, DEC, OSHA, and EPA requirements, and would require a CHASP (see Chapter 10), minimizing the potential for adverse impacts on water quality. The erosion and sediment control measures would be in accordance with those presented in DEC's New York Standards and Specifications for Erosion and Sediment Control. Groundwater recovered through dewatering of the BPU extension area would be treated, as necessary, prior to discharge to the combined sewer system and would not be expected to result in adverse impacts on surface water quality.

In-water construction activities for the Proposed Action that would result in sediment disturbance include the following:

- Driving of piles used to support the proposed archipelago and esplanade extension between the BMB and Pier 11, the reconstruction of Pier 15 and the New Market Building pier, the marina and its proposed floating wave attenuator and breakwater, and the wave attenuator and/or breakwater associated with the small craft launch area, as described in the previous section.
- Pile encasement activities conducted at Piers 35 and 42.
- Dredging at the reconstructed Pier 15 as necessary to facilitate the relocation and mooring of the historic vessel the *Wavertree* on the north side of Pier 15 (maximum of approximately 15,000 cubic yards within an approximately 12,170-square-foot area) and the temporary mooring (less than 6 months) of attraction vessels on the south side of Pier 15 (maximum of approximately 21,000 cubic yards within an approximately 13,070-square-foot area).

With the exception of pile encasement, these activities would be conducted from a construction barge. Pile encasement would also require the use of divers to excavate the area around each pile selected for encasement. No dredging would occur during the period established by regulatory agencies to protect certain species of overwintering fish within the East River (usually mid-November through mid-April). While disturbance of sediment has the potential to result in increased suspended sediment in the water column and resuspension and redeposition of contaminants associated with sediments (see previous discussion under *Existing Conditions*), these temporary effects would be localized and confined to the immediate vicinity of pile driving activities. Dredging volume and area would be limited to that necessary to facilitate the temporary relocation of the *Wavertree* during reconstruction of Pier 15, and the mooring of the *Wavertree* and attraction vessels on opposite sides of the reconstructed Pier 15. Any increase in suspended sediment would move away from the area of in-water construction and would be expected to dissipate shortly after the completion of pile driving or pile repair activity. Therefore, in-water construction activities would not be expected to result in significant adverse impacts on water quality. Similarly, any contaminants released to the water column as a result of sediment disturbance would be expected to dissipate rapidly and would not be expected to result in significant long-term impacts on water quality. The bottom material to be dredged will be required to undergo testing for contaminants in accordance with DEC specifications in order for DEC and USACE to authorize dredging within the project site.

Operation

The operation of the proposed esplanade, pavilions, and refurbished piers would not be expected to result in an increase in stormwater runoff and may result in reduction of stormwater flow to

the river with the introduction of pervious surface on Piers 35 and 42, and the BMB Plaza. The operation of the pavilions would result in minimal increase in discharges to the municipal combined sewer system and therefore would not be expected to result in significant adverse impacts on water quality resulting from increased CSOs or discharges from the water pollution control plant that exceed the effluent quality limits.

Additionally, the proposed pile spacing for the reconstruction of Pier 15 within the historic pier footprint (20-foot bent spacing), the reconstruction of the New Market Building pier within the existing footprint (20- to 25-foot bent spacing), and for the archipelago and expanded esplanade between the BMB and Pier 11 (25-foot bent spacing) would not be expected to impair the movement of tidal waters or the designated use of the East River within the project area.

Given the water depth within the proposed New Market Building marina, generally 10 to 38 feet at MLW, and the proposed use for mostly small to mid-size vessels, it is unlikely that transient boat activity at the marina would contribute to sediment resuspension. These depths are generally greater than the minimum 10-foot depth found to minimize sediment disturbance from boats (USACE 1994, Asplund 2000, Gucinski 1981 in Klein 1997). This range of depths would also be sufficient to allow a clearance of 2 to 3 feet between the propeller of a vessel and the bottom during low waters identified as necessary to prevent increased turbidities associated with boat operations (NOAA 1976 in USACE 1993). Therefore, boat operations would not be expected to result in increased suspended sediment within the project area.

The wakes of vessels using the marina are not expected to be more energetic than the normal wind waves or the wake of channel traffic already affecting the area; regardless, most of the project shoreline is armored to prevent erosion or other shoreward impacts. Marina activities present a small increase in the potential for accidental petroleum or sewage spills to the river; however, the small sizes of the anticipated vessels and the fact that no fueling facilities are planned as part of the Proposed Action limit the likelihood of a large-scale accidental discharge. The design of the marina and small craft launch area will allow sufficient flushing (exchange of an amount of water within a region of interest) to occur to minimize potential water quality impacts.[2] Therefore, the operation of the marina and small craft launch area would not be expected to result in significant adverse impacts on water quality.

The relocation of the CSO to the east of its current location as part of the extension of the BPU by 350 feet to the northeast would not result in additional CSOs to the East River and would not be expected to result in significant adverse impacts on water quality. The relocation of this CSO closer to Pier 6 has the potential to improve water quality as a result of greater flushing expected to occur near Pier 6, compared with the current location adjacent to a wall that extends down to the mud line.

AQUATIC BIOTA

Construction

Implementation of the erosion and sediment control measures would minimize potential adverse impacts on aquatic biota from the discharge of stormwater during construction of the upland

[2] In general, existing guidelines consider a marina to be flushed if hydrodynamic analyses indicate there is between 30 and 90 percent exchange of the volume of water in the marina within approximately 24 hours (USACE 1993, EPA 1993), or when approximately 37 percent of the dye introduced into an area is gone within 12 to 24 hours (Blumberg et al. 2003).

project elements. In-water project elements such as pile driving and possible dredging at Pier 15, as described above under "Water Quality," have the potential to result in temporary adverse impacts on fish and macroinvertebrates due to the following:

- Increases in suspended sediment;
- Noise associated with pile driving; and
- Loss of bottom habitat and associated benthic invertebrates.

Any temporary increase in suspended sediment associated with pile driving, pile repair, dredging and other in-water construction activities resulting in sediment disturbance would be localized and expected to dissipate shortly after the completion of the sediment disturbing activity and would not be expected to result in significant adverse impacts on water quality or aquatic biota. Suspended sediment originating from an area of in-water construction activity would be localized and would be expected to dissipate from the project area quickly. Sediments throughout the Harbor Estuary contain contaminants. While East River sediments have been found to contain contaminants at concentrations that may pose a risk to some benthic macroinvertebrates, the currents within the project area (maximum of 1 to 3 ft/sec near the shoreline to 6 ft/sec or more in the channel) should dissipate these sediments such that redeposition within or outside the project area would not be expected to significantly adversely affect benthic macroinvertebrates or bottom fish.

Life stages of estuarine-dependent and anadromous fish species, bivalves, and other macroinvertebrates generally are tolerant of elevated suspended sediment concentrations and have evolved behavioral and physiological mechanisms for dealing with variable concentrations of suspended sediment (Birtwell et al. 1987, Dunford 1975, Levy and Northcote 1982 and Gregory 1990 in Nightingale and Simenstad 2001a, LaSalle et al. 1991). Fish are mobile and generally avoid unsuitable conditions such as increases in suspended sediment and noise (Clarke and Wilber 2000). While the localized increase in suspended sediment may cause fish to temporarily avoid the area where bottom-disturbing activities are occurring, the affected area would be expected to be small. Similar nearby suitable habitats would be available for use by fish to avoid the area being disturbed. Fish also have the ability to expel materials that may clog their gills when they return to cleaner, less sediment-laden waters. Most shellfish are adapted to naturally turbid estuarine conditions and can tolerate short-term exposures by closing valves or reducing pumping activity. Mobile benthic invertebrates that occur in estuaries have been found to be tolerant of elevated suspended sediment concentrations. In studies of the tolerance of crustaceans exposed to suspended sediments for up to two weeks, nearly all mortality was caused by the extremely high suspended sediment concentrations (greater than 10,000 mg/L) (Clarke and Wilber 2000), which would not occur from the in-water work associated with the Proposed Action. Therefore, temporary increases in suspended sediment resulting from in-water construction activities would not be expected to result in significant adverse impacts on fish and mobile benthic macroinvertebrates.

Pile driving can produce underwater sound pressure waves that can affect fish, with the type and intensity of sounds varying with factors such as the type and size of the pile, firmness of the substrate, depth of water, and the type and size of the pile driver. Larger piles and firmer substrate require greater energy to drive the pile, resulting in higher sound pressure levels (SPL). Hollow steel piles appear to produce higher SPLs than similarly sized wood or concrete piles (Hanson et al. 2003). Sound attenuates more rapidly in shallow waters than in deep waters (Rogers and Cox 1988 in Hanson et al. 2003). SPLs generated by the driving of hollow steel piles with impact hammers can reach levels that can injure fish (Hanson et al. 2003) and may not

generate sound in the frequencies that elicits avoidance behavior in fish. Impact hammers generate short pulses of sound with little of the sound energy occurring in the infrasound frequencies, the sound frequencies that have been shown to elicit an avoidance response in fish (Enger et al. 1993, Knudsen et al. 1994, and Sand et al. 2000 in Hanson et al. 2003). Therefore, fish have been observed exhibiting an initial startle response to the first few strikes of an impact hammer, after which fish may remain in an area with potentially harmful sound levels (Dolat 1997, NMFS 2001 in Hanson et al. 2003). While there are little data available on the SPL required to injure fish, fish with swim bladders and smaller fish have been shown to be more vulnerable (Hanson et al. 2003).

At least one pile driving rig would be operating during the in-water construction period to install piles that would be needed for the proposed in-water elements. The construction of Pier 15 and the archipelago/esplanade expansion are expected to be completed within 12 and 18 months, respectively, with a likely cessation of in-water construction activities during the November to April window typically imposed by regulatory agencies to protect certain fish species overwintering in the Harbor Estuary. Because pile driving would likely be restricted to the footprint of Pier 15, the footprint of the New Market Building pier, the archipelago, the esplanade expansion area, and the piles required for the marina, breakwater, and wave fences at the New Market Building pier, and floating wave attenuator and/or breakwater for the small craft launch area, and would be expected to be completed outside the period established by regulatory agencies to protect overwintering fish, pile driving would not be expected to result in significant adverse impacts on aquatic biota.

The installation of new piles associated with the esplanade, reconstruction of Pier 15 and the New Market Building pier, marina and small craft launch area; and pile encasement at Piers 35 and 42 would result in the loss of benthic habitat and benthic macroinvertebrates associated with these areas that are unable to move from the area of activity. However, the permanent loss of benthic macroinvertebrates within the piling footprints would not significantly impact the food supply for fish foraging in the area. Additionally, the new piles will provide additional attachment sites for algae and sessile invertebrates, and some piles may provide suitable refuge for fish.

Dredging to support the relocation of the *Wavertree* would temporarily increase suspended sediment and would result in the disturbance of benthic, infaunal habitat. The interpier area around the South Street Seaport is a sediment deposition area, and the dredged areas are expected to rapidly accumulate silt, replacing disturbed habitat in kind.

In summary, during construction of the in-water project elements, temporary increases in suspended sediment, noise generated by pile driving, and loss of bottom habitat and benthic macroinvertebrates would not be expected to result in significant adverse impacts on aquatic biota of the East River.

Operation

As discussed under "Water Quality," the operation of the proposed marina and small craft launch area would not be expected to result in significant adverse impacts on water quality, and, therefore, would not be expected to result in significant adverse impacts on fish or benthic macroinvertebrates. Some of the piles that would be installed as part of the Proposed Action may provide suitable refuge for fish.

As discussed under "Water Quality," the design of the pile spacing for the archipelago and expanded esplanade, and reconstructed Pier 15 and New Market Building pier, would enhance

flow under the piers and reduce the potential for sediment deposition, particularly when compared with the existing condition for the New Market Building pier.

The overwater structures not associated with water-dependent activities such as the marina and small craft launch area (i.e., the archipelago and expanded esplanade) were designed with the goal of not increasing the area of overwater coverage and shading of aquatic habitat currently present within the project area. Table 9-4 presents the proposed area of overwater coverage that would be added due to the archipelago and expanded esplanade, which are 15 to 25 feet wide, and the area of overwater coverage to be removed in offset. The archipelago and overwater extension of the esplanade between the BMB and Pier 11 will result in approximately 34,400 square feet (0.79 acres) of new overwater coverage. Additionally, the marina proposed at the New Market Building pier would result in an addition of approximately 34,483 square feet (0.79 acres) of overwater coverage within the project area. Marina platform widths would range from 5 to 8 feet for the finger piers, and 8 to 12 feet for the main docks. The floating wave attenuation element on the outboard side of the marina, parallel to the river, is expected to be approximately 12 feet wide and have a draft of approximately 5 feet. The breakwater on the north side of the marina, perpendicular to the shoreline, is expected to be a pile-supported wall-type breakwater comprising wave boards with gaps to create a semi-permeable screen. The width of this breakwater would be approximately 15 feet. Total approximate overwater coverage associated with the floating wave attenuator and breakwater is 12,000 square feet (0.28 acres). The 15-foot-wide wave attenuator and/or breakwater proposed for the small craft launch area would result in approximately 5,000 square feet of overwater coverage. The wave attenuator and/or breakwater proposed for the small craft launch area, and the structures associated with the marina, are narrow (less than 15 feet) and would, therefore, permit some light to reach the water and mud line under them. DEC generally considers aquatic habitat under an overwater structure to be shade-impacted after the first 15 feet from the structure's edge. Therefore, these walkways, the wave attenuator, and breakwater would be expected to result in minimal adverse impacts on aquatic habitat from shading and are not included as new overwater coverage in Table 9-4.

Table 9-4
Change in Overwater Coverage Due to Overwater Structures Not Associated with Water-Dependent Activities

	Square Feet	Acres
Overwater Coverage Added		
Archipelago—BMB to South Side of Pier 6	16,400	0.38
Esplanade Expansion—North Side of Pier 6 to Pier 11	18,000	0.41
TOTAL	**34,400**	**0.79**
Overwater Coverage Removed		
Pier 42 Decking to Create Cove Between Piers 36 and 42	20,000	0.46
Overwater Coverage to be Removed From Other Locations Within the Project Area	14,400	0.33
TOTAL	**34,400**	**0.79**
NET CHANGE (Coverage Removed Minus New Overwater Coverage)	**0**	**0.00**

As presented in Table 9-4, the new overwater coverage resulting from the Proposed Action that is not associated with water-dependent activities such as the marina and small craft launch area (i.e., the archipelago and Pier 42) is approximately 34,400 square feet (0.79 acres). However, the

size of the proposed cove between Piers 36 and 42 (developed through the removal of decking and piles at the southern portion of Pier 42), and additional areas of overwater coverage identified for removal from within the project area, will offset the overwater coverage added by the archipelago and esplanade expansion. Therefore, the Proposed Action would not be expected to result in significant adverse impacts on aquatic habitat due to shading. The reconstruction of Pier 15 has been permitted separately, and because it will be constructed within the original footprint, is not considered to contribute to a net increase in overwater coverage within the project area. Because the current berth for the *Wavertree* at the South Street Seaport would remain empty once the vessel is relocated to the north side of Pier 15, there would be no increase in shading of aquatic habitat due to historic vessels within the project area. The historic vessels moored on the south side of Pier 15 would be there for less than 6 months and would not be expected to result in increased shading impacts.

In summary, during operation of the East River Esplanade, stormwater run-off and change in areas of aquatic habitat with overwater coverage would not be expected to result in significant adverse impacts on the aquatic biota of the East River.

THREATENED OR ENDANGERED SPECIES

As discussed in Section D, "Existing Conditions," the preference of shortnose sturgeon for deep water habitat suggests that it is unlikely that individuals of this species would occur within the project area except as transients. Furthermore, the Hudson River below Tappan Zee is not considered optimal shortnose sturgeon habitat, and this species would be expected to occur only rarely south of the Battery. Because water quality impacts associated with pile driving and other construction activities that disturb bottom sediment would be localized and ephemeral, the deep channel habitat preferred by this species while in transit to and from spawning and nursery habitat in the upper portion of the Hudson River would not be impacted during construction of the Proposed Action. Therefore, the Proposed Action would not be expected to result in significant adverse impacts on shortnose sturgeon.

The four species of marine turtle (loggerhead, green, Kemp's ridley, and leatherback) would not be expected to occur within the project area except as seasonally transient individuals. Because they neither nest nor reside in the area year-round, and are only rarely observed in this portion of the estuary, they would not be expected to be impacted by the construction or operation of the Proposed Action.

As discussed previously, the peregrine falcon nesting locations near the project area between 500 and 1,500 feet from the project area are not used every year. The Proposed Action would not affect the availability of the nesting locations. Because peregrine falcons nesting in urban areas are tolerant of human activity (Nadareski 2002), construction activities would not be expected to significantly adversely affect nesting success. Neither construction activities nor the operation of the Proposed Action would be expected to affect the suitability of the nesting locations.

ESSENTIAL FISH HABITAT

Construction of the Proposed Action would not be expected to result in significant adverse impacts on EFH for the reasons discussed above under "Aquatic Biota." The Proposed Action would result in benefits to EFH by:

- Offsetting new overwater coverage due to non-water-dependent activities (archipelago and expanded esplanade) by removing existing overwater coverage at Pier 42 to create a cove and from other areas within the project area.
- Reducing piling density to promote through flow and reduce sediment deposition under Pier 15 and the reconstructed New Market Building pier, and designing the archipelago and the expanded esplanade with 25-foot bent spacing.

TERRESTRIAL RESOURCES

CONSTRUCTION

As noted previously, wildlife habitat within and adjacent to the proposed East River Esplanade and Piers project site is limited to the wading bird and waterfowl foraging habitat present within the beach area under the Brooklyn Bridge, and the low-quality terrestrial habitat found under the FDR Drive and the existing portions of the esplanade. The bird and other wildlife species expected to occur within the project site are those highly tolerant of urban conditions and the current noise level within the project area. Adverse impacts could occur to some *individual* birds and other wildlife currently using this extremely limited wildlife habitat if:

- Construction activities cause individual wildlife to leave the project area and there are no suitable habitats that are available nearby; or
- Cladding of the underside of the FDR Drive reduces or eliminates the suitability of this Urban Structure Exterior habitat to urban wildlife such as nesting barn swallows, pigeons, and other structure-oriented species, and there are no suitable habitats available nearby.

In general, the wildlife species expected to occur within the project site are common to urban areas, and the relocation and/or loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the region. Therefore, no significant adverse impacts on terrestrial resources are anticipated as a result of construction of the Proposed Action.

OPERATION

The operational phase of the project is intended to increase public access to the East River waterfront. While human activity is prevalent within the project area, the nature of the human activity under the proposed conditions is expected to change. Invariably, human recreational areas attract or aggregate wildlife species that might be scarce or absent without such activity. Increased foraging opportunities for bird species such as black-capped chickadees (*Parus atricapillus)*, sparrows (*Passer* spp.), gulls (Family: Laridae), and other species accustomed to human interaction are likely. Landscaping added to the esplanade (containers), and native plantings as part of redevelopment of Pier 35 and the urban beach proposed for Pier 42 would enhance the wildlife habitat currently found within the project site. Proposed plant species include the following trees and understory plantings: Black Locust (*Robinis pseudoacacia*) and Honey Locust (*Gleditisea tricanthos inermis* "Halka"), pine trees (*Pinus flexis* "Vanderwolf"), Swamp White Oak (*Quercus bicolor*), River Birch (*Betula nigra* "Heritage"), Cherry (*Prunus virginiana* "Canada Red"), Serviceberry (*Amelanchier canadensis*), and Beach Plum (*Prunus maritime*). Evergreen shrubs will include Ilex (*Ilex glabr*a), Cherry Laurel (*Prunus laurocerasus* "Otto Luykins"), Skip Laurel (*Prunus laurocerasus* "Schipkaensis"), and Bayberry (*Myrica pennsylvanica*). Deciduous shrubs will include Fragrant Sumac (*Rhus aromatica*), Beach Rose (*Rosa rugosa*), Witchhazel (*Hamamelis* sp.), Sweetspire (*Itea virginica*), Clethra (*Clethra* sp.),

Red Osier Dogwood (*Cornus* sp.) and Viburnum (*Viburnum* sp.). Ornamental grasses will include Panicum, Pennisetum, Miscanthus, and other common native and horticultural grasses. Grasses would be planted with wildflowers and perennials including Monarda, Liatris, Yarrow, Coneflower, Sunflower, Goldenrod, Phlox, Shasta Daisy, Montauk Daisy, and others. These proposed landscaping plants will provide structural habitat as well as increased forage (seeds, berries, and insects attracted to the plants).

In summary, the construction and operation of the Proposed Action would not be expected to result in significant adverse impacts on birds and other wildlife and would have the potential to benefit wildlife through habitat improvements. ✷