US Army Corps
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New York District

REVISED DRAFT

Integrated Hurricane Sandy
General Reevaluation Report
and
Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to
Rockaway Inlet and Jamaica Bay

Appendix D
Environmental Compliance

August 2018

Attachments:

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Appendix D

Environmental Compliance

Attachment D1

USFWS Planning Aid Letter

USFWS Draft Coordination Act Report

(Pending—September 2018)

August 2018

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

August 18, 2016

Peter Weppler, Chief
Environmental Analysis Branch
U.S. Army Corps of Engineers
Jacob K. Javits Federal Bldg.
26 Federal Plaza
New York, NY 10278-0090

Attn: Catherine Alcoba

Dear Mr. Weppler:

This letter transmits the U.S. Fish and Wildlife Service's (Service) Planning Aid Letter (PAL) for the U.S. Army Corps of Engineers (Corps) feasibility study entitled, "Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay" Project. The purpose of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.)* is to assure equal consideration and coordination of fish and wildlife resources. This PAL provides a preliminary description of: the fish and wildlife resources present within the study area; the studies and other projects occurring in the area; a description of the proposed action; preliminary potential impacts of the action; recommended study and surveys that should be undertaken; and potential avoidance, minimization, and mitigation measures. This PAL was developed in support of the Service's FWCA responsibilities in reviewing the Corps water resources development projects. Section 2(b) of the FWCA requires that the final report of the Secretary of the Interior: (1) determine the magnitude of the direct, indirect, and cumulative impacts of proposed projects on fish and wildlife resources, and (2) make specific recommendations as to measures that should be taken to conserve those resources. The Service continues to review these documents at this time, requesting additional detail as needed and providing recommendations. As a result, this PAL does not, at this time, constitute the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA.

Introduction

Identification of Purpose, Scope, and Authority

Purpose

The primary objective of the proposed study is to examine coastal storm risk management problems and opportunities for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Study Area (USACE 2016a). The Corps' goal is to identify solutions that will reduce Atlantic Ocean Shoreline and Jamaica Bay vulnerability to storm damage over time.

The purpose of the FWCA consultation is to document the potential impacts upon fish and wildlife resources expected from the implementation of the proposed project, and recommend measures to conserve and protect fish and wildlife resources.

Scope

The Corps identified the study area as "the Atlantic Coast of New York City between East Rockaway Inlet and Rockaway Inlet, and the water and lands within and surrounding Jamaica Bay, New York" (USACE 2016a). In order to delineate the FWCA analysis area, the Service included all areas within and adjacent to the Corps' identified project area that would be directly or indirectly impacted by the proposed project. The eastern and western boundaries of the FWCA analysis area are East Rockaway Inlet and the Lower Bay adjacent to Coney Island. The southern boundary extends 1,640 feet (ft) south of the southern edge of the designated offshore dredging area as this is the potential migration distance of the sedimentation plume created by offshore dredging operations (Minerals Management Service 2001). The northern boundary of the FWCA analysis area will be determined based on the results of the hydrological changes stemming from the construction, and operations and maintenance of the storm surge barrier.

The temporal scope of the FWCA analysis extends from the short-term impacts due to the construction of the proposed project to the long-term impacts that may occur over the 50-year life of the project. Initial construction will occur from 2017 to 2019.

Authority

The East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Study was authorized by the House of Representatives dated September 27, 1997, as stated within the Congressional Record for the U.S. House of Representatives (USACE 2016a). It states, in part:
"With the funds provided for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York Project, the conferees direct the Corps of Engineers to initiate a reevaluation report to identify more cost effective measures of providing storm damage protection for the project. In conducting the reevaluation, the Corps should include consideration of using dredged material from maintenance dredging of East Rockaway Inlet and should also investigate the potential for ecosystem restoration within the project area."

Relevant Prior and On-Going Studies/Reports/Projects

Federal Relevant Prior and On-Going Studies/Reports/Projects

- *Rockaway Beach Erosion Control and Hurricane Protection Project*
- *Rockaway Hudson Raritan Estuary Project, Ecosystem Restoration Feasibility Study*
- *Spring Creek Park (North) Ecosystem Restoration Project*
- *Spring Creek South: Storm Resilience and Ecosystem Restoration Project*
- *East Rockaway Inlet Federal Navigation Project*
- *Atlantic Coast of Long Island, Jones Inlet to East Rockaway Inlet, Long Beach Island, New York, Storm Damage Reduction Project*
- *Jamaica Bay Federal Navigation Channel*
- *Jamaica Bay, Marine Beach and Plumb Beach Ecosystem Restoration Feasibility Study*
- *Jamaica Bay Marsh Island Restoration: Elders East, Elders West, Yellow Bar Hassock, Black Wall, and Rulers Bar*
- *Plumb Beach Beneficial Use of Dredge Material Project*
- *Breezy Point Risk Mitigation System*
- *Fort Tilden Shore Access and Resiliency Project*
- Sunset Cove's Salt Marsh and Upland Habitat
- *Jamaica Bay Self-Sustaining Oyster Population*
- *West Pond Breach Repair*
- *Rockaway Boardwalk*
- *Flood Mitigation in Rail Yards - Rockaway Park Rail Yard - Queens*
- *Fresh Creek Coastal Protection*
- *Howard Beach Comprehensive Coastal Protection Study*
- *Upper Hawtree Flood Protection and Drainage Improvements*

State and Local Relevant Prior and On-Going Studies/Reports/Projects

- *Breezy Point Cooperative Beach Scraping*

Refer to New York City's Department of Environmental Protection Jamaica Bay Watershed Protection Plan (NYCDEP 2014) for a description of the following New York City funded and implemented proposed/on-going and completed projects:

Proposed/On-Going Projects

- *Jamaica Bay wastewater treatment plant upgrades*
- *Science and Resilience Institute at Jamaica Bay*
- *Jamaica Bay-Rockaway Parks Conservancy*
- *Clean Streets/Clean Beaches*
- *Ribbed Mussel Pilot*
- *Marsh Island Wave Attenuator Study*
- *Paerdegat Basin Restoration*
- *Belt Parkway Stormwater Control Measures*
- *Long Term Control Plan*
- *Green Infrastructure Program Implementation*

- *Springfield Gardens, Baisley Pond, and Area-wide Sewer Improvements*
- *Waterfront Revitalization Program*

Completed Projects

- *Sea Lettuce (ulva) Harvesting Pilot*
- *Algal Turf Scrubber Pilot*
- *Oyster Bed Pilot*
- *Eel Grass (Zostera marina) Pilot*
- *Stormwater Pilot Monitoring Program*

Description of Study and FWCA Analysis Area

The project area is comprised of the Rockaway Peninsula, Jamaica Bay, and Coney Island (Figure 1), and the designated offshore dredging area.

Figure 1: Project Area including the land and waters of the Rockaway Peninsula, Jamaica Bay, and Coney Island.

Rockaway Peninsula is a developed barrier peninsula comprised of extensive residential and commercial development and associated infrastructure, New York City-owned/managed beaches, a private beach community, private beach clubs, and National Park Service beaches including upland parcels that are part of the Gateway National Recreation Area (GNRA). The peninsula is approximately 11 miles in length and averages 0.4 miles in width. An estimated 7,900 residential and commercial structures on the peninsula fall within the Federal Emergency Management Agency (FEMA) regulated 100-year floodplain (USACE 2016a).

The Corps describes Jamaica Bay in their draft General Re-evaluation Report as: "the largest estuarine waterbody in the NYC metropolitan area covering an approximately 20,000 acres (17,200 of open water and 2,700 acres of upland islands and salt marsh). Jamaica Bay measures approximately 10 miles at its widest point east to west and four miles at the widest point north to south, being approximately 26 square miles in total. The mean depth of the Bay is approximately 13 feet with maximum depths of 60 feet in the deepest historical borrow pits. Navigation channels within the Bay are authorized to a depth of 20 feet. Jamaica Bay has a typical tidal range of 5 to 6 feet. The portions of NYC and Nassau County surrounding the waters of Jamaica Bay are urbanized, densely populated, and very susceptible to flooding. An estimated 41,000 residential and commercial structures are within the FEMA regulated 100-year Jamaica Bay floodplain" (USACE 2016a).

Coney Island is attached to Long Island and is approximately 4 miles long and 1 mile wide. This area is comprised of extensive residential and commercial development and associated infrastructure, New York City-owned/managed beaches, a wastewater treatment plant, and an amusement park.

The offshore dredging/borrow area is located approximately 2.0 miles south of Rockaway Peninsula and approximately 6 miles east of the Rockaway Inlet. The borrow area is approximately 2.6 miles long and 1.1 miles wide with depths between 36 and 58 ft (Alcoba Pers. Com. 2016). The borrow area covers approximately 1,830 acres of marine subtidal habitat.

Ecological Significance of Project Area

The habitats within the project area are of regional and ecological significance as designated by federal and state entities. As described below, the project area provides valuable habitats to a suite of migratory birds, threatened and endangered species, and species of special concern.

Service Significant Habitat and Habitat Complex

The Jamaica Bay and Breezy Point Complex encompasses the entire Jamaica Bay estuarine lagoon, park of the Rockaway Inlet, the western part of the Rockaway barrier beach, Plumb Beach, and most of the tidal creeks and undeveloped uplands adjacent to the Bay (USFWS 1997). This habitat complex is of regional importance due to the location and rich food resources found within the complex. The complex contains: beach and dune habitat for nesting bird and rare plant species, foraging areas for waterfowl, shorebirds, and colonial nesting waterbirds; important breeding and juvenile nursery habitat for finfish and shellfish, nesting habitats for gulls, terns, waterfowl, and herons, upland breeding habitat for grassland bird nesting and foraging areas; as well as butterfly concentration areas (USFWS 1997).

Gateway National Recreation Area

The Gateway National Recreation Area (GRNA) is an urban park complex managed by the National Park Service. The park is comprised of 27,000 acres located in New York and New Jersey. Within New York, the park is broken into three distinct districts: Refuge District, Breezy Point District, and North Shore District which are described below (National Park Service 2004):

Refuge District

The Jamaica Bay Wildlife Refuge is a 9,155 acres refuge located on a marsh island in the middle of Jamaica Bay. The refuge provides diverse habitat to many species of birds, reptiles, and amphibians, and marine and aquatic species. The refuge is identified as a critical stopover area on the Eastern Flyway migration route with more than 325 species having been observed at the refuge. Within the refuge, the following habitats are present: salt marsh, freshwater, brackish ponds, upland woods, fields, beach, open water and bay islands.

Breezy Point District

The Breezy Point District includes the following units: Breezy Point Tip, West Beach, Fort Tilden, and Jacob Riis which are located along the Atlantic Coast of Rockaway Peninsula. The Breezy Point Tip is comprised of more than 200 acres of sand dunes, salt and brackish marshes, and grasslands. The site hosts a number of breeding species including federal- and state-listed species: piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii*), least tern (*Sterna antillarum*), common tern (*Sterna hirundo)*, black skimmer (*Rynchops niger*), and American oystercatcher (*Haematopus palliates*). West Beach provides some limited grassland habitat to nesting killdeer (*Charadrius vociferous*) and cottontail rabbits. Fort Tilden provides habitat for nesting species of piping plover and American oystercatcher.

North Shore District

The North Shore District includes the following units: Floyd Bennett Field, Canarsie Pier, Dead Horse Bay, Plum Beach, and Bergen Beach. Previously a municipal airport, Floyd Bennett Field provides 140 acres of grassland habitat for grasshopper sparrows (*Ammodramus savannarum*), meadowlarks (*Sturnella magna*), American kestrels (*Falco sparverius*), and northern harriers (*Circus cyaneus)*. Canarsie Pier is surrounded by valuable salt marsh habitat. Plumb Beach provides important foraging habitat to shorebirds and spawning habitat for horseshoe crabs (*Limulus polyphemus*). The habitat at Plumb Beach includes tidal mud flats, low salt marsh areas, a tidal lagoon, and a fragile dune system.

Audubon Important Bird Areas (IBA)

The IBA program identifies, monitors, and protects habitats critical to the success of bird populations (More information about Audubon IBA can be found at: http://ny.audubon.org/conservation/what-important-bird-area). Within the project area, the Jamaica Bay complex is a designated important bird area. The habitats present within the complex include the marine and tidal wetland portions of the bay itself as well as the barrier beach/dune system and some adjoining upland shrub and grassland. This IBA is an important site for wintering, breeding, and migrating birds. Observations have been made of black-bellied plovers (*Pluvialis squatarola*), red knots (*Calidris canutus rufa*), piping plovers, laughing gulls (*Leucophaeus atricilla*), roseate terns, common terns, Forster's terns (*Sterna forsteri)*, least terns, black skimmers, brant (*Branta bernicula*), greater scaup (*Aythya marila*), and peregrine falcons (*Falco peregrinus*) (National Audubon Society 2013).

New York State Department of State Significant Coastal Fish and Wildlife Habitats

Jamaica Bay is designated as a New York State Department of State Significant Coastal Fish and Wildlife Habitat. The designated area includes the entire bay, salt marsh, fringing tidal marsh, tidal flats, dredge spoil islands, and adjacent upland areas which include open field, shrub thicket, developing woodlands, and beach grass dune (NYSDOS 1992). The designated habitat is of great significance as one of the largest coastal wetland ecosystems in New York State, the habitat provides nesting and foraging habitat for a number of state listed species (endangered, threatened) and state designated species of special concern including piping plover, common tern, northern harrier, diamondback terrapin (*Maclemys t. terrapin*), upland sandpiper (*Bartramia longicauda)*, barn owl (*Tyto alba)*, short eared owl (*Asio flammeus)*, and grasshopper sparrow; a regionally important recreational fishing and birdwatching site; hosts wintering waterfowl concentration of statewide importance, and hosts the only population of breeding laughing gulls in New York State.

New York State Department of Environmental Conservation (NYSDEC) Critical Environmental Area

The NYSDEC designates Critical Environmental Areas (CEA). In order for a site to be designated as a CEA, it must have an exceptional or unique character with respect to one or more of the following (More information about NYSDEC CEA can be found at http://www.dec.ny.gov/permits/6184.html):

- a benefit or threat to human health;
- a natural setting (e.g., fish and wildlife habitat, forest and vegetation, open space, and areas of important aesthetic or scenic quality);
- agricultural, social, cultural, historic, archaeological, recreational, or educational values; or
- an inherent ecological, geological, or hydrological sensitivity to change that may be adversely affected by any change.

Jamaica Bay, including the tributaries, tidal wetlands, and regulated adjacent areas, was designated by the NYSDEC as a CEA in order to protect the ecosystem and the large number of wildlife present within the site.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES

The project area is comprised of a number of habitats found in the marine, terrestrial, and estuarine systems. For the purposes of describing the fish and wildlife resources found within the project area, the communities are identified using "Ecological Communities of New York State Second Edition" (Edinger et al. 2014).

Marine System

The marine system includes those habitats within the open ocean, the associated coastline, and the shallow coastal bays that are saline because they lack significant freshwater inflow. The limits extend from mean high water seaward, beyond the limits of rooted vascular vegetation (Edinger et al. 2014). For the purposes of this discussion, the marine system includes the offshore borrow area, subtidal, and intertidal habitat found along the shore of the Rockaway Peninsula.

Invertebrates

The borrow area covering approximately 1,830 acres of subtidal habitat, would provide approximately 17 million cubic yards of suitable beach fill material for the initial construction of the project (Alcoba pers. comm. 2016). Invertebrate resources located within the borrow area are unknown at this time. However, resources identified at other borrow areas include the following species: worms (*Polygordius triestinus*), amphipods (*Gammarus oceanicus, Protohaustorius wigleyi, P. wigleyi,* and *Amphiporeia gigantean*), polychaete worms (*Magelona rosea, Spiophanes bombyx, Syllidae spp.,* and *Tharyx acutus)*, crustaceans (*Leptochelia savignyi*), sand dollar (*Echinarachnius parma)*, small clam (*Tellina agilis*), and surf clam (*Spisula solidissima*) (USACE 1999, USACE 2004).

Invertebrates located within the intertidal habitat are unknown at this time. However, invertebrates identified during surveys within similar habitat found the following dominant species: oligochaeta, nematoda, blue mussel (*Mytilus edulis*), and turbellaria flatworms. Dominant wrack line organisms may include: springtail (*Anurida maritima*), bivalves, amphipod beach fleas (*Talorchestia longicornis* and *orchestia grillus)*, and common sea star (*Asterias forbesii*) (USACE 2005).

While it is likely that many of these species may be found within the proposed borrow area site, the Service recommends that the Corps undertake a study to inventory and understand the resources present within the project area. Please provide a copy of this report to the Service.

Finfish

Common species found in the nearshore and offshore habitats include American sandlance (*Ammodytes americanus*), Atlantic butterfish (*Peprilus triacanthus*), Atlantic croaker (*Micropogonias undulatus*), Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), Atlantic menhaden (*Brevoortia tyrannus*), Atlantic silverside (*Menidia menidia*), Atlantic Sturgeon (*Acipenser oxyrhynchus oxyrhynchus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), cunner (*Tautogolabrus adspersus*), northern kingfish (*Menticirrhus saxatilis*), spot (*Leiostomas xanthurus),* striped bass (*Morone saxatilis*), summer flounder (*Paralichthys dentatus*), tautog (*Tautoga onitis*), weakfish (*Cynoscion regalis),* windowpane flounder (*Scophthalmus aquosus*), and winter flounder (*Pseudopleuronfictes americanus*) (USFWS 1997, Edinger et al. 2014, NYSDEC 2005).

Marine Turtles

Sea turtle species that may be found within the open water of the project area are the Atlantic green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelysis coriacea)*, and loggerhead (*Caretta caretta*) sea turtles (USFWS 1997, Edinger 2014).

Marine Mammals

Marine mammals which may be present within the nearshore and offshore habitats include seals, whales, and dolphins. Common species of seal documented within the project area include harbor seal (*Phoca vitulina*) and gray seal (*Halichoerus grypus*). Common whale species observed within the project area include the finback (*Balaenoptera physalus*), minke whale (*B. acutorostrata*), and humpback whale (*Megaptera novaeangliae) (*USFWS 1997, Edinger et al. 2014). Common dolphin species include common dolphin (*Delphinus delphis),* bottlenose dolphin *(Tursiops truncatus*), white-sided dolphin (*Lagenorhynchus acutus*), striped dolphin (*Stenella coeruleoalba*), and pilot whale (*Globicephala melaena*) (USFWS 1997, Edinger et al. 2014).

Avian

Seabirds commonly observed in the New York Bight that may be present within the project area include coastal or nearshore birds and pelagic birds. Nearshore species include sea ducks, loons, grebes, and gulls; while pelagic species may include shearwaters, petrels, fulmars, gannetts, phalaropes, skuas, kittiwakes, jaegers, and auks (USFWS 1997). Information about coastal breeding species including shorebirds and colonial nesting waterbirds can be found within the Terrestrial and Estuarine Systems sections below.

Terrestrial System

The maritime beach, maritime dune, maritime grasslands, and maritime shrubland/forest ecosystems can be found throughout the project area. The maritime beach is a sparsely vegetated habitat above the mean high tide (Edinger et al. 2014). The maritime beach is bordered by the maritime dune or other maritime habitat such as maritime shrubland or maritime forests (Edinger et al. 2014). These beach and dune communities are found along the shore of the Rockaway peninsula and to a limited extent on Coney Island. The maritime forests can be found within the National Park Service Gateway properties on Rockaway Peninsula and the maritime grasslands located at Floyd Bennett Field. The majority of the upland habitat surrounding Jamaica Bay would be characterized as developed/urbanized.

Invertebrates

Invertebrates found within the maritime beach and dune system may include brine fly (*Ephydridae spp*.), ground beetle (*Clivinia spp.*), and beach flea amphipods (*Talorchestia longicornis* and *T. megalopthalma*) (USACE 2005).

Mammals

Terrestrial mammals found within Jamaica Bay and the surrounding mainland include: black-tailed jackrabbit (*Lepus californicus*), domestic/feral cat, eastern chipmunk (*Tamias striatus*), eastern cottontail rabbit (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), hoary bat (*Lasiurus cinereus*), house mouse (*Mus musculus*), little brown myotis (*Myotis lucifugus*), meadow vole (*Microtus pennsylvanicus),* muskrat (*Ondatra zibethicus*), Norway rat (*Rattus norvegicus*), opossum (*Didelphis virginiana*), raccoon (*Pragon lotor*), red bat (*Lasiurus borealis*), silver-haired bat (*Lasionycteris noctivagans*), and white-footed mouse (*Peromyscus leucopus*) (USFWS 1997, NYC Urban Park Rangers 2015 Final Report, NPS 2007, and Waldman 2008).

Plants

Common plants found within the maritime beach community include beachgrass (*Ammonphila breviligulata*), sea rocket (*Cakile edentula ssp. edentuala)*, seaside atriplex (*Atriplex patula*), seabeach atriplex (*A. arenaria*), seabeach sandwort (*Honckenya peploides*), salsola (*Salsola kali*), seaside spurge (*Chamaesyce polygonifolia*), seabeach knotweed (*Polygonum glaucum*), and seabeach amaranth (*Amaranthus pumilus*) (Edinger et al. 2014).

The maritime dune plant community is comprised of common species such as beachgrass (*Ammonphila breviligulata*), dusty miller (*Artemisia stelleriana*), beach pea (*Lathyrus japonicus* var. *maritimus)*, sedge (*Carex silicea),* seaside goldenrod (*Solidago sempervirens*), and sand-rose (*Rosa rugosa)* (Edinger et al. 2014). In stabilized dune plant communities, common species include beach heather (*Hudsonia tomentosa*), bearberry (*Arctostaphylos uva-ursi*), beachgrass, cyperus (*Cyperus polystachyos* var. *macrostachyus*), seaside goldenrod, beach pinweed (*Lechea maritima*), jointweed (*Polygonella articulata*), common evening primrose (*Oentohera biennis),* sand rose, bayberry (*Myrica pensylvanica*), beach plum (*Prunus maritima*), poison ivy (*Toxicodendron radicans*), and the lichens (*Cladonia submitis and Centaria arenaria*) (Edinger et al. 2014).

Common plants found within the maritime grasslands include little bluestem (*schizachyrium scoparium),* switchgrass (*Panicum vigatum*), seaside goldenrod (*Solidago sempervirens*) (Waldman 2008), common hairgrass (*Avenella flexuosa*), and poverty grass (*Danthonia spicta*) (Edinger et al. 2008). Other species that may be found within maritime grassland communities include Pennsylvania sedge (*Carex Pensylvanica*), rush (*Juncus greenei),* Indian grass (*Sorghastrum nutans*), Atlantic golden aster (*Pityopsis flacata*), bushy rockrose (*Helianthemum dumosum),* hoary frostweed (*H. propinquum*), white-topped aster (*Sericocarpus asteroides),* pussy's-toes (*Antennaria plantaginifolia*), bitter milkwort (*Polygala polygama*), hyssop-leaved boneset (*Eupatorium hyssopifolium*), bayberry, shining sumac (*Rhus copallinum*), and northern dewberry (*Rubus flagellaris*) (Edinger 2014).

Common invasive/non-native plant species found within the terrestrial systems of the project area include common reed (*Phragmites australis)* and purple loosestrife (*Lythrum salicaria)* (Waldman 2008).

Avian

Beach habitat also provides essential foraging and nesting habitats for nesting shorebirds, including the federally-listed threatened piping plover, endangered roseate tern, and State-listed threatened least tern, common tern, and species of special concern black skimmer. The federally-listed threatened red knot utilizes sandy beaches within the study area as stopover/foraging habitat during spring and fall migrations. However, this species is more concentrated in areas where horseshoe crab eggs and bivalves are available for forage, which is in the bay intertidal habitat discussed more below. Seabeach amaranth is a federally-listed (threatened) plant that grows in this beach habitat. Information about the federally- and state-listed species can be found below. The American oystercatcher is a ground-nesting shorebird which breeds within the ocean beach, dunes, terrestrial upland, bayside beach, and bay island habitats that many federally- and state-listed ground-nesting shorebird species breed in within the study area.

Estuarine System

The estuarine system consists of deepwater tidal habitats, the adjacent tidal wetlands, and the marsh islands (Edinger et al. 2014). The estuarine intertidal extends from the highest tide level to the lowest tide level and includes the salt marshes and intertidal mudflats.

Estuarine Intertidal

Salt Marsh

Salt marshes are among the most productive communities known, providing important ecological services including wildlife habitat, shoreline erosion control, and water column filtration (Waldman 2008). Since the European colonization, approximately 12,000 acres of 16,000 acres of salt marsh has been lost (NYCDEP 2007, USFWS 1997, Waldman 2008). The loss of wetlands is due to a number of factors including: reduced sediment input, shoreline hardening, dredging, sea level rise, nitrogen pollution, and potential grazing by the salt marsh periwinkle (Waldman 2008). Rates of salt marsh loss have been estimated based on the analysis of aerial photographs. Between 1924 and 1974 the rate of loss was approximately 0.4% annually. Since 1974, the rate has increased to 1.4% annually (Hartig et al. 2002 in Waldman 2008).

Salt marsh cordgrass (*Spartina alternaflora*) is the dominant species found within low salt marsh. Dominant species found within the high salt marsh include: salt meadow cordgrass (Spartina patens), salt grass (*Distichlis spicata*), black grass *(Juncus gerardii*), glasswort (*Salicornia spp.*), and sea lavender (*Limonium carolinianum*).

Brackish and Freshwater Ponds

Within Jamaica Bay Wildlife Refuge, there are two man-made freshwater ponds: East Pond and West Pond, and small freshwater ponds. The East and West Ponds were constructed and managed as waterfowl habitat. During Hurricane Sandy, the ponds were breached. The East

Pond was repaired by the Transit Authority as part of its efforts to restore train service to the Rockaways shortly after the storm. The National Park Service proposes to return West Pond back to its freshwater state by repairing the breach and the loop path, filling of the pond, and restoring the habitat. Common vegetation found within the emergent freshwater marshes include: pickerelweed (*Pontedaria cordata*), cattail (*Typha spp.*), bullrush (*Scirpus validus*), harbor sedges (*Carex spp.*), rushes (*Juncus spp.*), and water plantain (*Alisma spp.*) (Mack and Feller 1990 in Waldman 2008).

Horseshoe Crabs

Although the draft Environmental Appendix of the Draft Hurricane Sandy General Reevaluation Report and Environmental Impact Statement (GRR/EIS) states on page 4-99 that horseshoe crabs no longer spawn at Plum Beach since the 1990's, spawning has been documented in the eastern limits of Plumb Beach, from just west of the comfort station to the eastern limit of the beach as the shoreline turns into Plumb Beach Channel as recently as 2013, the most recent data available (Sclafani et al. 2014). Distribution of spawning data collected since 2010 indicates that Plum Beach had a total crabs/square meter value of 6 in 2011 (peak on May 30), 5 in 2012 (peak on May 20), and 7 in 2013 (peak on May 10) (Sclafani et al. 2014).

Estuarine Subtidal

Water Quality

Jamaica Bay is a 31-square-mile water body with a broader watershed of approximately 142 square miles, which includes portions of Brooklyn, Queens, and Nassau County (NYCDEP 2007). The Bay has experienced extensive modifications to the freshwater and brackish creeks, the filling of salt marshes (approximately 12,000 acres lost), the dredging of the subtidal areas of the Bay (an estimated 125 million cubic yards removed), and modifications to the tidal inlet connections with Atlantic Ocean (NYCDEP 2007).

The majority of the bay's water inputs are primarily from the sewage treatment facilities which contribute between 259-287 million gallons of treated effluent per day (NYCDEP 2007, Waldman 2008). Water quality sampling and modeling show that Jamaica Bay is a eutrophic system, but in spite of this, water quality indicators suggest that the water quality of the bay remains good with the exception of seasonally specific geographic areas (NYCDEP 2007). The bay experiences annual algal blooms, depressed dissolved oxygen levels in select areas, and increased nutrient levels. Jamaica Bay and many of the tributaries are listed on the New York State Department of Environmental Conservation's Section 303(d) List of Impaired/TMDL Waters. The known and suspected sources of pollutants include Combined Sewer Overflows, Municipal discharge from NYC Wastewater Treatment Plants, urban/storm runoff, and other sanitary discharge sources.

Contaminants

The primary sediments found within the eastern and northern portions of the bay are characterized as muddy fine sand while the areas in the southern and western portions of the bay are characterized as fine to medium sands (USFWS 1997). Contaminants known or thought to occur within the project area include: polychlorinated biphenyl (PCBs), dioxins, mercury and other heavy metals, pesticides (i.e. DDT) and polycyclic aromatic hydrocarbons (PAHs). Levels of these contaminants have decreased over the last several decades as a result of the passage of the Clean Water Act, the discontinued production of DDT and PCBs in the United States and improved sewage treatment (Steinberg et al. 2004). The Corps (2016b) states that the "contaminations adhere to organic compounds and settle into sediments; now found to exceed acceptable levels throughout the Bay (Steinberg et al. 2004)." However, it appears that Steinberg et al. (2004) indicates that the levels of DDT, mercury, cadmium, silver, dioxin, nickel and lead measured in 1998 are below the effects range-median for each respective contaminant. Other chemicals from wastewater treatment plants discharges, combined sewer overflows, non-point source discharges, chemical and oil spills are also known to occur within the project area. A study by Benotti and Brownawell (2007) identified 15 anthropogenic compounds in Jamaica Bay at least once, including 12 that were identified in most or all of the 24 sites which were surveyed. These compounds included: caffeine, cotinine, nicotine, paraxanthine, acetaminophen, carbamazepine, cimetidine, codeine, diltiazem, ketoprofen, metformin, ranitidine, and salbutamol. The Service believes there is a need for further testing of contaminants within the project area to determine current levels contaminants and to aid in the development of appropriate avoidance and mitigation measures.

Aquatic Plants and Algae

Algae found within the subtidal and intertidal waters include: sea lettuce (*Ulva latuca*), brown kelp/bladderwrack (*Fucus vesiculosus*), cyanobacteria (*Nostoc*), diatom (*Asterionella, Flagilaria circular, Pseudomonas sp.,* and *Tabellaria sp.*), dinoflagellate (*Ceratium hirundinella* and *Peridinium sp.*), green algae (*Chlorella sp., Chlorella vulgaris, Cladophora gromerata, Closterium moniliforme, Codium fragile, Draparnaldia glomerata, Enteromorpha intestinalis, Enteromorpha linza, Microcystis sp., Mougeotia scalaris, Protoderma marinum, Rhizoclonium riparium, Rhodomonas sp., Spirogyra porticalis, Ulva lactuca,* and *Volvox aureus*), red algae (*Ceramium sp. 1, ceramium sp. 2, Chondrus crispus, Gracilaria confervoides, Gracilaria foliifera,* and *Hildenbrandia prototypus*), and yellow-green algae (*Vaucheria compacta*) (Waldman 2008, NPS 2007).

Finfish and Shellfish

The waters of Jamaica Bay provide important spawning, foraging, and nursery habitat for many finfish and shellfish species. Common species documented in the bay include: winter flounder, summer flounder, windowpane flounder, weakfish, bluefish , scup (*Stenotomus chrysops*), blueback herring (*Alosa aestivalis*), Atlantic cod (*Gadus morhua*), black sea bass, northern kingfish, tautog, Atlantic silversides (*Menidia menidia*), mummichog, striped killifish (*Fundulus majalis*), Atlantic menhaden, bay anchovy (*Anchoa mitchilli*), northern pipefish (*Syngnathus fuscus*), American shad (*Alosa sapidissima*), Atlantic sturgeon, searobin (*Prionotus spp.*), striped bass (*Morone saxatilis*), banded killifish (*Fundulus diaphanus*), cunner, inland silversides (*Menidia berylinna*), striped searobin (*Prionotus evolans*), white mullet (*Mugil curema*), and white perch (*Morone americana*) (NPS 2007, USFWS 1997, NYSDOS 1992).

Small populations of alewife (*Alosa pseudoharengus*) may be found in Hook and Motts Creeks (Waldman 2008). American eel (*Anguilla rostrata*) were once common in Jamaica Bay but has experienced range-wide declines (Haro et al. 2000 in Waldman 2008).

The bay supports shellfish populations of hard clams (*Mercenaria mercenaria*), soft clams (*Mya arenaria*), mussels, and rock crabs (*Cancer irroratus)* (NYSDOS 1992). At one time Jamaica Bay supported a large fishery for oyster (*Crassostrea virginica*), hard clam, softshell clam, and blue crab (*Callinectes sapidus*) (Waldman 2008). However due to threats of disease the fisheries were closed in 1921 (Waldman 2008). Oysters were once an abundant fishery producing upwards of 700,000 bushels of oysters per year at its peak (Grambo and Vega 1984 in Waldman 2008, Franz 1982 in Zarnoch and Schreibman 2012). Due to overfishing, habitat losses from dredging, filling, and pollution have led to a collapse of the fishery (Zarnoch and Schreibman 2012).

Avian

Significant concentrations of wintering waterfowl can be found in Jamaica Bay. Large numbers of greater scaup, American black duck (*Anas rubripes*), brant, Canada goose (*Branta canadensis*), bufflehead (*Bucephala albeola*), canvasback (*Aythya valisneria*), mallard (*Anas platyrhynchos*), ruddy duck (*Oxyura jamaicensis*), red-breasted merganser (*Mergus serrator*), snow goose (*Chen caerulescens*), and American wigeon (*Anas americana*) have been documented since the late 1970's (NYSDOS 1992, USFWS 1997, Waldman 2008). Other species documented within the bay include horned grebe (*Podiceps auritus*), green-winged teal (*Anas crecca*), gadwall (*Anas strepera*), northern shoveler (*Anas clypeata*), and common goldeneye (*Bucephala clangula*) (USFWS 1997).

Reptiles

Reptiles which may be found within Jamaica Bay include kemp's ridley, Atlantic green, loggerhead, and leatherback sea turtles and diamondback terrapin (USFWS 1997, and Waldman 2008).

Mammals

Marine mammals that have been observed within the bay include bottlenose dolphin and harbor seal (Waldman 2008).

Jamaica Bay Marsh Islands

The bay islands have many of the above described communities present, typically including low marsh, high marsh, and terrestrial uplands. Although many of the islands are man-made from dredge material placement, they provide important breeding habitat for shorebirds (tern colonies) and wading birds (heron rookeries).

Insects, Moths, and Butterflies

The bay is located along the migration route of the monarch butterfly (*Danaus plexippus*) (Brower 2004 in Waldman 2008) and provides habitat for a number of insects, skippers, and butterflies including several regionally and state rare species: Appalachian azure (*Celastrina neglectamajor*), tawny emperor (*Asterocampa clyton*), white-m hairstreak (*Parrhasius m-album*), and checkered white butterfly (*Pontia protodice*). Additional information about the insects can be obtained in NPS (2007).

Avian

The islands found within Jamaica Bay provide habitat for a number of nesting birds including: common terns, American oystercatcher, black skimmer (NYSDOS 1992), killdeer, spotted sandpiper (*Actitus macularia*), greater yellowlegs (*Tringa melanoleuca*), and ruddy turnstone (*Arenaria interpres*) (Waldman 2008).

The Islands also support a number of nesting wading birds including black-crowned night heron (*Nycticorax nycticorax*), green-back heron (*Butorides virescens*), yellow crowned night heron (*Nyctanassa violacea*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), and glossy ibis (*Plegadis falcinellus*) (NYSDOS 1992). For the last 31 years, New York City Audubon has been surveying select islands and mainland sites in the New York and New Jersey area for wading birds including herons, egrets and ibis, cormorants, gulls, and terns. During the 2015 survey of Elders Point East, Little Egg Marsh, Subway Island, and Canarsie Poll the following species were observed breeding: snowy egret, black-crowned night heron, great egret, glossy ibis, little blue heron, and tricolored heron (*Egretta tricolor*) (Winston 2015). Other species observed during the surveys include: double-crested cormorants (*Phalacrocorax auritus*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), laughing gull, clapper rail (*Rallus crepitans*), American oystercatcher, least sandpiper (*Calidris minutilla*), fish crow (*Corvus ossifragus),* red-winged blackbird (*Agelaius phoeniceus*), Canada goose, mallard, willet (*Tringa semipalmata*), ruddy turnstone, Forster's tern, gray catbird, song sparrow (*Melospiza melodia*), boat-tailed grackle (*Quiscalus major*), brant, dunlin (*Calidris alpina*), short-billed dowitcher (*Limnodromus griseus*), semipalmated sandpiper (*Calidris pusilla*), European starling (*Sturnus vulgaris*), spotted sandpiper, osprey, and northern harrier.

Reptiles and Amphibians

Common species of reptiles and amphibians found within Jamaica Bay include: common garter snake (*Thamnophis sauritus sauritus*), diamondback terrapin (*Maclemys t. terrapin*), eastern box turtle (*Terrapene c. carolina*), eastern garter snake (*Thamnophis sauritus*), eastern hognose snake (*Heterodon platirhinos*), eastern milk snake (*Lampropeltis triangulum triangulum*), eastern painted turtle (*Chrysemys p. picta*), Fowler's toad (*Bufo woodhousii fowleri*), gray treefrog (*Hyla versicolor*), green frog (*Rana clamitans*), northern black racer (*Coluber c. constrictor*), northern brown snake (*Storeria d. dekayi*), painted turtle (*Chrysemys picta*), redback salamander (*Plethodon cinereus*), red-spotted newt (*Notophthalmus viridescens*), smooth green snake

(*Opheodrys vernalis*), snapping turtle (*Chelydra serpentina*), spotted salamander (*Ambystoma maculatum*), and spring peeper (*Pseudacris crucifer*) (USFWS 1997, NPS 2007).

Prior to Hurricane Sandy, diamondback terrapin had been documented nesting at three sites within Jamaica Bay. After Hurricane Sandy modified the nesting habitat within the bay, Rodriquez (2006) documented diamondback terrapin nesting in new locations and an absence of nesting in previously documented locations.

Mammals

Mammals found within the Bay islands include those terrestrial mammals summarized in the Terrestrial System described above.

Cultural Systems

Contrasting the natural habitats, there is a number of 'cultural systems' present within the project area. Edinger et al. (2014) describes cultural communities as those communities created and maintained by human activities, or modified by human influence, to such a degree that the physical conformation of the substrate, or the biological composition of the resident community, is substantially different from the character of the substrate or community as it existed prior to human influence. Cultural communities present in the project area may include: Marine Submerged Artificial Structure/Reef, Marine Dredge Spoil Shore, Marine Riprap/Artificial Shore, Marine Dredge Excavation Pit/Channel, Mowed lawn, Railroad, Paved road/path, Maritime dredge spoil islands, Landfill/dump, and urban structure exterior. Urban development and alterations associated with the above mentioned systems change the form and function of the pre-existing habitats, ultimately restricting the ecosystem services, limiting habitat availability and habitat quality.

Federally- and State-listed Species

Within the study area, the piping plover (federally-listed) and least tern (state-listed) nest in marine beach and maritime dune habitats along the ocean shoreline. Plovers forage on invertebrates primarily along the ocean and bay shorelines, while the least tern forages for fish in ocean and bay open waters. The roseate (federally-listed) and common terns (federally-listed) and black skimmers (state – Special Concern) breed on maritime beach/dune habitats and forage for fish in ocean and bay open waters. Common terns and black skimmers nest within the project area. Roseate terns had historically nested within the project area but not within the last 5 years.

These species grow/breed at three locations within the study area's Atlantic Ocean shoreline: NYC Parks' Arverne beaches (B19th street- B59th street); National Park Service's GNRA parcels (Jacob Riis, Fort Tilden, and Breezy Point); and Breezy Point Cooperative (private beach community from B201-B222 streets). A summary of population trends over the last 5 years for piping plover and seabeach amaranth that breed/grow within each of these locations within the study area are listed as follows (NYSDEC Long Island Colonial Waterbird and Piping Plover Data 2011-2015, 2016 data not yet available at the time of the preparation of this document):

Year	NYC Park's Arverne Beaches		NPS's GNRA Beaches		Breezy Point Cooperative	
	Piping Plover pairs	Seabeach amaranth plant #'s	Piping Plover pairs	Seabeach amaranth plant #'s	Piping Plover pairs	Seabeach amaranth plant #'s
2015	16	166	20	78	8	279
2014	12	45	19	54	7	73
2013	11	17	16	42	10	166
2012	15	78	18	88	15	625
2011	10	467	15	161	10	1,015

Limiting factors in shorebird productivity include disturbances from recreational activities, flooding/inundation of nests, predation, beach stabilization practices, and loss of habitat from development. Limiting factors in seabeach amaranth growth include trampling from off-road vehicles and/or pedestrians, loss of habitat from development, beach stabilization practices which promote dense beach grass growth, burial of seed banks, and competition with perennial plants as beach habitat is stabilized (USFWS 1996).

Description of Alternatives

The Corps is proposing the following components for the Tentatively Selected Plan (which is identified by the Corps as the plan likely to become the recommended plan) and Action Alternative. The Corps has identified two separate planning reaches: the Atlantic Ocean Shorefront Planning Reach and the Jamaica Bay Planning Reach.

Description of the Tentatively Selected Plan (TSP)

Atlantic Ocean Shorefront Planning Reach

The Atlantic Ocean shorefront planning reach includes the following components: a reinforced dune (composite seawall), beach nourishment with a 4-year renourishment cycle, the extension of 5 existing groins, and construction of 13 new groins. Sand will be obtained from a borrow area located approximately 2 miles south of the Rockaway Peninsula and about 6 miles east of the Rockaway Inlet.

Jamaica Bay Planning Reach

The Corps has provided two alignments/alternatives for the TSP. Alignment/Alternative C1-E and C2 are described below in brief. A more detailed description of the alignment/alternatives can be found in the Corps' Draft GRR and Enclosure 1. Enclosure 1 is an unpublished document the Corps provided to the Service for the purposes of this coordination.

Storm Surge Barrier

The Corps has proposed two alignments for the storm surge barrier, alignment C-2 and C-1E as seen in Figure 2. The Corps stated in the GRR that C-1E would be preferred over C-1W as C-1E "would likely result in less impact to the Gil Hodges Memorial Bridge; would result in less real estate and aesthetic impacts to the Roxbury Community where alignment C-1W would tie in; is located in a more stable channel location; and avoids potential impacts to submerged cables" (Corps 2016a). C-1E would require a 3,970-foot storm surge barrier across Rockaway Inlet from near Jacob Riis Park to Floyd Bennet Field while C-2 would require a 5,715-foot storm surge barrier across Rockaway Inlet from Breezy Point to Sheepshead Bay/Kingsborough Community College.

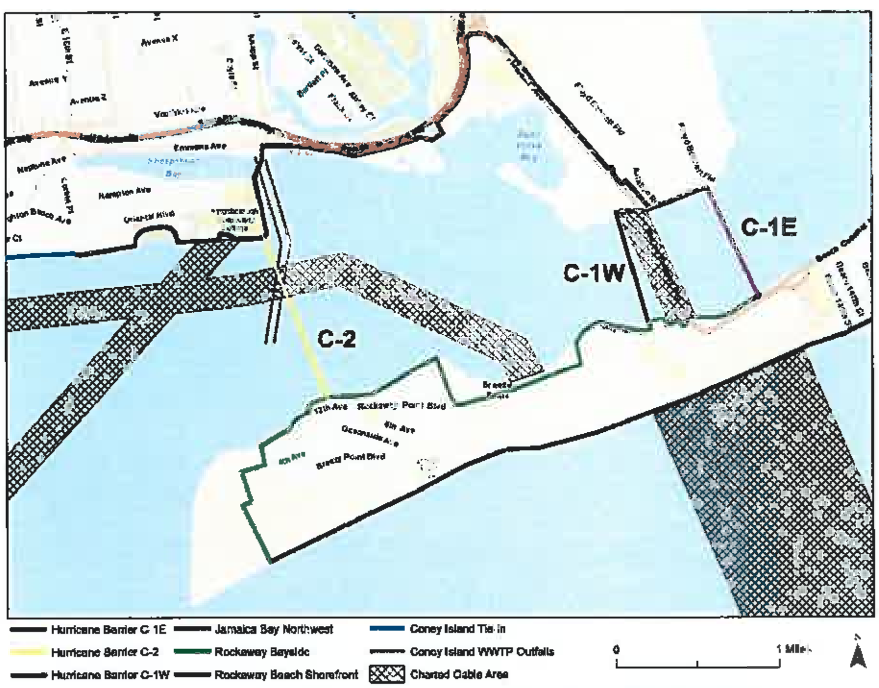

Figure 2: Depiction of the storm surge barrier alignments.

Alignment/Alternative C1-E

Based on the selection of the storm surge barrier alignment C-1E, the following components are proposed for the remaining shoreline of the Jamaica Bay Planning Unit: reinforced dune, levee, concrete floodwalls, sector gates, elevated promenades (berm faced and vertical faced), seawall reconstruction, and the Coney Island tie-in (Figure 3).

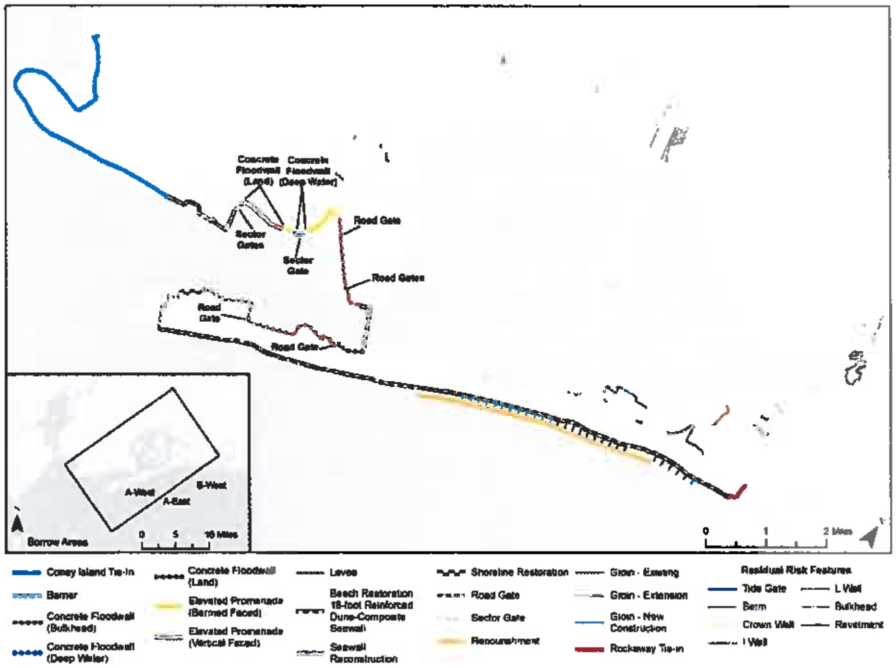

Figure 3: Depiction of the TSP with storm surge barrier alignment C-1E.

Alignment/Alternative C2

Based on the selection of the storm surge barrier alignment C-2, the following components are proposed for the remaining shoreline of the Jamaica Bay Planning Unit: reinforced dune, levee, seawall reconstruction and the Coney Island tie-in.

Description of the Action Alternative

The action alternative, also referred to as the Perimeter Plan, includes the optimized plan for the Atlantic Shoreline Planning Reach, two tie-ins (Coney Island and Rockaway Shorefront eastern tie-in), and the Jamaica Bay Northwest, Head of Bay. and Rockaway Bayside Coastal Storm Risk Management units. These units contain the following components: floodgates, roadway floodgates, railroad floodgate, the construction of vertical living shorelines, land-based floodwall, rip rap and a shallow foundation sheet pile or T-wall core, and roadway/beach access gates (Figure 4).

Figure 4: Depiction of the Action Alternative.

PRELIMINARY DESCRIPTION OF IMPACTS ON FISH AND WILDLIFE RESOURCES

The proposed action has the potential to directly and indirectly adversely impact fish and wildlife resources within the project area and the condition of Jamaica Bay and Rockaway Peninsula, resulting from the Corps' proposed project. Preliminary anticipated impacts are summarized below. The Service will conduct a full impact analysis and present it in the Draft FWCA report.

Direct impacts include: Loss and habitat modification of the habitats present within the project area including the offshore borrow area, intertidal mudflats, intertidal marshes, and maritime beach and maritime dunes; the burial of marine intertidal and marine beach invertebrate species and temporal modification of intertidal, and marine habitats; the temporary increase in turbidity and sedimentation of offshore, intertidal and estuarine habitats; and alteration/modification of hydrological regime within Jamaica Bay.

Indirect impacts include: decreases in habitat values for federally and state-listed plant and animal species; alteration/modification to the sediment budget; accelerated vegetative succession on barrier island; decreased biodiversity at the community level; development of habitat preferred by mammalian and avian predators; and reduced habitat values for waterfowl and migratory shorebirds.

RECOMMENDATIONS

As the Service conducts the impact analysis, we will develop a recommended, comprehensive mitigation plan with measures to avoid, minimize, and mitigate project impacts. In the interim, the Service provides preliminary avoidance, minimization, and mitigation measures listed as follows:

- Incorporate time of year restrictions into the construction timeline. Time-of-year restrictions should apply to both the initial beach fill and the renourishment cycles. The Service recommends a time of year restriction during which no work should be conducted between April 1 and September 30 to avoid adverse impacts to nesting shorebirds, spawning finfish, essential fish habitat, horseshoe crabs, and nesting diamondback terrapins. Additional restrictions for winter flounder should be included from January 15 to May 15. The Service will provide additional recommended restrictions for the Atlantic Shorefront Planning Reach and Jamaica Bay Planning Reach for migratory birds (including red knot), winter flounder, spawning fish, spawning horseshoe crabs, nesting diamondback terrapins and migrating anadromous/catadromous fish upon completion of surveys and/or description of proposed project components.

- Evaluate alternatives with less shore hardening components and/or incorporate natural and hybrid (natural and built) infrastructure into the project design. Traditional shoreline stabilization methods, or hard structures, result in adverse modification to natural resources: reduced or degraded habitat for breeding, spawning, nesting, feeding, growing; impaired movement of organisms between aquatic and terrestrial habitat; altered physical structure of the water's edge, with resultant changes to hydrology; increased infestation of invasive plants; local changes in water quality, including changes to temperature and increases in turbidity, nutrients and contaminants; and increased erosion of the adjacent natural shorelines and scouring in front of the structure (NYSDEC 2016). The last of the five principal planning objectives identified by the Corps is to "enhance natural storm surge buffers, also known as natural and nature-based features (NNBFs), and improve coastal resilience." As identified by Sutton-Grier et al. (2015) and Cunniff and Schwartz (2015), the various infrastructures types (natural, built and hybrid) and nature-based measures have different strengths and weaknesses that may be combined to maximize the strengths and minimize the weaknesses of each type. The Coastal Green Infrastructure Research Plan for NYC identifies 6 coastal green infrastructure (CGI) strategies relevant in NYC Coastal Areas (Zhou et al. 2014): constructed wetlands and maritime forests; constructed reefs; constructed breakwater islands; channel shallowing; ecologically-enhanced bulkheads and revetments; and living shorelines (sill-type).

- Restore natural areas (wetlands and uplands) within the project area by promoting native species and managing/eliminating invasive species; restore shorebird and colonial waterbird habitat, and construct diamondback terrapin nesting mounds.

- There are numerous efforts to improve the water quality within Jamaica Bay. The Corps should explore opportunities to partner with local municipalities and state agencies to improve bay water quality through improved storm-water treatment, removal of floatables and improve flushing in tributaries and canals.

- Incorporate best management practices (BMPs) during construction to minimize sedimentation and turbidity.

- With respect to the offshore borrow area, the following measures are recommended: all offshore dredging activities should be coordinated with the National Marine Fisheries

Service in order to coordinate protection of resources under their jurisdiction; exposing and impacting various sediment types during dredging should be avoided, maintaining the same sediment type at the borrow area would increase the probability that the same pre-dredging benthic assemblage will re-establish after dredging, producing deep, steep-sided pits with little to no water circulation that may lead to silt and organic matter accumulation and hypoxic or anoxic conditions, should be avoided while broad, shallow pits with gently sloping sides are less likely to exhibit these effects; and leave as many untouched "islands" in the borrow area as possible to facilitate benthic invertebrate recovery (Rice 2009)

- During beach nourishment, beach fill material must be compatible, similar in color and grain size distribution with the native sediment on the existing beach. During the initial construction and after each renourishment cycle, the Corps should ensure that the beach is graded at a gentle uniform slope with no piles, ridges, or holes left in the final graded beach placement materials. Additional BMPs for dune nourishment proposed by Rice (2009) include: designing non-uniform berm height to allow waves, tides and overwash to penetrate the beach to varying degrees to create a diversity of topographical microhabitats; staging of heavy equipment and pipes should occur off the beach where possible; and renourishment episodes should not occur before the ecosystem has recovered from the previous episode to prevent permanent perturbations to the system.

- If the dunes are to be planted with vegetation, the Corps should consult with the Service on other native plant species that can be incorporated into the planting scheme in order to increase plant diversity and heterogeneity in the proposed project area. Plants should consist of native species that reflect the local plant communities for the appropriate planting zone (e.g., foredune, dune face, dune crest, back of dune) (Rice 2009).

- The Service recommends the Corps develop an adaptive management plan and post-construction monitoring protocols.

The Service is in the process of refining and further developing more specific information/recommendations and invites the Corps to coordinate with the Service in this regard.

Corps Proposed Mitigation Measures/Best Management Practices

The Corps carried out the following evaluations to quantify environmental impacts: "Permanent and temporary impacts using an acreage metric. This provides a traditional measure of mitigation needs, and does not account for the level of ecological service and/or functions provided by the habitat types; and Evaluation for Planned Wetlands (EPW) was paired with a Benthic Index of Biological Integrity (B-IBI) to evaluate impacts to ecological functioning within coastal wetlands in in-water habitats." The GRR states that the TSP with alignment C-1E would temporarily impact 128.9 acres and permanently impact 129.7 acres. The TSP with alignment C-2 would temporarily impact 86.2 acres and permanently impact 62.2 acres. The action alternative would temporarily impact 249.1 acres and permanently impact 247 acres (Corps 2016a).

In order to mitigate these impacts, the Corps proposed the following mitigation project in addition to the proposed use of BMPs for sedimentation:

"Constructing the Dead Horse Bay and Duck Point projects are recommended as mitigation for Alternative C-2. Proposed mitigation for Alternative C-2 would provide 202 acres of habitat, which is an increase of 134 acres more than the existing condition. The mitigation requirements for Alternative C-1E are satisfied by a combination of constructing the Floyd Bennett Field Wetlands Habitat Creation project and the Elders Island project. Proposed mitigation for Alternative C-1E would provide 247 acres of habitat, which is an increase of 93 acres more than the existing condition. The combination of the Dead Horse Bay project and the Floyd Bennett Field Wetlands Habitat Creation project satisfies the mitigation requirements for the Perimeter Plan. Proposed mitigation for the Perimeter Plan would provide 341 acres of habitat, which is an increase of 227 acres more than the existing condition."

The Service requests a description of ecological modeling used to determine the acreage of impacted habitat, the quantity of each habitat impacted, a description of the proposed mitigation plan and engineering drawings of the above mentioned mitigation projects. Additionally, the Service requests a description of the measures the Corps proposes to incorporate into the project plan to avoid minimize and mitigate project related impacts.

STUDY NEEDS AND REQUEST FOR MORE INFORMATION

The Corps (2016a) states that the "most current available data were used for environmental analyses of the study area, augmented by field visits to the study areas and reviews of habitat classification using the most recent aerial photographs." The Service has provided updated information regarding species presence and distribution based on annual monitoring of nesting shorebirds, monitoring efforts conducted by New York City Audubon for long-legged wading birds, and from the National Park Service Bioblitz effort. However, available information regarding the presence, abundance, and distribution of species in the project area for many of the natural resources in the project area are outdated or were unavailable. In order for the Corps and the Service to better assess the project related impacts, the Service recommends that the Corps review recent/ongoing surveys/studies being conducted by federal, state, local and non-profit agencies, or conduct their own studies to determine species presence, abundance, and distribution for the following resources within the project area:

- The Service recommends surveys to determine the invertebrates located within the borrow area, the intertidal and upper beach habitats including shellfish. Additional surveys expanding on the survey efforts of NPS, NYC Audubon and Cornell Cooperative Extension to understand the distribution of spawning horseshoe crabs in order to understand how the construction of seawalls and bulkheads will affect these spawning sites.
- The information the Service provided regarding finfish was attained from NPS (2007), USFWS (1997), NYSDOS (1992). The most recent effort, carried out by NPS (2007), is nearly 10 years old and the effort was limited to Fort Tilden, Floyd Bennet Field and Jamaica Bay Refuge. The surveys which informed NYSDOS (1992) were conducted in 1974, 1983, and 1985. Surveys to identify the species present within the project area and

distribution should be undertaken. Both alewife and American eel have been documented within the project area and based on distribution may indicate opportunities to enhance habitat for these anadromous species.
- The Service has provided recent information for nesting shorebirds and long-legged wading birds that has been collected by the respective managers of the ocean front and Jamaica Bay Marsh islands. Surveys to determine the presence and distribution of red knots during the spring and fall migration should be undertaken throughout the project area.
- As discussed above, the nesting distribution of diamondback terrapins was altered after Hurricane Sandy. The Service recommends surveys to identify nesting locations of diamondback terrapin.

Additional testing for contaminants should be pursued in order to delineate contaminated sediments and identify appropriate avoidance and mitigation recommendations.

In June of 2016, the Corps provided the engineering drawings for Reaches 3-6 of the Atlantic Shoreline Planning Reach. The Corps should provide the Service with engineering drawings for the remaining reaches (1 and 2) in the Atlantic Shoreline Project Planning Reach and Jamaica Bay Planning Reach.

Conclusion

The project area comprised of marine, terrestrial, and estuarine habitats provides habitat to over 214 species of special emphasis and listed species, 48 species of fish, and 120 species of birds year round and seasonally. The habitats within the project area have been identified as significant by the Service, the New York State Department of State, NYSDEC, and the National Audubon Society. The Service has summarized species that may be found within each habitat. Many of these species are federally- and/or state-listed species and species of concern. Due to the potential for the proposed project to affect federally-listed species that are known to, or that may, occur within the vicinity of the proposed project, the Service recommends that the Corps initiate consultation in accordance with Section 7 of the Endangered Species Act.

The proposed action has the potential to affect a number of the species found within the project area as a result of modification and loss of important spawning, breeding, nursery, and foraging habitat. The Service recommends that the Corps review recent surveys/studies (federal, state, and local agencies) and/or conduct their own studies to determine species presence, abundance, distribution, and potential project impacts as discussed above. The Service also recommends that the Corps consider carrying out contaminant tests. The Service is available to coordinate on these efforts and provide further guidance on what surveys/studies should be conducted.

The Service has requested the following additional information:

- anticipated impact to the hydrological regime within Jamaica Bay from construction of, and the operation of the storm surge barrier;
- a sediment budget for the maritime beach/dune system as well as for Jamaica Bay

- the engineering drawings for the Jamaica Bay Planning Reach, reaches 1 and 2 for the Atlantic Shorefront Planning Reach, and the proposed mitigation projects;
- a description of ecological modeling used to determine the acreage of impacted habitat, the quantity of each habitat impacted, a description of the proposed mitigation plan.

The Service has provided a preliminary list of anticipated impacts, but will provide a more comprehensive analysis upon receipt of the information requested above. Additionally, the Service has provided a preliminary list of mitigation measures that have been recommended for similar projects. Upon completion of the impact analysis, the Service will provide a comprehensive list of recommended avoidance, minimization, and mitigation measures.

The Service appreciates the opportunity to coordinate with the Corps on this study. We look forward to coordinating with the Corps as they further develop this project. If you have any questions or require additional information, please contact Terra Willi of the Long Island Field Office at 631-286-0485.

Sincerely,

Acting for

David A. Stillwell
Field Supervisor

Enclosure

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ROCKAWAY AND JAMAICA BAY HSGRR
2016 TENTATIVELY SELECTED PLAN DESCRIPTION

The tentatively selected HSGRR Coastal Storm Risk Management plan for the area from East Rockaway Inlet to Rockaway Inlet and the lands within and surrounding Jamaica Bay New York consists of the following components, which are generally described for 2 Planning Reaches: 1) A reinforced dune and Berm Construction, in conjunction with groins in select locations along the Atlantic Ocean Shoreline; 2) a line of protection along Jamaica Bay and Rockaway Inlet with a storm surge barrier at one of two identified currently identified locations, i.e. plan C1-E and C2; and 3) residual risk features in locations surrounding Jamaica Bay. Twenty-six (26) project residual risk feature locations have been identified for which five (5) have detail available at this time. In general, these features are intended to provide a design height of +6 ft NAVD through various methods to reduce frequent flooding. As additional residual risk features are further developed, additional NEPA documentation and resource agency coordination would be provided. This TSP description includes the maximum footprint for the plan, however the footprint may be reduced in scope based on public and agency comments as well as new information.

If plan C1-E is selected for the barrier:
The TSP extends along approximately 152,000 linear feet of project area extending from the eastern end of the Rockaway peninsula at Inwood, Nassau County to the western end of the Rockaway peninsula, at Breezy Point, Queens, where the plan wraps around the existing shoreline past the Gil Hodges Memorial Bridge. Near Jacob Riis Park a storm surge barrier crosses Rockaway Inlet landing at Floyd Bennet Field, Brooklyn. The plan continues up Flatbush Avenue before turning west along the existing shoreline and continuing west until Norton Point. From Norton Point, the line of protection continues on the north side of Coney Island, crossing Coney Island Creek. From Coney Island Creek it continues north along the shoreline to high ground.

If the plan C2 is selected for the barrier:
The TSP extends approximately 111,800 linear feet of project area extending from the eastern end of the Rockaway peninsula at Inwood, Nassau County to the western end of the Rockaway peninsula, at Breezy Point, Queens, where the plan wraps around the existing shoreline. A storm surge barrier crosses Rockaway Inlet from Breezy Point to Sheepshead Bay/Kingsborough Community College, Brooklyn. The plan continues west until Norton Point. From Norton Point, the line of protection continues on the north side of Coney Island, crossing Coney Island Creek. From Coney Island Creek it continues north along the shoreline to high ground.

The plan along the Atlantic Ocean Shorefront consists of:

- A reinforced dune (composite seawall) with a structure crest elevation of +17 feet (NAVD88) and dune elevation of +18 feet (NAVD88), and a design berm width of 60 feet extending approximately 35,000 LF from Beach 9th to Beach 149th. The bottom of dune reinforcement extends up to 15 feet below the dune crest.
- A beach berm elevation of +8 ft NAVD and a depth of closure of -25 ft NAVD;
- A total beach fill quantity of approximately 804,000 cy for the initial placement, including tolerance, overfill and advanced nourishment with a 4-year renourishment cycle of approximately 1,021,000 cy, resulting in an advance berm width of 60 feet;
- Obtaining sand from borrow area located approximately 2 miles south of the Rockaway Peninsula and about 6 miles east of the Rockaway Inlet. It is about 2.6 miles long, and 1.1 miles wide, with depths of 36 to 58 feet and contains approximately 17 million cy of suitable beach fill material, which exceeds the required initial fill and all periodic renourishment fill operations.
- Extension of 5 existing groins; and
  Construction of 13 new groins.

If the C1-E plan is selected, the alignment along Jamaica Bay and Rockaway Inlet consists of:

- Reinforced Dune along the shoreline in Reaches 1 and 2 of the Atlantic Coast Planning Reach, from Beach 149th to Breezy Point.

- Levee and from approximately B227th St. north overland across Breezy Point, thence eastward from B222nd St. to B201st St. Approximately 450,000 cy of sediment required for levee construction.
- Concrete floodwall south along B201st St. extending east along north side of Rockaway Blvd to B184th St., thence north to existing shoreline. Concrete floodwall continues east to storm surge barrier approximately 2300 ft. east of the Gil Hodges Memorial Bridge/Marine Parkway Bridge.
- A 3,970-foot storm surge barrier across Rockaway Inlet from near Jacob Riis Park to Floyd Bennet Field;
- A concrete floodwall on land running north along Flatbush Avenue towards the Belt Parkway;
- A berm-faced elevated promenade running west along the waterside of the Belt Parkway to a concrete floodwall at Gerritsen Inlet;
- A sector gate across Gerritsen Inlet, which ties in to a concrete floodwall;
- Elevated promenades (berm faced and vertical faced) extend from Gerritsen Inlet around Plumb Beach westward to the inlet at Sheepshead Bay;
- A sector gate across Sheepshead Bay
- Seawall reconstruction around the eastern end of Coney island at Kingsborough Community College;
- A reinforced dune across sandy beach at Kingsborough Community College/Oriental and Manhattan Beach, and
- Seawall reconstruction from Manhattan Beach to approximately Corbin Place,
- The Coney Island tie-in, where the line of protection continues west until Norton Point. From Norton Point, the line of protection continues on the north side of Coney Island, crossing Coney Island Creek. From Coney Island Creek it continues north along the shoreline to high ground.

If the C2 plan is selected, the alignment along Jamaica Bay and Rockaway Inlet consists of:

- Reinforced Dune along the shoreline in Reaches 1 and 2 of the Atlantic Coast Planning Reach, from Beach 149th to Breezy Point.
- Levee from approximately B227th St. north overland across Breezy Point, to approximately B218th St.
- A 5,715-foot storm surge barrier across Rockaway Inlet from Breezy Point to Sheepshead Bay/Kingsborough Community College;
- Seawall reconstruction from the base of the surge barrier at Sheepshead Bay/Kingsborough Community College to Kingsborough College/Oriental Beach;
- A reinforced dune across sandy beach at Kingsborough Community College/Oriental and Manhattan Beach, and
- Seawall reconstruction from Manhattan Beach to approximately Corbin Place,
- The Coney Island tie-in, where the line of protection continues west until Norton Point. From Norton Point, the line of protection continues on the north side of Coney Island, crossing Coney Island Creek. From Coney Island Creek it continues north along the shoreline to high ground.

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The plan for the 5 residual risk feature project areas currently identified (of up to 26 residual risk features) consists of:

1) Edgemere - contains 2 features (berm and bulkhead) in an area with an existing ground elevation of +4 ft. NAVD, with a design height of +6 ft. NAVD)

- A berm with one section that is approximately 225' long from intersection of northern portion of Conch Place terminating at Norton Ave and Beach 45th Street,
- A second berm section approximately 3400' long along the eastern shore approximately at Beach 43rd St. extending along the shoreline terminating roughly at the northern corner of beach 35th St.
- A bulkhead approximately 600' from terminus of Beach 44th St. around northern tip of point, to eastern shore approximately at Beach 43rd St.

2) Norton Basin - contains 2 features (bulkhead and I-wall) in an area with an existing ground elevation of +4 ft NAVD, with a design height of +6 ft NAVD)

- A bulkhead approximately 200' from the intersection between Norton Drive and Coldspring Rd, extending parallel to Norton Drive along the shoreline.
- An I-Wall from the eastern end of the bulkhead along Norton Drive and north on Westbourne Ave, terminating at intersection with Dunbar St. with a length of 2070 ft.

3) Mott Basin - contains 2 features (berm and bulkhead) in an area with an existing ground elevation of +4 ft NAVD, with a design height of +6 ft NAVD)

- A berm section beginning near the northern end of Eggert Pl. running along the shoreline, extending inland to terminus of McBride St. and along Battery road and Pinson St., terminating roughly at intersection between Horton Ave. and Pinson St. with a length: 1360 ft.
- A bulkhead extending from a location approximately 80' from terminus of Dickens St. parallel to Enright road, then running northward parallel to and on the nearest side to Pearl Street and terminating at the shoreline.

4) Brookville Boulevard - contains 2 features (road raising and two sections of I-wall) in an area with an existing ground elevation of +4 ft NAVD, with a design height ranging from +5.5 ft NAVD to +6 ft NAVD)

- A road raising segment approximately 2800' long, along Brookville Boulevard, starting from a location approximately 200' north of intersection with Rockaway Boulevard extending northward terminating at Brookville Boulevard and 149th Ave.
- An I-Wall western segment, which is approximately 410' long starting at 231-08 148th Ave and running north, past end of 148th Ave along high ground to 147-51 231st St.
- An I-Wall western segment, which is approximately 1090 ft. long starting at 148-74 Brookville Blvd and running northward along high ground at rear of properties until northern terminus at 148-99 235th St.

5) Canarsie contains 1 feature (revetment) in an area with an existing ground elevation of +4 ft NAVD, with a design height of +6 ft NAVD)

- A revetment extending approximately 240' from intersection between E 108th St. and Flatlands 1st St. and extending along the shoreline a length of 410 ft.

US Army Corps of Engineers®
New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D2a
Endangered Species Act Compliance
Biological Assessment For:

Piping Plover (*Charadrius melodus*)

Seabeach Amaranth (*Amaranthus pumilus*)

Rufa Red Knot (*Calidris canutus)*

August 2018

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1 INTRODUCTION

1.1 Purpose and Objective of the Biological Assessment

This Biological Assessment (BA) has been prepared in accordance with requirements identified in the Endangered Species Act (ESA) of 1973, to identify and discuss potential impacts to federally-listed threatened and endangered (T&E) species caused by the U.S. Army Corps of Engineers (USACE), New York District (District) activities associated with implementation of the Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet, New York Hurricane Sandy General Reevaluation (Project), Queens County, New York (Figure 1). T&E species include those species federally- listed and protected by the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) under the ESA.

In accordance with Section 7(a)(2) of the ESA, as amended, federal agencies are required to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any habitat of such species determined to be critical unless an exemption has been granted. Additionally, a BA must be prepared if listed species or critical habitat may be present in an area to be impacted by a "major construction activity." A major construction activity is defined at 50 CFR §402.02 as a construction project (or an undertaking having similar effects) which is a major federal action significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act (NEPA) (42 U.S.C. 4332(2)(C)).

1.2 List of Species

The USFWS, through its historical formal consultation with the District regarding implementation of the Project, identified three T&E species as being present in or near the Project Area. Based on habitat and life history assessments, recommendations from the USFWS in the original (currently being updated) Fish and Wildlife Coordination Act 2B Report (USFWS 1995a) and follow-up consultation for this Project with the New York State Department of Environmental Conservation (NYSDEC) and New York City Department of Parks and Recreation (DPR), the District has determined that the following federally-listed species are likely to occur in the East Rockaway Project Area and warrant impact analyses within a BA:

- Piping Plover (*Charadrius melodus*), federally threatened;
- Seabeach Amaranth (*Amaranthus pumilus*), federally threatened; and
- Rufa Red Knot (*Calidris canutus),* federally threatened.

Figure 1: Project Area Location

The state-listed threatened common tern (*Sterna hirundo*) and least tern (*Sterna antillarum*) and the federally and state-listed Endangered roseate tern (*Sterna dougallii*), utilize beach habitat similar to that of the piping plover and seabeach amaranth, and have been identified as species that may occur in the Project Area (USACE 1998, USFWS 1995a). Additionally, the state species of special concern, black skimmer (*Rynchops niger*), also is known to nest on coastal beaches and frequently nests in or near tern nesting areas (NatureServe 2002). None of these species have been identified by the USFWS as species requiring further ESA consultation (USFWS 1995a). However, measures taken to avoid and protect piping plover, red knot and seabeach amaranth habitats would benefit and protect these species as well.

1.3 Objectives for this BA

This BA will support the Environmental Impact Statement (EIS) that will identify and evaluate potential environmental impacts associated with the proposed Project, and will maintain compliance with Section 7(a)(2) of the ESA. The BA is designed to provide the USFWS with the required information for their assessment of the effects of the proposed Project on federally-listed endangered and threatened species.

Specific objectives of this BA are to:

1. Ensure Project actions do not contribute to the loss of viability of T&E species;
2. Comply with the requirements of the ESA, as amended, that Project actions not jeopardize or adversely modify critical habitat for federally-listed T&E species;
3. Analyze the effects of implementation of Project actions on federally-listed T&E species;
4. Recommend impact avoidance, minimization, and measures to offset impacts to federally- listed T&E species; and,
5. Provide biological input to ensure District compliance with the NEPA and the ESA.

1.4 Project Background

Rockaway, New York, has an extensive history of property damage and economic loss as a result of coastal flooding and erosion associated with frequent storms. Significant beach erosion and sand loss has reduced the width of the protective beach front and has exposed properties to a high risk of damage from ocean flooding and wave attack, and existing groins and jetties along the island have deteriorated and are becoming less effective at reducing sand loss along the shoreline and providing wave protection. Non shorefront flooding in Rockaway is attributed to storm surges in Jamaica Bay inundating the bay shorelines of Rockaway (Back Bay Flooding) and storm surges that overtop the high elevations located near the Rockaway beachfront flowing across the peninsula to meet the surge into Jamaica Bay (Cross Shore Flooding).

The Reformulation Study for East Rockaway Inlet to Rockaway Inlet and Jamaica Bay was authorized by the House of Representatives, dated 27 September 1997, as stated within the Congressional Record for the US House of Representatives. It states, in part:

> *"With the funds provided for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York project, the conferees direct the Corps of Engineers to initiate a reevaluation report to identify more cost-effective measures of providing storm damage*

protection for the project. In conducting the reevaluation, the Corps should include consideration of using dredged material from maintenance dredging of East Rockaway Inlet and should also investigate the potential for ecosystem restoration within the project area."

Public Law 113-2 (29Jan13), The Disaster Relief Appropriations Act of 2013 (the Act), was enacted in part to "improve and streamline disaster assistance for Hurricane Sandy, and for other purposes". The Act directed the Corps of Engineers to:

> *"…reduce future flood risk in ways that will support the long-term sustainability of the coastal ecosystem and communities and reduce the economic costs and risks associated with large-scale flood and storm events in areas along the Atlantic Coast within the boundaries of the North Atlantic Division of the Corps that were affected by Hurricane Sandy" (PL 113-2).*

In partial fulfillment of the requirements detailed within the Act, the Corps produced a report assessing "authorized Corps projects for reducing flooding and storm risks in the affected area that have been constructed or are under construction". The East Rockaway Inlet to Rockaway Inlet, NY project met the definition in the Act as a constructed project. In accordance with the Act, the Corps is proceeding with this GRR to address resiliency, efficiency, risks, environmental compliance, and long-term sustainability within the study area (USACE, 2013a).

1.5 Project Area Description

The communities located on the Rockaway peninsula from west to east include Breezy Point, Roxbury, Neponsit, Belle Harbor, Rockaway Park, Seaside, Hammels, Arverne, Edgemere and Far Rockaway. The former Fort Tilden Military Reservation and the Jacob Riis Park (part of the Gateway National Recreation Area) are located in the western half of the peninsula between Breezy Point and Neponsit. The characteristics of nearly all of the communities on the Rockaway peninsula are similar. Ground elevations rarely exceed 10 feet, except within the existing dune field. Elevations along the Jamaica Bay shoreline side of the peninsula generally range from 5 feet, increasing to 10 feet further south toward the Atlantic coast. An estimated 7,900 residential and commercial structures on the peninsula fall within the FEMA regulated 100-year floodplain.

During Hurricane Sandy, tidal waters and waves directly impacted the Atlantic Ocean shoreline. Tidal waters amassed in Jamaica Bay by entering through Rockaway Inlet and by overtopping and flowing across the Rockaway Peninsula. Effective coastal storm risk management for communities within the study area requires reductions in risk from two sources of coastal storm damages: inundation, wave attack with overtopping along the Atlantic Ocean shorefront of the Rockaway peninsula and flood waters amassing within Jamaica Bay via the Rockaway Inlet.

The study area (Figure 1), consisting of the Atlantic Coast of New York City between East Rockaway Inlet and Rockaway Inlet, and the water and lands within and surrounding Jamaica Bay, New York is vulnerably located within the Federal Emergency Management Agency (FEMA) regulated 100-year floodplain. The shorefront area, which is a peninsula approximately 10 miles in length, generally referred to as Rockaway, separates the Atlantic Ocean from Jamaica Bay immediately to the north. The greater portion of Jamaica Bay lies in the Boroughs of

Brooklyn and Queens, New York City, and a section at the eastern end, known as Head-of-Bay, lies in Nassau County. More than 850,000 residents, 48,000 residential and commercial structures, and scores of critical infrastructure features such as hospitals, nursing homes, wastewater treatment facilities, subway, railroad, and schools are within the study area

The Project Area consists of beaches, sand dunes, low-growing shrubs, and tidal flats, and has been highly modified as a result of human development. Upland areas in the vicinity of the Project have been committed to residential, commercial and recreational development. Near shore and upper beach areas in the Project Area are heavily utilized for beach recreation. Numerous stone groins currently exist in the Project Area. The shoreline has been stabilized since the 1880s with beach fill, groins, bulkheads, and a stone jetty at Rockaway Inlet.

1.6 Description of Habitat and Species

Oceanfront beach, bayfront and deepwater ocean habitats constitute the majority of the Project Area. The beach community includes upper, intertidal, and nearshore subtidal areas. Except for the sparsely vegetated herb and herb/shrub community associated with the upper beach/dune area, most of the Project Area is devoid of vegetation and is significantly impacted from human use of the area for recreational activities. In addition, significant development abuts the upper beach zone in most of the Project Area.

Jamaica Bay which is located on the north side of the peninsula is the largest estuarine waterbody in the New York City metropolitan area covering an approximately 20,000 acres (17,200 of open water and 2,700 acres of upland islands and salt marsh). Jamaica Bay measures approximately 10 miles at its widest point east to west and four miles at the widest point north to south, including approximately 26 square miles in total. The mean depth of the bay is approximately 13 feet with maximum depths of 60 feet in the deepest borrow pits. Navigation channels within the bay are authorized to a depth of 20 feet. Jamaica Bay has a typical tidal range of five to six feet. The portions of New York City and Nassau County surrounding the waters of Jamaica Bay are urbanized, densely populated, and very susceptible to flooding. An estimated 41,000 residential and commercial structures within the FEMA regulated 100-year Jamaica Bay floodplain.

The Rockaway Beach Endangered Species Nesting Area was established in 1996 by New York City as a response to the piping plovers nesting in Far Rockaway, Queens.

1.6.1 Habitat Types

Jamaica Bay, formed by the barrier created by the Rockaway Peninsula, and its saltmarsh islands form one of the most recognizable and striking natural features within the urban landscape of NYC. Prior to the extensive urban development occurring over the past 150 years, tidewater grasslands colonized postglacial outwash plains at the ends of many creeks and streams in Jamaica Bay creating fringing salt marshes which encircled Jamaica Bay. Extensive saltmarsh islands and many more thousands of acres of fringing marshes and transitional uplands once adjoined the mainland, and the Rockaway peninsula did not extend much past what is now Jacob Riis Park. Under current conditions, the Rockaway peninsula has been substantially extended to the west, creating a more funnel shaped Rockaway Inlet; islands have been removed by dredging or extended to the nearby mainland by fill; shorelines have been altered by dredge and fill activities; bulkheads have been installed to stabilize and protect shorelines; channels and borrow areas have been dredged, altered bottom contours affecting flows; and natural tributaries have essentially disappeared causing sediment input from these tributaries to be mainly silts and particulates from urban runoff (DEP, 2007).

Existing coastal habitats within both planning reaches generally occur along an ecological continuum dependent upon tidal influence. The critical tidal elevations that help define these habitats include MLLW, MHW, and mean higher high water (MHHW).

Biological communities were classified into twelve distinct habitat types that were identified and mapped throughout the study area. They represent the range of conditions and habitat quality observed throughout the Atlantic Ocean Shorefront Planning Reach and the Jamaica Bay Planning Reach, including both native habitats and those resulting from long-term anthropogenic disturbances. Specifically, the Atlantic Ocean Shorefront Planning Reach consists of oceanfront beach habitat with isolated dune habitats. Most of the study area is devoid of vegetation and is significantly impacted by human use of the area for recreational activities and significant development that abuts the upper beach zone in most of the Study Area. The Jamaica Bay Planning Reach consists of a diverse mosaic of the twelve habitat types. While many native communities can be found throughout Jamaica Bay, it is also characterized by dense urban development that has altered and/or created new habitats indicative of the historic anthropogenic disturbance.

The intertidal zone extends from the low tide line to the high tide line and is submerged and exposed according to daily tidal cycles. The zone is unvegetated and consists of fine-grained sand substrate. Wrack and ocean debris are common within this zone. Species diversity is relatively low due to limited ability of species to withstand the daily submersion and exposure. Micro and macro-invertebrates known to inhabit this zone include crabs, shrimp, bivalves, and worms. The intertidal zone provides key foraging habitat for shorebirds/seabirds, which feed on these organisms.

The affected near shore subtidal zone extends from the low water line down to 25 feet (ft) below mean low water (MLW) and is nearly continuously submerged. The zone is unvegetated and consists of fine-grained sand substrate. The area contains a rich diversity of species including crabs, shrimp, bivalves, worms, and finfish. In addition, numerous man-made groins extend from the intertidal zone into the subtidal zone from 200 to 600 ft (USACE 1998). These structures provide habitat for numerous fish, macro-invertebrates, and birds.

Throughout both reaches of the study area, many natural shorelines have been replaced with hardened structures such as groins, bulkheads, revetments, or rip rap. These hardened structures have interrupted the naturally occurring ecological continuum and caused an unnatural transition from upland areas (i.e., usually impervious surfaces associated with urban areas) immediately into deep subtidal area. These shorelines provide limited habitats and services to a suite of resources identified as critical to the Jamaica Bay ecosystem.

1.6.2 Tides and Tidal Currents

The mean tidal range along the Atlantic Ocean Shorefront project area is 4.5 ft and the spring tidal range reaches 5.4 ft The Mean High Water (MHW) level and Mean Low Water (MLW) level relative to NAVD88 are +1.5 ft and - 3.0 ft, respectively for the Atlantic Coast.

With respect to the Bay, the MHW level and MLW level relative to NAVD88 within the Bay are +2.4 and -3.07 respectively.

Currents at East Rockaway Inlet have average maximum velocities of 3.1 and 2.3 knots at flood tide, and 2.6 and 2.2 knots at ebb tides. Rockaway Inlet is the only tidal inlet to Jamaica Bay with high currents at its narrowest point which is 0.63 miles with an average depth of 23 feet (USFWS 1997). At the entrance to Rockaway Inlet, the prevailing currents slow as they enter the mouth of the Bay and turn to the east and again slow which significantly reducing tidal exchange. Tides in Jamaica Bay are semi-diurnal and average 5 feet. Dredging has deepened the mean depth of the bay from approximately 3 feet in the past to 13 feet now, which has increased the residence time of water from 11 days to an average of 33 days but varying by depth and location (USFWS 1997). The maximum tidal current speeds in North Channel at Canarsie Pier are 0.5 knots (0.84 ft/s) flood and 0.7 knots (0.84 ft/s) ebb (USACE 2005). USGS observations of flow speeds at the USGS Rockaway Inlet gage are generally 1.0 knots or less during neap tide periods and 1.7 knots or less during spring tide periods (Arcadis 2016b).

1.6.3 Finfish and Shellfish

The nearshore waters of the Project Area support seasonally abundant populations of many recreational and commercial finfish (USACE 1998, USFWS 1982, 1995a). Primary recreational fish species include black sea bass (*Centropristis striata*), summer flounder (*Paralichthysdentatus*), winter flounder (*Pseudopleuronectes americanus*), weakfish (*Cynosion regalis*), bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), striped bass (*Morone saxatillis*), and Atlantic mackerel (*Scomber scombrus*) (USFWS 1989). Nearshore waters also contain a number of migrant anadromous and catadromous species such as the Atlantic sturgeon (*Acipenser oxyhinchus*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), American shad (*Alosa sapidissima*), striped bass, and American eel (*Anguilla rostrata*) (Woodhead 1992).

1.6.4 Invertebrate Communities

The benthic community of the greater Project Area is dominated by polychaetous annelids, followed by malacostracans, bivalves, and gastropods (Reid et al. 1991, Ray and Clarke 1995, Ray 1996, USACE 2006). Common shellfish species in the Project Area are the hardshell clam (*Mercenaria mercenaria*), softshell clam (*Mya arenaria*), telling (*Tellina agilis*), razor clam (*Ensis directus*), rock crab (*Cancer irroratus*), lady crab (*Ovalipes ocellatus*), American lobster (*Homarus americanus*), hermit crab (*Homarus americanus*) and blue crab (*Callinectes sapidus*) (USACE 1998, 2005). Mussels (*Mytilus* spp) dominate man-made structures such as groins and jetties in the Project Area (USACE 1998). Ghost crabs (*Ocypode* spp) and sand fleas (*Talorhestia* spp.) dominate the beach community (USACE 1998). Surveys conducted by the USACE in 2003 indicate that the borrow area itself contains very small, to no, localized populations of surf clam (USACE 2006).

1.6.5 Significant Habitats

No federally designated critical habitat is found within or near the proposed project area. Jamaica Bay and Breezy Point have been designated Significant Coastal Fish and Wildlife Habitat by the New York State Department of State (NYSDOS), Division of Coastal Resources. Jamaica Bay, Breezy Point, and Rockaway Beaches have also been designated globally Important Bird Areas by Audubon New York. The federally-listed threatened piping plover (Charadrius melodus) and threatened seabeach amaranth (Amaranthus pumilus) have been identified within the project area.

1.6.6 Listed Species

The federally and state-listed piping plover, seabeach amaranth, rufa red knot, and roseate tern, as well as the state-listed common tern and least tern, and the state species of special concern black skimmer, all nest or carry out a major portion of their life cycle activities (i.e., breeding, resting, foraging) within essentially the same habitat (Table 1). This habitat encompasses areas located between the high tide line and the area of dune formation and consists of sand or sand/cobble beaches along ocean shores, bays and inlets and occasionally in blowout areas located behind dunes (Bent 1929, NatureServe 2002, NJDEP 1997, USACE 2006, USFWS 2004a).

Table 1: Protection Status of Species that Utilize Habitats Similar to those in the Project Area

Common Name	Federal Status	State Status
Common Tern	Not Listed	Threatened
Least Tern	Not Listed	Threatened
Piping Plover	Threatened	Endangered
Roseate Tern	Endangered	Endangered
Seabeach Amaranth	Threatened	Threatened
Rufa Red Knot	Threatened	Endangered

Piping plover have been identified and are known to nest within upper beach areas located within the Project Area (USACE 1998, USFWS 1995a, b, 2002). Red knots migrate through the project area and are dependent on intertidal and sand and mud flats for foraging and resting. Although not commonly seen in large numbers, there have been recent sightings of a few red knots in the vicinity of the Project. The USFWS has determined that habitats that occur in the Project Area are suitable for piping plover and seabeach amaranth (USFWS 1995a). Therefore, the life histories of piping plover and seabeach amaranth and potential impacts to these species and their associated habitats are discussed in detail in this Biological Assessment. The black skimmer and least, roseate, and common terns, could potentially utilize habitats within the Project Area. Measures taken to avoid and protect plover and seabeach amaranth habitats would benefit and protect these species, as well as numerous other shorebird/seabird species that depend on coastal habitats.

2 PROPOSED FEDERAL ACTION

The Recommended Plan for this Project is a component of the USACE response to the unprecedented destruction and economic damage to communities within the study area caused by Hurricane Sandy. The recommendations herein include a systems-based approach for coastal storm risk management that provides a plan for the entire area, which has been formulated with two planning reaches to identify the most efficient solution for each reach. Project partners include the New York State Department of Environmental Conservation, the New York City (NYC) Mayor's Office of Recovery and Resiliency, the NYC Department of Parks and Recreation, the NYC Department of Environmental Protection, and the National Park Service.

2.1 Study Objectives

Five principal planning objectives have been identified for the study, based upon a collaborative planning approach. These planning objectives are intended to be achieved throughout the study period, which is from 2020 – 2070:

1. Reduce vulnerability to storm surge impacts;
2. Reduce future flood risk in ways that will support the long-term sustainability of the coastal ecosystem and communities;
3. Reduce the economic costs and risks associated with large-scale flood and storm events;
4. Improve community resiliency, including infrastructure and service recovery from storm effects
5. Enhance natural storm surge buffers and improve coastal resilience.

2.2 Recommended Plan Description

The Coastal Storm Risk Management (CSRM) Recommended Plan for the area from East Rockaway Inlet to Rockaway Inlet and the lands within and surrounding Jamaica Bay New York consists of the following components, which are generally described for 2 Planning Reaches: 1) A reinforced dune and Berm Construction, in conjunction with groins in select locations along the Atlantic Ocean Shoreline; 2) High Frequency Flood Risk Reduction Features (HRFRRF) features in locations surrounding Jamaica Bay. In general, these features are intended to provide a design height of +6 ft NAVD through various methods to reduce frequent flooding. As HRFRRF features are further developed, additional NEPA documentation and resource agency coordination would be provided, as necessary. This Recommended Plan description includes the maximum footprint for the plan; however the footprint may be changed based on public and agency comments as well as new information.

2.3 Recommended Plan: Atlantic Shorefront

The general approach to developing CSRM along Rockaway Beach (between Beach 9th Street and Beach 169th Street, which the east and west tapers are included) was to evaluate erosion control alternatives in combination with a single beach restoration plan to select the most cost effective renourishment approach prior to the evaluation of alternatives for coastal storm risk management. The most cost effective erosion control alternative is beach restoration with increased erosion control. This constitutes of a beach berm width of 60ft at an elevation of +8ft

NAVD88 constructed by a beach fill quantity of 1.6 million CY for the initial placement and with a 4-year 1,021,000 CY renourishment cycle, as needed, for the life of the project (50 years). In addition, a screening analysis was performed to evaluate the level of risk reduction provided by a range of dune and berm dimensions and by reinforced dunes, which would be combined with the beach restoration with increased erosion control to optimize CSRM at Rockaway Beach. A composite seawall was selected as the best coastal storm risk management alternative. The composite seawall protects against erosion and wave attack and also limits storm surge inundation and cross-peninsula flooding. The Recommended Plan spans from Beach 20th Street to Beach 149th Street (Reach 3 through Reach 6b) and combines Beach Restoration and Erosion Control and two tapered beach sections at both the east and west end of the project (Beach 9-19, and Beach 150-Beach 169, respectively), which are described below. In summary, the Recommended Plan has the following features:

- A composite seawall with a structure crest elevation of +17 feet (NAVD88), the dune elevation is +18 feet (NAVD88), and the design berm width is 60 feet;
- A beach berm elevation of +8 ft NAVD and a depth of closure of -25 ft NAVD;
- A total beach fill quantity of 1.6 million CY for the initial placement, including tolerance, overfill and advanced nourishment with a 4-year renourishment cycle of 1,021,00 cy, resulting in a minimum berm width of 60 feet;
- Extension of 5 existing groins; and
- Construction of 13 new groins.

The east beachfill taper is approximately 3,000 ft in shorefront length from Beach 19th Street east to Beach 9th Street. The taper comprises of approximately 1,000 ft of dune and beach taper including reinforced dune feature and approximately 2,000 ft of dune and beach fill without reinforced dune feature. In addition to the tapering of berm width, the dune elevation also tapers from an elevation of +18 ft NAVD at 19th Street down to approximately +12 ft NAVD at Beach 9th Street which will be tied into the existing grade. The west beachfill taper is approximately 5,000 ft in shorefront length from Beach 149th Street west to Beach 169th street fronting Riis Park. The beachfill taper will be beach fill only with a berm width tapered from the design width at 149th Street to the existing width and height at 169th Street. In addition to the beachfill taper, a tapered groin system comprised of three (3) rock groins is included for this section.

Figures 2a through 2d show the Atlantic Ocean Shorefront component of the Recommended Plan.

Figure 2a: Atlantic Ocean Shorefront Component of Recommended Plan (1 of 4)

Figure 2b: Atlantic Ocean Shorefront Component of Recommended Plan (2 of 4)

Figure 2c: Atlantic Ocean Shorefront Component of Recommended Plan (3 of 4)

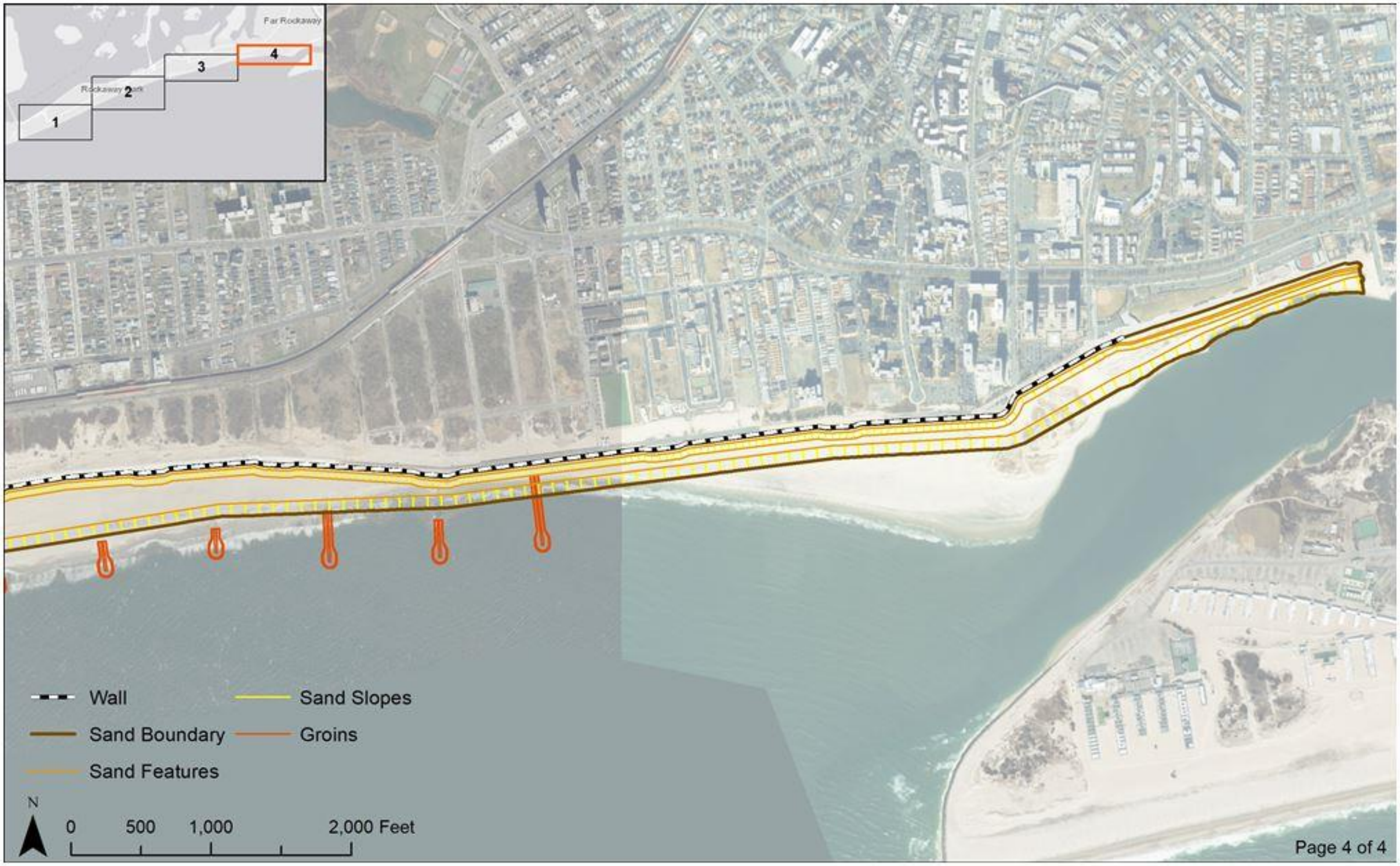


Figure 2d: Atlantic Ocean Shorefront Component of Recommended Plan (4 of 4)

2.4 Recommended Plan: Jamaica Bay

2.4.1 Cedarhurst-Lawrence

The Cedarhurst-Lawrence project (Figure 3) begins on the east side of the channel near the driveway to Lawrence High School. It consists of approximately 1000 feet of deep bulkhead that follows the existing bulkhead line around the southern end of the channel at Johnny Jack Park, and continues north along the west side before being connected to high-ground behind the Five Towns Mini Golf & Batting Facility with a 23 foot segment of medium floodwall. The project is located in Nassau County and crosses the border between the Village of Cedarhurst and the town of Hempstead. Project design elevations have preliminarily been established based on expected wave exposure are set at an elevation of +10.0ft NAVD88.

There are three existing outfalls in the area where the bulkhead will be raised. Each of the outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The outlet pipes will be replaced if the design phase indicates it is necessary. Drainage along the landward side of the bulkhead will be provided by a small ditch or drainage collection pipe, with inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station capacity is estimated to be approximately 40 cubic feet per second (cfs), which will be refined during the design phase.

CEDARHURST-LAWRENCE OUTLET TABLE

Drainage Area	**Outfall Size**	**Outfall Location**
Drainage Basin L1	TBD	Existing Outfall
Drainage Basin L1	TBD	Existing/New Culvert (500 feet from Peninsula Boulevard).
Drainage Basin L1	TBD	Existing/New Culvert (500 feet from Peninsula Boulevard).
Drainage Basin L1	5’x3’	Outfall L-1, Approximately 250 feet from Peninsula Boulevard

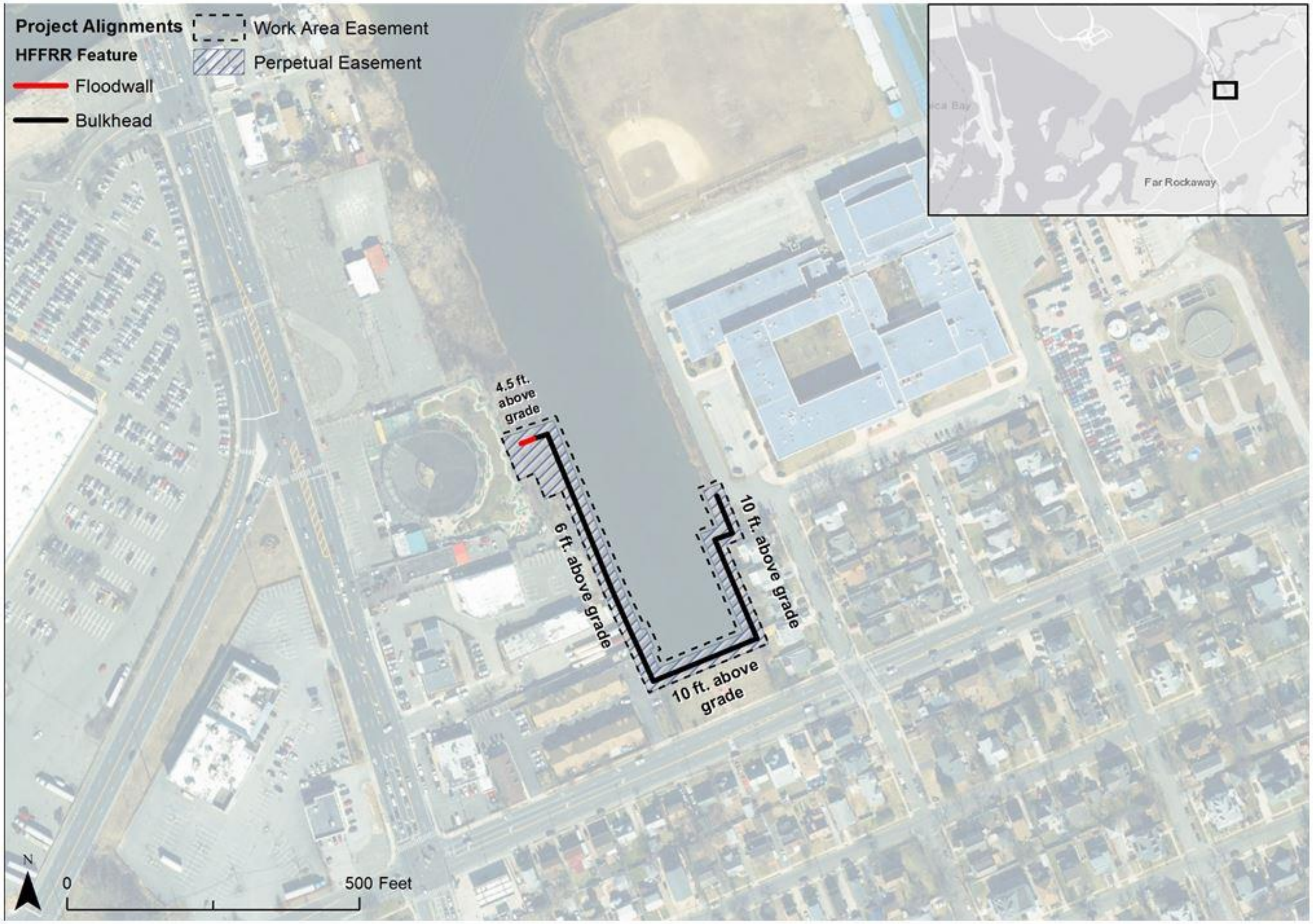


Figure 3: Cedarhurst-Lawrence HFFRRF Project Plan

2.4.2 Motts Basin North

This project consists of a medium floodwall beginning just north of the corner of Alemada Ave. and Waterfront Blvd. and continuing to the east along the south side of Waterfront Blvd. for approximately 540 feet (Figure 4). The line of protection then shifts to a section of medium floodwall above an existing outfall, continuing east for 47 feet before transitioning back into a low floodwall for an additional 105 feet. Project design elevations vary have preliminarily been established based on the expected wave exposure and are +8.0ft.

The existing outlet will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The outlet pipes will be replaced if the design phase indicates it is necessary. Drainage along the landward side of the bulkhead will be provided by a small ditch. Inlets will connect to the existing and one proposed additional drainage outlets.

MOTTS OUTLET TABLE

Drainage Area	Outfall Size	Outfall Location
Drainage Basin L1	TBD	Existing Outfall

Figure 4: Motts Basin North HFFRRF Project Plan

2.4.3 Mid-Rockaway - Edgemere Area

The eastern end of the project area (Figure 5) begins at high ground near the intersection of Beach Channel Drive and Beach 35th Street. The project moves north and then west following parallel to Beach 35th Street before jogging to the north and crossing the abandoned portion of Beach 38th Street and continuing west. The project turns north and runs along the peninsula between Beach 43rd Street and the coastal edge. This approximately 3,200 foot section of hybrid berm has been maintained as far landward as possible and weaves in and out between the properties. The hybrid berm is strategically used at these locations to minimize and avoid impacts to existing healthy wetland habitats. This area has also been identified as a good candidate for the use of Natural and Nature Based Features (NNBFs). The NNBF design includes placement of a stone toe protection and rock sill structure just off the existing shoreline to attenuate wave action and allow tidal marsh to establish between the rock sill and the berm. In some locations the eroded/degraded shoreline (subtidal) will be regraded to allow for the development of low marsh (*Spartina alterniflora*) to provide productive nursery habitats behind the sill structures. The shore slope behind the structure will be regraded to reduce risk of erosion further and create suitable elevation gradients and substrates for establishment of a high tidal marsh, designated as scrub shrub areas in the figure. In addition, the graded habitat behind the structure will be designed to allow the shoreward migration of various habitats with rising sea levels, thereby extending the life of these important ecological systems. On the north east of the Edgemere peninsula the project then transitions into 200 feet of shallow bulkhead, which continues north along existing water front properties and bulkheads. Approximately 200' of medium floodwall then cuts west across, at the tip of the Edgemere peninsula. A road ramp on Beach 43rd Street has been included to maintain both pedestrian, and vehicle access to the coastal edge at north end of Beach 43rd street. The floodwall continues in southwest direction along the coastline after which it transitions into a 750 foot section of high berm. The berm continues west from Beach 43rd Street before turning south just to the east of the unpaved extension of Beach 44th Street. The project then transitions into a 660 foot section of high floodwall which continues southwest staying as far landwards as possible to avoid an existing restoration project. Near the intersection of Norton Avenue and Beach 46th Street, north of Norton Avenue, the floodwall transitions back into a low berm which runs parallel to Norton Avenue southwest and then turns northwest along Conch Place. The area waterward of this berm has also been identified as a good location for the use of NNBFs and to restore high marsh habitat. Project design elevations vary and have preliminarily been established based on expected wave exposure. Project elevations range between +8.0ft and +9.5t NAVD88.

The Edgemere interior drainage basin has two subbasins, E1 and E2 covering approximately 194 acres and 274 acres, respectively. The Edgemere drainage basin is almost fully developed and predominantly residential, except for a stretch of undeveloped, grassy area along the southern part of E1 and southwestern part of E2. Subbasin E1 was estimated to require 9 outlets, including 2 existing outlets. Subbasin E2 was estimated to require 6 outlets, including 1 existing outlet (See Edgemere Outlet Table). Each of the existing outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The existing outlet pipes will be replaced if the design phase indicates it is necessary due to the condition of the pipes or a need for additional capacity. The new outlets are generally assumed to be 5 ft. wide by 3 ft. high box culverts. Drainage along the landward side of the berm/floodwall structures will be provided by a small ditch or drainage collection pipe, with some inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station analysis indicates that three pump stations are desired in the Edgemere Area. Due to the length of the area and difficulties in draining all of the area to a single site, drainage subbasin E1 is proposed to have two pump stations one pump station would be located near Norton Avenue and Beach 49th Street and the other near Beach 43rd Street and Hough Place with a combined capacity of about 210 cfs. Subbasin E2 is proposed to have one pump station located near Beach 38th Street with an estimated capacity of 120 cfs. It should be noted that each pump station will include additional gravity capacity that will operate when the pump station is not in operations mode. The capacity of each pump station and drainage outlet will be refined during the project design phase.

EDGEMERE OUTLET TABLE

Drainage Basin	Outfall Size	Outfall Location
Drainage Basin E1	TBD	Existing Outfall ROC-648
Drainage Basin E1	5'x3'	Outfall E1-1 located on Norton Avenue between Beach 47th and 48th Streets.
Drainage Basin E1	5'x3'	Outfall E1-2 located on Norton Avenue between Beach 46th and 45th Streets.
Drainage Basin E1	5'x3'	Outfall E1-3 located on Beach 45th Street north of Hough Place.
Drainage Basin E1	5'x3'	Outfall E1-4 located on the north end of Beach 45th Street.
Drainage Basin E1	5'x3'	Outfall E1-5 located 550 feet north of Hough Place.
Drainage Basin E1	5'x3'	Outfall E1-6 located 500 feet north of Hough Place.
Drainage Basin E1	TBD	Existing Outfall ROC-637
Drainage Basin E1	5'x3'	Outfall E1-7 located north of Beach 40th Street.
Drainage Basin E2	TBD	Existing Outfall ROC-638
Drainage Basin E2	5'x3'	Outfall E2-1 located 50 feet east of Beach 37th Street.
Drainage Basin E2	5'x3'	Outfall E2-2 located 50 feet east of Beach 37th Street.
Drainage Basin E2	5'x3'	Outfall E2-3 located 50 feet east of Beach 36th Street.
Drainage Basin E2	5'x3'	Outfall E2-4 located 50 feet east of Beach 36th Street.
Drainage Basin E2	5'x3'	Outfall E2-5 located between Beach 36th Street and Beach 35th Street.

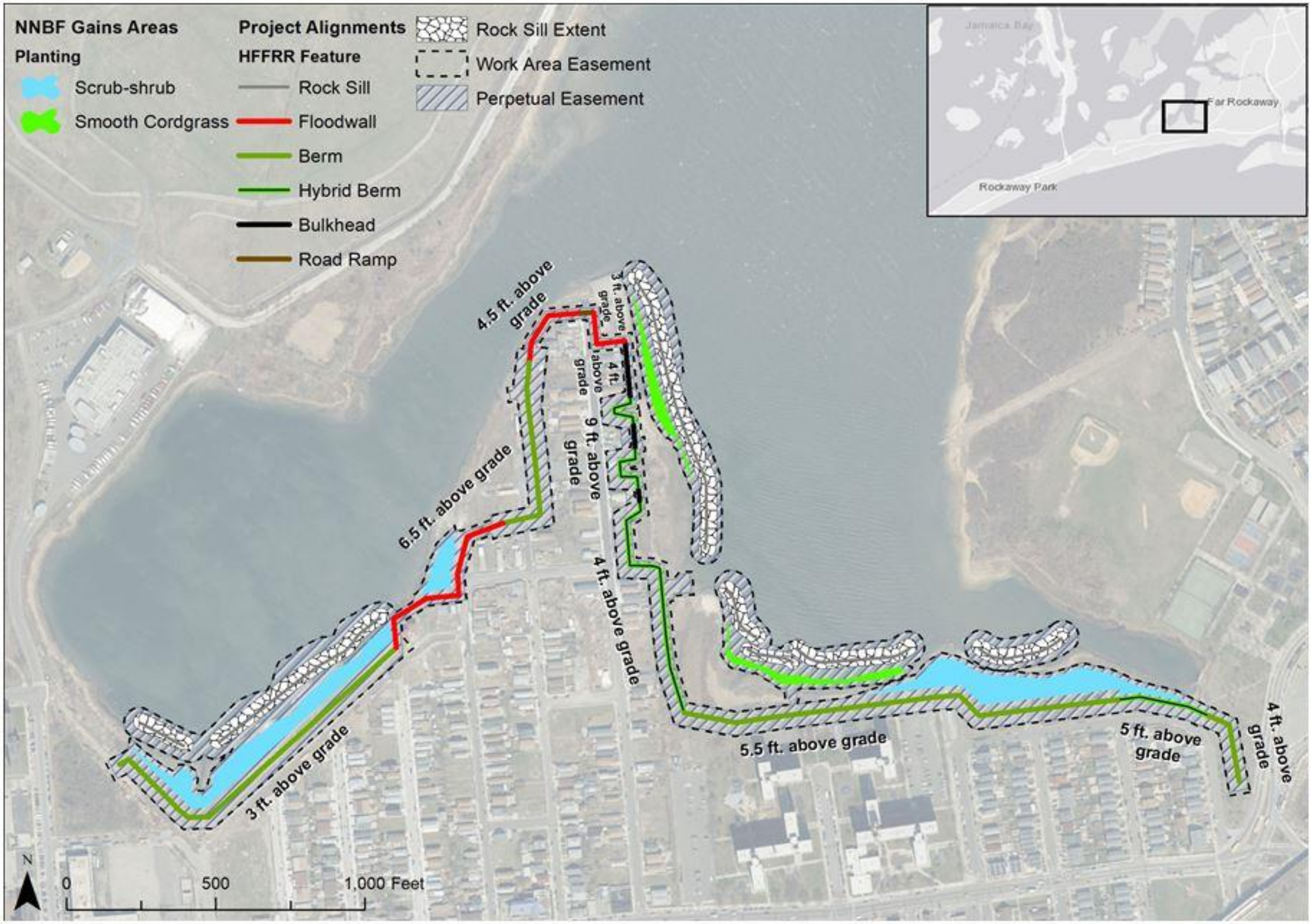


Figure 5: Mid Rockaway – Edgemere Area HFFRRF Project Plan

2.4.4 Mid-Rockaway - Arverne Area

This area of the project (Figure 6) begins at high ground to the north of Almeda Avenue and Beach 58th Street. An approximately 1,100 foot section of low berm runs south along Beach 58th Street. The berm has been maintained as far landward as possible to avoid healthy habitat. This segment has been identified as a candidate for the use of NNBFs. Much of the area is identified as existing quality wetlands, but a portion of fill area has been identified where intermediate marsh (*Spartina patens*) will be restored. The project then transitions to an approximately 1,200 foot long medium floodwall which, for feasibility level analysis, is purposefully sited along property boundaries at the southern end of the channel to minimize impacts to the existing waterfront businesses. A road ramp has been included to maintain access to the marina. At the southwest corner of the channel the project transitions to run along the coastal edge north for approximately 1,700 feet. This segment transitions between revetments and bulkheads to match the existing coastline conditions and uses. The portion between Thursby Avenue and Elizabeth Road has been aligned such that it can be integrated into the planned NYC DPR Thursby Basin Park project. Just north of De Costa Avenue, the project transitions to low berm for approximately 1,600 feet and runs west along De Costa Avenue and around the edges of healthy habitat while also creating an area for stormwater storage and a pump station just north of Beach Street. At the corner of De Costa Avenue and Beach 65th Street the low berm transitions into a hybrid berm to minimize habitat impacts. The hybrid berm continues west and then north for 300 feet to the corner of Beach 65th Street and Bayfield Avenue. The project then transitions to a 2,400 foot long shallow bulkhead which travels west along the line of existing bulkheads where they exist and parallel with Bayfield Avenue in areas without existing bulkhead. The bulkhead section ends just west of the corner of Bayfield Avenue and Beach 72nd Street. The area west of Beach 69th Street and the eastern end of De Costa Ave has been identified as a good candidate for NNBF. Based on existing elevations and profiles, a combination of either fill or excavation is used to provide the appropriate elevations shoreward of the rock sills to maximize healthy subtidal habitats, with restoring a transition area for low to high intertidal marsh. Eroded shorelines were replaced with low intertidal (*Spartina alternaflora*) habitats, and transition to either intermediate (*Spartina patens*) and/or high marsh (scrub-shrub) habitats. From the end of the bulkhead section the project continues south with a 120 foot section of medium floodwall connecting the bulkhead to a 1,080 foot section of high berm. The berm runs south along Beach 72nd Street and turns west at Hillmeyer Avenue and continues west past the corner of Barbados Drive and Hillmeyer Avenue, where it turns north and transitions to a flood wall to minimize the features footprint. The berm section has been position close to the roads to minimize impacts on habitat. The berm section transitions into a high floodwall which goes west and then runs parallel to the coast southwest for 440 feet, ending at a bulkhead section just west of the end of Hillmeyer Avenue. The Brant Point area includes the creation of wetlands between the berm and the rock sills that are placed just off the coastal edge. The rock sill will protect the shoreline where eroded areas will be restored to low marsh habitats protecting the existing high quality habitats shoreward. The areas behind the existing wetlands areas will be graded to provide a transition area to high marsh and then uplands where practical. The existing uplands areas will be replanted as necessary to provide for a high quality maritime forest habitat, with appropriate tree species. South of Hillmeyer Avenue the alignment follows the bulkheaded coastal edge. The project proposes a high frequency flood risk reduction bulkhead feature that follows an existing bulkhead along the coastal edge for approximately 270 feet ending just south of Almeda Avenue.

From this point a low floodwall runs parallel with the coastal edge southeast for 700 feet then transitions into a deep bulkhead. This section of bulkhead continues southeast along the line of existing bulkhead for approximately 540 feet to the end of Thursby Avenue. The project continues as a low floodwall for approximately 1,400 feet, traveling east along Thursby Avenue and then south, parallel with Beach 72nd Street turning west and running along Amstel Boulevard, ending just past Beach 74th street. Two road ramps and one vehicular gate are included to maintain access to the waterfront. The final segment is approximately 250 feet of medium floodwall which runs along the coastal edge and connect the low floodwall to high ground in the west. Project design elevations vary and have preliminarily been established based on the expected wave exposure. Project elevations range between +8.0ft and +11.5t.

The Arverne drainage basin has three subbasins A1, A2, and A3, covering 76 acres, 139 acres, and 209 acres, respectively. The Arverne drainage basin is almost fully developed and predominantly residential, with a few, scattered undeveloped areas.. Subbasin A1 was estimated to require 8 outfalls, including 5 existing outfalls. Subbasin A2 was estimated to require 3 outlets. Subbasin A3 was estimated to require 5 outlets, including 3 existing outlets. Each of the existing outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The existing outlet pipes will be replaced if the design phase indicates it is necessary due to the condition of the pipes or a need for additional capacity. The new outlets are generally assumed to be 5 ft. wide by 3 ft. high box culverts (See Arverne Outlet Table). Drainage along the landward side of the berm/floodwall structures will be provided by a small ditch or drainage collection pipe, with some inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station analysis indicates that three pump stations are desired in the Arverne Area. Drainage subbasin A1 is proposed to have a pump station located adjacent to DE Costa Avenue near Beach 72nd with a capacity of about 70cfs. Subbasin A2 is proposed to have one pump station located on DE Costa Avenue near Beach 63rd Street with an estimated capacity of 180 cfs. Subbasin A3 is proposed to have one pump station located south of Thursby Avenue with an estimated capacity of 300 cfs. It should be noted that each pump station will include additional gravity capacity that will operate when the pump station is not in operations mode. The capacity of each pump station and drainage outlet will be refined during the project design phase.

ARVERNE OUTLET TABLE

Drainage Basin	Outfall Size	Outfall Location
Drainage Basin A1	TBD	Existing Outfall ROC-633
Drainage Basin A1	TBD	Existing Outfall ROC-634
Drainage Basin A1	TBD	Existing Outfall ROC-40062
Drainage Basin A1	5'x3'	Outfall A1-1 located at the end of Hillmyer Avenue.
Drainage Basin A1	5'x3'	Outfall A1-2 located adjacent to Hillmyer Avenue and Barbadoes Avenue.
Drainage Basin A1	TBD	Existing Outfall ROC-658
Drainage Basin A1	5'x3'	Outfall A1-3
Drainage Basin A1	TBD	Existing Outfall ROC-659
Drainage Basin A2	5'x3'	Outfall A2-1 located on Bayfield Avenue 150 feet west of Beach 65th Street.
Drainage Basin A2	5'x3'	Outfall A2-2 located at the east end of DE Costa Avenue.
Drainage Basin A2	5'x3'	Outfall A2-3 located at the east end of Burchell Road.
Drainage Basin A3	TBD	Existing Outfall ROC-??? Located at the east end of Thursby Avenue.
Drainage Basin A3	TBD'	Existing Outfall ROC-636
Drainage Basin A3	5'x3'	Outfall A3-1 located 250 north of Beach Channel Drive on 58 Street.
Drainage Basin A3	TBD	Existing Outfall ROC-635
Drainage Basin A3	5'x3'	Outfall A3-2 located 50 north of Beach Channel Drive on 58 Street.

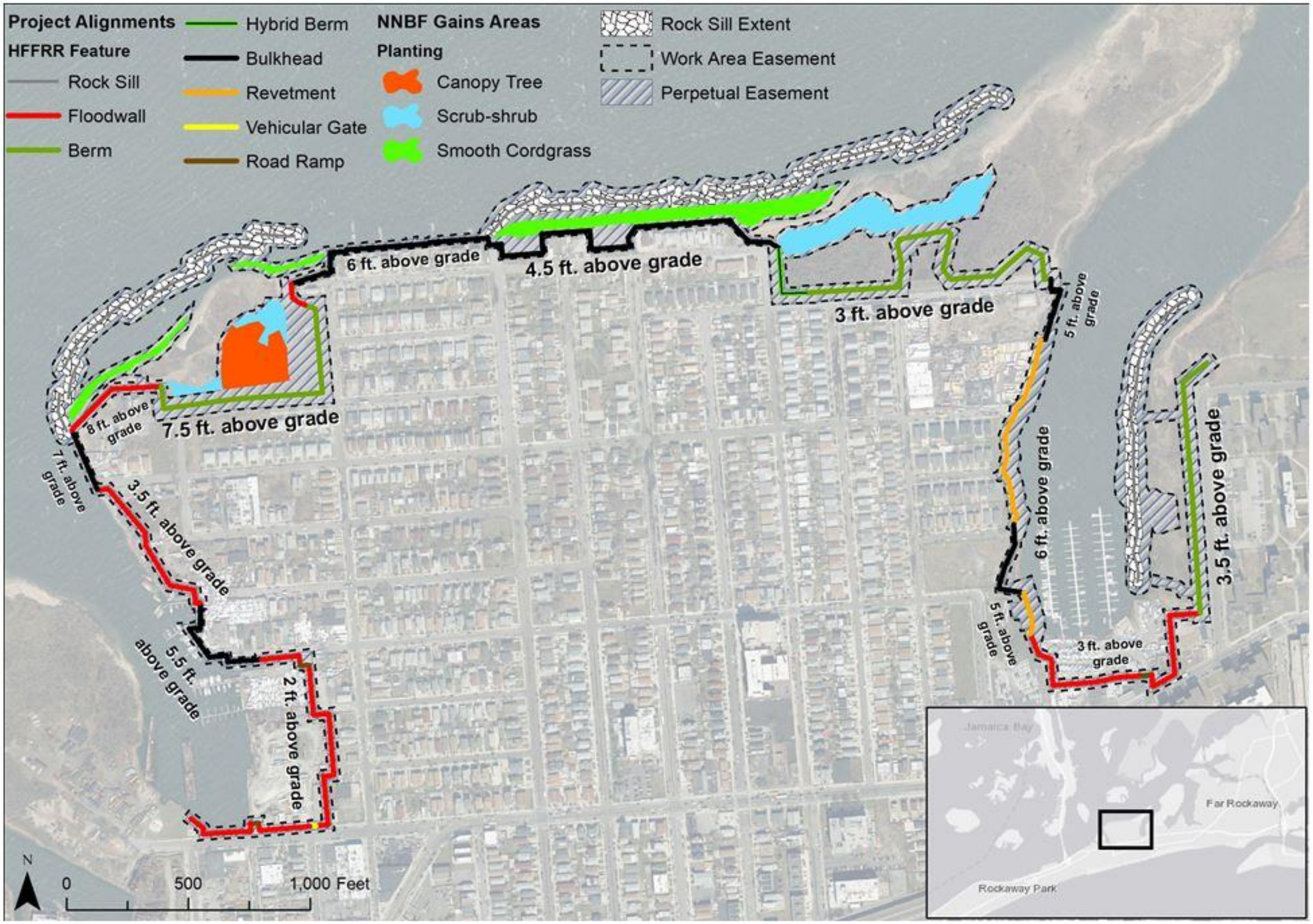


Figure 6: Mid Rockaway – Arverne Area HFFRRF Project Plan

2.4.5 Mid-Rockaway - Hammels Area

Two separate segments compose the Hammels area of the Mid-Rockaway project (Figure 7). The east segment begins approximately 320 feet west of the intersection of Beach 75th Street and Beach Channel Drive. It is composed of approximately 1,400 feet of low floodwall, running west along the north side of Beach Channel Drive, and parallel with the Rockaway Line elevated subway track. Three road ramps have been included to maintain access to the water front properties. The west segment consists of 1,400 feet of low floodwall beginning to the west of the MTA facility Hammels Wye adjacent to the Rockaway Line. The project heads west and south in a stair-step fashion avoiding impacts on existing structures, ending on the north side of Beach Channel Drive just west of Beach 87th Street. Three road ramps have been included to maintain access to the waterfront. Project design elevations have preliminarily been established based on the expected wave exposure, which is expected to be low, and are set at +8.0ft NAVD88.

The Hammels drainage basin includes two subbasins, H1 and H2, approximately 105 acres and 139 acres respectively. The Hammels drainage basin is almost fully developed, except for a few scattered grassy areas and is predominantly residential, with some commercial development. Subbasin H1 was estimated to require 3 outlets, including 2 existing outlets. Subbasin H2 was estimated to require 3 outlets, including 1 existing outlet. Each of the existing outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system (See Hammels Outlet Table). The existing outlet pipes will be replaced if the design phase indicates it is necessary due to the condition of the pipes or a need for additional capacity. The new outlets are generally assumed to be 5 ft. wide by 3 ft. high box culverts. Drainage along the landward side of the berm/floodwall structures will be provided by a small ditch or drainage collection pipe, with some inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station analysis indicates that two pump stations are desired in the Hammels Area. Drainage subbasin H1 is proposed to have a pump station located at the southern end of Hammels near Beach 87th Street with a capacity of about 100cfs. Subbasin H2 is also proposed to have one pump station which is located at the northern end of Hammels near Beach Channel Drive with an estimated capacity of 180 cfs. It should be noted that each pump station will include additional gravity capacity that will operate when the pump station is not in operations mode. The capacity of each pump station and drainage outlets will be refined during the project design phase.

HAMMELS OUTLET TABLE

Drainage Area	Outfall Size	Outfall Location
Drainage Basin H1	TBD	Existing Outfall ROC-656
Drainage Basin H1	5'x3'	Outfall H1-1, Approximately 70 feet east of Beach 85th Street
Drainage Basin H1	TBD	Existing Outfall ROC-657
Drainage Basin H2	5'x3'	Outfall H2-1, Approximately 350 feet west of Beach 80th Street
Drainage Basin H2	5'x3'	Outfall H2-2, Approximately 100 feet east of Beach 79th Street
Drainage Basin H2	TBD	Existing Outfall ROC-653

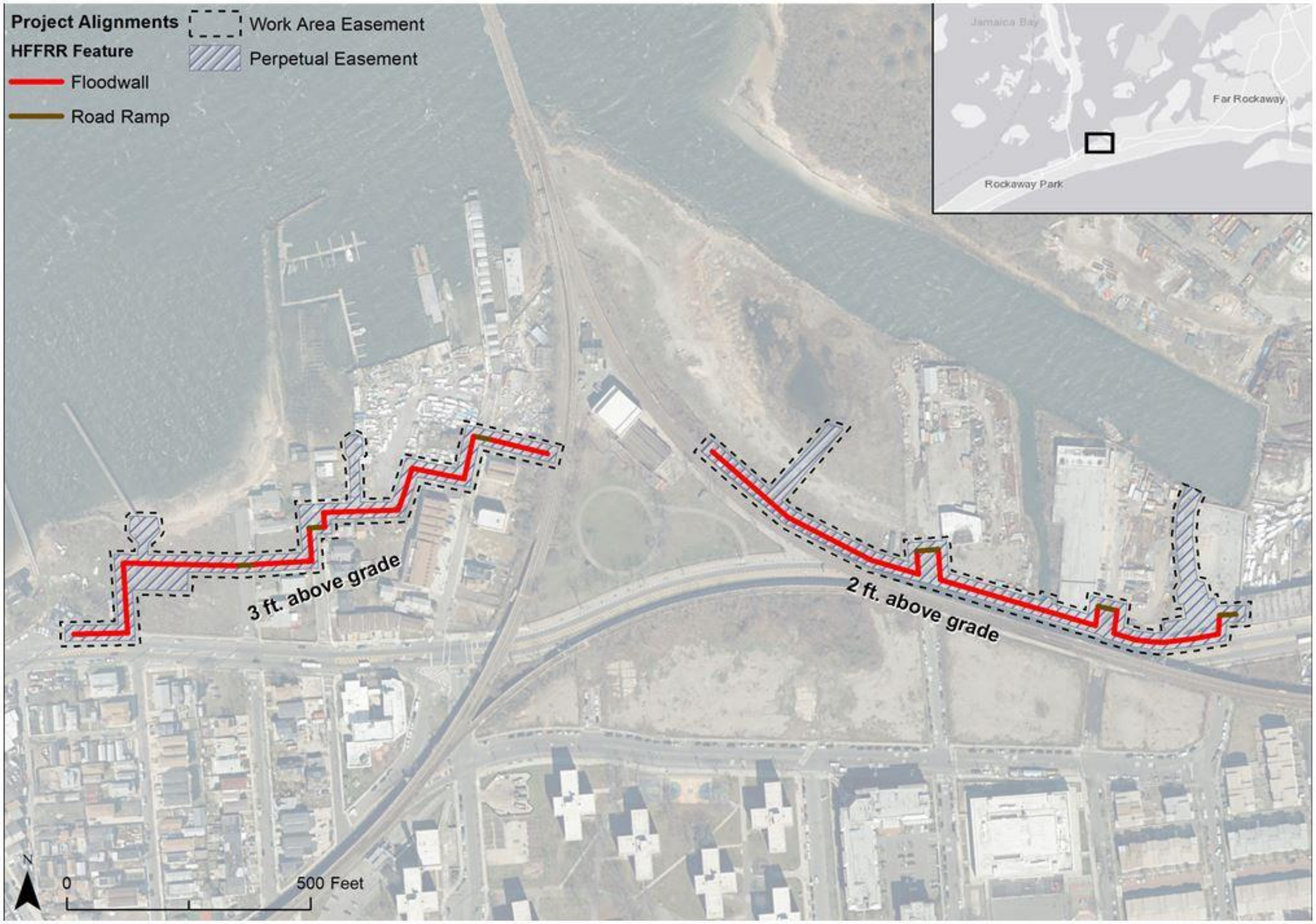


Figure 7: Mid Rockaway – Hammels Area HFFRRF Project Plan

2.5 Project Elements

Structural and non-structural management measures, including Natural and Nature-Based Features (NNBF), were developed to address one or more of the planning objectives for the project. Management measures were developed in consultation with the non-federal sponsor (NYSDEC), state and local agencies, and non-governmental entities. Measures were evaluated for compatibility with local conditions and relative effectiveness in meeting planning objectives. Effective measures were combined to create CSRM alternatives for two geographically discrete reaches: the Atlantic Ocean shorefront and Jamaica Bay. Integrating CSRM alternatives for the two reaches provides the most economically efficient system-wide solution for the vulnerable communities within the study area. It is important to note that any comprehensive approach to CSRM in the study area must include an Atlantic Ocean shorefront component because overtopping of the Rockaway peninsula is a source of flood waters into Jamaica Bay. Efficient CSRM solutions were formulated specifically to address conditions at the Atlantic Ocean shorefront. The best solution for the Atlantic Shorefront reach was included as a component of the alternative plans for the Jamaica Bay reach.

Project elements determined to potentially elicit adverse effects to protected species under USFWS jurisdiction are those alternatives identified for the Atlantic Ocean shorefront component of the project, only. The Jamaica Bay/Back Bay component of the project, therefore, has been determined not to introduce risk to the protected species due to the fact that there is no documentation of protected species occurrence or habitat in this area of effect, and, the CSRM features identified for this component of the project would not pose any risk or threat to protected species under USFWS jurisdiction if any occurrence or utilization were documented.

The Atlantic Ocean shorefront reach is subject to wave attack, wave run up, and over topping along the Rockaway peninsula. The general approach to developing CSRM along this reach was to evaluate erosion control alternatives in combination with a single beach restoration plan to select the most cost effective renourishment approach prior to the evaluation of alternatives for coastal storm risk management. The most cost effective erosion control alternative is beach restoration with increased erosion control (See Figures 2a through 2d). This erosion control alternative had the lowest annualized costs over the 50-year project life and the lowest renourishment costs over the project life. A screening analysis was performed to evaluate the level of risk reduction provided by a range of dune and berm dimensions and by reinforced dunes, which would be combined with beach restoration with increased erosion control to optimize CSRM at the Atlantic Ocean shorefront.

Beach fill for the Atlantic Shoreline component of the proposed project is available from an offshore borrow area. The borrow area is located approximately two miles offshore (south) of the Rockaway peninsula.

Other factors such as prior projects at Rockaway Beach, project constraints, stakeholder concerns, and engineering judgment were also applied in the evaluation and selection. A composite seawall was selected as the best coastal storm risk management alternative. The composite seawall protects against erosion and wave attack and also limits storm surge inundation and cross-peninsula flooding (Figures 8 and 9). The structure crest elevation is +17 feet (NAVD88), the dune elevation is +18 feet (NAVD88), and the design berm width is 60 feet. The armor stone in horizontally composite structures significantly reduces wave breaking pressure, which allows smaller steel sheet pile walls to be used in the design if the face of the wall is completely protected by armor stone. The composite seawall may be adapted in the future to rising sea levels by adding 1-layer of armor stone and extending the concrete cap up to the elevation of the armor stone.

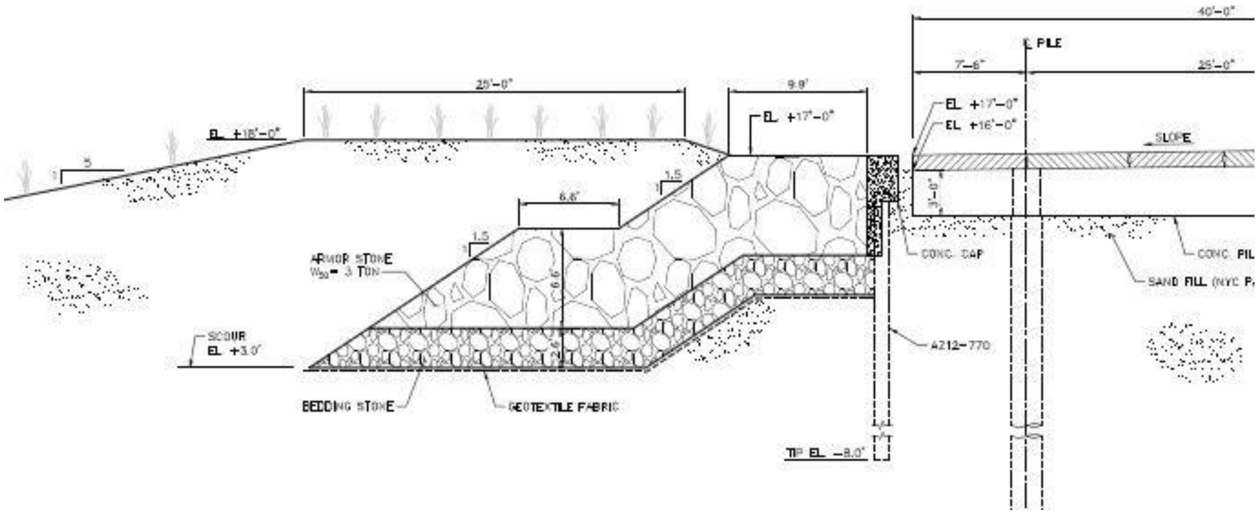


Figure 8: Composite Seawall Beach 19th St. to Beach 126th St

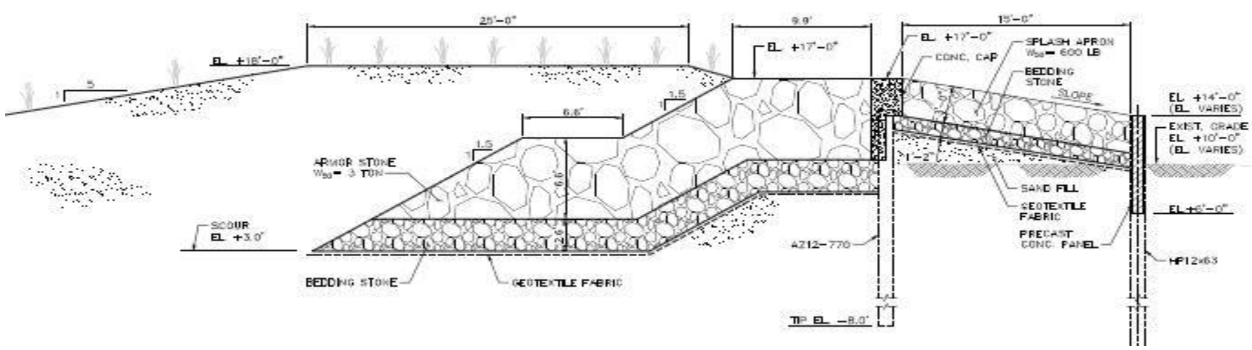


Figure 9: Composite Seawall Beach 126th St. to Beach 149th St.

2.5.1 The Atlantic Ocean Shorefront Beachfill

The selected storm damage reduction plan including changes from the authorized project, comprises approximately 152,000 lf of dune and beach fill and generally extends from the eastern end of the barrier island at Beach 19th street to the western boundary of Breezy Point. This component of the Project includes the following: 1) a dune with a top elevation of +18 ft above NAVD88, a top width of 25 ft, and landward and seaward slopes of 1V:5H that will extend along the entire footprint (1V:3H on landward slope fronting the boardwalk). See Table 2.

All beachfill quantities include an overfill factor of 11% based on the compatibility analysis for the borrow areas. In addition the initial construction quantities include an additional 15% for construction tolerance. It is noted that the advance fill and renourishment quantities do not include tolerance since the purpose of the advance fill and renourishment is to place a specific volume of sediment to offset anticipated losses between renourishment operations, rather than build a specific template. Beachfill quantities required for initial construction of each alternative are estimated based on the expected shoreline position in June of 2018. It is impossible to predict the exact shoreline position in June 2018 since the wave conditions vary from year to year and affect shoreline change rates. The shoreline position in June of 2018 was estimated based on a 2.5 year GENESIS-T simulation representative of typical wave conditions.

Table 2: Initial Construction Beachfill Quantities

Reach	Reach Length (ft)	Recommended Plan Fill Quantity (CY)
West Taper		306,000
Reach 3	10,320	356,000
Reach 4	5,380	294,000
Reach 5	10,650	321,000
Reach 6a	3,730	250,000
Reach 6b	2,000	20,000
East Taper		49,000
Total		**1,596,000**

2.5.2 Atlantic Ocean Shorefront: Construction of New Groins and Extension of Existing Groins

Three types of groin measures are considered in the alternative analysis: new groin construction, groin extension, and groin shortening. The exact dimensions and stone sizes of the existing groins at Rockaway is not available. Therefore, it is assumed that the existing groins in Reaches 5 and 6 are similar to the proposed new groin designs. Generally a groin is comprised of three sections: 1) horizontal shore section (HSS) extending along the design berm; (2) an intermediate sloping section (ISS) extending from the berm to the design shoreline, and (3) an outer sloping section (OS) that extends from the shoreline to offshore. The head section (HD) is part of the OS and is typically constructed at a flatter slope than the trunk of the groin and may require larger stone due to the exposure to breaking waves.

The spacing between groins in this study is based on the existing spacing in Reach 5 (720 ft) and Reach 6a (780 ft). The required lengths of the new groins is based on the GENESIS-T model simulations.

The Project requires the immediate construction of a 12 new groins in reach 3 and 4 (between 92nd Street to 121st Street) and an additional groin in reach 6a (34th street). The 5 groin extension are located in Reach 6a (between 37th Street – 49th Street). The extension of the groin lengths vary and range from 75 ft to 200 ft. Groin widths will be 13 ft. See Table 3.

Table 3: Summary of Groin Lengths

Alt	Reach	Number	Street	HSS (ft)	ISS (ft)	OS (ft)	Total (ft)	Notes:
3	6a	1	34th St	90	108	328	526	New 526’
3	6a	2	37th St	90	108	328	526	Extension 175’
3	6a	3	40th St	90	108	328	526	Extension 200’
3	6a	4	43rd St	90	108	228	426	Extension 75’
3	6a	5	46th St	90	108	228	426	Extension 150’
3	6a	6	49th St	90	108	228	426	Extension 200’
3	4	1	92nd St	90	108	128	326	New 326’
3	4	2	95th St	90	108	128	326	New 326’
3	4	3	98th St	90	108	128	326	New 326’
3	4	4	101st St	90	108	128	326	New 326’
3	4	5	104th St	90	108	128	326	New 326’
3	4	6	106th St	90	108	128	326	New 326’
3	4	7	108th St	90	108	128	326	New 326’
3	3	8	110th St	90	108	153	351	New 351’
3	3	9	113th St	90	108	178	376	New 376’
3	3	10	115th St	90	108	178	376	New 376’
3	3	11	118th St	90	108	178	376	New 376’
3	3	12	121st St	90	108	128	326	New 326’

2.5.3 Sand Removal from Offshore Borrow Area

An offshore borrow area which is 2.6 miles long and 1.1 miles wide, located approximately 2 miles south of East Rockaway (Figure 10) between 35 feet mean low water and about 60 feet mean low water, has been identified as a potential source of sand material for beach fill and dune construction activities.

Figure 10: Location of the East Rockaway Borrow Area

2.6 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions of the Project include beach renourishments and maintenance of beach access locations. Renourishments will be conducted every 4-years or as needed over the 50-year life of the Project. During each renourishment, approximately 1,100,000 CY of sand will be added to the beach from the borrow area located approximately 2 miles offshore to the south of East Rockaway. Inlet maintenance dredging (115,000 cy/yr) is included in the 1.1 million cy of material needed for the renourishment.

3 SPECIES OCCURENCE

Previous surveys conducted by USFWS and NYC DPR confirmed presence of piping plover and seabeach amaranth, as well as suitable habitat for red knot in the Atlantic Ocean Shoreline component of the Project Area (USFWS 1982, 1994a, 1995a, 1995b, 1996; NYC DPR 2017). Therefore, in accordance with the ESA recommendations, the following section provides species profiles for each of these federally-listed T&E species. This information, along with the knowledge of local experts, wildlife biologists, botanists, and District and USFWS personnel, was utilized to identify potential impacts to these species as a result of implementation of the proposed action.

3.1 PIPING PLOVER

On January 10, 1986, the piping plover was listed as threatened and endangered under provisions of the ESA. Three distinct populations were identified by the Service during the listing process: Atlantic Coast (threatened), Great Lakes (endangered), and Northern Great Plains (threatened). No critical habitat has been designated or proposed in the Atlantic Coast breeding area which is the focus of this BA.

The Atlantic Coast population breeds on coastal beaches from Newfoundland to North Carolina (NC) (and, occasionally, in South Carolina) and winters along the Atlantic Coast from NC southward, along the Gulf Coast, and in the Caribbean (Section 3 cited as Biological Assessment, Fire Island Inlet to Montauk Point Coastal Storm Risk Management, Suffolk County, New York. Prepared and submitted by: U.S. Fish and Wildlife Service, Chesapeake Bay Field Office and U.S. Army Corps of Engineers, New York District).

3.1.1 Life History

Piping plovers are small, sand-colored shorebirds approximately 7 inches long, with a wingspread of about 15 inches.

Breeding-Piping plovers begin returning to their Atlantic Coast nesting beaches in mid-March (Coutu et al. 1990; Cross 1990; Goldin 1990; MacIvor 1990; Hake 1993). Males establish and defend territories and court females by early April (Cairns 1982). Piping plovers are monogamous, but usually shift mates between years (Wilcox 1959; Haig and Oring 1988; MacIvor 1990; Strauss 1990) and, less frequently, between nesting attempts in a given year (Haig and Oring 1988, MacIvor 1990, Strauss 1990). Plovers are known to breed at one year of age (MacIvor 1990; Haig 1992), but the rate at which this occurs is unknown. Egg-laying and incubation can start as early as mid-April (USFWS 1996a).

Piping plovers nest on coastal beaches (NC to Newfoundland), sand spits at the end of barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and in overwash-created bare sand areas cut into or between dunes. In the central portions of their Atlantic Coast range (including NY-NJ), they may also nest on areas where suitable dredged material has been deposited.

Nest sites are shallow-scraped depressions in substrates ranging from fine-grained sand mixtures to sand and pebbles, shells, or cobble (Bent 1929; Cairns 1982; Burger 1987; Patterson 1988; Flemming et al. 1990; MacIvor 1990; Strauss 1990). Nests may be difficult to detect, especially during the six-to seven-day egg-laying phase when the birds generally do not incubate (Goldin

1994). Eggs may be present on the beach from mid-April through late July and clutch size for an initial nest attempt is usually four eggs, with one egg laid every other day.

Full-time incubation usually begins with the completion of the clutch and is shared equally by both sexes for a period lasting from 27 to 28 days (Wilcox 1959; Cairns 1977; MacIvor 1990). Eggs in a clutch usually hatch within four to eight hours of each other, but the hatching period may extend to 48 hours.

Piping plovers generally fledge only a single brood (one or more chicks from a nest) per season, but may re nest several times if previous nests are lost or, infrequently, if a brood is lost within several days of hatching. A few rare instances of adults re-nesting following fledging of an early brood have also been observed. Chicks are precocial and are capable of foraging for themselves within several hours of hatching (Wilcox 1959; Cairns 1982) and may move hundreds of feet from the nest site during their first week of life (USFWS 1996a). Chicks may increase their foraging range up to 3,280 ft (Loegering 1992) or more based on observations from Fire Island to Moriches Inlet monitoring in 2016 (Carey et al. 2017), and will remain with both parents until they fledge at 25 to 35 days of age. Depending on the date of hatching, flightless chicks may be present from mid-May until late August, although most fledge by the end of July (Patterson 1988; Goldin 1990; MacIvor 1990; Howard et al. 1993). Nest success depends heavily on camouflage (Hull 1981). Cryptic coloration is a primary defense mechanism for this species; nests, adults, and chicks all blend in with their beach surroundings. Chicks sometimes respond to off-road vehicles (ORVs) and/or pedestrians by crouching and remaining motionless (Cairns 1977). Adult piping plovers respond to avian and mammalian predators by displaying a variety of distraction behaviors including squatting, false brooding, running, and injury feigning. Distraction displays may occur at any time during the breeding season, but are most frequent and intense during the time of hatching (Cairns 1977).

Migration-Fall migration to southern wintering grounds begins in mid-to late summer. Juvenile plover may remain on breeding grounds later but are generally gone mid-to late August (Cuthbert and Wiens 1982). A study of migration routes, duration, stopovers, and other behaviors of radio-tagged plovers is in progress (Loring et al. 2017). But the pattern of both spring and fall counts at migration suites along the southeastern Atlantic Coast demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to one month during their migrations (Noel et al. 2006; Stucker and Cuthbert 2006).

Feeding-Piping plovers feed on invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks (Bent 1929; Cairns 1977; Nicholls 1989). Important feeding areas may include intertidal portions of ocean beaches, overwash areas, mudflats, sandflats, wracklines, sparse vegetation, and shorelines of coastal ponds, lagoons, or salt marshes (Gibbs 1986; Coutu et al. 1990; Hoopes et al. 1992; Loegering 1992; Goldin 1993; Elias-Gerken 1994; Cohen 2005; Houghton 2005). Studies by Cuthbert and Weins (1982) indicate that open shoreline areas are preferred and vegetated beaches are avoided. In Massachusetts, plover preferred mudflat, intertidal and wrack habitats for foraging (Hoopes et al. 1992). The relative importance of various feeding habitats may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993; Hoopes 1993; Elias-Gerken 1994) and by stage in the breeding cycle (Cross 1990). Adults and chicks on a given site may use different feeding habitats in varying proportion (Goldin 1990). Most time-budget studies reveal that chicks spend a very high proportion of their time feeding. Cairns (1977) found that chicks typically tripled their weight during the first two weeks post-hatching; chicks that failed to achieve at least 60 percent of this weight-gain by day 12 were unlikely to survive. Feeding territories are generally contiguous to nesting territories (Cairns 1977). Feeding activities of both adults and chicks may occur during all hours of the day and night (Burger 1994) and at all stages during the tidal cycle (Goldin 1993; Hoopes 1993).

3.1.2 Life History

The piping plover is a small robin-sized shorebird 17–18 cm (7.25 in) in length, a wingspan of 47 cm (19 in), and an average weight of 55 g (1.9 oz) (Sibley 2000). Piping plover breed and nest on coastal beaches from Newfoundland and southeastern Quebec to North Carolina and winter primarily on the Atlantic coast from North Carolina to Florida. Along the Atlantic coast, plover nest mainly on gently sloping foredunes above the high tide line, in blow-out areas behind primary dunes of sandy coastal beaches, and on suitable dredge spoil deposits (USFWS 1988, Cashin Associates 1993, NPS 1994). Nests are usually found in sandy areas with little or no vegetation. Vegetation, when present, consists of beach grass, sea rocket, and/or seaside goldenrod.

Plover begin northward migration to breeding grounds from southern U.S. wintering areas in March, and arrive on nesting grounds from March – May; males arrive prior to females. Fall migration to southern wintering grounds begins in mid- to late summer. Juvenile plover may remain on breeding grounds later but are generally gone by mid- to late August (Cuthbert and Wiens 1982). Atlantic coast breeders migrate primarily to Atlantic coast sites located farther south of breeding areas (i.e., Virginia to Florida, Bahamas) (Haig and Oring 1988, Haig and Plissner 1993).

The adult males arrive earliest, select beach habitats, and defend established territories against other males (Hull 1981). When adult females arrive at the breeding grounds several weeks later, the males conduct elaborate courtship rituals including aerial displays of circles and figure eights, whistling song, posturing with spread tail and wings, and rapid drumming of feet. The breeding season begins when adult female plovers reach the breeding grounds in mid- to late-April or in mid-May in northern parts of the range. (Bent 1929, Hull 1981).

Plover typically return to the same general nesting area in consecutive years (but few return to natal sites). Plover are known to shift breeding location by up to several hundred kilometers between consecutive years (NatureServe 2002). However, Wilcox (1959) found that plover a relatively site faithful and only 20 percent settled at a nest site farther than 1,000 ft from the previous year's locality. Previous reproductive success does not appear to increase the probability of returning to specific breeding sites (NatureServe 2002).

Nest sites are simple depressions or scrapes in the sand (Bent 1929, Wilcox 1959). The average nest is about 6 to 8 cm in diameter, and is often lined with pebbles, shells, or driftwood to enhance the camouflage effect. Males make the scrapes and may construct additional (unused) nests in their territories, which may be used to deceive predators or may simply reflect over-zealousness (Wilcox 1959, Hull 1981). Occupied nests are generally 50 to 100 meters apart (Wilcox 1959, Cairns 1977, Cuthbert and Wiens 1982).

Egg-laying commences soon after mating (Hull 1981, Cuthbert and Wiens 1982). Eggs are laid every second day. The average clutch size is four eggs (Wilcox 1959) and three-egg clutches occur most commonly in replacement clutches. The average number of young fledged per nesting pair usually is two or fewer. The young hatch about 27 to 31 days after egg laying. Incubation is shared by both adults (Wilcox 1959, Hull 1981).

Young plover leave the nest about two hours after hatching and immediately are capable of running and swimming. The young usually remain within about 200 meters of the nest, although they do not return after hatching (Wilcox 1959, Johnsgard 1979, Hull 1981). When disturbed or threatened, the young either freeze or combine short runs with freezing and blend very effectively into their surroundings (Wilcox 1959, Hull 1981). Adults will feign injury to draw intruders away from the nest or young (Bent 1929, Wilcox 1959). Adults also defend the nest territory against other adult piping plovers, gulls, and songbirds (Wilcox 1959, Matteson 1980). First (unsustained) flight has been observed at around 18 days, with chicks molting into first juvenile plumage by day 22 (NatureServe 2002).

Nest success depends heavily upon camouflage (Hull 1981). Hatching success ranges widely as follows: 91 percent for undisturbed beaches on Long Island (Wilcox 1959), 76 percent for undisturbed beaches in Nova Scotia (Cairns 1977), 44 percent on relatively undisturbed beaches at Lake of the Woods (Cuthbert and Wiens 1982), and 30 percent maximum at disturbed Michigan beaches (Lambert and Ratcliff 1979).

Plover diet consists of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates (Bent 1929). In New Jersey, intertidal polychaetes were the main prey of plovers (Staine and Burger 1994). Plover forage along ocean beaches, on intertidal flats and tidal pool edges. Studies by Cuthbert and Weins (1982) indicate that open shoreline areas are preferred and vegetated beaches are avoided. Plover obtain their food from the surface of the substrate, or occasionally will probe into the sand or mud.

Most time-budget studies reveal that chicks spend a very high proportion of their time feeding. Cairns (1977) found that chicks typically tripled their weight during the first two weeks post-hatching; chicks that failed to achieve at least 60 percent of this weight-gain by day 12 were unlikely to survive. Courtship, nesting, brood-rearing, and feeding territories are generally contiguous to nesting territories (Cairns 1977), although instances when brood-rearing areas are widely separated from nesting territories are common, thus increasing the geographic boundaries of their breeding area. Feeding activities of both adults and chicks may occur during all hours of the day and night (Burger 1994) and at all stages during the tidal cycle (Goldin 1993; Hoopes 1993).

In New York, 95.8 percent of piping plover pairs nested on non-federal land in 1999 (Rosenblatt 2000). Piping plover protection in this recovery unit, therefore, is highly dependent on the efforts of state and local government agencies, conservation organizations, and private landowners. Landowner efforts are often contingent on annual commitments. While many landowners are supportive and cooperative, others are not.

In Massachusetts, plover preferred mudflat, intertidal and wrack habitats for foraging (Hoopes et al. 1992a). On Assateague Island, bay beaches and island interiors were much more favorable as brood-rearing habitats than were ocean beaches (Patterson et al. 1992).

3.1.3 Threats to Species

The wide, flat, sparsely vegetated barrier beaches preferred by the piping plover are an unstable habitat, dependent on natural forces for renewal and susceptible to degradation by development and shoreline stabilization efforts. In high use recreational areas such as East Rockaway, the primary threat to piping plover is disturbance by recreational beach users during the breeding season. Other significant threats include destruction and degradation of habitat and predation (USFWS 1988, 1995b, Burger 1993, NJDEP 1997).

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat if natural coastal dynamics are impeded by numerous structures or roads, especially if those shorelines are also armored with hardened structures. Without development or armoring, low undeveloped islands can migrate toward the mainland, pushed by the overwashing of sand eroding from the seaward side and being re-deposited in the bay (Scavia et al. 2002). Overwash and sand migration are impeded on developed portions of islands. Instead, as sea-level increases, the ocean-facing beach erodes and the resulting sand is deposited offshore. The buildings and the sand dunes then prevent sand from washing back toward the lagoons, and the lagoon side becomes increasingly submerged during extreme high tides (Scavia et al. 2002), diminishing both barrier beach shorebird habitat and protection for mainland developments.

Modeling for three sea-level rise scenarios (reflecting variable projections of global temperature rise) at five important U.S. shorebird staging and wintering sites predicted loss of 20-70 percent of current intertidal foraging habitat (Galbraith et al. 2002). These authors estimated probabilistic sea-level changes for specific sites partially based on historical rates of sea-level change (from tide gauges at or near each site); they then superimposed this on projected 50 percent and 5 percent probability of global sea-level changes by 2100 of 34 cm and 77 cm, respectively.

3.1.4 Human Disturbance

Recreational disturbance: Disturbance, i.e., human and pet presence that alters bird behavior, disrupts piping plovers as well as other shorebird species. Disturbance can cause shorebirds to spend less time roosting or foraging and more time in alert postures or fleeing from the disturbances (Johnson and Baldassarre 1988; Burger 1991; Burger 1994; Elliott and Teas 1996; Lafferty 2001a, 2001b; Thomas et al. 2002), which limits the local abundance of piping plovers (Zonick and Ryan 1995; Zonick 2000). Shorebirds that are repeatedly flushed in response to disturbance expend energy on costly short flights (Nudds and Bryant 2000). Shorebirds are more likely to flush from the presence of dogs than people, and birds react to dogs from farther distances than people (Lafferty 2001a, 2001b; Thomas et al. 2002). Dogs off leash are more likely to flush piping plovers from farther distances than are dogs on leash; nonetheless, dogs both on and off leashes disturb piping plovers (Hoopes 1993). Pedestrians walking with dogs often go through flocks of foraging and roosting shorebirds; some even encourage their dogs to chase birds.

Off-road vehicles (ORVs) can significantly degrade piping plover habitat (Wheeler 1979) or disrupt the birds' normal behavior patterns (Zonick 2000). The FWS Piping Plover Atlantic Coast Population Revised Recovery Plan cites tire ruts crushing wrack into the sand, making it unavailable as cover or as foraging substrate (Hoopes 1993; Goldin 1993). The Recovery Plan also notes that the magnitude of the threat from ORVs is particularly significant, because vehicles extend impacts to remote stretches of beach where human disturbance will otherwise be very slight. Godfrey et al. (1980 as cited in Lamont et al.1997) postulated that ORVs may compact the substrate and kill marine invertebrates that are food for the piping plover. Zonick

(2000) found that the density of ORVs negatively correlated with abundance of roosting piping plovers on the ocean beach. Cohen et al. (2008) found that radio-tagged piping plovers using ocean beach habitat at Oregon Inlet in North Carolina were far less likely to use the north side of the inlet where ORV use is allowed, and recommended controlled management experiments to determine if recreational disturbance drives roost site selection. Ninety-six percent of piping plover detections were on the south side of the inlet even though it was farther away from foraging sites (1.8 km from the sound side foraging site to the north side of the inlet versus 0.4 km from the sound side foraging site to the north side of the inlet; Cohen et al. 2008).

3.1.5 Habitat Loss/Alteration

Along the Atlantic coast, development, encroachment of beach vegetation, flooding and erosion are primary factors in the loss of suitable breeding and nesting habitat for piping plover (Haig 1992). In Maine, construction of seawalls, jetties, piers, homes, parking lots, and other structures has reduced historic nesting habitat by more than 70%; where more than 20 miles of historic habitat may have supported more than 200 pairs of piping plovers, 32 pairs nested in 1993 on habitat with an estimated capacity of 52 pairs (Maine Department of Inland Fisheries and Wildlife 1995). Wilcox (1959) pointed to summer home and road construction as causes of declining plover nesting along Moriches Bay on Long Island, New York, between 1939 and 1951. Raithel (1984) cited coastal development and shoreline stabilization, including construction and dredging of permanent breachways, building of breakwaters, and planting of dune areas, as major contributors to the decline of the piping plover in Rhode Island. Analysis of 4 years of piping plover nest location data on a New York site revealed that the nests were significantly farther from concrete walkways leading from the dunes to the berm than were random points, suggesting that the walkways decrease the carrying capacity of the beach (Hoopes 1995). In 1993 NYSDEC documented a reduction in nest sites and habitat use by piping plover and least terns at a colony on Long Island and attributed the reduction to severe erosion and loss of suitable habitat in the area (USACE 1998, USACE 2006).

The location of development on beaches where they are vulnerable to erosion often leads to impacts that go far beyond the footprint of the facilities themselves. Requests from private communities within the Fire Island National Seashore, New York, to construct artificial dunes on adjacent undeveloped National Park Service lands in 1993 (NPS 1992, 1993) exemplify situations where shoreline development has created demand to modify and stabilize habitat suitable for plover nesting.

Plover are also likely experiencing loss of habitat in areas where the vegetation in the upper beach zone exceeds levels desired by piping plover. In general, plover prefer to nest in sparsely vegetated areas (Cohen et al. 2002, 2003a, 2003b). However, dense vegetation located near the breeding area is also desirable for plover foraging and cover.

Important factors influencing future habitat losses and gains include the amount of sea-level rise, which may vary regionally due to subsidence or uplift and the specific landforms occurring within a region (Galbraith et al. 2005; Gutierrez et al. 2007). Gutierrez et al. (2007) predicted varying responses of spits, headlands, wave-dominated barriers, and mixed-energy barriers for four sea-level rise scenarios in the U.S. mid-Atlantic region (overlapping most of the piping plover's New York-New Jersey and southern recovery units). Development and testing of models linking predictions of sea-level rise, changes in beach geomorphology, and piping plover nesting habitat is currently in progress (Gutierrez et al. 2011; Gieder et al. 2014; Gutierrez et al. 2015). Human responses, especially coastal armoring, will play key roles in the effects of sea-level rise on the quantity, quality, and distribution of piping plover habitats.

3.1.6 Predation

Predation has been identified as a major factor limiting piping plover reproductive success at many Atlantic Coast sites (Burger 1987a, MacIvor 1990, Patterson et al. 1991, Cross 1992, Elias-Gerken 1994). As with other limiting factors, the nature and severity of predation is highly site-specific. Predators of piping plover eggs and chicks include red fox, striped skunk, raccoon, Norway rat, opossum, crows, ravens, gulls, common grackles, American kestrel, domestic and feral dogs and cats, and ghost crabs.

Human activities affect the types, numbers, and activity patterns of predators, thereby exacerbating natural predation. Human activities have abetted the expansions in the populations and/or range of other species such as gulls (Drury 1973, Erwin 1979) and opossum (Gardner 1982). The availability of trash at summer beach homes increases local populations of skunks, raccoons and fox (Raithel 1984, Strauss 1990). In Massachusetts, predators, primarily red fox (*Vulpes vulpes*), destroyed 52 – 81 percent of nests in one study area (MacIvor et al. 1990). Similarly, on Assateague Island, Maryland and Virginia, predators, mainly red fox and raccoon (*Procyon lotor*), accounted for about 90 percent of the known causes of nest loss (Patterson et al. 1992). In addition, gulls, grackles (*Quiscalus quiscula*), crows (*Corvus* spp.), and in developed, high recreational use areas such as East Rockaway, domestic and free-roaming cats and dogs are equally as detrimental to plover populations by direct predation or disturbance of nest sites (Cartar 1976, Lambert and Ratcliff 1979, Cairns and McLaren 1980, Nol 1980, USFWS 1988, Patterson et al. 1990, NJDEP 1997).

3.2 Seabeach Amaranth

Seabeach amaranth is a native annual plant that inhabits barrier island beaches along the Atlantic Coast. This plant historically occurred in 31 counties in nine states from Cape Cod in Massachusetts to South Carolina. However, by 1990, only 55 populations remained, which were located in South Carolina, North Carolina, and New York (USFWS 1996). In 1993, the USFWS listed the plant as a federally-threatened species because of the declining population and its overall vulnerability to habitat destruction (USFWS 1993). Seabeach amaranth is also listed as threatened or endangered throughout its current and historical range, including New York where it is imperiled (i.e., endangered). Accordingly, the ESA, as well as several state-level endangered species laws and regulations, protect this species.

Due to the protection afforded to it by the ESA and state laws, seabeach amaranth has returned to several states after years of extirpation. Known populations of this species occur in New York, Delaware, Maryland, Virginia, North Carolina, and South Carolina (USFWS 2004b). Many of these new occurrences are the result of reintroduction and restoration programs conducted by federal, state, and local governments and non-profit organizations. Long Island supports the largest population of seabeach amaranth within its historical range, which extends from South Carolina to Massachusetts. Each year Endangered Species Biologists from the Long Island Field Office of the USFWS assist the New York Natural Heritage Program in conducting annual surveys for this threatened species. Within New York and across its range, seabeach amaranth numbers vary from year to year. Data in New York is available from 1987 to 2016. Recently, the number of plants across the entire state dwindled from a high of 244,608 in 2000 to 4,985 in 2016. This trend of decreasing numbers is seen throughout its range. A total of 249,261 plants were found throughout the species' range in 2000. By 2016, those numbers had dwindled to 9,221 plants. Seabeach amaranth is dependent on natural coastal processes to create and maintain habitat. However, high tides and storm surges from tropical systems can overwash, bury, or inundate seabeach amaranth plants or seeds, and seed dispersal may be affected by strong storm events (per Biological Assessment, Fire Island Inlet to Montauk Point Coastal Storm Risk Management, Suffolk County, New York. Prepared and submitted by: U.S. Fish and Wildlife Service, Chesapeake Bay Field Office and U.S. Army Corps of Engineers, New York District April 2018).

Life History

Seabeach amaranth germinates as small, unbranched, fleshy red colored sprigs between June and July in New York State (USFWS 2004b). These sprigs develop into a rosette of small, wrinkled leaves that branch out from the low-lying reddish stems. As the plant matures, it develops into a clump with numerous stems, which can reach a diameter of 3 ft. The small (1.3 to 2.5 centimeters in diameter) rounded leaves are clustered around the tip of the stems, exhibit a spinach-green color, and have a small notch at the rounded tip of the leaf (USFWS 1996). Inconspicuous flowers develop in clusters around the stem in mid-summer and can produce seed by July. Seed production continues until the plant dies, usually in mid to late fall, but can continue into January (USFWS 1996).

Seabeach amaranth is most likely wind-pollinated, based on the morphology of the flower and inflorescence and lack of visual, chemical, or nectar attractants. Additionally, this species is capable of self-pollination, as are other species of *Amaranthus* (USFWS 1996). Seed dispersal is carried out by water (hydrochory) and wind (anemochory) (USFWS 1996).

The primary habitat for seabeach amaranth consists of the dynamic and ever changing seaward facing areas of barrier islands, including overwash flats at accreting ends of islands, lower foredunes, and upper strands of non-eroding beaches located landward of the wrack line (USFWS 1996). Seabeach amaranth occasionally establishes populations in other habitats, including sound-side beaches, foredune blowouts, and on replenished beaches. Typical of the species, on Fire Island in New York, seabeach amaranth tends to grow on the ocean beach in bare or sparsely vegetated swales and along overwash zones (National Park Service [NPS] 1998).

Seabeach amaranth occupies a narrow beach zone that lies above mean high tide at the lowest elevations at which vascular plants regularly occur. Seaward, the plant grows only above the high tide line, as it is intolerant of even occasional flooding during the growing season.

Landward, seabeach amaranth does not occur more than a meter or so above the beach elevation on the foredune, or anywhere behind it, except in overwash areas. The species is, therefore, dependent on a terrestrial, upper beach habitat that is not flooded during the growing season.

This zone is absent on beaches that are experiencing high rates of erosion. Seabeach amaranth is never found on beaches where the foredune is scarped by undermining water at high or storm tides (Weakley and Bucher 1992).

No other vascular plant species regularly occupies a lower topographic position than seabeach amaranth (USFWS 1996). Seabeach amaranth's range correlates with a zone of tidal amplitude of 5 or 6 ft and occupies elevations that range from 8 inches (in) to 5 ft above high mean high tide (USFWS 1996). Although it grows in a very low topographical position, it is highly intolerant of inundation by saltwater, and often perishes if exposed (USFWS 1996). The plant is usually found growing on nearly pure silica sand substrate, which is mapped as 'Beach-Foredune Association' or 'Beach (occasionally flooded)' by the U.S. Natural Resources Conservation Service (NRCS).

In areas where it occurs, seabeach amaranth is an important beach stabilizing and dune building species because it acts as a 'sand binder' by trapping wind-blown sand under its lower leaves and branches. This trapped sand accumulates in a mound and eventually buries the lower leaves and stems, while the plant continues to grow. A single large clump of seabeach amaranth can trap a mound of 2 to 3 cubic yards (cy) of sand (USFWS 1996).

Seabeach amaranth has a very low tolerance for vegetative competition and does not occur on well-vegetated sites. However, habitat occupied by seabeach amaranth may be sparsely vegetated with other annual forbs, or less commonly, perennial grasses and scattered shrubs (USFWS 1996). Once other vegetation, such as American beach grass, begins to encroach upon habitat occupied by seabeach amaranth, the amaranth is quickly out competed and the individual or population is replaced by the encroaching vegetation. Scientists believe that availability of water and certain plant species are probably the limiting factors because the more extensive root systems of species such as beach grass are more efficient for the uptake of these resources (USFWS 1996).

Ecologists consider seabeach amaranth a 'fugitive' species because of its ability to escape competition and to quickly occupy new habitat as it becomes available (Randall 2002). Hurricanes and storms that re-shape shorelines may have both a positive and negative effect on the species. For example, a storm event that causes severe beach erosion may displace existing individuals, but also may uncover seed banks that have been buried for years. Following hurricanes Bertha and Fran in 1996, several new populations of seabeach amaranth appeared that were likely linked to the effects of the storms (Randall 2002).

3.2.1 Threats to Species

Seabeach amaranth has been and continues to be threatened by destruction or adverse alteration of its habitat. As a fugitive species dependent on a dynamic landscape and large-scale geophysical processes, it is extremely vulnerable to habitat fragmentation and isolation of small populations. Further, because this species is easily recognizable and accessible, it is vulnerable to taking, vandalism, and the incidental trampling by curiosity seekers. The most serious threats to the continued existence of seabeach amaranth are construction of beach stabilization structures, natural and man-induced beach erosion and tidal inundation, fungi (i.e., white wilt), beach grooming, herbivory by insects and mammals, and off-road vehicles. Herbivory by webworms, deer, feral horses, and rabbits is a major source of mortality and lowered fecundity for seabeach amaranth. However, the extent to which herbivory affects the species as a whole is unknown.

Potential effects to seabeach amaranth from vehicle use on the beaches include vehicles running over, crushing, burying, or breaking plants, burying seeds, degrading habitat through compaction of sand and the formation of seed sinks caused by tire ruts. Seed sinks occur when blowing seeds fall into tire ruts, then a vehicle comes along and buries them further into the sand preventing germination. If seeds are capable of germinating in the tire ruts, the plants are usually destroyed before they can reproduce by other vehicles following the tire ruts. Those seeds and their reproductive potential become lost from the population.

Pedestrians also can negatively affect seabeach amaranth plants. Seabeach amaranth occurs on the upper portion of the beach which is often traversed by pedestrians walking from parking lots, hotels, or vacation property to the ocean. This is also the area where beach chairs and umbrellas are often set up and/or stored. In addition, resorts, hotels, or other vacation rental establishments may set up volleyball courts or other sporting activity areas on the upper beach at the edge of the dunes. All of these activities can result in the trampling and destruction of plants. Pedestrians walking their dogs on the upper part of the beach, or dogs running freely on the upper part of the beach, may result in the trampling and destruction of seabeach amaranth plants. The extent of the effects that dogs have on seabeach amaranth is not known (per Biological Assessment, Fire Island Inlet to Montauk Point Coastal Storm Risk Management, Suffolk County, New York. Prepared and submitted by: U.S. Fish and Wildlife Service, Chesapeake Bay Field Office and U.S. Army Corps of Engineers, New York District. April 2018). .

3.2.2 Human Disturbance

Vehicular use on beaches generally has an adverse effect on seabeach amaranth. The plant is a brittle species and individuals generally do not survive even a single pass by an off road vehicle (ORV) tire (USFWS 1996). In northern beaches, such as in New York, these beaches are relatively narrow and vehicular traffic is often concentrated in the elevation zone required by seabeach amaranth (USFWS 1996). Accordingly, areas open to moderate to heavy ORV use during the seabeach amaranth growing season typically do not have populations of the plant in ORV travel corridors. However, during the dormant season, limited ORV use may actually be beneficial to seabeach amaranth because physical disturbance of the beach helps prevent colonization by perennial species, such as beach grass (USFWS 1996).

Another detrimental vehicle-based activity to seabeach amaranth is beach grooming (USFWS 1996). Mechanical rakes are dragged along the beach surface by a tractor or other vehicle to rid the beach of vegetation, trash, and wrack. This practice is usually carried out on heavily used bathing beaches and results in the exclusion of seabeach amaranth by precluding the plant from becoming established.

Humans use beaches for a variety of activities, including sunbathing, swimming, jogging, walking, birding, and beachcombing. Accordingly, pedestrians walking on beaches occupied by seabeach amaranth have the potential to crush individual plants. However, because most pedestrians prefer to walk on packed sand near the wetted shoreline seaward of seabeach amaranth habitat, the effects of pedestrian traffic are generally negligible (USFWS 1996).

3.2.3 Habitat Loss/Alteration

Shoreline stabilization is detrimental to pioneer species, such as seabeach amaranth, that require unstable, unvegetated, or 'new' land (USFWS 1996). Construction of both 'hard' and 'soft' shoreline stabilization structures are often associated with deteriorated seabeach amaranth habitat (USFWS 1996).

Hard structures are constructed of stone, concrete, steel, or wood and include rip-rap, seawalls, revetments, groins, terminal groins, and breakwaters. Soft structures include construction using non-permanent materials, such as sand, for replenishing beaches and dune construction, rehabilitation, or enhancement.

Many of these structures, both hard and soft, often occupy the same elevation range that is required by seabeach amaranth. Additionally, when structures such as bulkheads and seawalls are built, wave action and wind often lower the beach profile seaward of the structure, creating an area unsuitable for seabeach amaranth (USFWS 1996). During seabeach amaranth status surveys conducted from 1987 to 1990, no seabeach amaranth populations were observed on shorelines that were associated with bulkheads, sea walls, or rip-rap zones (USFWS 1996).

Beach nourishment and dune stabilization have varying degrees of potential effects on seabeach amaranth. Beach nourishment, for example, may have both a negative and positive effect on seabeach amaranth populations (USFWS 1996). On one hand, an adverse effect of sand placement is burial of the existing seed bank within the placement zone. On the other hand, the new beach created by placement is without other vegetation that might out compete seabeach amaranth and would likely be at an elevation that is suitable for the reestablishment of seabeach amaranth if there is a seed source nearby.

Beach nourishment can have positive site-specific impacts on seabeach amaranth. Although more study is needed before the long-term impacts can be accurately assessed, seabeach amaranth has colonized several nourished beaches, and has thrived in some sites through subsequent re-applications of fill material (FWS 1993). However, on the landscape level, beach nourishment is similar to other beach stabilization efforts in that it stabilizes the shoreline and curtails the natural geophysical processes of barrier islands.

3.2.4 Herbivory/Predation

Herbivory by webworms (caterpillars of small moths) may be detrimental to localized populations of seabeach amaranth (USFWS 1996). Although not unheard of in the northern part of seabeach amaranth range, herbivory appears to be a much more common problem in southern populations (USFWS 1996). In South Carolina, four species of webworm are known to consume seabeach amaranth and include beet webworm (*Loxostege similialis*), garden webworm (*Achyra rantilis*), southern beet webworm (*Herpetogramma bipunctalis*), and Hawaiian beet webworm (*Spoladea recurvalis*) (USFWS 1996). The ranges of several of these species extend into New York. In 1994, an infestation of saltmarsh moth (*Estigmene acraea*) caterpillars totally consumed leaves of many seabeach amaranth plants at Jones Beach Island East (USFWS 1996).

3.3 RUFA RED KNOT

The red knot (*Calidris canutus*) was added to the list of federal candidate species in 2006. The species was listed as Endangered in 2014. Red knots are federally protected under the Migratory Bird Treaty Act, and are New Jersey State-listed as endangered. The red knot is currently listed as endangered or threatened in New York State.

Red knots were heavily hunted for both market and sport during the 19th and early 20th centuries in the Northeast and the mid-Atlantic. Red knot population declines were noted by several authors of the day, whose writings recorded a period of intensive hunting followed by the introduction of regulations and at least partial population recovery.

Calidris canutus is classified in the Class Aves, Order Charadriiformes, Family Scolopacidae, Subfamily Scolopacinae. Six subspecies are recognized, each with distinctive morphological traits (i.e., body size and plumage characteristics), migration routes, and annual cycles. Each subspecies is believed to occupy a distinct breeding area in various parts of the Arctic but some subspecies overlap in certain wintering and migration areas. (FWS BO for Long Beach, NY Project 2014).

Calidris canutus canutus, C. c. piersma, and *C. c. rogersi* do not occur in North America. The subspecies *C.c. islandica* breeds in the northeastern Canadian High Arctic and Greenland, migrates through Iceland and Norway, and winters in Western Europe (Committee on the Status of Endangered Wildlife in Canada. *C. c. rufa* breeds in the central Canadian Arctic (just south of the *C. c. islandica* breeding grounds) and winters along the Atlantic coast and the Gulf of Mexico coast (Gulf coast) of North America, in the Caribbean, and along the north and southeast coasts of South America including the island of Tierra del Fuego at the southern tip of Argentina and Chile (Ibid).

3.3.1 Life History

The rufa red knot is a medium-sized shorebird about 9 to 11 inches (in) (23 to 28 centimeters (cm)) in length. The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States (Southeast), the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed (Ibid).

The red knot is a large, bulky sandpiper with a short, straight, black bill. During the breeding season, the legs are dark brown to black, and the breast and belly are a characteristic russet color that ranges from salmon-red to brick-red. Males are generally brighter shades of red, with a more distinct line through the eye. When not breeding, both sexes look alike – plain gray above and dirty white below with faint, dark streaking. As with most shorebirds, the long-winged, strong-flying knots fly in groups, sometimes with other species. Red knots feed on invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab eggs. On the breeding grounds, knots mainly eat insects (Ibid).

Small numbers of red knots may occur in New Jersey year-round, while large numbers of birds rely on New Jersey's coastal stopover habitats during the spring (mid-May through early June) and fall (late-July through November) migration periods. Smaller numbers of knots may spend all or part of the winter in New Jersey. Red knots also rely on New York's coastal stopover habitats during the spring and fall migration periods. As stated above, several stopover habitats in New York are being proposed for critical habitat designations (Ibid).

The primary wintering areas for the rufa red knot include the southern tip of South America, northern Brazil, the Caribbean, and the southeastern and Gulf coasts of the U.S. The rufa red knot breeds in the tundra of the central Canadian Arctic. Some of these robin-sized shorebirds fly more than 9,300 miles from south to north every spring and reverse the trip every autumn, making the rufa red knot one of the longest-distance migrating animals. Migrating red knots can complete non-stop flights of 1,500 miles or more, converging on critical stopover areas to rest and refuel along the way. Large flocks of red knots arrive at stopover areas along the Delaware Bay and New York/New Jersey's Atlantic coast each spring, with many of the birds having flown directly from northern Brazil. The spring migration is timed to coincide with the spawning season for the horseshoe crab (*Limulus polyphemus*). Horseshoe crab eggs provide a rich, easily digestible food source for migrating birds. Mussel beds on New Jersey's southern Atlantic coast and intertidal/wrack line areas on New York's coast are also important forage habitats for migrating knots. Birds arrive at stopover areas with depleted energy reserves and must quickly rebuild their body fat to complete their migration to Arctic breeding areas. During their brief 10- to 14-day spring stay in the mid-Atlantic, red knots can nearly double their body weight.

Major spring stopover areas along the Atlantic coast include Río Gallegos, Península Valdés, and San Antonio Oeste (Patagonia, Argentina); Lagoa do Peixe (eastern Brazil, State of Rio Grande do Sul); Maranhão (northern Brazil); the Virginia barrier islands (United States); and Delaware Bay (Delaware, New Jersey and New York, United States) (Cohen *et al.*. 2009, p. 939; Niles *et al.*. 2008, p. 19; González 2005, p. 14). However, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts from Argentina to Massachusetts (Niles *et al.*. 2008, p. 29). In Massachusetts, red knots use sandy beaches and tidal mudflats during fall migration. In New York and the Atlantic coast of New Jersey, knots use sandy beaches during spring and fall migration (Niles *et al.*. 2008, p. 30).

From geolocators, examples of spring migratory tracks are available for three red knots that wintered in South America. One flew about 4,000 mi (6,400 km) over water from northeast Brazil in 6 days. Another flew about 5,000 mi (8,000 km) from the southern Atlantic coast of Brazil (near Uruguay) over land and water (the *eastern* Caribbean) in 6 days. Both touched down in North Carolina, and then used Delaware Bay as the final stopover before departing for the arctic breeding grounds (Niles *et al.*. 2010a, p. 126). A third red knot, which had wintered in Tierra del Fuego, followed an overland route through the interior of South America, departing near the Venezuela-Colombia border. This bird then flew over the Caribbean to Florida, and finally to Delaware Bay (Niles 2011a).

In Delaware Bay, red knots preferentially *feed* in microhabitats where horseshoe crab eggs are concentrated, such as at horseshoe crab nests (Fraser et al.. 2010, p. 99), at shoreline discontinuities (e.g., creek mouths) (Botton et al.. 1994, p. 614), and in the wrack line (Nordstrom et al.. 2006a, p. 438; Karpanty et al.. 2011, pp. 990, 992). (The wrack line is the beach zone just above the high tide line where seaweed and other organic debris are deposited by the tides.) Wrack may also be a significant foraging microhabitat outside Delaware Bay, for example, where mussel spat (i.e., juvenile stages) are attached to deposits of tide-cast material. Wrack material also concentrates certain *invertebrates* such as amphipods, insects, and marine worms (Kluft and Ginsberg 2009, p. vi), which are secondary prey species for red knots.

For many shorebirds, the supra-tidal (above the high tide) sandy habitats of inlets provide important areas for roosting, especially at higher tides when intertidal habitats are inundated (Harrington 2008, pp. 4–5). Along the Atlantic coast, dynamic and ephemeral features are important red knot habitats, including sand spits, islets, shoals, and sandbars, often associated with inlets (Harrington 2008, p. 2). From South Carolina to Florida, red knots are found in significantly higher numbers at inlets than at other coastal sites (Harrington 2008, pp. 4–5).

The District has been undertaking comprehensive monitoring of red knots on the South Shore of Staten Island (SSSI), New York project area for two years. To date, no rufa red knot have been observed within the SSSI project are, but, red knot were observed at Great Kills, NY (Ebird website- http://ebird.org/ebird/subnational2/US-NY-103/hotspots).

3.3.2 Threats to Red Knot

Much of the U.S. coast within the range of the red knot is already extensively developed. Direct loss of shorebird habitats occurred over the past century as substantial commercial and residential developments were constructed in and adjacent to ocean and estuarine beaches along the Atlantic and Gulf coasts. In addition, red knot habitat was also lost indirectly, as sediment supplies were reduced and stabilization structures were constructed to protect developed areas.

Sea level rise and human activities within coastal watersheds can lead to long-term reductions in sediment supply to the coast. Damming of rivers, bulkheading highlands, and armoring coastal bluffs have reduced erosion in natural source areas and, consequently, the sediment loads reaching coastal areas. Although it is difficult to quantify, the cumulative reduction in sediment supply from human activities may contribute to the long-term shoreline erosion rate. Along coastlines subject to sediment deficits, the amount of sediment supplied to the coast is less than that lost to storms and coastal sinks (inlet channels, bays, and upland deposits), leading to long-term shoreline recession.

Red knots require open habitats that allow them to see potential predators and that are away from tall perches used by avian predators. Invasive species, particularly woody species, degrade or eliminate the suitability of red knot roosting and foraging habitats by forming dense stands of vegetation. Although not a primary cause of habitat loss, invasive species can be a regionally important contributor to the overall loss and degradation of the red knot's nonbreeding habitat.

Commercial harvest of horseshoe crabs has been implicated as a causal factor in the decline of the rufa red knot by decreasing the availability of horseshoe crab eggs in the Delaware Bay stopover (Niles *et al*.. 2008, pp. 1-2). Notwithstanding the importance of the horseshoe crab and Delaware Bay, other lines of evidence suggest that the rufa red knot also faces threats to its food resources throughout its range.

About 40 percent of the U.S. coastline within the range of the red knot is already developed, and much of this developed area is stabilized by a combination of existing hard structures and ongoing beach nourishment programs. In those portions of the range for which data are available (New Jersey and North Carolina to Texas), about 40 percent of inlets, a preferred red knot habitat, are hard-stabilized, dredged, or both. Hard stabilization structures and dredging degrade and often eliminate existing red knot habitats, and in many cases prevent the formation of new shorebird habitats. Beach nourishment may temporarily maintain suboptimal shorebird habitats where they would otherwise be lost as a result of hard structures, but beach nourishment also has adverse effects to red knots and their habitats. Demographic and economic pressures remain strong to continue existing programs of shoreline stabilization and to develop additional areas, with an estimated 20 to 33 percent of the coast still available for development. However, we expect existing beach nourishment programs will likely face eventual constraints of budget and sediment availability as sea level rises. In those times and places that artificial beach maintenance is abandoned, the remaining alternatives would likely be limited to either a retreat from the coast or increased use of hard structures to protect development. The quantity of red knot habitat would be markedly decreased by a proliferation of hard structures. Red knot habitat would be significantly increased by retreat, but only where hard stabilization structures do not exist or where they get dismantled. The cumulative loss of habitat across the nonbreeding range could affect the ability of red knots to complete their annual cycles, possibly affecting fitness and survival, and is thereby likely to negatively influence the long-term survival of the rufa red knot.

In wintering and migration areas, the most common predators of red knots are peregrine falcons (*Falco peregrinus*), harriers (*Circus* spp.), accipiters (Family Accipitridae), merlins (*F. columbarius*), shorteared owls (*Asio flammeus*), and greater black-backed gulls (*Larus marinus*) (Niles *et al.* 2008, p. 28). In addition to greater black-backed gulls, other large gulls (e.g., herring gulls (*Larus argentatus*)) are anecdotally known to prey on shorebirds. Predation by a great horned owl (*Bubo virginianus*) has been documented in Florida Nearly all documented predation of wintering red knots in Florida has been by avian, not terrestrial, predators (2014 FWS BO). However, in migration areas like Delaware Bay, terrestrial predators such as red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) may be a threat to red knots by causing disturbance, but direct mortality from these predators may be low (Niles *et al.* 2008, p. 101).

Red knots' selection of high-tide roosting areas on the coast appears to be strongly influenced by raptor predation, something well demonstrated in other shorebirds (Niles *et al*.. 2008, p. 28). Red knots require roosting habitats away from vegetation and structures that could harbor predators (Niles *et al*.. 2008, p. 63). Red knots' usage of foraging habitat can also be affected by the presence of predators, possibly affecting the birds' ability to prepare for their final flights to the arctic breeding grounds (Watts 2009) (e.g., if the knots are pushed out of those areas with the highest prey density or quality). In 2010, horseshoe crab egg densities were very high in Mispillion Harbor, Delaware, but red knot use was low because peregrine falcons were regularly hunting shorebirds in that area (Niles 2010a). Growing numbers of peregrine falcons on the Delaware Bay and New Jersey's Atlantic coasts are decreasing the suitability of a number of important shorebird areas (Niles 2010a). Analyzing survey data from the Virginia stopover area, Watts (2009) found the density of red knots far (greater than 3.7 mi (6 km)) from peregrine nests was nearly eight times higher than close (0 to 1.9 mi (0 to 3 km)) to peregrine nests. In addition, red knot density in Virginia was significantly higher close to peregrine nests during those years when peregrine territories were not active compared to years when they were (Watts 2009).

The quantity and quality of red knot prey may also be affected by the placement of sediment for beach nourishment or disposal of dredged material. Invertebrates may be crushed or buried during project construction. Although some benthic species can burrow through a thin layer of additional sediment, thicker layers (over 35 in (90 cm)) smother the benthic fauna. By means of this vertical burrowing, recolonization from adjacent areas, or both, the benthic faunal communities typically recover. Recovery can take as little as 2 weeks or as long as 2 years, but usually averages 2 to 7 months (Burlas et al 2001; Peterson and Manning 2001, p.1). Although many studies have concluded that invertebrate communities recovered following sand placement, uncertainty remains about the effects of sand placement on invertebrate communities and how these impacts may affect red knots.

3.3.3 Human Disturbance

Sea level rise and human activities within coastal watersheds can lead to long-term reductions in sediment supply to the coast. Damming of rivers, bulkheading highlands, and armoring coastal bluffs have reduced erosion in natural source areas and, consequently, the sediment loads reaching coastal areas. Although it is difficult to quantify, the cumulative reduction in sediment supply from human activities may contribute substantially to the long-term shoreline erosion rate. Along coastlines subject to sediment deficits, the amount of sediment supplied to the coast is less than that lost to storms and coastal sinks (inlet channels, bays, and upland deposits), leading to long-term shoreline recession

In addition to reduced sediment supplies, other factors such as stabilized inlets, shoreline stabilization structures, and coastal development can exacerbate long-term erosion (Herrington 2003). Coastal development and shoreline stabilization can be mutually reinforcing. Coastal development often encourages shoreline stabilization because stabilization projects cost less than the value of the buildings and infrastructure. Conversely, shoreline stabilization sometimes encourages coastal development by making a previously high-risk area seem safer for development (U.S. Climate Change Science Program [CCSP] 2009). Protection of developed areas is the driving force behind on-going shoreline stabilization efforts. Large-scale shoreline stabilization projects became common in the past 100 years with the increasing availability of heavy machinery. Shoreline stabilization methods change in response to changing new technologies, coastal conditions, and preferences of residents, planners, and engineers. Along the Atlantic and Gulf coasts, an early preference for shore-perpendicular structures (e.g., groins) was followed by a period of construction of shore-parallel structures (e.g., seawalls), and then a period of beach nourishment, which is now favored (Morton et al. 2004; Nordstrom 2000).

3.3.4 Habitat Loss

Structural development along the shoreline and manipulation of natural inlets upset the naturally dynamic coastal processes and result in loss or degradation of beach habitat (Melvin et al. 1991). As beaches narrow, the reduced habitat can directly lower the diversity and abundance of biota (life forms), especially in the upper intertidal zone. Shorebirds may be impacted both by reduced habitat area for roosting and foraging, and by declining intertidal prey resources, as has been documented in California (Defeo et al. 2009; Hubbard 2003). In an estuary in England, Stillman et al. (2005) found that a 2 to 8 percent reduction in intertidal area (the magnitude expected through sea level rise and industrial developments including extensive stabilization structures) decreased the predicted survival rates of 5 out of 9 shorebird species evaluated (although not of *Calidris canutus*).

In Delaware Bay, hard structures also cause or accelerate loss of horseshoe crab spawning habitat (U.S. Climate Change Science Program [CCSP] 2009; Botton et al. *in* Shuster et al. 2003; Botton et al. 1988), and shorebird habitat has been, and may continue to be, lost where bulkheads have been built (Clark 2009). In addition to directly eliminating red knot habitat, hard structures interfere with creation of new shorebird habitats by interrupting the natural processes of overwash and inlet formation. Where hard stabilization is installed, the eventual loss of the beach and its associated habitats is virtually assured (Rice 2009), absent beach nourishment, which may also impact red knots as discussed below. Where they are maintained, hard structures are likely to significantly increase the amount of red knot habitat lost as sea levels continue to rise.

3.3.5 Predation

In wintering and migration areas, the most common predators of red knots are peregrine falcons (*Falco peregrinus*), harriers (*Circus* spp.), accipiters (Family Accipitridae), merlins (*F. columbarius*), shorteared owls (*Asio flammeus*), and greater black-backed gulls (*Larus marinus*)

(Niles et al. 2008). In addition to greater black-backed gulls, other large gulls (e.g., herring gulls [*Larus argentatus*]) are anecdotally known to prey on shorebirds (Breese 2010). Predation by a great horned owl (*Bubo virginianus*) has been documented in Florida (Schwarzer, *pers. comm*., June 17, 2013). Nearly all documented predation of wintering red knots in Florida has been by avian, not terrestrial, predators (Schwarzer, *pers. comm*., June 17, 2013). However, in migration areas like Delaware Bay, terrestrial predators such as red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) may be a threat to red knots by causing disturbance, but direct mortality from these predators may be low (Niles et al.et al. 2008).

At key stopover sites, however, localized predation pressures are likely to exacerbate other threats to red knot populations, such as habitat loss, food shortages, and asynchronies between the birds' stopover period and the occurrence of favorable food and weather conditions. Predation pressures worsen these threats by pushing red knots out of otherwise suitable foraging and roosting habitats, causing disturbance, and possibly causing changes to stopover duration or other aspects of the migration strategy.

4 EFFECT ANAYLSIS

4.1 Piping Plover

The piping plover area managed by the NYC Department of Parks and Recreation (DPR) is located at the Rockaway Peninsula which extends from Beach 9th Street to Beach 149th Street on the ocean side, accounting for 6.5 miles of coastline. This stretch of beach is split into three continuous management areas Far Rockaway (Beach 9th Street - Beach 35th Street), Arverne by the Sea (Beach 35th Street – Beach 73rd Street) and Rockaway Beach (Beach 73rd Street - Beach 149th Street). Collectively, these three management areas are known as the Rockaway Beach Endangered Species Nesting Area (RBESNA). RBESNA has been managed as a breeding site for piping plovers since 1996.

According to the 2017 RBESNA Final Report (DPR 2017) 20 pairs of piping plovers had a total of 42 fledglings resulting in a productivity of 2.1 for all of RBESNA. Overall, piping plovers had a nest success rate of 79%, with 19 out of the 24 nests created resulting in at least one fledgling per nest. When separated by location, Arverne by the Sea had the highest productivity rate: 15 piping plover pairs fledged 35 chicks with a productivity rate of 2.33 and a nest success of 88% (15 out of 17 nests). The success of this area is partly due to the fencing off of the dunes and shore areas, which are essential for chick survival. Interestingly, the pair that nested at the B64th Street site, in a swim beach, fledged four chicks, for a productivity rate of 4.0 in that site.

Far Rockaway had five piping plover pairs that fledged seven chicks for a productivity rate of 1.40, and 57% of its nests succeeded (four out of seven nests). It is also interesting to note that the vegetation density and overall layout of the beach in Far Rockaway differed greatly from Arverne by the Sea, with Far Rockaway being a flat and open beach with a sparsely vegetated back dune, compared to Arverne by the Sea which has a higher density of vegetation. Far Rockaway also does not host any colonies of terns or black skimmers. Because of the high success during the breeding seasons of 2014 (UPR, 2014) and 2015 (UPR, 2015), the 2015 seasonal science team recommended that Far Rockaway become a pre-fenced area as suggested by the Piping Plover (Charadrius melodus) Atlantic Coast Population Revised Recovery Plan (USFWS, 1996), for areas with recurring nesting three years in a row.

4.1.1 Historic Trends

According to the 2017 RBESNA Final Report, the 2017 piping plover breeding season had a total of 20 nesting pairs, an increase over the 17 pairs from 2016 (UPR, 2016). There were a record number of fledglings for RBESNA in 2017, with a total of 42 fledglings, compared to 31 fledglings in 2016 (Table 4).

Figure 11: 2017 Nesting Season

Table 4: Piping plover pair and fledgling count at RBESNA from 1996 to 2017

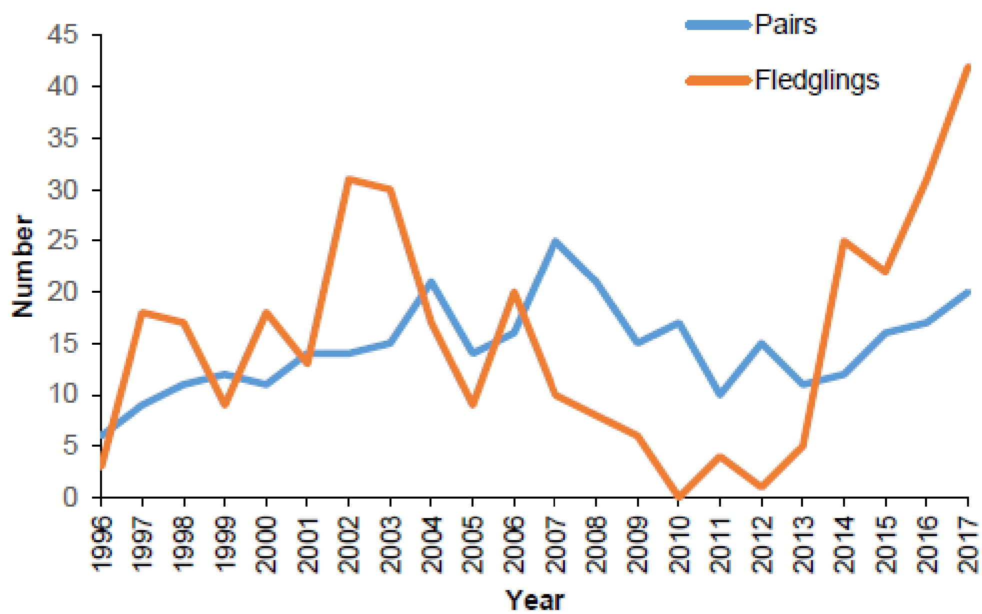
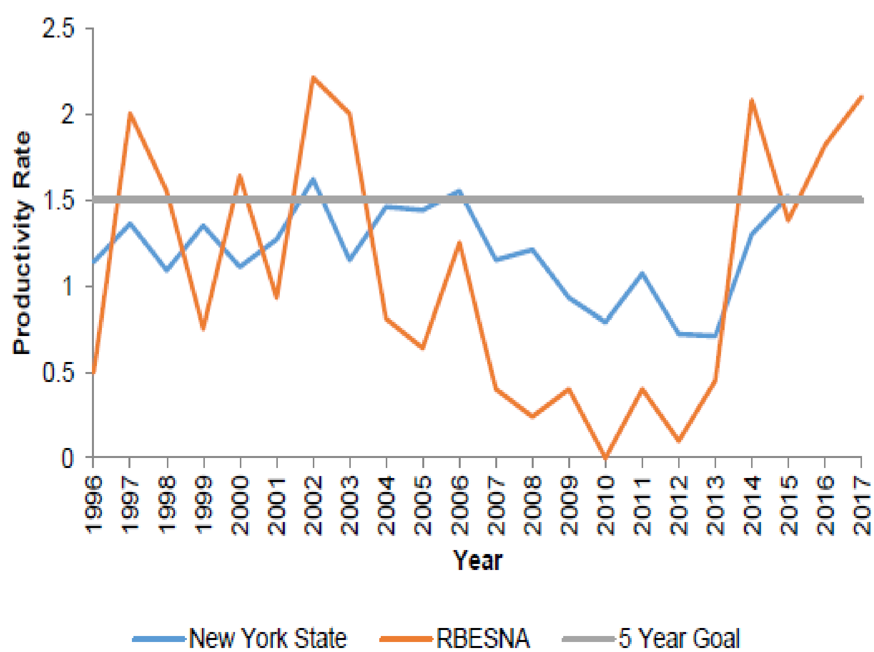


Table 5: Piping plover productivity rate for RBESNA and New York State (USFWS, 2016) from 1996 to 2017



According to the 2017 RBESNA Final Report, the RBESNA exceeded the productivity goal set out by the USFWS. The RBESNA productivity generally follows the same trend that the New York State productivity follows. If the productivity trend continues to increase as it has since 2013, RBESNA and New York State might be able to reach the goal of achieving a productivity rate of 1.5 for five years in a row. The piping plover productivity in 2017 was 2.1, an increase from 2016, and the second highest productivity at RBENSA in 21 years. Table 6 presents a summary of data collected from 1996-2017.

Table 6: Data Collected from 1996 to the present (2017) for piping plovers nesting at RBESNA

Year	Pairs	Nests	Eggs	Chicks	Fledglings	Productivity Rate
1996	6	8	26	3	3	0.50
1997	9	11	39	27	18	2.00
1998	11	16	62	30	17	1.55
1999	12	18	64	24	9	0.75
2000	11	17	53	35	18	1.64
2001	14	20	63	38	13	0.93
2002	14	18	65	44	31	2.21
2003	15	28	87	47	30	2.00
2004	21	27	95	53	17	0.81
2005	14	18	68	39	9	0.64
2006	16	27	103	40	20	1.25
2007	25	35	128	53	10	0.40
2008	21	32	108	29	8	0.24
2009	15	23	68	41	6	0.40
2010	17	23	83	51	0	0.00
2011	10	12	42	30	4	0.40
2012	15	19	69	50	1	0.10
2013	11	14	51	36	5	0.45
2014	12	14	54	43	25	2.08
2015	16	18	64	51	22	1.38
2016	17	22	80	49	31	1.82
2017	20	24	83	56	42	2.10

4.1.2 No Action

Future habitat conditions in the Project Area without the Project would be varied. Based on past experience in coastal areas of New York and New Jersey, the upper beach zone and dunes would continue to erode in many areas and may even be eliminated entirely in areas of severe erosion. This would result in significant loss of habitat upon which the piping plover and other shorebirds/seabirds depend on for nesting habitat. However, in other areas along the shoreline, the upper beach zone could accrete sand and increase in size, thereby potentially increasing available piping plover habitat. Although some accretion may occur in the Project Area over time, many areas are expected to experience erosion and loss of upper beach and dune habitats without the proposed Project activities (USACE 1989, 1998, 2002, 2005). The intertidal and subtidal zones would retain their current width and substrate composition. However, the locations of these zones would shift off-shore or on-shore depending on erosion and accretion rates in the area. Accordingly, the overall impact of the No Action alternative on piping plover habitat would likely be negative.

4.1.3 Proposed Action

Although some minor, short-term, impacts to plover food resources and habitat could result from proposed Project modifications, overall improvements to plover habitat can be expected to result from the proposed activity. Therefore, after a full evaluation of plover life history, habitats in the Project Area, plover management activities, and proposed Project activities, a conservative May Affect, Likely to Adversely Affect (LAA) determination was made by the District on populations of piping plover as a result of implementation these proposed activities (Table 7). Details of this determination are provided below.

Table 7: Summary of Project Effects on Populations of Piping Plover

Activities	Potentially Beneficial	Not Likely to Adversely Affect	Likely to Adversely Affect	No Effect
No-Action				
Project				
Staging Area Construction and Use				X
Beach Fill			X	
Groin Extension			X	
Groin Construction			X	
Dune and Seawall Construction			X	
HRFRRF				X
Cumulative Impacts				
Periodic re-nourishment	X	X		
Periodic maintenance of infrastructure			X	
Long Term Impacts from Groins	X	X	X	
Long Term Impacts from HRFRRF	X			

The primary direct impacts resulting from implementation of the Project will be disturbance and direct impact of benthic, immobile invertebrate and plant communities currently living in these areas due to burial from beach fill material. As a result, piping plover could experience some short- term loss of food resources within the beach fill placement. However, the direct placement of beach fill is not expected to cause long-term significant impacts on the piping plover. The area of actual permanent plover habitat loss due to permanent structures is small and would result in a negligible loss of foraging substrate for the species. In addition, although plover would avoid foraging within areas of direct sand placement in the intertidal zone until benthic food sources recolonized the site, recolonization of benthic communities in the intertidal zones typically takes place within six months to two years following beach fill placement activities (USFWS 1991, Burlas et al 2001, Peterson and Manning 2001). Regardless of the long term benefits resulting from the implementation of the project, a conservative May Affect (LAA), Likely to Adversely Affect determination was made by the District as a result of implementation of these proposed activities.

Placement of beach fill and dune restoration is likely to increase overall habitat value for piping plover along the affected beachfront by expanding the area of suitable breeding, nesting and foraging habitat. Therefore, a Potentially Beneficial Impact determination was made by the District for piping plover for this proposed Project activity for the reasons stated below. Studies of beach nourishment projects along the Atlantic Coast have documented that when construction windows and best plover management practices are adhered to, beach nourishment generally provides valuable habitat for beach nesting birds such as the piping plover (NJDEP 1997, USFWS 2004a). Construction activities occurring in the Project Area are likely to halt further loss of existing plover nesting habitat and will likely increase the amount of suitable habitat by increasing the size of the upper beach zone. Unpublished data from piping plover monitoring conducted by the District in beach fill placement areas near Shinnecock and the Hamptons, Long Island, NY, shows that piping plover and least terns (species that nest on upper beach habitats) returned to breed on sites within 1 year following construction activities (Cohen et al. 2002, 2003a, 2003b).

Permanent hard structures such as seawall, groins, sand fence, access ways, and walkovers also would eliminate any suitable foraging or nesting areas directly within the footprint of these structures. However, the area of overall impact from these structures is expected to be minimal (< 1.0 ac) and most of the habitat that will be impacted is not of high habitat value to plover. Specifically, plover forage primarily in the intertidal zone and nest in the upper beach zone in front of dunes. The areas in which hard structures are proposed include mostly subtidal areas that would be affected from groin placement, and portions of the upper dune that would be affected by buried seawall, fence, access ways, and walkovers. Overall impacts directly within the footprint of these structures would be permanent, but are not expected to significantly affect piping plover breeding or foraging activities for the long term. Regardless of the possible short term adverse effects vs. long term benefits, a conservative May Affect, Likely to Adversely Affect (LAA) determination was made by the District as a result of implementation of these proposed activities.

Other short-term impacts, such as a slight decrease in water quality and an increase in turbidity, also are likely to occur during beach fill and groin construction and rehabilitation activities. Changes in water quality and turbidity may cause some short-term avoidance of the intertidal zone by piping plover during periods of low water quality resulting from construction activities. These impacts to plover foraging activities will be short term and will have a minimal effect on plover because plover are mobile and can utilize unaffected foraging areas nearby. In addition, construction activities will be scheduled to avoid any active plover nesting periods (i.e., construction scheduled from approximately September 2 through March 31), which will avoid potential impacts to less-mobile plover chick foraging activities. Plover also are expected to avoid active construction areas due to noise and activities. Limiting construction in known active nesting areas to September 2 through March 31 will also minimize this impact. Impacts from these activities are expected to be short-term and cause no significant or long term negative effects on plover populations. Regardless of the mitigation measures incorporated as BMPs for the construction of the project, to be conservative, a May Affect, Likely to Adversely Affect (LAA) determination was made by the District for piping plover for these proposed activities.

Construction of new vehicle and pedestrian access points pose potential threat to piping plover because these activities are likely to provide access to new areas of the beach and may increase vehicle and public use of beach areas. This increase in human activity may disrupt nesting plover in areas in proximity to access points and beach activities. Plover are known to be sensitive to disturbance and experience lower reproductive success in areas where they are disturbed frequently (Flemming et al. 1988, Burger 1991, 1994, Goldin 1992, 1993, Cross and Terwilliger 1993, Collazo et al. 1995).

Despite the fact that much of the Project Area is currently highly developed and is used extensively for recreational activities by humans, the District will follow recommendations provided by the NYSDEC and USFWS, to reduce the impacts to plover in the Project Area (USFWS 1989, 1994, 1999, USACE 1998,). These impact minimization measures are detailed in Section 5.

Efforts to restrict human access and activities near the nest sites, and use of exclusion devices to reduce predation are believed to be major contributing factors in nesting success of plovers in coastal areas such as those found in the project area (USFWS 1995b, 2003, Cohen et al. 2002, 2003a, 2003b). In addition, NatureServe (2002) notes that population declines may have been countered with intensive management efforts that include creation of habitat using dredge material. Thus, a May Affect, Likely to Adversely Affect (LAA) determination was made by the District on piping plover for proposed Project activities.

4.1.4 Cumulative Effects

The proposed beach renourishment activities would cause short-term impacts to plover foraging by directly covering the benthic organisms that plover feed on and causing short term availability in benthic species (USFWS 1991, Burlas et al 2001, Peterson and Manning 2001). These impacts are similar to the impacts from initial beach fill activities as discussed above. However, as discussed previously, these impacts will have minimal short-term impact on plover populations. Renourishment activities will provide long-term protection of potential breeding and nesting areas in the upper beach and primary dune areas. To further reduce potential impacts, beach renourishment activities will adhere to recommended construction windows. In addition, the District will support the conduct of pre-nourishment field surveys for active piping plover nesting areas. Beach fill would not be placed within 1000 m of active populations of piping plover or other state or federally-listed shorebirds/seabirds during the breeding season. Even though multiple Potentially Beneficial activities were identified as compared with only one Likely to Affect activity, a conservative May Affect, Likely to Adversely Affect (LAA) determination has been made for these proposed activities.

Occasional maintenance of beach access locations, boardwalks, and comfort stations will be required. These activities have the potential to disturb plover. However, as noted above, the District will support NYC DPRs efforts to identify the location of nesting plover in the vicinity of these areas, and maintenance activities would be scheduled outside of key breeding and nesting periods.

Groin construction and extension may cause habitat degradation by robbing sand from the down-drift shoreline. For example, the Coastal Barriers Study Group (1987) and the Ocean City, Maryland and Vicinity Water Resources Study Reconnaissance Report (USACE 1994) attribute the accelerated, landward shoreline recession of the north end of Assateague Island in Maryland to cumulative effects on the natural drift system from inlet stabilization and nourishment of the rapidly eroding beaches at Ocean City. However, loss of sand down-drift of a jetty or groin may be partially off-set by habitat accretion on the up-drift side of a structure. Breezy Point at the western end of southern Long Island, New York, serves as an example of concentrated piping plover numbers on the accreting side of a jetty (Goldin 1990). Beaches on the accreting side of jetties may also be subject to plant succession that makes them less attractive to piping plovers over time (NJDEP 1997, USFWS 2004). The District will monitor the long-term effects of groin placement on habitat for known populations of piping plover or other state or federally-listed shorebirds/seabirds identified in the greater Project Area and appropriate ameliorative action would be taken. Even though the potential impacts and benefits are offsetting with the long term project condition ensuring the sustainability of nesting habitat, a May Affect, Likely to Adversely Affect (LAA) determination was made by the District for piping plover from this proposed Project activity.

4.2 Seabeach Amaranth

According to the 2017 RBESNA Final Report, a total of 4,881 seabeach amaranth plants were located, flagged, and measured in August and the first week in September (Table 8). This is a large increase from the 2,517 plants counted in 2016. Most plants were found in Arverne by the Sea between Beach 57th Street and Beach 38th Street inside the fenced off area. Diameter of the plants fluctuated from 0.30 to 47 centimeters. Most plants had a diameter of 2.0 centimeters, and the biggest plant presented mature infructescences with seeds. This year NRG put cage-like exclosures around plants not within symbolic fencing. These were used to prevent accidental crushing by pedestrians or vehicles.

Table 8: Seabeach Amaranth Survey Results

Count	Mean	Median	Mode	Minimum	Maximum
4,881 plants	3.14 cm	2.20 cm	2.0 cm	0.30 cm	47.0 cm

Figure 12: Seabeach Amaranth 2017 Location Map

4.2.1 Historic Trends

Historically, seabeach amaranth occurred in nine states from Massachusetts to South Carolina. The populations, which have been extirpated, are believed to have succumbed as a result of hard shoreline stabilization structures, erosion, tidal inundation, and possibly, herbivory by webworms (U.S. Fish and Wildlife Service 1994). The continued existence of the plant is threatened by these activities (Elias-Gerken 1994, Van Schoik and Antenen 1993), as well as the adverse alteration of essential habitat primarily as a result of "soft" shoreline stabilization (beach nourishment, artificial dune creation, and beach grass plantings), but also from beach grooming and other causes (Murdock 1993). Populations of seabeach amaranth at any given site are extremely variable (Weakley and Bucher 1992) and can fluctuate by several orders of magnitude from year to year. For example, seabeach amaranth declined from 55,832 plants in 2003 to 2,639 plants in 2006 at the Westhampton Island West survey site (NYNHP 2006). The primary reasons for the natural variability of seabeach amaranth are the dynamic nature of its habitat and the significant effects of stochastic factors, such as weather and storms, on mortality and reproductive rates. Although wide fluctuations in species populations tend to increase the risk of extinction, variable population sizes are a natural condition for seabeach amaranth; the species is well-adapted to its ecological niche (U.S. Fish and Wildlife Service 1996a).

Seabeach amaranth has been identified as occurring within the Project Area. Seabeach amaranth inhabits dynamic, sparsely vegetated seaward facing beaches at elevations of 8 in to 5 ft above mean high water. Habitat such as this is known to be present within the Project Area and is likely to experience some impacts as a result of proposed Project activities. The following section provides an evaluation of the potential impacts from No-Action and proposed Project alternatives on populations of seabeach amaranth.

4.2.2 No Action

As with the no-action scenario for piping plover, future habitat conditions without the Project would include both loss and accretion of sediment in the upper beach and dune areas. However, much of the Project Area is expected to experience erosion and loss of upper beach and dune habitats without the proposed Project activities (USACE 1989, 1998, 2002, 2005). In these areas, the upper beach zone would lose sand and would decrease in size, thereby potentially reducing available seabeach amaranth habitat. The width of intertidal and subtidal zones will remain stable. But, locations of these zones may shift off-shore or on-shore depending on erosion and accretion rates in the area. Accordingly, the overall impact of the No Action alternative on seabeach amaranth habitat would likely be negative.

4.2.3 Proposed Action

Implementation of the Project actions will affect the upper, intertidal, nearshore subtidal beach zones and primary dune areas of coastal beaches in the Project Area through the direct placement of beach fill and structures such as retaining walls, walkovers, and beach access areas. These activities could bury amaranth communities and historic seed banks. In addition, hard structures such as groins, would not result in any permanent loss of potential habitat because these structures will impact areas of the beach/dune that are not typically suitable for amaranth. A summary of Project activities and their effects on populations of seabeach amaranth are presented in Table 9.

Table 9: Summary of Project Effects on Populations of Seabeach Amaranth

Activities	Potentially Beneficial	Not Likely to Adversely Affect	Likely to Adversely Affect	No Effect
No-Action				
Project				
Staging Area Construction and Use				X
Beach Fill			X	
Groin Extensions			X	
Groin Construction			X	
Dune and Seawall Construction			X	
HRFRRF				X
Cumulative Impact				
Periodic Re-nourishment	X	X		
Periodic Maintenance of Dunes and Infrastructure	X		X	
Long term impacts from Groins	X	X		
Long term impacts HRFFRF	X			X

Vehicle and pedestrian access points pose potential threats to seabeach amaranth because these activities are likely to provide access to new areas of the beach and may increase vehicle and public use of beach areas. This increase in human activity could directly impact unprotected amaranth if they were to occur in the Project Area. In addition, similar to the recommendations provided by NYSDEC and USFWS for the piping plover, the District will implement several measures in an effort to minimize potential adverse impacts to existing seabeach amaranth populations (USACE 1998, USFWS 1999). These impact minimization measures are detailed in Section 5 and in summary include the following: support NYC DPR pre and post-construction surveys of the Project Area to determine the presence/absence of seabeach amaranth as well as education of residents, landowners, beach visitors, and beach managers and the use of physical deterrents to deter human use of potential seabeach amaranth habitat and limiting construction activities during the growing season within areas of known amaranth populations (i.e., limited activities from approximately June through November); Even though mitigation measures will be taken to avoid and minimize access to areas that are shown to have seabeach amaranth, a conservative May Affect, Likely to Adversely Affect (LAA) determination was made by the District for populations of seabeach amaranth related to the implementation of the overall action.

Construction of the Project is likely to increase overall habitat suitability for seabeach amaranth along the affected beachfront in the long term. Although the planned beach berm is designed for an elevation of 9ft NAVD, which is slightly higher than seabeach amaranth's preferred elevation, as the beach berm slopes toward the ocean, there will be a zone that falls within the plants preferred elevation range. Expanding the beach and particularly the zone most suitable for amaranth would likely provide habitat for seabeach amaranth. Even though a Potentially Beneficial Impact determination is identified for some aspects of this proposed plan, to be conservative, a May Affect, Likely to Adversely Affect (LAA) determination was made by the District for seabeach amaranth from this overall proposed Project activity.

4.2.4 Cumulative Effects

The proposed beach renourishment activities will provide long-term protection of potential habitat for seabeach amaranth in the upper beach and primary dune areas. Beach fill material would not be placed within 25 ft of the perimeter of population clusters or individual stems of seabeach amaranth. To further reduce potential direct impacts, the District will support NYC DPRs conduct of pre-nourishment field surveys for amaranth.

Although there is likely a limited extent of disturbance to seabeach amaranth from the project and because the species was identified as occurring in only a small portion of the Project Area, implementation of the proposed action could not reasonably be considered as contributing to cumulative adverse impacts on seabeach amaranth. Additionally, some elements of the proposed Project would serve to protect amaranth habitat. Regardless, so as to be conservative, a May Affect, Likely to Adversely Affect (LAA) determination was made by the District for seabeach amaranth from this proposed Project activity.

4.3 Red Knot

There have been recent sightings and documentation of a few red knots in the vicinity of the Project. Despite the development and high recreational use of the area by humans, red knot are utilizing the suitable habitats in the Project Area. As a result, the USFWS has requested a Potential Effect determination on populations of red knot related to the implementation of the proposed action. Red knot are typically dependent upon intertidal and upper beach zones, using gradually sloping sparsely vegetated areas of the upper beach, bay shoreline and intertidal areas for foraging. Habitats such as these are known to be present within the Project Area and are may experience some impacts as a result of proposed Project activities. The following section provides an evaluation of the potential impacts from No-Action and proposed the Project alternative on populations of red knot. Affect determinations for the No-Action alternative and for various components of the proposed Project are presented in Table 12.

4.3.1 No Action

As with the no-action scenario for piping plover, future habitat conditions without the Project would include both loss and accretion of sediment in the upper beach and dune areas. However, much of the Project Area is expected to experience erosion and loss of upper beach and dune habitats without the proposed Project activities (USACE 1989, 1998, 2002, 2005). In these areas, the upper beach zone would lose sand and would decrease in size, thereby potentially reducing available red knot habitat. The width of intertidal and subtidal zones will remain stable. But, locations of these zones may shift off-shore or on-shore depending on erosion and accretion rates in the area. Accordingly, the overall impact of the No Action alternative on red knot habitat would likely be negative.

Table 10: Summary of Project Effects on Populations of Red Knot

Activities	Potentially Beneficial	Not Likely to Adversely Affect	Likely to Adversely Affect	No Effect
No-Action				
Project				
Staging Area Construction and Use				X
Beach Fill			X	
Groin Extension			X	
Groin Construction			X	
Dune and Seawall Construction			X	
HRFRRF				X
Cumulative Impacts				
Periodic Re-nourishment	X	X		
Periodic Maintenance of Infrastructure				X
Long Term Impacts from Groins	X	X		
Long Term Impacts from HRFRRF	X	X		

4.3.2 Proposed Action

Although some minor, short-term, impacts to the red knot food resources and habitat will result from proposed Project modifications, overall improvements to habitat can be expected to result from the proposed activity. Therefore, after a full evaluation of red knot life history, habitats in the Project Area, management activities, and proposed Project activities, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District on populations of red knot as a result of implementation the overall proposed activities (Table 10). Details of this determination are provided below.

The primary direct impacts resulting from implementation of the Project will be disturbance and direct impact of benthic, immobile invertebrate and plant communities currently living in these areas due to burial from beach fill material, and from addition of or extension of groins, which could provide habitat for predators of red knot. As a result, red knots will experience some short-term loss of food resources within the beach fill placement, and possible increased risk of predation. However, the direct placement of beach fill is not expected to cause long-term significant impacts on the red knot, and the predator population is not expected to increase due to human use of the project area. The area of actual permanent red knot habitat loss due to permanent structures is small and would result in a negligible loss of foraging substrate for the species. In addition, although the red knot would avoid foraging within areas of direct sand placement in the intertidal zone until benthic food sources recolonized the site, recolonization of benthic communities in the intertidal zones typically takes place within six months to two years following beach fill placement activities. Therefore, because most elements of the proposed Project are expected to be short-term and insignificant, and not likely to negatively affect red knot populations in the long term, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District as a result of implementation of the overall proposed activities.

Placement of beach fill and dune restoration is likely to increase overall habitat value along the affected beachfront by expanding the area of suitable foraging habitat. Therefore, a Potentially Beneficial Impact determination was made by the District for Red Knot for this proposed Project activity for the reasons stated below. Studies of beach nourishment projects along the Atlantic Coast have documented that when construction windows and best management practices are adhered to, beach nourishment generally provides valuable habitat for beach nesting birds such as the red knot. Construction activities occurring in the Project Area are likely to halt further loss of existing habitat and will likely increase the amount of suitable habitat by increasing the size of the upper beach zone.

Permanent hard structures such as groins, would eliminate any suitable foraging habitat directly within the footprint of these structures since red knot forage primarily in the intertidal zone along the coastline and bay shoreline, and they also could provide habitat for predators of red knot. However, the area of overall impact from these structures is expected to be minimal and most of the habitat that will be impacted is not of high habitat value to red knot, and predator populations are not anticipated to increase due to human use of the project area. The areas in which hard structures are proposed include mostly subtidal areas that would be affected from groin placement. Overall impacts directly within the footprint of these structures would be permanent, but are not expected to significantly affect red knot foraging activities in the long term. Therefore, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District as a result of implementation of the overall activities.

Other short-term impacts, such as a slight decrease in water quality and an increase in turbidity, also are likely to occur during beach fill and groin construction and rehabilitation activities. Changes in water quality and turbidity may cause some short-term avoidance of the intertidal zone by the red knot during periods of low water quality resulting from construction activities. These impacts to their foraging activities will be short term and will have a minimal effect on them because red knot are mobile and can utilize unaffected foraging areas nearby. In addition, construction activities will be scheduled to avoid any active plover nesting areas (i.e., construction scheduled from approximately September 2 through March 31), which will avoid potential impacts to the red knot foraging activities. Impacts from these activities are expected to be short-term and cause no significant negative effects on plover populations. Therefore, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District for the red knot, for the proposed activities.

These impact minimization measures are detailed in Section 5 and in summary include the following: supporting NYC DPRs pre and post-construction surveys of the Project Area to determine the presence of red knot; restricting construction activities within areas of known red knot populations; supporting NYC DPRs education of residents, landowners, beach visitors, and beach managers; Therefore, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District for red knot for the overall proposed Project activities.

4.3.3 Cumulative Effect

The proposed beach renourishment activities would cause short-term impacts to red knot foraging by directly covering the benthic organisms that red knot feed on and causing short term availability in benthic species (USFWS 1991, Burlas et al 2001, Peterson and Manning 2001). These impacts are similar to the impacts from initial beach fill activities as discussed above. However, as discussed previously, these impacts will have minimal short-term impact on red knot populations. Renourishment activities will provide long-term protection of potential stop over areas in the upper beach and primary dune areas. To further reduce potential impacts, beach renourishment activities will adhere to recommended construction windows. In addition, the District will conduct pre-nourishment field surveys for active red knots in the area. Therefore, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District for red knot from the proposed Project activity.

Occasional maintenance of beach access locations, boardwalks, and comfort stations will be required. These activities have the potential to disturb red knots. However, as noted above, the District will conduct surveys to identify the location of red knots in the vicinity of these areas. Maintenance activities would be scheduled outside of key stop over periods.

Groin construction and extension may cause habitat degradation by robbing sand from the down-drift shoreline. For example, the Coastal Barriers Study Group (1987) and the Ocean City, Maryland and Vicinity Water Resources Study Reconnaissance Report (USACE 1994) attribute the accelerated, landward shoreline recession of the north end of Assateague Island in Maryland, to cumulative effects on the natural drift system from inlet stabilization and nourishment of the rapidly eroding beaches at Ocean City. However, loss of sand down-drift of a jetty or groin may be partially off-set by habitat accretion on the up-drift side of a structure. Therefore, a May Affect, but Not Likely to Adversely Affect (NLAA) determination was made by the District for red knot from this proposed Project activity.

5 RECOMMENDATIONS

To minimize potential adverse impacts on the piping plover and seabeach amaranth, the USACE will follow recommendations previously provided by the NYSDEC and USFWS as described below (USACE 1998, USFWS 1999). These measures are expected to minimize potential adverse impacts on numerous other species that may use coastal habitats in the Project Area, including several state-listed shorebird species. Time of year (TOY) no-dredge/work restriction recommendations are as follows: for piping plover from April 1 through September 2, and for seabeach amaranth from June 1 through November 1, when the presence of these species within an area of potential effect is confirmed.

5.1 PIPING PLOVER

1) The USACE will coordinate with NYCDPR, and as deemed necessary, will either provide funding for or supplement their monitoring surveys during the nesting season, and prior to and post construction activities, to identify nesting plover in the Project Area and to document all known locations of plover.
2) The USACE will conduct construction activities near active plover nesting areas only from September 2 through March 31 to avoid the protected shorebird nesting period.
3) Construction activities will avoid all delineated locations of the species during the breeding season and will undertake all practicable measures to avoid incidental taking of the species.
4) The USACE will reinitiate consultation with the USFWS to identify acceptable protective measures should any changes to the project or species elicit a trigger to support such reinitiation.
5) The USACE will coordinate with NYCDPR so as to support their endeavors to educate residents, landowners, beach visitors and beach managers on piping plover.

5.2 SEABEACH AMARANTH

1) The USACE will coordinate with NYCDPR, and as deemed necessary, will either provide funding for or supplement their monitoring surveys prior to and post construction activities, to identify SBA in the Project Area and to document all known locations of SBA.
2) The USACE will restrict construction activities in areas of known SBA populations during the growing season (allow limited activities only, from June through November).
3) Construction activities will avoid all delineated locations of the plant and will undertake all practicable measures to avoid incidental taking of the plant.
4) The USACE will reinitiate consultation with the USFWS to identify acceptable protective measures should any seabeach amaranth plants be identified within the direct construction footprint.
5) The USACE will coordinate with NYCDPR so as to support their endeavors to educate residents, landowners, beach visitors and beach managers on seabeach amaranth.

6 CONCLUSIONS

When trying to promote conservation goals using iconic species such as Piping Plover and Seabeach Amaranth, it is important to keep in mind that there are conflicting measures and recommendations among stakeholders with competing legitimate goals. When a consensus is met on the management goals among these stakeholders, the accomplishment of a more productive public policy to protect the species ensues.

To accomplish the goals of this management consensus for this project, USACE will coordinate and collaborate with USFWS, NYSDEC and NYC DPR to review management practices aimed at urban ecosystems, which differ greatly from managing forever wild or rural locations. There are many reports on urban ecosystems that successfully support native wildlife, as well as the active management efforts that accomplish this specific goal (DiCicco 2014, Feinburg et al. 2014, Fisher 2011, Flores et al. 1998,). Central Park is an example of an early planned construction intended as a naturalistic pastoral design (Brown 2013). Urbanization produces a variety of unprecedented and intense manipulations to an ecosystem. These include changes in disturbance regimes, biota, landscape structure, physiological stresses (e.g. air pollution), as well as include extensive cultural, economic and political factors (McDonnell and Pickett 1990).

It is the USACE's determination, that implementing the proposed action in accordance with the standards and guidelines (including mitigation measures that include protective and conservative best management practices) recommended by USFWS and NYSDEC, will not jeopardize the continued existence or contribute to the loss of viability of either piping plover or seabeach amaranth populations that occur or utilize the project area, and the proposed action would not significantly contribute to cumulative impacts associated with piping plover and seabeach amaranth, the USACE concludes that the overall project results in a May Affect is Likely to Adversely Affect (LAA) determination for piping plover and seabeach amaranth, and a May Affect, but Not Likely to Adversely Affect (NLAA) determination for red knot.

USACE requests that USFWS issue their Biological Opinion, which may include an Incidental Take Statement (ITS), as/if necessary, based upon the analyses provided in this Biological Assessment, according to and in compliance with our joint Section 7 obligations.

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US Army Corps of Engineers®
New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D2b
Endangered Species Act Compliance
NMFS NLAA Determination Concurrence

August 2018

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

JAN 1 2 2017

Mr. Peter Weppler, Chief
Environmental Analysis Branch
Planning Division
New York District
26 Federal Plaza
New York, NY 10278

Re: East Rockaway Inlet to Rockaway Inlet

Dear Mr. Weppler:

We have completed our consultation under section 7 of the Endangered Species Act (ESA) in response to your letter received January 5, 2017 regarding the above-referenced proposed project. We reviewed the action agency's consultation request document and related materials. Based on our knowledge, expertise, and the action agency's materials, we concur with the action agency's conclusion that the proposed action is not likely to adversely affect the ESA-listed species and/or designated critical habitat under our jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required.

Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required. Should you have any questions about this correspondence please contact Dan Marrone at 978-282-8465 or Daniel.Marrone@noaa.gov. For questions related to Essential Fish Habitat please contact Karen Greene with our Habitat Conservation Division at (732) 872-3023 or Karen.Greene@noaa.gov.

Sincerely,

Kimberly B. Damon-Randall
Assistant Regional Administrator
for Protected Resources

EC: Marrone NMFS/PRD; Gallo ACOE; Greene NMFS/HCD
PCTS: NER-2017-13934
File Code: H:\Section 7 Team\Section 7\Non-Fisheries\ ACOE\Informal\2017\New York\Pilot_East Rockaway Inlet

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New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D3
Essential Fish Habitat Assessment for Federally-Managed Fisheries Species

August 2018

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Appendix I
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1 INTRODUCTION

1.1 Purpose and Objective of the Essential Fish Habitat Assessment

The regional fisheries management councils, with assistance from National Marine Fisheries Service (NMFS), are required under the 1996 amendments to Magnuson-Stevens Fishery Management and Conservation Act to delineate Essential Fish Habitat (EFH) for all managed species, minimize to the extent practicable adverse effects on EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of EFH.

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (NMFS 2016a). In addition, the presence of adequate prey species is one of the biological properties that can define EFH. The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom, and structures underlying the water; areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life-cycle; and "prey species" as being a food source for one or more designated fish species (NMFS 2016b).

Pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, Federal agencies are required to consult with the NMFS regarding any action they authorize, fund, or undertake that may adversely affect EFH. For assessment purposes, an adverse effect has been defined in the Act as follows: "Any impact which reduces the quality and/or quantity of EFH. Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species fecundity), site specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions."

The objective of this EFH assessment is to describe the potential adverse effects to designated EFH for federally-managed fisheries species within the project site. It will also describe the conservation measures proposed to avoid, minimize or otherwise offset potential adverse effects to designated EFH resulting from the recommended plan.

Figure 1 Project Area Location

1.2 Project Background

Rockaway, New York, has an extensive history of property damage and economic loss as a result of coastal flooding and erosion associated with frequent storms. Significant beach erosion and sand loss has reduced the width of the protective beach front and has exposed properties to a high risk of damage from ocean flooding and wave attack, and existing groins and jetties along the island have deteriorated and are becoming less effective at reducing sand loss along the shoreline and providing wave protection. Non-shorefront flooding in Rockaway is attributed to storm surges in Jamaica Bay inundating the bay shorelines of Rockaway (Back Bay Flooding) and storm surges that overtop the high elevations located near the Rockaway beachfront flowing across the peninsula to meet the surge into Jamaica Bay (Cross Shore Flooding).

The Reformulation Study for East Rockaway Inlet to Rockaway Inlet and Jamaica Bay was authorized by the House of Representatives, dated 27 September 1997, as stated within the Congressional Record for the US House of Representatives. It states, in part:

> *"With the funds provided for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York project, the conferees direct the Corps of Engineers to initiate a reevaluation report to identify more cost-effective measures of providing storm damage protection for the project. In conducting the reevaluation, the Corps should include consideration of using dredged material from maintenance dredging of East Rockaway Inlet and should also investigate the potential for ecosystem restoration within the project area."*

Public Law 113-2 (29Jan13), The Disaster Relief Appropriations Act of 2013 (the Act), was enacted in part to "improve and streamline disaster assistance for Hurricane Sandy, and for other purposes". The Act directed the Corps of Engineers to:

> *"...reduce future flood risk in ways that will support the long-term sustainability of the coastal ecosystem and communities and reduce the economic costs and risks associated with large-scale flood and storm events in areas along the Atlantic Coast within the boundaries of the North Atlantic Division of the Corps that were affected by Hurricane Sandy" (PL 113-2).*

In partial fulfillment of the requirements detailed within the Act, the Corps produced a report assessing "authorized Corps projects for reducing flooding and storm risks in the affected area that have been constructed or are under construction". The East Rockaway Inlet to Rockaway Inlet, NY project met the definition in the Act as a constructed project. In accordance with the Act, the Corps is proceeding with a Draft Integrated Hurricane Sandy General Reevaluation Report (HSGRR) and Environmental Impact Statement (EIS) to address resiliency, efficiency, risks, environmental compliance, and long-term sustainability within the study area.

1.3 Project Area Description

The communities located on the Rockaway peninsula from west to east include Breezy Point, Roxbury, Neponsit, Belle Harbor, Rockaway Park, Seaside, Hammel, Arverne, Edgemere and Far Rockaway. The former Fort Tilden Military Reservation and the Jacob Riis Park (part of the Gateway National Recreation Area) are located in the western half of the peninsula between

Breezy Point and Neponsit. The characteristics of nearly all of the communities on the Rockaway peninsula are similar. Ground elevations rarely exceed 10 feet, except within the existing dune field. Elevations along the Jamaica Bay shoreline side of the peninsula generally range from 5 feet, increasing to 10 feet further south toward the Atlantic coast. An estimated 7,900 residential and commercial structures on the peninsula fall within the FEMA regulated 100-year floodplain.

During Hurricane Sandy, tidal waters and waves directly impacted the Atlantic Ocean shoreline. Tidal waters amassed in Jamaica Bay by entering through Rockaway Inlet and by overtopping and flowing across the Rockaway Peninsula. Effective coastal storm risk management for communities within the study area requires reductions in risk from two sources of coastal storm damages: inundation, wave attack with overtopping along the Atlantic Ocean shorefront of the Rockaway peninsula and flood waters amassing within Jamaica Bay via the Rockaway Inlet.

The study area (Figure 1), consisting of the Atlantic Coast of New York City between East Rockaway Inlet and Rockaway Inlet, and the water and lands within and surrounding Jamaica Bay, New York is vulnerably located within the Federal Emergency Management Agency (FEMA) regulated 100-year floodplain. The shorefront area, which is a peninsula approximately 10 miles in length, generally referred to as Rockaway, separates the Atlantic Ocean from Jamaica Bay immediately to the north. The greater portion of Jamaica Bay lies in the Boroughs of Brooklyn and Queens, New York City, and a section at the eastern end, known as Head-of-Bay, lies in Nassau County. More than 850,000 residents, 48,000 residential and commercial structures, and scores of critical infrastructure features such as hospitals, nursing homes, wastewater treatment facilities, subway, railroad, and schools are within the study area

The project area consists of mosaic of native as well as highly modified habitats as a result of human development. Upland areas in the vicinity of the Project have been committed to residential, commercial and recreational development. Near shore and upper beach areas in the project area are heavily utilized for beach recreation. Numerous stone groins currently exist in the project area. The shoreline has been stabilized since the 1880s with beach fill, groins, bulkheads, and a stone jetty at Rockaway Inlet.

2 PROPOSED FEDERAL ACTION

The Recommended Plan is a component of the USACE response to the unprecedented destruction and economic damage to communities within the study area caused by Hurricane Sandy. The recommendations herein include a systems-based approach for coastal storm risk management that provides a plan for the entire area, which has been formulated with two planning reaches to identify the most efficient solution for each reach. Project partners include the New York State Department of Environmental Conservation, the New York City (NYC) Mayor's Office of Recovery and Resiliency, the NYC Department of Parks and Recreation, the NYC Department of Environmental Protection, and the National Park Service.

2.1 Study Objectives

Five principal planning objectives have been identified for the study, based upon a collaborative planning approach. These planning objectives are intended to be achieved throughout the study period, which is from 2020 – 2070:

1. Reduce vulnerability to storm surge impacts;

2. Reduce future flood risk in ways that will support the long-term sustainability of the coastal ecosystem and communities;
3. Reduce the economic costs and risks associated with large-scale flood and storm events;
4. Improve community resiliency, including infrastructure and service recovery from storm effects
5. Enhance natural storm surge buffers and improve coastal resilience.

2.2 Recommended Plan Description

The Coastal Storm Risk Management (CSRM) Recommended Plan for the area from East Rockaway Inlet to Rockaway Inlet and the lands within and surrounding Jamaica Bay New York consists of the following components, which are generally described for 2 Planning Reaches: 1) A reinforced dune and Berm Construction, in conjunction with groins in select locations along the Atlantic Ocean Shoreline; 2) High Frequency Flood Risk Reduction Features (HRFRRF) features in locations surrounding Jamaica Bay. In general, these features are intended to provide a design height of +6 ft NAVD through various methods to reduce frequent flooding. As HRFRRF features are further developed, additional NEPA documentation and resource agency coordination would be provided, as necessary. This Recommended Plan description includes the maximum footprint for the plan; however, the footprint may be reduced in scope based on public and agency comments as well as new information.

2.3 Recommended Plan: Atlantic Shorefront

The general approach to developing CSRM along Rockaway Beach (between Beach 9th Street and Beach 169th Street, which the east and west tapers are included) was to evaluate erosion control alternatives in combination with a single beach restoration plan to select the most cost effective renourishment approach prior to the evaluation of alternatives for coastal storm risk management. The most cost-effective erosion control alternative is beach restoration with increased erosion control. This constitutes of a beach berm width of 60ft at an elevation of +8ft NAVD88 constructed by a beach fill quantity of 1.6 million CY for the initial placement and with a 4-year 1,021,000 CY renourishment cycle, as needed, for the life of the project (50 years). In addition, a screening analysis was performed to evaluate the level of risk reduction provided by a range of dune and berm dimensions and by reinforced dunes, which would be combined with the beach restoration with increased erosion control to optimize CSRM at Rockaway Beach. A composite seawall was selected as the best coastal storm risk management alternative. The composite seawall protects against erosion and wave attack and also limits storm surge inundation and cross-peninsula flooding. The Recommended Plan spans from Beach 20th Street to Beach 149th Street (Reach 3 through Reach 6b) and combines Beach Restoration and Erosion Control and two tapered beach sections at both the east and west end of the project (Beach 9-19, and Beach 150-Beach 169, respectively), which are described below. In summary, the Recommended Plan has the following features:

- A composite seawall with a structure crest elevation of +17 feet (NAVD88), the dune elevation is +18 feet (NAVD88), and the design berm width is 60 feet;
- A beach berm elevation of +8 ft NAVD and a depth of closure of -25 ft NAVD;

- A total beach fill quantity of 1.6 million cy for the initial placement, including tolerance, overfill and advanced nourishment with a 4-year renourishment cycle of 1,021,00 cy, resulting in a minimum berm width of 60 feet;
- Extension of 5 existing groins; and
- Construction of 13 new groins.

The east beachfill taper is approximately 3,000 ft in shorefront length from Beach 19th Street east to Beach 9th Street. The taper comprises of approximately 1,000 ft of dune and beach taper including reinforced dune feature and approximately 2,000 ft of dune and beach fill without reinforced dune feature. In addition to the tapering of berm width, the dune elevation also tapers from an elevation of +18 ft NAVD at 19th Street down to approximately +12 ft NAVD at Beach 9th Street which will be tied into the existing grade. The west beachfill taper is approximately 5,000 ft in shorefront length from Beach 149th Street west to Beach 169th street fronting Riis Park. The beachfill taper will be beach fill only with a berm width tapered from the design width at 149th Street to the existing width and height at 169th Street. In addition to the beachfill taper, a tapered groin system comprised of three (3) rock groins is included for this section.

Figures 2a through 2d show the Atlantic Ocean Shorefront component of the Recommended Plan.

Figure 2a: Atlantic Ocean Shorefront Component of Recommended Plan (1 of 4)

Figure 2b: Atlantic Ocean Shorefront Component of Recommended Plan (2 of 4)

Figure 2c: Atlantic Ocean Shorefront Component of Recommended Plan (3 of 4)

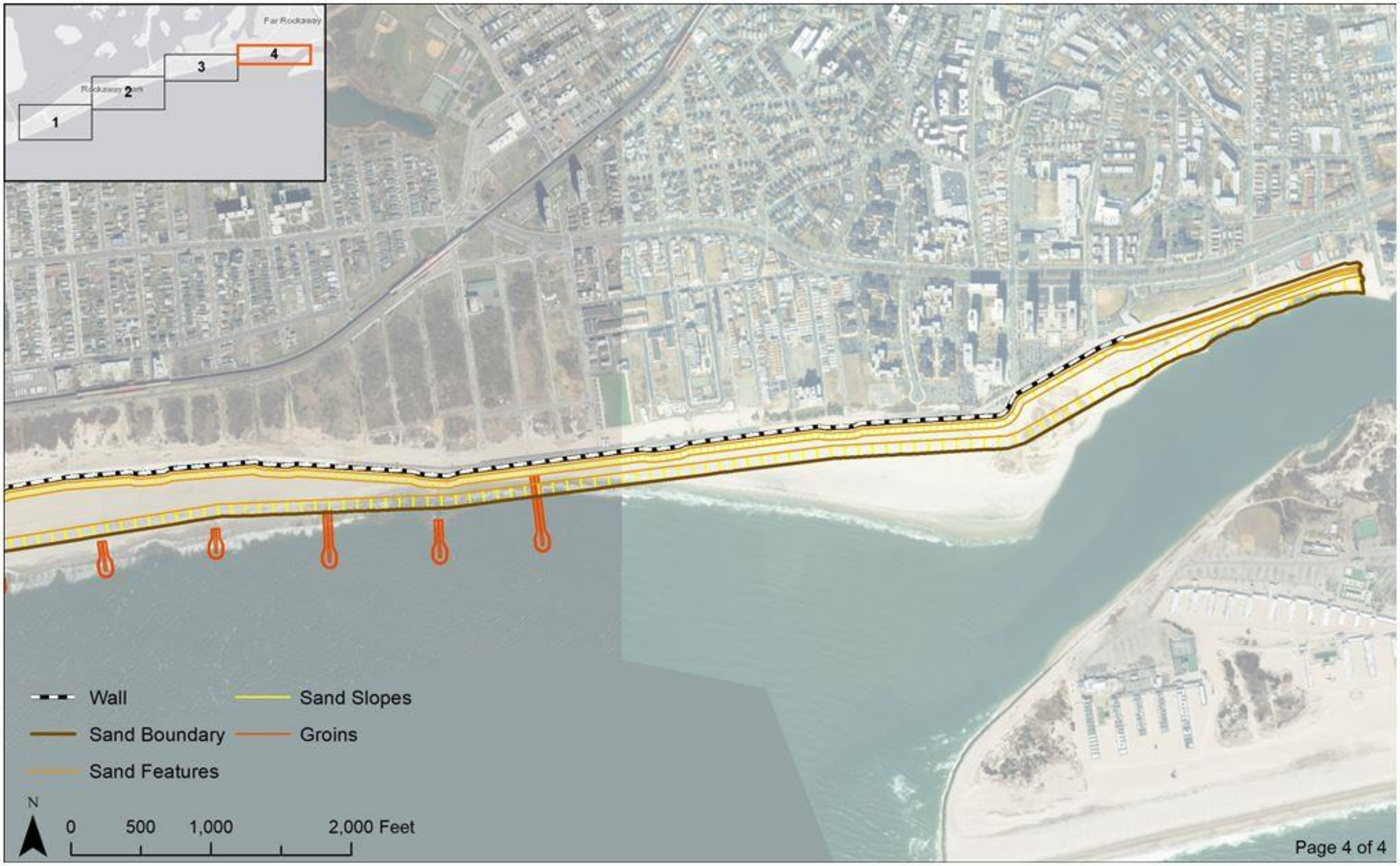

Figure 2d: Atlantic Ocean Shorefront Component of Recommended Plan (4 of 4)

2.4 Recommended Plan: Jamaica Bay

2.4.1 Cedarhurst-Lawrence

The Cedarhurst-Lawrence project (Figure 3) begins on the east side of the channel near the driveway to Lawrence High School. It consists of approximately 1000 feet of deep bulkhead that follows the existing bulkhead line around the southern end of the channel at Johnny Jack Park, and continues north along the west side before being connected to high-ground behind the Five Towns Mini Golf & Batting Facility with a 23 foot segment of medium floodwall. The project is located in Nassau County and crosses the border between the Village of Cedarhurst and the town of Hempstead. Project design elevations have preliminarily been established based on expected wave exposure are set at an elevation of +10.0ft NAVD88.

There are three existing outfalls in the area where the bulkhead will be raised. Each of the outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The outlet pipes will be replaced if the design phase indicates it is necessary. Drainage along the landward side of the bulkhead will be provided by a small ditch or drainage collection pipe, with inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station capacity is estimated to be approximately 40 cubic feet per second (cfs), which will be refined during the design phase.

Table 1: Cedarhurst-Lawrence Outlet Table

Drainage Area	Outfall Size	Outfall Location
Drainage Basin L1	TBD	Existing Outfall
Drainage Basin L1	TBD	Existing/New Culvert (500 feet from Peninsula Boulevard).
Drainage Basin L1	TBD	Existing/New Culvert (500 feet from Peninsula Boulevard).
Drainage Basin L1	5'x3'	Outfall L-1, Approximately 250 feet from Peninsula Boulevard

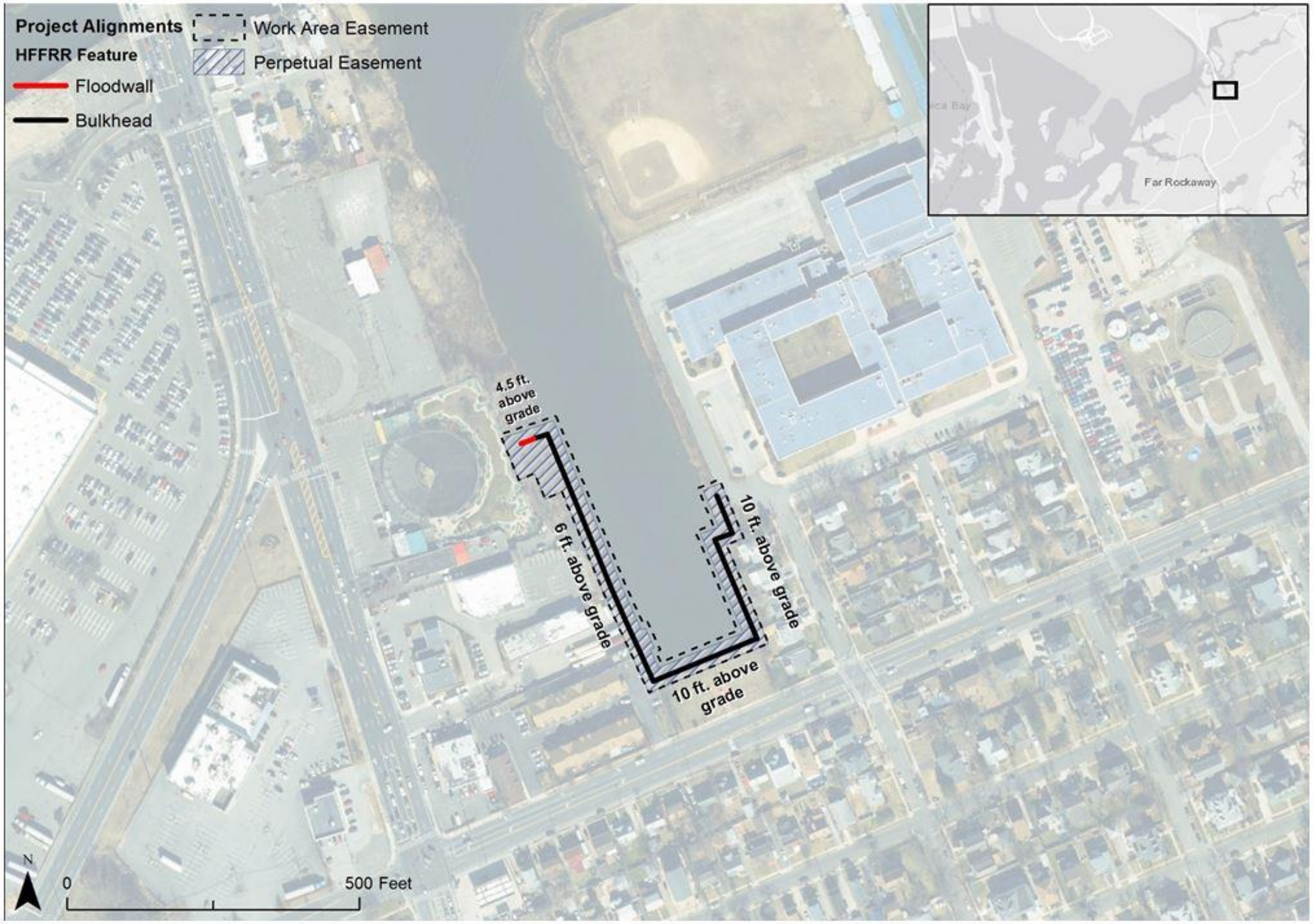

Figure 3: Cedarhurst-Lawrence HFFRRF Project Plan

2.4.2 Motts Basin North

This project consists of a medium floodwall beginning just north of the corner of Alemada Ave. and Waterfront Blvd. and continuing to the east along the south side of Waterfront Blvd. for approximately 540 feet (Figure 4). The line of protection then shifts to a section of medium floodwall above an existing outfall, continuing east for 47 feet before transitioning back into a low floodwall for an additional 105 feet. Project design elevations vary have preliminarily been established based on the expected wave exposure and are +8.0ft.

The existing outlet will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The outlet pipes will be replaced if the design phase indicates it is necessary. Drainage along the landward side of the bulkhead will be provided by a small ditch. Inlets will connect to the existing and one proposed additional drainage outlets.

Table 2: Motts Outlet Table

Drainage Area	Outfall Size	Outfall Location
Drainage Basin L1	TBD	Existing Outfall

Figure 4: Motts Basin North HFFRRF Project Plan

2.4.3 Mid-Rockaway - Edgemere Area

The eastern end of the project area (Figure 5) begins at high ground near the intersection of Beach Channel Drive and Beach 35th Street. The project moves north and then west following parallel to Beach 35th Street before jogging to the north and crossing the abandoned portion of Beach 38th Street and continuing west. The project turns north and runs along the peninsula between Beach 43rd Street and the coastal edge. This approximately 3,200 foot section of hybrid berm has been maintained as far landward as possible and weaves in and out between the properties. The hybrid berm is strategically used at these locations to minimize and avoid impacts to existing healthy wetland habitats. This area has also been identified as a good candidate for the use of Natural and Nature Based Features (NNBFs). The NNBF design includes placement of a stone toe protection and rock sill structure just off the existing shoreline to attenuate wave action and allow tidal marsh to establish between the rock sill and the berm. In some locations the eroded/degraded shoreline (subtidal) will be regraded to allow for the development of low marsh (smooth cordgrass) to provide productive nursery habitats behind the sill structures. The shore slope behind the structure will be regraded to reduce risk of erosion further and create suitable elevation gradients and substrates for establishment of a high tidal marsh, designated as scrub shrub areas in the figure. In addition, the graded habitat behind the structure will be designed to allow the shoreward migration of various habitats with rising sea levels, thereby extending the life of these important ecological systems. On the north east of the Edgemere peninsula the project then transitions into 200 feet of shallow bulkhead, which continues north along existing water front properties and bulkheads. Approximately 200' of medium floodwall then cuts west across, at the tip of the Edgemere peninsula. A road ramp on Beach 43rd Street has been included to maintain both pedestrian, and vehicle access to the coastal edge at north end of Beach 43rd street. The floodwall continues in southwest direction along the coastline after which it transitions into a 750 foot section of high berm. The berm continues west from Beach 43rd Street before turning south just to the east of the unpaved extension of Beach 44th Street. The project then transitions into a 660 foot section of high floodwall which continues southwest staying as far landwards as possible to avoid an existing restoration project. Near the intersection of Norton Avenue and Beach 46th Street, north of Norton Avenue, the floodwall transitions back into a low berm which runs parallel to Norton Avenue southwest and then turns northwest along Conch Place. The area waterward of this berm has also been identified as a good location for the use of NNBFs and to restore high marsh habitat. Project design elevations vary and have preliminarily been established based on expected wave exposure. Project elevations range between +8.0ft and +9.5t NAVD88.

The Edgemere interior drainage basin has two subbasins, E1 and E2 covering approximately 194 acres and 274 acres, respectively. The Edgemere drainage basin is almost fully developed and predominantly residential, except for a stretch of undeveloped, grassy area along the southern part of E1 and southwestern part of E2. Subbasin E1 was estimated to require 9 outlets, including 2 existing outlets. Subbasin E2 was estimated to require 6 outlets, including 1 existing outlet (See Edgemere Outlet Table). Each of the existing outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The existing outlet pipes will be replaced if the design phase indicates it is necessary due to the condition of the pipes or a need for additional capacity. The new outlets are generally assumed to be 5 ft. wide by 3 ft. high box culverts. Drainage along the landward side of the berm/floodwall structures will be provided by a small ditch or drainage collection pipe, with some inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station analysis indicates that three pump stations are desired in the Edgemere Area. Due to the length of the area and difficulties in draining all of the area to a single site, drainage subbasin E1 is proposed to have two pump stations one pump station would be located near Norton Avenue and Beach 49th Street and the other near Beach 43rd Street and Hough Place with a combined capacity of about 210 cfs. Subbasin E2 is proposed to have one pump station located near Beach 38th Street with an estimated capacity of 120 cfs. It should be noted that each pump station will include additional gravity capacity that will operate when the pump station is not in operations mode. The capacity of each pump station and drainage outlet will be refined during the project design phase.

Table 3: Edgemere Outlet Table

Drainage Basin	Outfall Size	Outfall Location
Drainage Basin E1	TBD	Existing Outfall ROC-648
Drainage Basin E1	5'x3'	Outfall E1-1 located on Norton Avenue between Beach 47th and 48th Streets.
Drainage Basin E1	5'x3'	Outfall E1-2 located on Norton Avenue between Beach 46th and 45th Streets.
Drainage Basin E1	5'x3'	Outfall E1-3 located on Beach 45th Street north of Hough Place.
Drainage Basin E1	5'x3'	Outfall E1-4 located on the north end of Beach 45th Street.
Drainage Basin E1	5'x3'	Outfall E1-5 located 550 feet north of Hough Place.
Drainage Basin E1	5'x3'	Outfall E1-6 located 500 feet north of Hough Place.
Drainage Basin E1	TBD	Existing Outfall ROC-637
Drainage Basin E1	5'x3'	Outfall E1-7 located north of Beach 40th Street.
Drainage Basin E2	TBD	Existing Outfall ROC-638
Drainage Basin E2	5'x3'	Outfall E2-1 located 50 feet east of Beach 37th Street.
Drainage Basin E2	5'x3'	Outfall E2-2 located 50 feet east of Beach 37th Street.
Drainage Basin E2	5'x3'	Outfall E2-3 located 50 feet east of Beach 36th Street.
Drainage Basin E2	5'x3'	Outfall E2-4 located 50 feet east of Beach 36th Street.
Drainage Basin E2	5'x3'	Outfall E2-5 located between Beach 36th Street and Beach 35th Street.

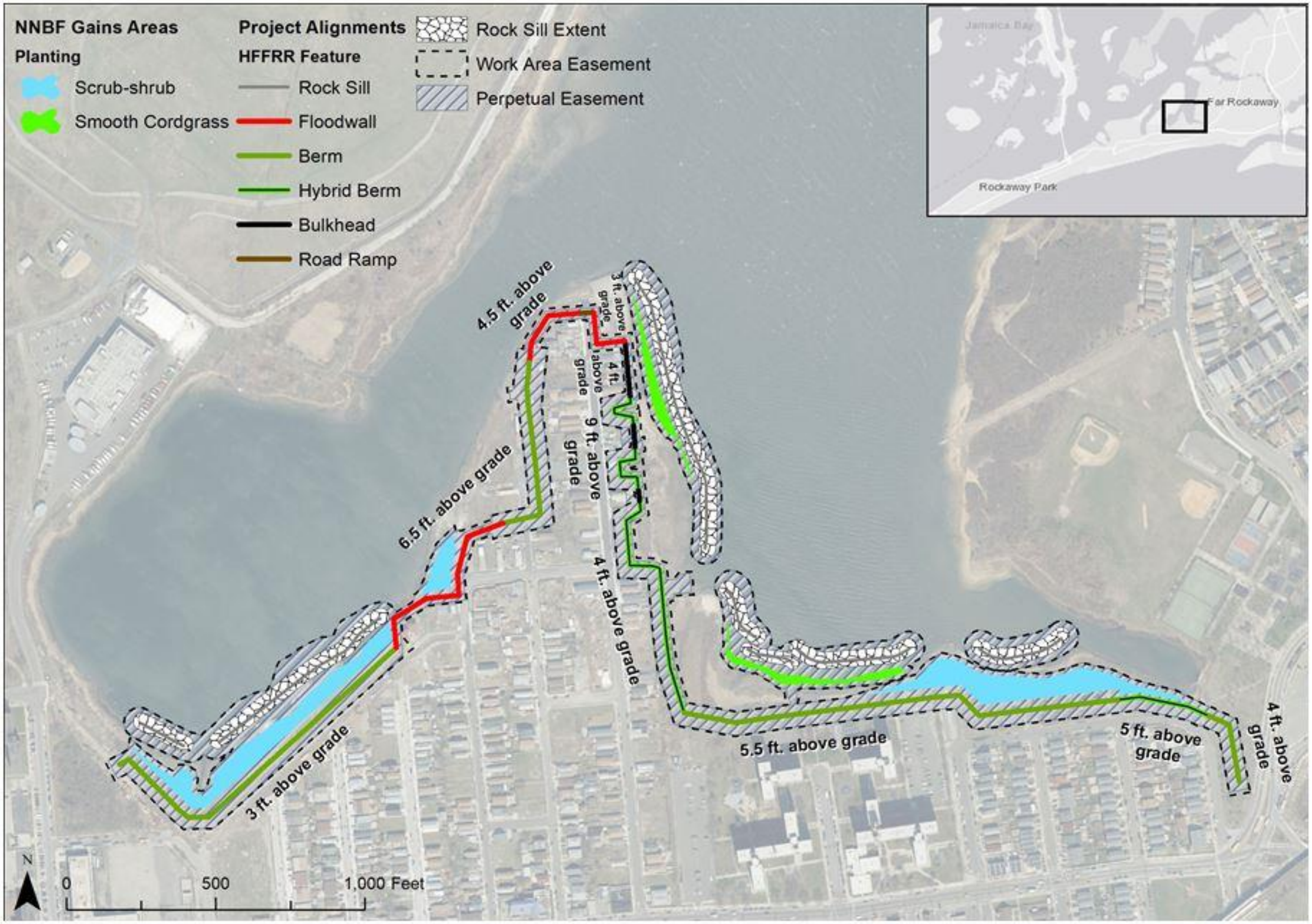

Figure 5: Mid Rockaway – Edgemere Area HFFRRF Project Plan

2.4.4 Mid-Rockaway - Arverne Area

This area of the project (Figure 6) begins at high ground to the north of Almeda Avenue and Beach 58th Street. An approximately 1,100 foot section of low berm runs south along Beach 58th Street. The berm has been maintained as far landward as possible to avoid healthy habitat. This segment has been identified as a candidate for the use of NNBFs. Much of the area is identified as existing quality wetlands, but a portion of fill area has been identified where intermediate marsh (Salt meadow Hay) will be restored. The project then transitions to an approximately 1,200 foot long medium floodwall which, for feasibility level analysis, is purposefully sited along property boundaries at the southern end of the channel to minimize impacts to the existing waterfront businesses. A road ramp has been included to maintain access to the marina. At the southwest corner of the channel the project transitions to run along the coastal edge north for approximately 1,700 feet. This segment transitions between revetments and bulkheads to match the existing coastline conditions and uses. The portion between Thursby Avenue and Elizabeth Road has been aligned such that it can be integrated into the planned NYC DPR Thursby Basin Park project. Just north of De Costa Avenue, the project transitions to low berm for approximately 1,600 feet and runs west along De Costa Avenue and around the edges of healthy habitat while also creating an area for stormwater storage and a pump station just north of Beach Street. At the corner of De Costa Avenue and Beach 65th Street the low berm transitions into a hybrid berm to minimize habitat impacts. The hybrid berm continues west and then north for 300 feet to the corner of Beach 65th Street and Bayfield Avenue. The project then transitions to a 2,400 foot long shallow bulkhead which travels west along the line of existing bulkheads where they exist and parallel with Bayfield Avenue in areas without existing bulkhead. The bulkhead section ends just west of the corner of Bayfield Avenue and Beach 72nd Street. The area west of Beach 69th Street and the eastern end of De Costa Ave has been identified as a good candidate for NNBF. Based on existing elevations and profiles, a combination of either fill or excavation is used to provide the appropriate elevations shoreward of the rock sills to maximize healthy subtidal habitats, with restoring a transition area for low to high intertidal marsh. Eroded shorelines were replaced with low intertidal (smooth cordgrass) habitats, and transition to either intermediate (salt meadow hay) and/or high marsh (scrub-shrub) habitats. From the end of the bulkhead section the project continues south with a 120 foot section of medium floodwall connecting the bulkhead to a 1,080 foot section of high berm. The berm runs south along Beach 72nd Street and turns west at Hillmeyer Avenue and continues west past the corner of Barbados Drive and Hillmeyer Avenue, where it turns north and transitions to a flood wall to minimize the features footprint. The berm section has been positioned close to the roads to minimize impacts on habitat. The berm section transitions into a high floodwall which goes west and then runs parallel to the coast southwest for 440 feet, ending at a bulkhead section just west of the end of Hillmeyer Avenue. The Brant Point area includes the creation of wetlands between the berm and the rock sills that are placed just off the coastal edge. The rock sill will protect the shoreline where eroded areas will be restored to low marsh habitats protecting the existing high quality habitats shoreward. The areas behind the existing wetlands areas will be graded to provide a transition area to high marsh and then uplands where practical. The existing uplands areas will be replanted as necessary to provide for a high quality maritime forest habitat, with appropriate tree species. South of Hillmeyer Avenue the alignment follows the bulkheaded coastal edge. The project proposes a high frequency flood risk reduction bulkhead feature that follows an existing bulkhead along the coastal edge for approximately 270 feet ending just south of Almeda Avenue. From this point a low floodwall runs parallel with the coastal edge southeast for 700 feet then transitions into a deep bulkhead. This section of bulkhead continues southeast along the line of existing bulkhead for approximately 540 feet to the end of Thursby Avenue. The project continues as a low floodwall for approximately 1,400 feet, traveling east along Thursby Avenue and then south, parallel with Beach 72nd Street turning west and running along Amstel Boulevard, ending just past Beach 74th street. Two road ramps and one vehicular gate are included to maintain access to the waterfront. The final segment is approximately 250 feet of medium floodwall which runs along the coastal edge and connect the low floodwall to high ground in the west. Project design elevations vary and have preliminarily been established based on the expected wave exposure. Project elevations range between +8.0ft and +11.5t.

The Arverne drainage basin has three subbasins A1, A2, and A3, covering 76 acres, 139 acres, and 209 acres, respectively. The Arverne drainage basin is almost fully developed and predominantly residential, with a few, scattered undeveloped areas. Subbasin A1 was estimated to require 8 outfalls, including 5 existing outfalls. Subbasin A2 was estimated to require 3 outlets. Subbasin A3 was estimated to require 5 outlets, including 3 existing outlets. Each of the existing outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system. The existing outlet pipes will be replaced if the design phase indicates it is necessary due to the condition of the pipes or a need for additional capacity. The new outlets are generally assumed to be 5 ft. wide by 3 ft. high box culverts (See Arverne Outlet Table). Drainage along the landward side of the berm/floodwall structures will be provided by a small ditch or drainage collection pipe, with some inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station analysis indicates that three pump stations are desired in the Arverne Area. Drainage subbasin A1 is proposed to have a pump station located adjacent to DE Costa Avenue near Beach 72nd with a capacity of about 70cfs. Subbasin A2 is proposed to have one pump station located on DE Costa Avenue near Beach 63rd Street with an estimated capacity of 180 cfs. Subbasin A3 is proposed to have one pump station located south of Thursby Avenue with an estimated capacity of 300 cfs. It should be noted that each pump station will include additional gravity capacity that will operate when the pump station is not in operations mode. The capacity of each pump station and drainage outlet will be refined during the project design phase.

Table 4: Arverne Outlet Table

Drainage Basin	Outfall Size	Outfall Location
Drainage Basin A1	TBD	Existing Outfall ROC-633
Drainage Basin A1	TBD	Existing Outfall ROC-634
Drainage Basin A1	TBD	Existing Outfall ROC-40062
Drainage Basin A1	5'x3'	Outfall A1-1 located at the end of Hillmyer Avenue.
Drainage Basin A1	5'x3'	Outfall A1-2 located adjacent to Hillmyer Avenue and Barbadoes Avenue.
Drainage Basin A1	TBD	Existing Outfall ROC-658
Drainage Basin A1	5'x3'	Outfall A1-3
Drainage Basin A1	TBD	Existing Outfall ROC-659
Drainage Basin A2	5'x3'	Outfall A2-1 located on Bayfield Avenue 150 feet west of Beach 65th Street.
Drainage Basin A2	5'x3'	Outfall A2-2 located at the east end of DE Costa Avenue.
Drainage Basin A2	5'x3'	Outfall A2-3 located at the east end of Burchell Road.
Drainage Basin A3	TBD	Existing Outfall ROC-??? Located at the east end of Thursby Avenue.
Drainage Basin A3	TBD'	Existing Outfall ROC-636
Drainage Basin A3	5'x3'	Outfall A3-1 located 250 north of Beach Channel Drive on 58 Street.
Drainage Basin A3	TBD	Existing Outfall ROC-635
Drainage Basin A3	5'x3'	Outfall A3-2 located 50 north of Beach Channel Drive on 58 Street.

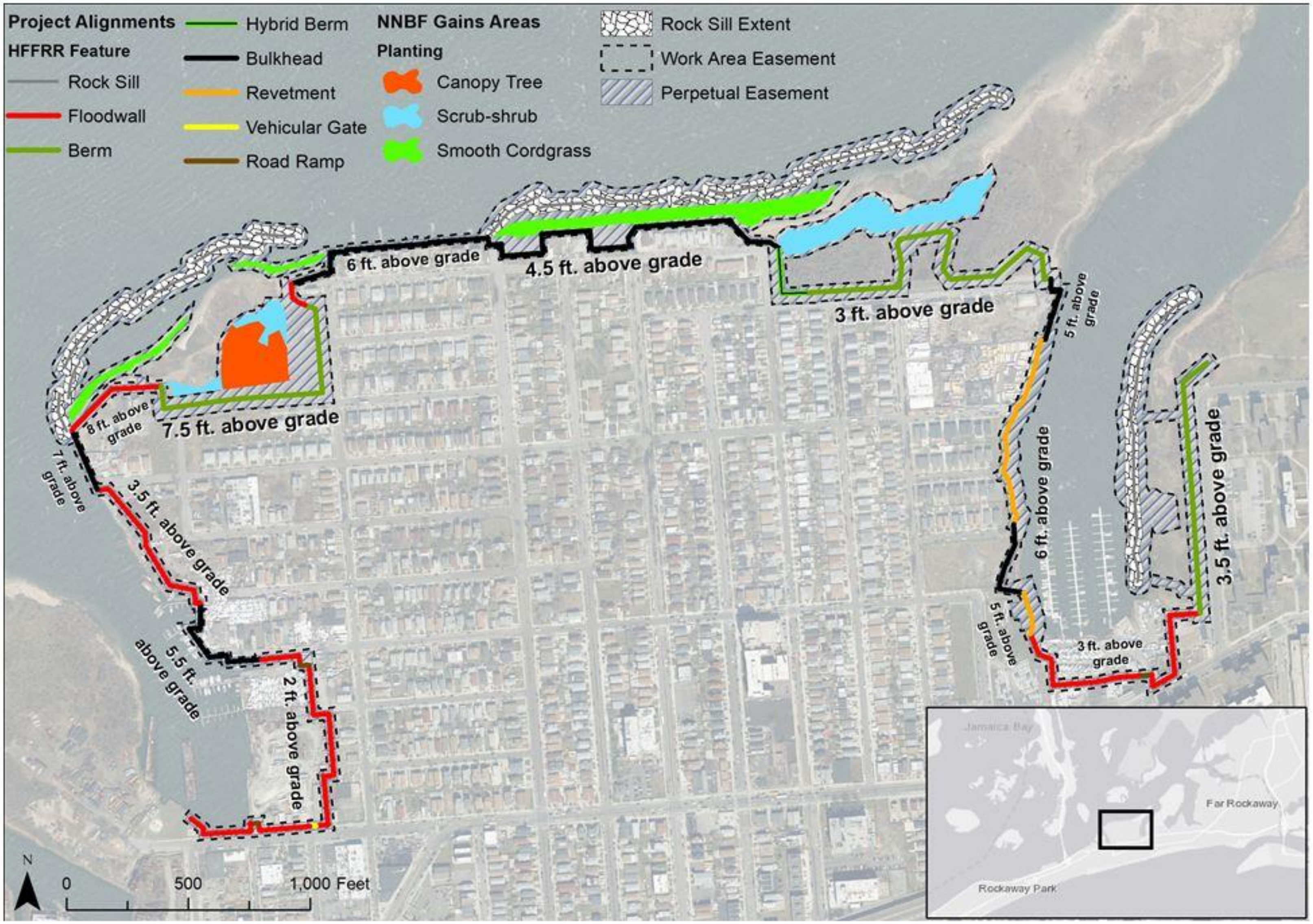

Figure 6: Mid Rockaway – Averne Area HFFRRF Project Plan

2.4.5 Mid-Rockaway - Hammels Area

Two separate segments compose the Hammels area of the Mid-Rockaway project (Figure 7). The east segment begins approximately 320 feet west of the intersection of Beach 75th Street and Beach Channel Drive. It is composed of approximately 1,400 feet of low floodwall, running west along the north side of Beach Channel Drive, and parallel with the Rockaway Line elevated subway track. Three road ramps have been included to maintain access to the water front properties. The west segment consists of 1,400 feet of low floodwall beginning to the west of the MTA facility Hamels Wye adjacent to the Rockaway Line. The project heads west and south in a stair-step fashion avoiding impacts on existing structures, ending on the north side of Beach Channel Drive just west of Beach 87th Street. Three road ramps have been included to maintain access to the waterfront. Project design elevations have preliminarily been established based on the expected wave exposure, which is expected to be low, and are set at +8.0ft NAVD88.

The Hammels drainage basin includes two subbasins, H1 and H2, approximately 105 acres and 139 acres respectively. The Hammels drainage basin is almost fully developed, except for a few scattered grassy areas and is predominantly residential, with some commercial development. Subbasin H1 was estimated to require 3 outlets, including 2 existing outlets. Subbasin H2 was estimated to require 3 outlets, including 1 existing outlet. Each of the existing outlets will be modified to add a valve chamber that will include a sluice gate and flap valve to prevent high tides or storm surge from flooding through the drainage system (See Hammels Outlet Table). The existing outlet pipes will be replaced if the design phase indicates it is necessary due to the condition of the pipes or a need for additional capacity. The new outlets are generally assumed to be 5 ft. wide by 3 ft. high box culverts. Drainage along the landward side of the berm/floodwall structures will be provided by a small ditch or drainage collection pipe, with some inlets that will be connected to the existing or additional drainage outlets. When the drainage outlets are blocked by a storm tide the ditch or pipes will direct runoff towards a pump station. The preliminary pump station analysis indicates that two pump stations are desired in the Hammels Area. Drainage subbasin H1 is proposed to have a pump station located at the southern end of Hammels near Beach 87th Street with a capacity of about 100cfs. Subbasin H2 is also proposed to have one pump station which is located at the northern end of Hammels near Beach Channel Drive with an estimated capacity of 180 cfs. It should be noted that each pump station will include additional gravity capacity that will operate when the pump station is not in operations mode. The capacity of each pump station and drainage outlets will be refined during the project design phase.

Table 5: Hammels Outlet Table

Drainage Area	Outfall Size	Outfall Location
Drainage Basin H1	TBD	Existing Outfall ROC-656
Drainage Basin H1	5'x3'	Outfall H1-1, Approximately 70 feet east of Beach 85th Street
Drainage Basin H1	TBD	Existing Outfall ROC-657
Drainage Basin H2	5'x3'	Outfall H2-1, Approximately 350 feet west of Beach 80th Street
Drainage Basin H2	5'x3'	Outfall H2-2, Approximately 100 feet east of Beach 79th Street
Drainage Basin H2	TBD	Existing Outfall ROC-653

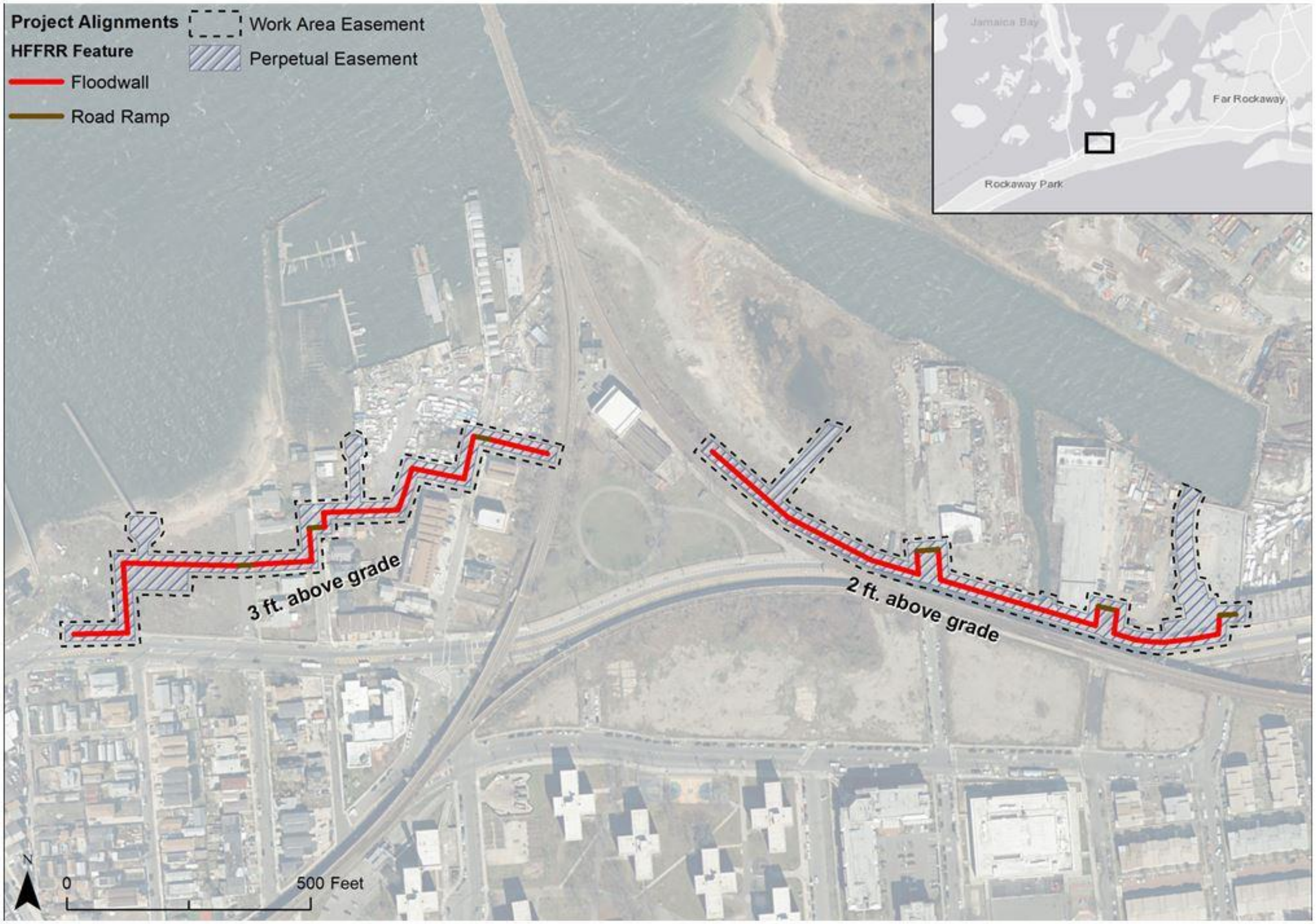

Figure 7: Mid Rockaway – Hammels Area HFFRRF Project Plan

2.5 Project Elements

Structural and non-structural management measures, including NNBFs, were developed to address one or more of the planning objectives for the project. Management measures were developed in consultation with the non-federal sponsor (NYSDEC), state and local agencies, and non-governmental entities. Measures were evaluated for compatibility with local conditions and relative effectiveness in meeting planning objectives. Effective measures were combined to create CSRM alternatives for two geographically discrete reaches: the Atlantic Ocean shorefront and Jamaica Bay. Integrating CSRM alternatives for the two reaches provides the most economically efficient system-wide solution for the vulnerable communities within the study area. It is important to note that any comprehensive approach to CSRM in the study area must include an Atlantic Ocean shorefront component because overtopping of the Rockaway peninsula is a source of flood waters into Jamaica Bay. Efficient CSRM solutions were formulated specifically to address conditions at the Atlantic Ocean shorefront. The best solution for the Atlantic Shorefront reach was included as a component of the alternative plans for the Jamaica Bay reach.

The Atlantic Ocean shorefront reach is subject to wave attack, wave run up, and over topping along the Rockaway peninsula. The general approach to developing CSRM along this reach was to evaluate erosion control alternatives in combination with a single beach restoration plan to select the most cost effective renourishment approach prior to the evaluation of alternatives for coastal storm risk management. The most cost-effective erosion control alternative is beach restoration with increased erosion control (See Figures 2a through 2d). This erosion control alternative had the lowest annualized costs over the 50-year project life and the lowest renourishment costs over the project life. A screening analysis was performed to evaluate the level of risk reduction provided by a range of dune and berm dimensions and by reinforced dunes, which would be combined with beach restoration with increased erosion control to optimize CSRM at the Atlantic Ocean shorefront.

Beach fill for the Atlantic Shoreline component of the proposed project is available from an offshore borrow area containing approximately 17 million cy of suitable beach fill material, which exceeds the required initial fill and all periodic renourishment fill operations. The borrow area is located approximately two miles offshore (south) of the Rockaway peninsula.

Other factors such as prior projects at Rockaway Beach, project constraints, stakeholder concerns, and engineering judgment were also applied in the evaluation and selection. A composite seawall was selected as the best coastal storm risk management alternative. The composite seawall protects against erosion and wave attack and also limits storm surge inundation and cross-peninsula flooding (Figures 8 and 9). The structure crest elevation is +17 feet (NAVD88), the dune elevation is +18 feet (NAVD88), and the design berm width is 60 feet. The armor stone in horizontally composite structures significantly reduces wave breaking pressure, which allows smaller steel sheet pile walls to be used in the design if the face of the wall is completely protected by armor stone. The composite seawall may be adapted in the future to rising sea levels by adding 1-layer of armor stone and extending the concrete cap up to the elevation of the armor stone.

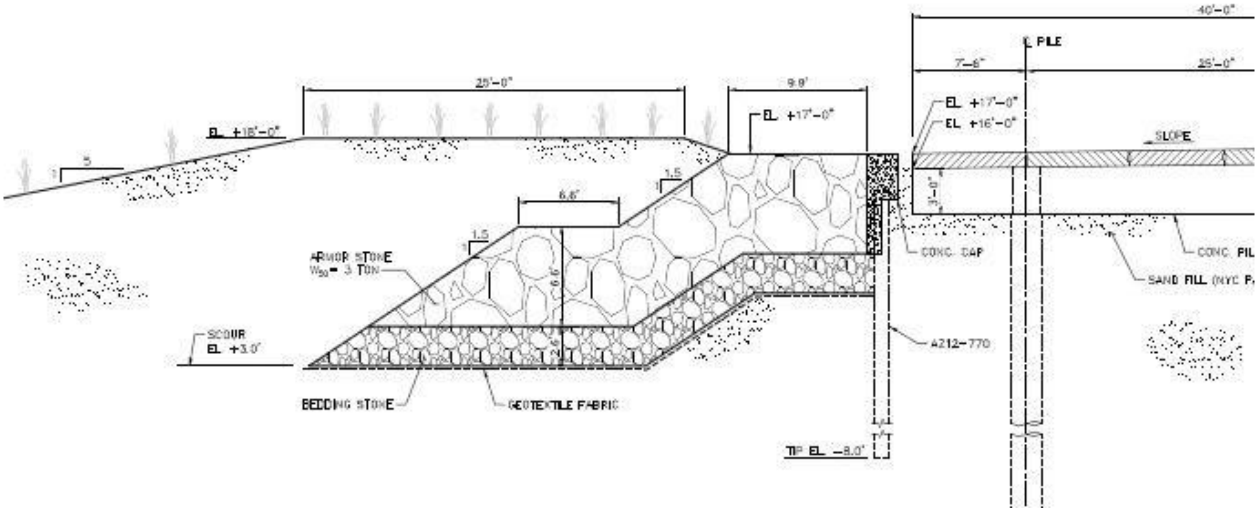

Figure 8: Composite Seawall Beach 19th St. to Beach 126th St

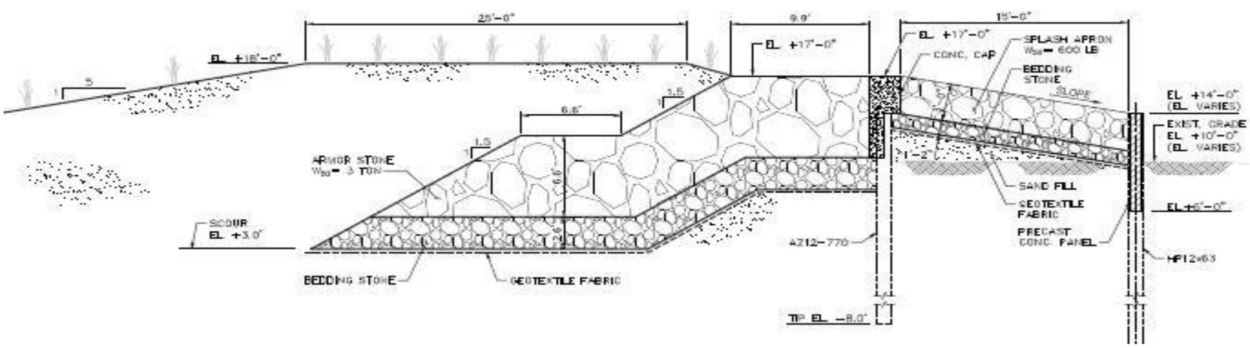

Figure 9: Composite Seawall Beach 126th St. to Beach 149th St.

2.5.1 The Atlantic Shorefront Beachfill

The selected storm damage reduction plan including changes from the authorized project, comprises approximately 152,000 lf of dune and beach fill and generally extends from the eastern end of the barrier island at Beach 19th street to the western boundary of Breezy Point. This component of the Project includes the following: 1) a dune with a top elevation of +18 ft above NAVD88, a top width of 25 ft, and landward and seaward slopes of 1V:5H that will extend along the entire footprint (1V:3H on landward slope fronting the boardwalk). See Table 2.

All beachfill quantities include an overfill factor of 11% based on the compatibility analysis for the borrow areas. In addition, the initial construction quantities include an additional 15% for construction tolerance. It is noted that the advance fill and renourishment quantities do not include tolerance since the purpose of the advance fill and renourishment is to place a specific volume of sediment to offset anticipated losses between renourishment operations, rather than build a specific template. Beachfill quantities required for initial construction of each alternative are estimated based on the expected shoreline position in June of 2018. It is impossible to predict the exact shoreline position in June 2018 since the wave conditions vary from year to year and affect shoreline change rates. The shoreline position in June of 2018 was estimated based on a 2.5 year GENESIS-T simulation representative of typical wave conditions.

Table 6: Initial Construction Beachfill Quantities

Reach	Reach Length (ft)	Recommended Plan Fill Quantity (CY)
West Taper		306,000
Reach 3	10,320	356,000
Reach 4	5,380	294,000
Reach 5	10,650	321,000
Reach 6a	3,730	250,000
Reach 6b	2,000	20,000
East Taper		49,000
Total		**1,596,000**

2.5.2 Atlantic Shorefront: Construction of New Groins and Groin Extensions

Three types of groin measures are considered in the alternative analysis: new groin construction, groin extension, and groin shortening. The exact dimensions and stone sizes of the existing groins at Rockaway is not available. Therefore, it is assumed that the existing groins in Reaches 5 and 6 are similar to the proposed new groin designs. Generally, a groin is comprised of three sections: 1) horizontal shore section (HSS) extending along the design berm; (2) an intermediate sloping section (ISS) extending from the berm to the design shoreline, and (3) an outer sloping section (OS) that extends from the shoreline to offshore. The head section (HD) is part of the OS and is typically constructed at a flatter slope than the trunk of the groin and may require larger stone due to the exposure to breaking waves.

The spacing between groins in this study is based on the existing spacing in Reach 5 (720 ft) and Reach 6a (780 ft). The required lengths of the new groins is based on the GENESIS-T model simulations.

The Project requires the immediate construction of a 12 new groins in reach 3 and 4 (between 92nd Street to 121st Street) and an additional groin in reach 6a (34th street). The 5 groin extension are located in Reach 6a (between 37th Street – 49th Street). The extension of the groin lengths vary and range from 75 ft to 200 ft. Groin widths will be 13 ft. See Table 7.

Table 7: Summary of Groin Lengths

Reach	Number	Street	HSS (ft)	ISS (ft)	OS (ft)	Total (ft)	Notes:
6a	1	34th St	90	108	328	526	New
6a	2	37th St	90	108	328	526	Extension
6a	3	40th St	90	108	328	526	Extension
6a	4	43rd St	90	108	228	426	Extension
6a	5	46th St	90	108	228	426	Extension
6a	6	49th St	90	108	228	426	Extension
4	1	92nd St	90	108	128	326	New
4	2	95th St	90	108	128	326	New
4	3	98th St	90	108	128	326	New
4	4	101st St	90	108	128	326	New
4	5	104th St	90	108	128	326	New
4	6	106th St	90	108	128	326	New
4	7	108th St	90	108	128	326	New
3	8	110th St	90	108	153	351	New
3	9	113th St	90	108	178	376	New
3	10	115th St	90	108	178	376	New
3	11	118th St	90	108	178	376	New
3	12	121st St	90	108	128	326	New

2.5.3 Sand Removal from Offshore Borrow Area

An offshore borrow area which is 2.6 miles long and 1.1 miles wide, located approximately 2 miles south of East Rockaway (Figure 10) between 35 feet mean low water and about 60 feet mean low water, has been identified as a potential source of sand material for beach fill and dune construction activities. The borrow area contains approximately 17,000,000 CY of suitable beach fill material.

Figure 10: Location of the East Rockaway Borrow Area

2.6 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions of the Project include beach renourishments and maintenance of beach access locations. Renourishments will be conducted every 4-years or as needed over the 50-year life of the Project. During each renourishment, approximately 1,100,000 CY of sand will be added to the beach from the borrow area located approximately 2 miles offshore to the south of East Rockaway. Inlet maintenance dredging (115,000 cy/yr) is included in the 1.1 million cy of material needed for the renourishment.

3 EFH DESIGNATIONS AND LIFE HISTORIES OF MANAGED FISH SPECIES

The species and life stages that have designated EFH in the project area were determined using the *Guide to Essential Fish Habitat Designations in the Northeastern United States* found on the NMFS website[1] (NMFS 2016b), as well as publicly available GIS data. The 10' x 10' squares of latitude and longitude within which the project area falls were selected and Tables 8 through 10 were generated. Table 8 details the 10' x 10' square coordinates and is followed by a short but detailed description of the selected squares, including landmarks along the coastline. Tables 9 and 10 list the designated EFH species for the project area, specific to the Atlantic Shoreline and Jamaica Bay project reaches as described above. The notation "X" indicates that EFH has been designated within the 10' x 10' square for a given species and life stage.

Table 8: 10' x 10' EFH Designated Coordinates

Cell	Coordinates			
	North	East	South	West
Square 1	40º 40.0' N	73º 50.0' W	40º 30.0' N	74° 00.0' W
Square 2	40º 40.0' N	73º 40.0' W	40º 30.1' N	73º 50.0' W

Square 1 Description: Atlantic Ocean waters within the square within the Hudson River estuary affecting the following: western Rockaway Beach, western Jamaica Bay, Rockaway Inlet, Barren I., Coney I. except for Norton Pt., Paerdegat Basin, Mill Basin, southwest of Howard Beach, Ruffle Bar, and many smaller islands.

Square 2 Description: Atlantic Ocean waters within the square within Great South Bay estuary affecting the following: Western Long Beach, NY., Hewlett, NY., Woodmere, NY., Cedarhurst, NY., Lawrence, NY., Inwood, NY., Far Rockaway, NY., East Rockaway Inlet, eastern Jamaica Bay, Brosewere Bay, Grassy Bay, Head of Bay, Grass Hassock Channel, eastern Rockaway Beach, Atlantic Beach, Howard Beach, J. F. K. International Airport, Springfield, NY., and Rosedale, NY., along with many smaller islands.

[1] https://www.habitat.noaa.gov/protection/efh/newInv/index.html

Table 9: Designated EFH Species and Life Stages – Atlantic Shorefront

	EFH	Species	Eggs	Larvae	Juveniles	Adults
1	NE	Atlantic salmon (*Salmo salar*)				X
2	NE	pollock (*Pollachius virens*)			X	
3	NE	Atlantic Cod (*Gadus morhua*)				X
4	NE	red hake (*Urophycis chuss*)	X	X	X	X
5	NE	winter flounder (*Pleuronectes americanus*)	X	X	X	X
6	NE	windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
7	NE	Atlantic herring (*Clupea harengus*)			X	X
8	NE	monkfish (*Lophius americanu*s)	X	X		x
9	NE	little skate (*Leucoraja erinacea*)			X	
10	NE	winter skate (*Leucoraja ocellata*)			X	X
11	MA	bluefish (*Pomatomus saltatrix*)			X	X
12	MA	long finned squid (*Loligo pealei*)	X			
13	MA	Atlantic butterfish (*Peprilus triacanthus*)				X
14	MA	Atlantic mackerel (*Scomber scombrus*)			X	X
15	MA	summer flounder (*Paralicthys dentatus*)		X	X	X
16	MA	scup (*Stenotomus chrysops*)	X	X	X	X
17	MA	black sea bass (*Centropristus striata*)			X	X
18	CMPS	king mackerel (*Scomberomorus cavalla*)	X	X	X	X
19	CMPS	Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
20	CMPS	cobia (*Rachycentron canadum*)	X	X	X	X
21	HMS	sand tiger shark (*Odontaspis taurus*)		X		
22	HMS	Bluefin tuna (*Thunnus thynnus*)			X	
23	HMS	dusky shark (*Charcharinus obscurus*)		X		
24	HMS	sandbar shark (*Charcharinus plumbeus*)			X	X
25	HMS	white shark (*Carcharodon carcharias*)		X	X	X
26	HMS	Skipjack tuna (*Katsuwonus pelamis*)				X
27	HMS	Smoothhound Shark (Atlantic Stock)		X	X	X

NE= New England Species;

MA = Mid-Atlantic Species;

CMPS = Coastal Migratory Pelagic Species;

HMS = Highly Migratory Species

Table 10: Designated EFH Species and Life Stages – Jamaica Bay

	EFH	Species	Eggs	Larvae	Juveniles	Adults
1	NE	Atlantic salmon (*Salmo salar*)				X
2	NE	pollock (*Pollachius virens*)			X	
3	NE	clearnose skate (Raja eglanteria)			X	X
4	NE	red hake (*Urophycis chuss*)	X	X	X	X
5	NE	winter flounder (*Pleuronectes americanus*)	X	X	X	X
6	NE	windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
7	NE	Atlantic herring (*Clupea harengus*)		X	X	X
8	NE	monkfish (*Lophius americanus*)	X	X		
9	NE	Little skate (*Leucoraja erinacea*)				X
10	NE	Winter skate (*Leucoraja ocellata*)			X	X
11	NE	Yellowtail flounder (Limanda ferruginea)				X
11	MA	bluefish (*Pomatomus saltatrix*)			X	X
12	MA	long finned squid (*Loligo pealei*)	X			
13	MA	Atlantic butterfish (*Peprilus triacanthus*)			X	X
14	MA	Atlantic mackerel (*Scomber scombrus*)			X	X
15	MA	summer flounder (*Paralicthys dentatus*)			X	X
16	MA	scup (*Stenotomus chrysops*)			X	X
17	MA	black sea bass (*Centropristus striata*)			X	X
18	MA	spiny dogfish (*Squalus acanthias*)			X	X
19	CMPS	king mackerel (*Scomberomorus cavalla*)	X	X	X	X
20	CMPS	Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
21	CMPS	cobia (*Rachycentron canadum*)	X	X	X	X
22	HMS	sand tiger shark (*Odontaspis taurus*)		X		
23	HMS	white shark (*Carcharodon carcharias*)		X		
24	HMS	smoothhound Shark (Atlantic Complex) (*Mustelus mustelus*)		X	X	X
25	HMS	sandbar shark (*Charcharinus plumbeus*)				X

NE= New England Species;

MA = Mid-Atlantic Species;

CMPS = Coastal Migratory Pelagic Species;

HMS = Highly Migratory Species

As shown on Tables 9 and 10, the project site has been identified as EFH for 27 species of fish for the Atlantic Shoreline project reach, and 25 species of fish for the Jamaica Bay project reach, respectively. The life stages of the Highly Migratory Species are broken down into neonates, juveniles, and adults. There are no 'egg' designations and neonates correspond to the “larvae” heading.

The following text provides a description of general habitat parameters of all identified designated EFH species and the applicable life stages specific to the EFH assessment. The habitat parameters were obtained from the *Guide to Essential Habitat Descriptions* and where necessary, supplemented by the *EFH Tables* (NMFS 2016c). If more than one geographic region was given in a description, the habitat parameters for the geographic region associated with the project area were used.

3.1 New England Species

3.1.1 Atlantic salmon (*Salmo salar*)

Eastern portions of the Atlantic Ocean along Long Island are designated as EFH habitat for salmon adults in the seawater salinity zone, mixing water/brackish salinity zone, and the tidal freshwater salinity zone. The habitat parameters for the applicable life stages are as follows.

<u>Adults</u>: Generally, the following conditions exist where Atlantic salmon adults are found migrating to the spawning grounds: streams with water temperatures below 22.8°C and dissolved oxygen above 5 parts-per-million (ppm). Oceanic adult Atlantic salmon are primarily pelagic and range from the waters of the continental shelf off southern New England north throughout the Gulf of Maine.

3.1.2 pollock (*Pollachius virens*)

The project site, for both planning reaches, is designated as EFH for pollock juveniles. The habitat parameters for the applicable life stages are as follows.

<u>Juveniles</u>: Generally, the following conditions exist where most pollock juveniles are found: water temperatures below 18°C, water depths between 0 and 250 meters, and salinities greater than 29 and 32%.

3.1.3 clearnose skate (*Raja eglanteria*)

The project site is designated as EFH for clearnose skate juveniles and adults within the Jamaica Bay planning reach. The habitat parameters for the applicable life stages are as follows.

<u>Juveniles</u>: Bottom habitats with a sandy or gravelly substrate or mud, generally found from the shore to depths of 137 meters, with the highest abundance from 73-91 meters. Most juveniles are found between in water with temperatures of 4-15°C.

<u>Adults</u>: bottom habitats with a sandy or gravelly substrate or mud within the same range as the juveniles.

3.1.4 Atlantic cod (*Gadus morhua*)

The project site is designated as EFH for Atlantic Cod adults in the Atlantic Shoreline project reach. The habitat parameters for the applicable life stage is as follows:

Adult: Bottom habitats with a substrate of rocks, pebbles, or gravel. Generally, the following conditions exist where cod adults are found: water temperatures below 10° C, depths from 10 - 150 meters, and a wide range of oceanic salinities.

3.1.5 red hake (*Urophysic chuss*)

The project site is designated as EFH for red hake eggs, larvae, juveniles, and adults for both planning reaches. The habitat parameters for the applicable life stages are as follows.

Eggs: Generally, the following conditions exist where hake eggs are found: sea surface water temperatures below 10°C along the inner continental shelf with salinities less than 25%. Red hake eggs are most often observed during the months from May to November, with peaks in June and July.

Larvae: Generally, the following conditions exist where red hake larvae are found: sea surface water temperatures below 19°C, water depths less than 200 meters, and salinities greater than 0.5%. Red hake larvae are most often observed from May through December, with peaks in September and October.

Juveniles: Generally, the following conditions exist where red hake juveniles are found: water temperatures below 16°C, water depths less than 100 meters, and a salinity range from 31 to 33%.

Adults: Bottom habitats in depressions with a substrate of sand and mud. Generally, the following conditions exist where red hake adults are found: water temperatures below 12° C, depths from 10 - 130 meters, and a salinity range from 33 – 34%.

3.1.6 winter flounder (*Pleutonectes americanus*)

The project site is designated as EFH for winter flounder eggs, larvae, juveniles, and adults in both planning reaches. The habitat parameters for the applicable life stages are as follows.

Eggs: Generally, the following conditions exist where winter flounder eggs are found: water temperatures less than 10°C, salinities between 10 to 30%, and water depths less than 5 meters. Winter flounder eggs are often observed from February to June.

Larvae: Generally, the following conditions exist where winter flounder larvae are found: sea surface water temperatures less than 15°C, salinities between 4 and 30‰, and water depths less than 6 meters. Winter flounder larvae are often observed from March to July.

Juveniles: Generally, the following conditions exist where winter flounder young-of-the-year are found: water temperatures below 28°C, water depths from 0.1 to 10 meters, and salinities between 5 and 33‰. Generally, the following conditions exist where juvenile winter flounder are found: water temperatures below 25°C, water depths from 1 to 50 meters, and salinities between 10 and 30%.

Adults: Generally, the following conditions exist where winter flounder adults are found: water temperatures below 25°C, water depths from 1 to 100 meters, and salinities between 15 and 33%.

3.1.7 windowpane flounder (*Scopthalmus aquosus*)

The project site is designated as EFH for windowpane flounder eggs, larvae, juveniles, and adults in both planning reaches. The habitat parameters for the applicable life stages are as follows.

Eggs: Generally, the following conditions exist where windowpane flounder eggs are found: sea surface water temperatures less than 20°C and water depths less than 70 meters. Windowpane flounder eggs are often observed from February to November with peaks in May and October.

Larvae: Generally, the following conditions exist where windowpane flounder larvae are found: sea surface water temperatures less than 20°C and water depths less than 70 meters. Windowpane flounder larvae are often observed from February to November with peaks in May and October.

Juveniles: Generally, the following conditions exist where windowpane flounder juveniles are found: water temperatures below 25°C, water depths from 1 to 100 meters, and salinities between 5.5 and 36%.

Adults: Generally, the following conditions exist where windowpane flounder adults are found: water temperatures below 26.8°C, water depths from 1 to 75 meters, and salinities between 5.5 and 36%.

3.1.8 Atlantic herring (*Clupea harengus*)

The project site is designated as EFH for Atlantic herring larvae, juveniles and adults in the Jamaica Bay planning reach, and juveniles and adults in the Atlantic Shorefront planning reach. The habitat parameters for the applicable life stages are as follows.

Larvae: Generally, the following conditions exist where Atlantic herring larvae are found: sea surface temperatures below 16° C, water depths from 50 - 90 meters, and salinities around 32‰. Atlantic herring larvae are observed between August and April, with peaks from September through November.

Juveniles: Generally, the following conditions exist where Atlantic herring juveniles are found: water temperatures below 10°C, water depths from 15 to 135 meters, and a salinity range from 26 to 32%.

Adults: Generally, the following conditions exist where Atlantic herring adults are found: water temperatures below 10°C, water depths from 20 to 130 meters, and salinities above 28%.

3.1.9 monkfish (*Lophius americanus*)

The project site is designated as EFH for monkfish eggs and larvae in both planning reaches, and adults in the Atlantic Shorefront planning reach. The habitat parameters for the applicable life stages are as follows.

Eggs: Generally, the following conditions exist where monkfish egg veils are found: sea surface water temperatures below 18°C and water depths from 15 to 1000 meters. Monkfish egg veils are most often observed during the months from March to September.

Larvae: Generally, the following conditions exist where monkfish larvae are found: water temperatures 15°C and water depths from 25 to 1000 meters. Monkfish larvae are most often observed during the months from March to September.

Adults: Bottom habitats with substrates of a sand-shell mix, algae covered rocks, hard sand, pebbly gravel, or mud. Generally, the following conditions exist where monkfish adults are found: water temperatures below 15° C, depths from 25 - 200 meters, and a salinity range from 29.9 - 36.7‰.

3.1.10 little skate (*Leucoraja erinacea*)

The project site is designated as EFH for little skate juveniles in the Atlantic Shorefront, and adults in the Jamaica Bay planning reaches. The habitat parameters for the applicable life stages are as follows.

Juveniles: Bottom habitats with a sandy or gravelly substrate or mud, generally found from the shore to depths of 137 meters, with the highest abundance from 73-91 meters. Most juveniles are found between in water with temperatures of 4-15°C.

Adults: bottom habitats with a sandy or gravelly substrate or mud within the same range as the juveniles.

3.1.11 winter skate (*Leucoraja ocellata*)

The project site is designated as EFH for winter skate juveniles and adults in both planning reaches. The habitat parameters for the applicable life stages are as follows.

Juveniles: Sand and gravel or mud shoreline to about 400 meters and are most abundant at depths less than 111 meters. The temperature range for these skates is from - 1.2 - 21 °C, with most found from 4-16 °C, depending on the season.

Adults: Sand and gravel or mud substrate found from shoreline to 371 meters, but are most abundant at less than 111 meters. The temperature range is also very similar, with a range from –1.2 - 20 °C, with most found in water with temperatures ranging from 5-15 °C.

3.1.12 yellowtail Flounder (*Limanda ferruginea*)

The project site is designated as EFH for yellowtail flounder adults in the Jamaica Bay planning reach. The habitat parameters for the applicable life stages are as follows

Adult: Bottom habitats with a substrate of sand or sand and mud. Generally, the following conditions exist where yellowtail flounder adults are found: water temperatures below 15° C, depths from 20 - 50 meters, and a salinity range from 32.4 - 33.5‰.

3.2 Mid-Atlantic Species

3.2.1 bluefish (*Pomatomus saltatrix*)

The project site is designated as EFH for bluefish juveniles and adults in both planning reaches. The habitat parameters for the applicable life stages are as follows.

Juveniles: Generally juvenile bluefish occur in estuaries from May through October. Typical conditions for juveniles are: water temperatures between 19°C and 24°C and salinities between 23 and 36%.

Adults: Adult bluefish are found in Mid-Atlantic estuaries from April through October. Typical conditions for adults are: water temperatures from 14°C to 16°C and salinities greater than 25%.

3.2.2 long finned squid (*Loligo pealei*)

The project site is designated as EFH for long-finned squid eggs in both planning reaches. The habitat parameters for the applicable life stages are as follows.

Eggs: EFH for long finned squid eggs occurs in inshore and offshore bottom habitats from Georges Bank southward to Cape Hatteras, generally where bottom water temperatures are between 10°C and 23°C, salinities are between 30 and 32 ppt, and depth is less than 50 meters. Eggs have also been collected in bottom trawls in deeper water at various places on the continental shelf. Like most loliginid squids, their egg masses or "mops" are demersal and anchored to the substrates on which they are laid, which include a variety of hard bottom types (e.g., shells, lobster pots, piers, fish traps, boulders, and rocks), submerged aquatic vegetation (e.g., *Fucus* sp.), sand, and mud.

3.2.3 Atlantic butterfish (*Peprilus triacanthus*)

The project site is designated as EFH for Atlantic butterfish juveniles, and adults for the Jamaica Bay planning reach, and only adults in Atlantic Shorefront planning reach. The habitat parameters for the applicable life stages are as follows.

Juveniles: Generally, juvenile butterfish occur in water depths between 10 and 365 meters, water temperatures between 3°C and 28°C, and a salinity range of 3 to 37%.

Adults: Generally, adult butterfish occur in water depths between 10 and 365 meters, water temperatures between 3°C and 28°C, and a salinity range of 4 to 26%.

3.2.4 Atlantic mackerel (*Scomber scrombrus*)

The project site is designated as EFH for Atlantic mackerel juveniles and adults for both planning reaches. The habitat parameters for the applicable life stages are as follows.

Juveniles: Generally, juvenile Atlantic mackerel occur in water depths between the shore and 320 meters, water temperatures between 4°C and 22°C, and salinities less than 25%.

Adults: Generally, adult Atlantic mackerel occur in water depths between the shore and 380 meters, water temperatures between 4°C and 16°C, and salinities less than 25%.

3.2.5 summer flounder (Paralichthys denntatus)

The project site is designated as EFH for summer flounder larvae, juveniles, and adults in the Atlantic Shorefront planning reach, and only juveniles and adults in the Jamaica Bay planning reach. The habitat parameters for the applicable life stages are as follows.

Larvae: In general, summer flounder larvae are most abundant nearshore at water depths between 10 and 70 meters, in water temperatures between 9°C and 12°C, and salinities between 23 to 33‰. They are most frequently found from September to February.

Juveniles: In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 11°C, water depths from 0.5 to 5 meters, and salinities ranging from 10 to 30%.

Adults: Generally, summer flounder occur in water depths between the shore and 25 meters. Seasonally, they inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer Continental Shelf at depths of 150 meters in colder months.

3.2.6 scup (*Stenotomus chrysops*)

The project site is designated as EFH for scup eggs, larvae, juveniles, and adults in the Atlantic Shorefront planning reach, and only juvenile and adults in the Jamaica Bay planning reach. The habitat parameters for the applicable life stages are as follows.

Eggs: In general, scup eggs are found from May through August, in water temperatures between 13°C and 23°C, water depths less than 30 meters, and salinities less than 15%.

Larvae: In general, scup larvae are most abundant nearshore from May through September, in water temperatures between 13°C and 23°C, water depths less than 20 meters, and salinities less than 15%.

Juveniles: In general, juvenile scup during the summer and spring are found in estuaries and bays, in association with various sands, mud, mussel, and eelgrass bed type substrates, between the shore and water depths of 38 meters. Typical conditions are: water temperatures less than 7°C and salinities less than 15%.

Adults: Generally, adult scup are found in water temperatures less than 7°C, water depths between 2 and 185 meters, and salinities less than 15%. Seasonally, wintering adults (November through April) are usually offshore.

3.2.7 black sea bass (*Centropristus striata*)

The project site is designated as EFH for black sea bass juveniles and adults for both planning reaches. The habitat parameters for the applicable life stages are as follows.

Juveniles: Juvenile black sea bass are usually found in association with rough bottom, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas. Typical conditions are: water temperatures less than 6°C, water depths between 1 and 38 meters, and salinities less than 18%.

Adults: Structured habitats (natural and man-made), sand and shell are usually the substrate preference of adult black sea bass. Typical conditions are: water temperatures less than 6°C, water depths between 20 and 50 meters, and salinities less than 20%.

3.2.8 spiny dogfish (*Squalus acanthias*)

The project site is designated as EFH for spiny dogfish juveniles (i.e., sub-female) and adult male in the Atlantic Shorefront planning reach. The habitat parameters for the applicable life stages are as follows

Female Sub-Adults (36-79 cm): Pelagic and epibenthic habitats throughout the region. Sub-adult females are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. Sub-adult females are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.

Male Adults (≥60 cm): Pelagic and epibenthic habitats throughout the region. Adult males are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.

3.3 Coastal Migratory Pelagic Species

The project site is designated as EFH for coastal migratory pelagic eggs, larvae, juveniles, and adults for the three species listed below for both planning reaches. These species are found in sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward. In addition, all coastal inlets and state-designated nursery habitats are of particular importance to these coastal migratory pelagics.

3.3.1 king mackerel (*Scomberomorus cavalla*)

In general, king mackerel are found in water temperatures less than 20°C and salinities less than 30%.

3.3.2 spanish mackerel (*Scomberomorus maculates*)

In general, Spanish mackerel are found in water temperatures less than 20°C and salinities less than 30%.

3.3.3 cobia (*Rachycentron canadum*)

In addition to the general habitat of the coastal migratory pelagics, Cobia are also found in high salinity bays, estuaries, and seagrass habitat. Typical conditions are: water temperatures less than 20°C and salinities less than 25%.

3.4 Highly Migratory Species

3.4.1 sand tiger shark (*Odontaspis taurus*)

The project site is designated as EFH for sand tiger shark neonates in both planning reaches. The habitat parameters for the applicable life stages are as follows.

Neonates/early juveniles: Neonates/early juveniles are found in shallow coastal waters to the 25-meter isobath.

3.4.2 dusky shark (*Charcharinus obscurus*)

The project site is designated as EFH for dusky shark neonates in the Atlantic Shorefront planning reach. The habitat parameters for the applicable life stages are as follows.

Neonate/early juveniles: Neonates/early juveniles are found in shallow coastal waters, inlets, and estuaries to the 25-meter isobath.

3.4.3 sandbar shark (*Charcharinus plumbeus*)

The project site is designated as EFH for sandbar shark juveniles and adults in the Atlantic Shorefront planning reach, and only adults in the Jamaica Bay planning reach. The habitat parameters for the applicable life stages are as follows.

Neonates/early juveniles: Neonates/early juveniles are found in shallow coastal areas to the 25-meter isobath. Typical conditions are: salinities greater than 22% and water temperatures greater than 21°C.

Late juveniles/subadults: Late juveniles/subadults are found offshore.

Adults: Adults are found in shallow coastal areas from the coast to the 50-meter isobath.

3.4.4 white shark (*Carcharodon carcharias*)

The project site is designated as EFH for white shark neonates, juveniles and adults in the Atlantic Shorefront planning reach, and only adults in the Jamaica Bay planning reach. The habitat parameters for the applicable life stages are as follows.

It is a migratory species, spending winters in southern waters and summers in northern waters. Sandbar sharks are found near shore at depths of 65.6 to 213.3 feet. In the northern hemisphere, mating occurs from May to June. Average length of gestation range from eight (8) to 12 months and is dependent on geological location. Litter size ranges from six (6) to 13 pups. In the western Atlantic, pups are born from June to August. Sandbar shark diet consists of bottom fish, shellfish, skates, stingrays, squid, shrimp, crabs, mollusks, and other smaller sharks (Florida Museum of Natural History, 2016).

3.4.5 smoothhound shark (Atlantic Complex) (*Mustelus mustelus*)

The project site is designated as EFH for smoothhound shark neonates, juveniles and adults in the both planning reaches. NMFS does not provide information pertaining to suitable habitat characteristics that support these life stages.

3.4.6 skipjack tuna (*Katsuwonus pelamis*)

The project site is designated as EFH for skipjack tuna adults in the Atlantic Shorefront planning reach. Its habitat is the pelagic surface waters. It is an extremely fast, ever moving species.

3.4.7 bluefin tuna (*Thunnus thynnus*)

The project site is designated as EFH for bluefin tuna juveniles in the Atlantic Shorefront planning reach. Their habitat is primarily surface water, also found in inshore and pelagic waters.

4 EFFECTS ON EFH SPECIES IN THE PROJECT AREA

The identified EFH species (Tables 9 and 10 shown above) potentially could occur in either or both of the planning reaches (i.e., Atlantic Shorefront and Jamaica Bay) at different times of the year. To support the evaluation of effect on these species, a separate EFH Assessment Worksheet has been prepared for each planning reach and are included as Appendix A. It is recognized that there are temporary impacts that could result to different life stages of the identified species due to the proposed construction given their potential presence in the project area. However, it is noted that the project is anticipated to have a long-term benefit on EFH designated fisheries through the proposed actions.

Effects on EFH designated species through the Recommended Plan, including both planning reaches, can be grouped into four distinct impact categories: impingement and/or entrainment, burial and sedimentation, habitat loss and alteration, and hydroacoustics. Each are discussed below specific to the two planning reaches. This is section is followed by a summary of identified direct, indirect, and cumulative effects on the EFH designated species. In addition, a comprehensive survey of the proposed mitigation is also provided.

4.1 Impingement and/or Entrainment

4.1.1 Atlantic Shorefront

The potential for impingement and/or entrainment of eggs and larvae is only specific to the dredging of sand within the proposed borrow area. As discussed below for habitat fragmentation, dredging of sand in shoals will focus on flatter areas surrounding the prominent shoals. Initial analysis completed by USACE has removed prominent shoal habitat from consideration for sand dredging. This was accomplished by avoiding sites with prominent shoal habitat such as the "Seaside Lumps" and "Fish Heaven", which are considered important sport and commercial fishing grounds (Long and Figley 1984).

It is recognized that the dredging activities could have adverse effects on EFH due to the entrainment of early life stages. The EFH designated species most likely to suffer mortality from dredging are juvenile winter flounder and windowpane flounder. Mortality of young-of-the-year (YOY) juvenile windowpane and winter flounder would be highest in the spring, just after they settle to the bottom and metamorphose. However, mortalities of small flounder would be minimized if dredging was restricted to the fall (October-December), after they are larger and start to move into deeper water (Pereira et al. 1999) and would be less plentiful on shallow borrow areas. Dredging and in water construction activities in the fall would also minimize any possible impacts on pelagic fish eggs and larvae produced by EFH- designated species since most of them spawn in the spring.

The USACE anticipates that construction activities will occur in the fall and winter. These dates align to minimize impacts to EFH, while also being protective of terrestrial species protected under jurisdiction of U.S. Fish and Wildlife Service.

4.1.2 Jamaica Bay

There will be no impacts associated with impingement and entrainment for proposed features of the Jamaica Bay planning reach.

4.2 Burial and Sedimentation

4.2.1 Atlantic Shorefront

The dredging of sand can lead to increased suspended sediment levels, and which could smoother (i.e., bury) immobile benthic organisms or juvenile demersal fish (i.e., flounder). As noted above, USACE anticipates a construction window (i.e., fall or winter) that would minimize impacts on pelagic fish eggs and larvae. The temporary impacts by removal and/or burial of a benthic community could have adverse effects on benthic food-prey organisms present in the borrow area. However, the impacts to EFH designed fish species is expected to be minimal as the borrow area is a relatively small when compared to the overall area of the larger Atlantic Shoreline. In addition, the borrow area is anticipated to be recolonize by benthic communities following dredging operations within 2 years. Finally, it is recognized that the suspended sediment can also impact foraging or migratory species; however, these larger, motile species are expected to alter behavior to avoid the construction area and utilize adjacent, more suitable habitats.

The near-shore beaches where sand will be placed, and groins constructed or enlarged, will also be susceptible to short-term increased suspended sediments as well as burial of existing habitats. It is recognized that EFH can be adversely impacted temporarily through water quality impacts such as increased turbidity and decreased dissolved oxygen content within and proximate to the construction work areas. These impacts would subside upon cessation of construction activities. Construction activities in the near shore environment will employ Best Management Practices (BMPs) to minimize construction impacts within open waters (i.e., construction scheduling). Similar to the discussion for dredging impacts, sand placement and groin construction could also bury benthic habitats and have indirect effects on EFH designated fish species. However, it is noted these impacts will be temporary and short term.

Finally, it is noted that an objective of the project is to protect these beach and near-shore habitats from future coastal storms while at the same time minimizing required maintenance and thereby reducing long-term cumulative impacts.

4.2.2 Jamaica Bay

It is recognized that benthic habitat can vary within the Jamaica Bay planning reach. Submerged aquatic vegetation beds have not been identified within the project area. In general, the intertidal and subtidal areas are flat, featureless sediment-dominated habitats devoid of vegetation or habitat structure. While lacking habitat structure, these large sediment areas support valuable habitat for numerous benthic invertebrates (e.g., worms, clams). These species in turn serve as prey species for fish, crabs, birds, and other faunal life.

Resuspension of sediments within Jamaica Bay planning reach due to in-water activities (i.e., bulkhead construction, rock sills) will have variable impacts on fish depending on species and life stage. To directly address this, construction activities in the near shore environment will employ BMPs to minimize construction impacts within open waters, and which will subside upon cessation of construction activities. For example, construction occurring at low tide and in-the-dry will minimize and/or avoid significant resuspension of sediment. It is also anticipated that during construction activities, if present, larger more motile fish species will modify their behavior and relocate to other more suitable habitats with no significant impact to the population or individual.

It is recognized that lethal levels of water column solids vary widely among species; one study found that the tolerance of adult fish for suspended sediment ranged from 580 milligrams per liter (mg/L) to 24,500 mg/L (Shrek et al. 1975 as cited in NMFS 2003). Common impacts to fish are the abrasion of gill membranes (resulting in inability to collect oxygen), impairment of feeding, reduction in dissolved oxygen, and fatal impacts to early life stages.

Larval stage fish also have wide suspended sediment tolerance ranges; however, the reported data is generally thought to represent tolerance levels for only relatively short exposure periods (e.g., less than 24 hours) (Morgan and Levings 1989). The project is not anticipated to have prolonged suspended solids for extended periods (i.e., less than 24 hours). Beyond that timeframe, mortality can occur at concentrations as low as 1,300 mg/L (Morgan et al. 1983). Kiorboe et al. 1981, (as cited in Clarke and Wilber 2000) indicate that hatching of striped bass can be delayed if daily sediment concentrations reach 100 mg/L. Wilbur and Clarke, 2001 (as cited in NMFS 2003), indicate that hatching is delayed for striped bass and white perch at concentrations of 800 and 100 mg/L, respectively. In a 2003 biological opinion, NMFS indicated that total suspended solids concentrations below 100 mg/L are not likely to affect eggs and larvae, at least over short durations (NMFS 2003).

Consistent with the discussion for dredging impacts, rock sill construction and potentially near shoreline construction (i.e., bulkheads) could bury benthic habitats and have indirect effects on EFH designated fish species. It is noted these impacts to benthic habitats will be temporary and short term as these areas will be quickly recolonized. There could be burial of eggs or larvae that result in mortality, but the anticipated construction schedule is intended to minimize or avoid these impacts. Finally, from a long-term perspective, the overall project is intended to enhance benthic habitat and in-water habitat complexity through incorporation of NNBFs as part of the HRFRRF. These will provide enhanced habitats for benthic communities, as well as the identified EFH fish species. A further discussion of ecological benefits associated with NNBFs is provided below.

4.3 Habitat Loss and Fragmentation

4.3.1 Atlantic Shorefront

It is anticipated that there will be alterations of the benthic and open water habitats associated with the borrow site. One major concern with respect to physical changes involves the potential loss of prominent offshore sandy shoal habitat within borrow sites due to sand dredging for the beach replenishment. It is generally regarded that prominent offshore shoals are areas that are attractive to fish, including the federally managed species, and are frequently targeted by recreational and commercial fishermen. Despite this, there is little specific information to determine whether shoals of this type have any enhanced value for fish. However, it is reasonable to expect that the increased habitat complexity at the shoals and adjacent bottom would be more attractive to fish than the flat featureless bottom that characterizes much of the mid-Atlantic coastal region (U.S. Fish and Wildlife Service 1999a). Since dredging of sand in shoals may result in a significant habitat alteration, it is proposed that these areas be avoided or the flatter areas surrounding the prominent shoals be mined. Initial analysis has removed prominent shoal habitat from consideration.

Other physical alterations to EFH within the borrow area involve substrate modifications. An example would be the conversion of a soft sandy bottom into a hard clay bottom through the removal of overlying sand strata. This could result in a significant change in the benthic community composition after recolonization, or it could provide unsuitable habitat required for surf clam recruitment or spawning of some finfish species. This could be avoided by correlating vibracore strata data with sand thickness to restrict dredging depths to avoid exposing a different substrate. Based on vibracore data, dredging depths would be considered to minimize the exposure of dissimilar substrates.

The removal of sand also leaves a depression or hole (borrow pit) in the sea floor that can persist for years. The rate at which borrow pits fill up will depend on the amount of sediment that is available and the direction and strength of currents in the area. Borrow pits can modify the habitat for benthic, bottom-feeding fishes since they are deeper than the surrounding sea floor and act as traps for fine grained sediments. Accumulation of mud can cause a change in benthic community structure that favors certain species of fish. Also, if circulation of bottom water in the pits is reduced, DO can fall to low enough levels (<2-3 ppm) that fish will avoid them all together. High organic contents of mud accumulating in pits could also cause oxygen depletion.

In terms of the near shore environment, it is recognized that construction of groins will alter the existing habitat. Constructed groins will create in water habitat areas suitable for recruitment and protection for numerous fish species. Beneficial impacts to the fish community would include the increase in food source, spawning beds, and shelter in the project area. Construction of groins would also provide living spaces for the food resource on which fish species rely. In addition to creating living spaces and increasing food availability of the project area, the proposed would potentially provide shelter for fish from wave attacks during large coastal storm events.

It is noted that recent literature has shown direct adverse effects of shoreline armoring on mobile upper shore invertebrates (Dugan et al 2008, Dugan 2011). Specific to this project, the upper shore is heavily utilized and historically disturbed by continuous recreational activities. As such, research of natural shorelines may not be comparable to this heavily urbanized beach. It is recognized that while certain benthic invertebrate populations may be displaced by the proposed in water features (i.e., groins), it is expected that the habitat complexity will support a diverse assemblage of benthic species that would continue to function as prey for both aquatic and terrestrial wildlife that utilize this shoreline.

4.3.2 Jamaica Bay

The recommended project will have both permanent and temporary impacts to shoreline habitats within the Jamaica Bay planning area and are summarized in Tables 11 and 12. These will result from construction of the HFFRRFs, and specific to EFH designated species focus on in-water activities (i.e., bulkhead construction, rock sill placement).

To account for these impacts, a series of NNBFs were developed as part of the proposed HFFRRFs to not only control erosion and help manage coastal storm risk, but also to provide opportunities for habitat restoration and enhancement which would offset unavoidable permanent impacts to Federal and state regulated areas and species. Table 13 presents proposed restoration / creation, as well as enhancement efforts associated with the NNBFs. While the project will result in unavoidable impacts to 3.74 acres of federal and state regulated waters and wetlands[2], the project includes 7.65

[2] Conservatively assumed to include the following habitat types: beach/shoreline, freshwater wetlands, intertidal wetlands, mudflats, and subtidal bottom.

acres of wetland restoration or creation, and 0.472 acres of wetland enhancement, and restoration of 1.35 acres.

While the project area includes EFH designated species in all life stages, the scope of the in-water activities is expected to only have minor, short-term impacts. These short-term impacts are directly tied to the objective to enhance ecological functioning of these shorelines, and with direct benefits to EFH designated species. The restored wetlands, and constructed sills will have direct benefits to spawning, nursery, foraging, and shelter habitats that are critical to supporting the identified EFH designated species.

Table 11: Permanent Habitat Impacts - Acreage

Habitat Type	CL	MBN	MRE	MRA	MRH	TOTAL
Beach / Unvegetated Shoreline	0.000	0.000	0.036	0.773	0.000	0.809
Freshwater Wetland	0.000	0.000	0.000	0.000	0.056	0.056
Intertidal Wetlands	0.108	0.045	0.875	1.675	0.115	2.817
Mudflats	0.046	0.000	0.000	0.015	0.000	0.061
Subtidal Bottom	0.000	0.000	0.000	0.000	0.000	0.000
Maritime Forest	0.318	0.000	0.000	1.487	0.000	1.806
Upland Ruderal	0.000	0.000	0.000	0.000	0.000	0.000
Urban	0.000	0.000	0.000	0.000	0.000	0.000
Total	**0.472**	**0.045**	**0.910**	**3.950**	**0.171**	**5.549**
Total Waters/Wetlands	**0.154**	**0.045**	**0.910**	**2.463**	**0.171**	**3.743**

CL: Cedarhurst-Lawrence
MB: Motts Basin North
MRE: Mid-Rockaway Edgemere Area
MRA: Mid-Rockaway Averne Area
MRH: Mid-Rockaway Hammels Area

Table 12: Temporary Habitat Impacts – Acreage

Habitat Type	CL	MBN	MRE	MRA	MRH	TOTAL
Beach / Unvegetated Shoreline	0.000	0.000	0.000	0.273	0.114	0.388
Freshwater Wetland	0.000	0.000	0.000	0.000	0.000	0.000
Intertidal Wetlands	0.005	0.000	0.051	0.013	0.000	0.069
Mudflats	0.440	0.000	0.000	1.917	0.015	2.371
Subtidal Bottom	0.058	0.000	3.985	7.191	0.000	11.234
Maritime Forest	0.000	0.000	0.000	0.000	0.000	0.000
Upland Ruderal	0.218	0.628	8.457	6.746	0.922	16.970
Urban	0.018	0.193	1.726	4.641	3.038	9.617
Total	**0.739**	**0.820**	**14.219**	**20.781**	**4.089**	**40.648**
Total Waters/Wetlands	**0.503**	**0.000**	**4.036**	**9.394**	**0.129**	**14.062**

CL: Cedarhurst-Lawrence
MB: Motts Basin North
MRE: Mid-Rockaway Edgemere Area
MRA: Mid-Rockaway Averne Area
MRH: Mid-Rockaway Hammels Area

Table 13: Restoration, Creation & Enhancement – Acreage

Habitat Type	Restoration / Creation		Enhancement	
	Mid-Rockaway Edgemere Area	Mid-Rockaway Averne Area	Mid-Rockaway Edgemere Area	Mid-Rockaway Averne Area
Intertidal Wetland	3.042	4.606	0.468	0.000
Maritime Forest	0.000	1.348	0.000	0.000

4.4 Hydroacoustics

4.4.1 Atlantic Shorefront

Ambient noise levels will be temporarily impacted as a result of in-water construction associated with dredging, sand placement, and groin construction. Intense sound can result in mortality, injury, and/or behavioral response. Generally, sounds in exceedance of 206 dB re 1 µPa (sound, expressed in decibels relative to one (1) micro-Pascal) are considered to be fatal to most fish species. This level of sound is rare and often associated with sheet pile construction, impact hammer, and no sound attenuating devices (e.g., bubble curtains). Other potential effects include rupture of the swim bladder (the bubble of air in the abdominal cavity of most fish species that is involved in maintenance of buoyancy), barotraumas, and oscillations of the swim bladder (leading to nearby organ damage). In other words, an animal that has had physical or physiological damage may be less likely than an animal without damage to avoid a predator or find food. Sounds above RMS 150 dB are often associated with behavioral impacts. These impacts could range from a fish altering its course of travel to avoiding an area during construction.

The type of construction proposed is not anticipated to cause sound levels that could result in mortality or injury. However, it is assumed that constructional activities could have behavioral impacts due to hydroacoustics. These impacts would be focused on fish changing a course of travel and avoiding a construction area, with limited to no impact on the survival of that individual or sustainability of the population.

4.4.2 Jamaica Bay

The potential impacts within the Jamaica Bay planning reach with respect to hydroacoustics are consistent with those discussed above for the Atlantic Shorefront. The type of construction proposed is not anticipated to cause sound levels that could result in mortality or injury. However, it is assumed that constructional activities could have behavioral impacts due to hydroacoustics. These impacts would be focused on fish changing a course of travel and avoiding a construction area, with limited to no impact on the survival of that individual or sustainability of the population.

5 POTENTIAL DIRECT/INDIRECT IMPACTS, CUMULATIVE, AND MITIGATION

The proposed activity would have immediate, short-term, direct and indirect impacts on EFH for some of the designated fish species and life history stages that occur in the immediate vicinity of the project areas. Dredging and placement activities in the project area are not expected to have any significant or long-term lasting effects on the “spawning, breeding, feeding, or growth to maturity” of the designated EFH species that occupy the both planning reaches. In fact, the Recommended Action is intended to have long term benefits to EFH by creating additional nearshore habitat structure and preserving or restoring native shoreline habitats. This section identifies the direct and indirect impacts that could result from the proposed project and makes recommendations for minimizing these impacts.

5.1 Direct Impacts

5.1.1 Atlantic Shorefront

Due to the mobility of larger fish, direct impacts from dredging and near shore construction activities (i.e., sand placement, and groin construction) would be limited to eggs, larvae, small fish, and benthic invertebrates or shellfish which would be removed, buried, or displaced. Specifically, dredging activities could have direct impacts to eggs, larvae, and potential juvenile EFH due to impingement or entrainment. The EFH designated species most likely to suffer mortality from dredging are juvenile winter flounder and windowpane flounder. These impacts will be minimized through construction scheduling (i.e., late fall or early winter). In addition, borrow pits left behind after dredging ceases would eventually provide good spawning habitat for winter flounder since the sand that would accumulate in them would provide substrate for eggs. In terms of benthic invertebrates and less mobile shellfish, it is assumed there will be direct impacts due to burial from suspended solids within the water column. Given the limited footprint size of in-water work, and ability of species to quickly recolonize disturbed habitats, these direct impacts are assumed to be minor, and short-term.

Minor short-term direct impact on benthic feeding fish species (e.g., windowpane, summer and winter flounder) would also be experienced due to temporary displacement during dredging or construction of groins (potentially due to water quality, hydroacoustics, burial, or habitat disturbance). It is anticipated that the substrates will return to pre-construction conditions as discussed above. As such, impacts to benthic communities are considered short-term because benthic invertebrate species are expected to fully recolonize the disturbed areas. While some areas will be permanently buried due to groin construction, this footprint is relatively small and will provide additional habitat structure important to EFH along this reach of shoreline. Finally, impacts from both dredging and nearshore or in water construction are considered minor and short-term because benthic feeding fish species are expected to avoid construction areas and feed in the surrounding area as result of water quality or hydroacoustics; and therefore, would not be adversely affected by the temporary localized reduction in available benthic food sources.

5.1.2 Jamaica Bay

Direct impacts due burial or sedimentation are possible as a result of in-water construction (i.e., bulkheads, rock sills). Construction activities in the near shore environment will employ BMPs (i.e., silt curtains, construction schedule) to minimize construction impacts within open waters. Rock sill construction could have direct effect on early life stages of EFH, as well as benthic habitats due to permanent burial of subtidal habitats. There could be burial of eggs or larvae that result in mortality, but construction BMPs will be intended to minimize or avoid these impacts can be employed. In addition, the small footprint relative to the overall habitats within Jamaica Bay will not affect the long-term sustainability of an EFH designated species. In fact, from a long-term perspective, the overall project of the project is intended to enhance in-water habitat complexity through incorporation of NNBFs as part of the HRFRRF. These will provide enhanced habitats for benthic communities, as well as the identified EFH fish species.

There would also be direct impacts to wetlands, mudflats, and other habitats that support multiple life stages of the identified EFH species. However, while there are direct impacts associated with the overall HFFRRFs, the NNBFs have been incorporated to offset these impacts and provide enhanced ecological functioning along these shorelines.

There would also be short-term direct impacts to larger foraging, transient, or migratory fish species within the project area as a result of water quality or hydroacoustics. However, it is assumed that these larger, mobile species will alter their behavior to avoid construction areas and utilize the surrounding area with no long-term impact to an individual or population.

5.2 Indirect Impacts

5.2.1 Atlantic Shorefront

As a result of dredging, placement of the material, and nearshore and in water construction activities, the most immediate, indirect effect on EFH areas would be the loss of benthic invertebrate prey species within the construction footprint of the proposed project. Small motile and sedentary epifaunal species (*e.g.*, small crabs, snails, tube- dwelling amphipods), and all infaunal species (*e.g.*, polychaetes), would be most vulnerable to suction dredging and burial from construction activities. However, impacts would be short term as infaunal organisms are likely to recolonize the area from nearby communities and re-establish to a similar community.

The EFH designated species most vulnerable to the loss of prey organisms are winter flounder, windowpane flounder, scup, and black sea bass. Winter flounder are obligate bottom feeders, preying primarily on infaunal polychaetes and tube-dwelling amphipods. The removal of benthic prey organisms will affect them more directly than any other EFH species. Windowpane flounder have larger mouths than winter flounder and feed primarily on small crustaceans (*i.e.*, mysid and decapod shrimp) and fish larvae. These are motile prey organisms that live in the water column or near the bottom and could, to some extent, avoid being removed by the dredge. Scup and black sea bass feed on a variety of benthic infaunal and epifaunal organisms that would be affected by dredging. The immediate impact of prey removal would be negligible since bottom feeding EFH species would re-locate to nearby areas with intact benthic food resources. It would also be a temporary condition, lasting only as long as it takes for benthic organisms to re-colonize the dredged area.

Studies performed in the Lower Bay of New York Harbor have shown that benthic community structure is disrupted by dredging but can reach a new equilibrium fairly rapidly. Cerrato and Scheier (1984) found that the borrow pits on the West Bank of the Ambrose Channel had distinctly different habitats from a nearby undredged control site. The benthic fauna at the control site was more diverse (*i.e.*, more species) and, in general, more stable (less susceptible to seasonal shifts in species composition and abundance) through time, whereas there were fewer species in the borrow pits, but some of them were very abundant. In a related study, Conover *et al.* (1985) found that fish, including some EFH-designated species, were actually more abundant in borrow pits. Of the EFH designated species, butterfish (mostly juveniles) were more abundant in the borrow pits, as were winter flounder (in the fall). Red hake were more abundant in one of the borrow pits and the largest catches of windowpane flounder were made in one of the pits in the spring. Summer flounder were generally more abundant in the borrow pits as well.

In addition, Conover *et al.* (1985) also examined the stomach contents of winter flounder in the three sampling sites and related them to benthic populations identified by Cerrato and Scheier (1984). The results indicated that, despite changes in the species composition of benthic communities after dredging, the feeding success of winter flounder in the pits was not affected. Winter flounder, like many other bottom-feeding species, are selective feeders that adapt their diets to whatever prey species are readily available. These results suggest that the feeding success of other bottom-feeding EFH species is also likely to not be affected by changes in benthic community structure caused by dredging.

The degree to which water quality is degraded, or temperature and salinity changes in borrow pits depends on the depth of the pit, the circulation of water through the pit, and the amount of fine sediment and organic matter that accumulates in the pit. Conover *et al*. (1985) determined that summer water temperatures tended to be lower in borrow pits and salinities consistently higher (generally by 1-3 ppt, but by 7.3 ppt in January). More importantly, DO concentrations measured between June and November did not vary between sites.

Bottom currents along the project area shore are strong, thus it is likely that DO levels near the bottom of borrow pits in the project area would not be reduced. There is, in fact, so much sand that is transported west along the outer New York coast that any hole created by dredging would likely fill in naturally within a very short time. If fine sediments accumulate in them, the benthic invertebrate community will change from a sand-dominated to a mud-dominated fauna. However, as long as water quality is not degraded, there would be no adverse impact on EFH. In fact, if summer water temperatures in borrow pits are lower than on adjacent shoal areas, EFH might be improved.

5.2.2 Jamaica Bay

Consistent with conclusions for the Atlantic Shorefront planning reach, indirect effects on EFH areas would be the loss of benthic invertebrate as well as shellfish prey species due to burial or temporary habitat disturbance. During and immediately after construction, EFH species are expected to alter their behavior and utilize adjacent, more suitable habitats within Jamaica Bay. The expected footprint that will result in burial (i.e., rock sills) is relatively small. Temporarily disturbed habitats are expected to quickly recover. Finally, the rock sills and other portions of the NNBFs are expected to provide enhanced ecological services to EFH species by protecting shoreline habitats as well as in-water habitat structure.

There also could be indirect effects as a result of impacts to shoreline habitats, with emphasis on wetlands. Tidal wetlands are essential to healthy fisheries, and provide an essential food, refuge, and nursery habitats for many EFH designated species. While the project will result in habitat disturbances that could have short term indirect impacts on the EFH species that utilize them, the long-term benefits of the project through construction of NNBFs are expected to offset these short-term impacts. The restored wetlands, and constructed sills will have direct benefits to spawning, nursery, foraging, and shelter habitats that are critical to supporting the identified EFH designated species.

5.3 Cumulative Impacts

Given the growth capacity of EFH-designated fish populations within the project area, the expected recolonization rates of benthic prey species, the ecological benefits associated with NNBFs as well as groin construction, there would be no expected cumulative effects. The overall objective of the project is to provide coastal protection, resiliency of these shoreline habitats, as well as enhanced ecological services where possible.

In summary, the cumulative impacts on EFH are not considered significant consistent with previous consultations with NMFS. Like the benthic environment, the impacts to EFH are temporary in nature and do not result in a permanent loss in EFH. Impacts to benthic communities are considered short-term and minor because benthic invertebrate species are expected to recolonize quickly. Infaunal organisms are likely to recolonize the area from nearby communities and re-establish to a similar community within a 2 - 6.5 month period (USACE 2001). Impacts to fish community assemblages are considered minor (USACE 2001), given the large extent of the Atlantic Ocean and Jamaica Bay compared to the project construction footprint, and recolonization rates of benthic communities. Only short-term adverse impacts would occur because of short-term changes to water quality during construction, including resuspension of sediments in the water column and changes to the quality or quantity of soft bottom substrates.

The borrow sites proposed for this project do not contain prominent shoal habitat features, wrecks and reefs, or any known hard bottom features that could be permanently lost due to the impacts from dredging. These types of habitat were avoided through careful site selection and coordination with fishery resource agencies. Some minor and temporary impacts would result in a loss of food source in the affected areas with each periodic nourishment. This impact would affect demersal or bottom-feeding EFH species such as summer flounder and windowpane. Cumulative losses of EFH can be avoided by not dredging deep holes, and leaving similar sandy substrate (with 3 feet of sand or more) for recruitment.

Steps taken to minimize impacts during construction are generally standardized across the District’s projects. Dredging windows are employed when necessary, dredging is conducted in a manner to avoid creating deep pits, dredging locations within borrow areas are rotated when possible to reduce impacts, buffer areas are established around cultural targets within borrow areas, and borrow areas are chosen to minimize impacts to shellfish and fisheries resources. With the inclusion of these measures in all projects, cumulative impacts for the Recommended Plan are expected to be minimized to the greatest extent possible.

5.4 Mitigation

As noted throughout this report, a series of NNBFs were developed as part of the proposed HFFRRFs to not only control erosion and help manage coastal storm risk, but also to provide opportunities for habitat restoration and enhancement which would offset unavoidable permanent impacts to Federal and state regulated areas. Specifically, these NNBFs provide the following ecological benefits and were incorporated in the feasibility design to also recognize future federal, state, and city permitting requirements:

5.4.1 Restoration / Creation of Low and High Marsh Habitats

For purposes of habitat accounting and recognizing the difficulty in differentiating between low and high marsh habitats during mapping, these habitats have been categorized as "intertidal wetlands". Specifically, these NNBF efforts target the following:

- Restoration of low marsh habitat in existing mudflat areas proximate to highly erosional shorelines; and
- Restoration and/or creation of high marsh habitat in adjacent uplands that are dominated by common reed (*Phragmites australis*) and other invasive species.

5.4.2 Creation of Rock Sill Features

Creation of rock sill features provides protection for the subtidal and intertidal habitats, as well as provide a hard bottom habitat for increased ecological production. These features provide additional opportunities for shellfish habitat creation.

5.4.3 Evaluation of Planned Wetland Analysis

Evaluation of Planned Wetlands (Bartoldus et al. 1994) was also used to characterize the functional impacts and benefits within intertidal wetlands associated with each HFFRRF. The assessment results provide estimates of current resource value loss, and the potential increase in resource value through implementation of NNBFs. EPW provides a quantitative measure for capacity of an intertidal wetland to perform the following five functions:

- Shoreline bank erosion control – capacity to provide erosion control and dissipate erosive forces at the shoreline bank
- Sediment stabilization – capacity to stabilize and retain previously deposited sediments
- Water quality – capacity to retain and process dissolved or particulate materials to the benefit of downstream surface water quality
- Fish (tidal) – degree to which a wetland habitat meets the food/cover, reproductive, and water quality requirements for fish
- Wildlife – presence of characteristics that distinguish a wetland as unique, rare, or valuable.

Within each function, numerous elements (i.e., physical, chemical, and biological characteristics) are evaluated in order to identify a wetland's capacity to perform a given function. Element scores (unitless numbers ranging from 0.0 to 1.0, where 1.0 represents the optimal score) were assessed for the existing condition and proposed NNBFs. The scores were combined to produce a Functional Capacity Index (FCI) value from 0.0 to 1.0, which provides a relative index of a reference site's capacity to perform a given function. Total acreage of proposed intertidal wetland restoration, creation, or enhancement at the site is then multiplied by the FCI value to produce a wetland functional capacity unit (FCU), which represents the site's capacity to perform each wetland function (Bartoldus *et al.* 1994). Although no specific values are given to maritime or coastal buffer habitats with EPW, the wetland numbers are enhanced by having the adjacent buffer.

A summary of the analysis and the numerical results of the EPW functional assessment is provided in Tables 14 and 15. In summary, Table 14 shows that the project will result in the loss of 8.59 FCU's across the five functions. However, Table 15 shows that the NNBFs will result in the gain of 34.51 FCUs across the five functions. Similar to the acreage metric evaluation, the EPW functional assessment shows significant gains to the shoreline ecosystem through the incorporation of NNBFs.

Table 14: EPW Functional Assessment – FCU Losses

Function	CL	MBN	MRE	MRA	MRH	TOTAL
Shoreline Bank Erosion	0.000	-0.022	-0.420	-1.014	0.000	-1.456
Sediment Stabilization	-0.108	-0.033	-0.643	-1.255	-0.129	-2.168
Water Quality	-0.100	-0.038	-0.776	-1.415	-0.101	-2.43
Fish (tidal(	-0.075	-0.024	-0.444	-0.890	-0.065	-1.498
Wildlife	-0.048	-0.022	-0.365	-0.558	-0.045	-1.038
Total	**-0.330**	**-0.139**	**-2.648**	**-5.132**	**-0.340**	**-8.589**

CL: Cedarhurst-Lawrence
MB: Motts Basin North
MRE: Mid-Rockaway Edgemere Area
MRA: Mid-Rockaway Averne Area
MRH: Mid-Rockaway Hammels Area

Table 15: EPW Functional Assessment – FCU Gains

Function	CL	MBN	MRE	MRA	MRH	TOTAL
Shoreline Bank Erosion	0.000	0.000	3.542	4.606	0.000	8.148
Sediment Stabilization	0.000	0.000	3.513	4.606	0.000	8.119
Water Quality	0.000	0.000	3.443	4.606	0.000	8.049
Fish (tidal(	0.000	0.000	2.470	3.224	0.000	5.694
Wildlife	0.000	0.000	1.965	2.533	0.000	4.498
Total	**0.000**	**0.000**	**14.933**	**19.574**	**0.000**	**34.507**

CL: Cedarhurst-Lawrence
MB: Motts Basin North
MRE: Mid-Rockaway Edgemere Area
MRA: Mid-Rockaway Averne Area
MRH: Mid-Rockaway Hammels Area

6 EFH CONSERVATION MEASURES AND CONCLUSION

The District plans to continue coordination with NMFS on appropriate EFH conservation and mitigation measures for the project. Currently, the District's best management practices, including seasonal restrictions (i.e. no-dredge windows on Atlantic Shorefront between September and 1 March), natural resource protective state and city mandated Special Conditions under their Clean Water Act (CWA) and Coastal Zone Management Act (CZMA) jurisdictions, as well as USFWS recommendations to ensure protection of species under their jurisdiction, will likely offer significant protections for potentially-affected EFH managed species.

To summarize potential impacts; a minor increase in turbidity and sedimentation would be generated by the proposed construction activities. If EFH species eggs and larvae are present during construction, they could be affected. During the construction period, adult and juvenile fish would leave the area of construction and move to nearby suitable locations outside the area of disturbance. Also, for a short period of time after construction, there would be a reduction in benthic organisms immediately adjacent to the in-water construction footprint; however, this area would be recolonized quickly. These impacts would occur over comparatively small, discrete areas and would not adversely impact local water flow and circulation. Therefore, implementation of the Recommended Plan may adversely affect EFH, but likely would result in minimal adverse effects as the resulting changes to EFH and its ecological functions would be relatively small and insignificant. In addition, it is anticipated that ecosystem restoration efforts as part of this Recommended Plan would result in long-term, net benefits to managed species (all life stages), associated species, and EFH. In summary, the District concludes that the Federal project will not cause significant adverse effects to EFH or EFH species.

7 REFERENCES

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APPENDIX A. EFH ASSESSMENT WORKSHEETS

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The federal agency's conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review timelines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained on the HCD Consultation website and NOAA's EFH Mapper will assist you in completing this worksheet. Please note that the Mapper is currently being up-dated with new designations and EFH maps and text descriptions for many species are temporarily missing. When you open the Mapper, read the WARNING that pops up when you click on the Greater Atlantic Region. It will direct you to a document with maps and text descriptions for each of the missing New England Species and to the Mapper's Data Inventory where a data layer for all the missing species is available for downloading into GIS software. Once the Mapper is up-dated, you can do a Location Query for your project location, but until then, the only way to easily generate a list of the missing species and life stages is to use your own GIS software. Before you fill out the worksheet, we recommend that you check with the appropriate HCD staff member to ensure that your list is complete and accurate. They will be able to answer any questions that you have.

Also note that a number of new Habitat Areas of Particular Concern (HAPCs) have been designated in the Greater Atlantic Region. HAPC maps will also be added to the Mapper the next time it is up-dated. Currently, they can be viewed by following the instructions on the warning page for the region. We expect the Mapper to be fully up-dated and functional later this spring.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study (hereafter Project)

DATE: 07/25/2018

PROJECT NO.:

LOCATION (Water body, county, physical address):
Specific to the Atlantic Shoreline project reach of the Project

PREPARER: U.S. Army Corps of Engineers, New York District

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS

EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? List the species: Red hake, winter flounder, windowpane flounder, monkfish, long finned squid, scup, king mackerel, Spanish mackerel, cobia. See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✔	☐
Is the action located in or adjacent to EFH designated for larvae? List the species: Red hake, winter flounder, windowpane flounder, monkfish, summer flounder, scup, king mackerel, Spanish mackerel, cobia. In addition, sand tiger shark, dusky shark, white shark, and smoothhound shark (Atlantic stock). [The life stages of the Highly Migratory Species are broken down into neonates, juveniles, and adults. There are no 'egg' designations and neonates are assumed to correspond to the “larvae” heading.] See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✔	☐
Is the action located in or adjacent to EFH designated for juveniles? List the species: Pollock, red hake, winter flounder, windowpane flounder, Atlantic herring, little skate, winter skate, bluefish, Atlantic mackerel, summer founlder, scup, black sea bass, king mackerel, Spanish mackerel, cobia, bluefin tuna, sanbar shark, white shark, and smoothhound shark (Atlantic Stock). See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✔	☐

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Atlantic salmon, Atlantic cod, red hake, winter flounder, windowpane flounder, Atlantic herring, monkfish, winter skate, bluefish, Atlantic butterfish, Atlantic mackerel, summer flounder, scup, black sea bass, king mackerel, Spanish mackerel, cobia, sandbar shark, white shark, skipjack tuna, and smoothhound shark (Atlantic Stock). See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✓	☐

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, sub-tidal, or water column?	Their are two components to this phase of the project: 1. Borrow source for sand will occur is sub-tidal waters. 2. Sand placement and groin construction will occur in intertidal waters.
What are the sediment characteristics?	1. Borrow source area is sand. Valuable sandy shoal habitat will be avoided and flatter areas focused on. 2. Beach and near-shore area is best characterized as sand.
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	No in response to both project areas. The near-shore area is heavily disturbed due to historic and current recreational use of the beach areas.
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	No. Wetlands are not mapped, and have not been identified in the field, within the Atlantic Shorefront area of the project.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	With regards to the borrow area, there could be surf clams and other shellfish present. This is addressed in greater depth in Sections 4 and 5 of the attached EFH Assessment Report.
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	No.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	No.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	No.
What is the typical salinity, depth and water temperature regime/range?	1. Borrow source. Unknown. 2. Beach and near shore. Ocean salinity is generally 32 parts per thousand within three miles of Long Island. Temperature ranges from 37 to 77 degrees Fahrenheit throughout the year. Depths range in this near shore environment, but are generally pretty shallow.
What is the normal frequency of site disturbance, both natural and man-made?	1. For the borrow source area, these areas are typically not recently disturbed from a physical perspective. It is recognized that commercial or recreational fishing may occur in the area. 2. For the beach and near-shore area, these areas are continually disturbed as a result of recreational activities and human utilization of the shoreline.
What is the area of proposed impact (work footprint & far afield)?	The project area is described in Section 2 of the attached EFH Assessment Report. Maps of the project area are included.

Step 3: **This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.**

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			The USACE anticipates that construction activities will occur from 2 September through 31 March. These dates align with potential protective areas for sensitive fish species such as the winter flounder, and also are protective of terrestrial species protected under jurisdiction of U.S. Fish and Wildlife Service. While the activities are further described in the attached EFH Assessment Report, the following activities will occur: 1. Dredging of sand from the borrow area. 2. Placement of sand and construction of buried seawall along the Atlantic Shoreline project reach. 3. Construction of 13 new groins and extension of 5 existing groins along the Atlantic Shoreline project reach. Construction of the groins is intended to reduce the long-term maintenance (i.e., sand placement) within the project area.
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✓		The benthic communities will be disturbed in both project areas (i.e., borrow site and near shore areas). It is recognized that there would be an indirect effect on identified EFH species due to the temporary loss of benthic food prey items. However, these effects on the benthic food-prey organisms is considered to be temporary as as benthic studies have demonstrated recolonization following dredging operations within 2 to 2.5 years. Impacts to fish community assemblages are considered minor given the large extent of the Atlantic Ocean compared to the project construction footprint, and recolonization rates of benthic communities. In addition, construction of groins could also provide living spaces for benthic communities on which fish species rely. In addition to potentially creating living spaces and increasing food availability of the project area, the proposed would potentially provide shelter for fish from wave attacks during large coastal storm events.
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.		✓	No.
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?		✓	No.

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	☐	☑	No.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.	☑	☐	Yes. It is recognized that shellfish such as surf clams could temporarily impacted as result of the sand mining, or construction in the near shore environment. Specific to the borrow source, USACE will evaluate potential steps to restrict dredging depths to exposure of a different hardened substrate that would be unsuitable to shellfish. Impacted areas are expected to be recolonized quickly given the limited extent of in-water construction footprint. Finally, impacts to shellfish as considered minor given the large extent of the Atlantic Ocean compared to the project construction footprint, and recolonization rates of shellfish and benthic communities. Finally, construction of groins could also provide living spaces for shellfish (i.e., mussels).
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?	☐	☑	
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	☑	☐	The project is being undertaken as a coastal storm risk management project, and is specifically designed be protective from coastal flooding and wave climates. It is expected that the placement of sand and construction of groins will alter near shore sediment transport. However, these changes are assumed to provide benefits to the near shore ecosystem by protecting these beaches from future coastal storms while also minimizing long-term maintenance requirements that could have cumulative effects.
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	☑	☐	Construction activities under the Recommended Plan would employ Best Management Practices (BMPs) to reduce construction impacts with emphasis on turbidity. It is recognized that sand mining as well as near shore construction will cause a short-term increase in turbidity. However, grain size of material is anticipated to be coarse and not create as much turbidity as fine grain sands. If eggs and larvae are present during construction, they could be affected. However defined construction windows should minimize this impact. In addition, during the construction period, it is assumed that adult and juvenile fish would leave the area of construction and move to nearby suitable locations outside the area of disturbance.

Will water depth change? What are the current and proposed depths?	✓	☐	The water depths will change within the borrow area. The depth of sand mining is unknown at this time. As discussed in the attached EFH Assessment Report, special consideration will be taken to maintain a consistent substrate in these borrow areas to minimize impacts to benthic and shellfish communities.
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.	☐	✓	
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	✓	☐	The project is being undertaken as a coastal storm risk management project, and is specifically designed be protective from coastal flooding and wave climates. Similar to discussion relative to sediment transport, it is expected that the placement of sand and construction of groins will provide benefits to the near shore ecosystem by protecting these beaches from future coastal storms while also minimizing long-term maintenance requirements that could have cumulative effects.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.	✓	☐	Water quality will be temporarily impacted as a result of in-water construction associated with sand mining, sand placement, and groin construction. Water quality impacts are assumed to primarily focus on turbidity and suspended sediments. Construction activities under the Recommended Plan would employ BMPs to reduce construction impacts with emphasis on turbidity. If eggs and larvae are present during construction, they could be affected. However defined construction windows should minimize this impact. In addition, during the construction period, it is assumed that adult and juvenile fish would leave the area of construction and move to nearby suitable locations outside the area of disturbance.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.	✓	☐	Ambient noise levels will be temporarily impacted as a result of in-water construction associated with sand mining, sand placement, and groin construction. The type of construction proposed is not anticipated to cause sound levels that could result in mortality or injury. However, it is assumed that they could have behavioral impacts. These primarily would be focused on fish changing a course of travel and avoiding a construction area, with limited to no impact on the survival of that individual or sustainability of the population.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	✓	☐	As discussed above, there will be temporary impacts to the benthic communities in both the borrow area as well as near shore environment. As such, it is recognized that there would be an indirect effect on identified EFH and EFH designated species due to the temporary loss of benthic food prey items. However, these effects on the benthic food-prey organisms is considered to be temporary as as benthic studies have demonstrated recolonization following dredging operations occurs within 2 to 2.5 years. Impacts to fish community assemblages are considered minor given the large extent of the Atlantic Ocean compared to the project construction footprint, and recolonization rates of benthic communities. In addition, construction of groins could also provide living spaces for benthic communities on which fish species rely. In addition to potentially creating living spaces and increasing food availability of the project area, the proposed would potentially provide shelter for fish from wave attacks during large coastal storms.

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT

Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
Spawning If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.	✓		Unlike any of the other EFH-designated species, winter flounder deposit their eggs on the bottom in nearshore waters in depths of 1 to 15 feet on mud, sand, and gravel substrates along the Atlantic coast of New York during the winter (peak spawning in February and March) (Pereira et al. 1999). There is a high probability that dredging on borrow areas in the winter would cause the mortality of winter flounder eggs. As such, USACE will try an restrict dredging to the fall or early winter, and risk of removing winter flounder eggs would be eliminated or minimized.
Nursery If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.		✓	The project is not anticipated to adversely affect nursery habitat that supports identified EFH designated species. It is recognized that larvae and juveniles could be present within the work area. However, it is recognized that scheduling will be considered to minimize adverse effects as discussed in the attached EFH Assessment Report. In addition, these highly motile species are expected to avoid the construction area and seek more suitable habitat in near proximity.
Forage If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.	✓		As discussed above, there will be temporary impacts to the benthic communities in both the borrow area as well as near shore environment. As such, it is recognized that there would be an indirect effect on identified EFH species due to the temporary loss of benthic food prey items. However, these effects on the benthic food-prey organisms is considered to be temporary as as benthic studies have demonstrated recolonization following dredging operations occurs within 2 to 2.5 years. It is also recognized that foraging or transient migratory fish will alter their behavior as a result of construction activities. However, it is assumed that these highly motile fish will find suitable habitat in near proximity and not have an adverse impact on either the individual or population.
Shelter If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.		✓	The project will not result in impacts to any habitat that provides shelter to EFH species. In fact, the construction of groins will provide additional near-shore habitat that fish could utilize for shelter or additional foraging.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.	☐	☑	Mitigation for the overall project is described in Section 5 of the attached EFH Assessment Report to account for both temporary and permanent impacts to federal and state regulated waters and wetlands. In addition, BMPs will be employed as necessary to avoid and/or minimize impacts to sensitive species of concern. Overall, the objective of the Atlantic Shoreline component of this project is to provide coastal storm protection, but also to minimize long-term maintenance of these beaches that could have cumulative effects on EFH designated species.

Step 5: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT

Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**	☐	**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	☑	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
	☐	**The adverse effect on EFH is substantial.** **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Anadromous species such as alewife (Alosa pseudoharengus), blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), and striped bass transit the inlet of the project area to reach spawning and nursery habitat in the freshwater portions of the system. Alewife and blueback herring, collectively known as river herring, spend most of their adult life at sea, but return to freshwater areas to spawn in the spring. They would be present in the project area as transients, and are likely to alter their behavior to avoid the construction area.
American eel	American eel (Anguilla rostrata) spawn in the Sargasso Sea, transit inlets as elvers and move into estuarine and freshwater habitats within coastal embayments. They inhabit these areas until they return to the sea through those inlets as adults. Given they would likely be adults within the project area, it is expected that these species will modify behavior to avoid the project area.
American shad	See discusion for alewife above.
Atlantic menhaden	Could be present within the project area, but would likely alter behavior to avoid the construction area.
blue crab	Will likely alter behavior to avoid the construction area. Construction of groins could provide long-term benefits to the species.
blue mussel	See discussion above for impacts to benthic and shellfish communities. Localized foot print could have temporary impacts, but project should provide long-term benefits to benthic communities including the blue mussel.
blueback herring	See alewife above.

Eastern oyster	N/A
horseshoe crab	The project is not expected to occur during breeding season. Individuals will avoid the construction area. Overall, the project could have long-term benefits to the species by further protection of near shore beach habitats.
quahog	See discussion above for impacts to benthic and shellfish communities.
soft-shell clams	See discussion above for impacts to benthic and shellfish communities. Construction of groins could provide long-term benefits to the species.
striped bass	Expected to avoid the construction area as adults or juveniles. No adverse impacts.
other species:	

Useful Links

National Wetland Inventory Maps

EPA's National Estuaries Program

Northeast Regional Ocean Council (NROC) Data

Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Resources by State:

Maine
Eelgrass maps

Maine Office of GIS Data Catalog

Casco Bay Estuary Partnership

Maine GIS Stream Habitat Viewer

New Hampshire
New Hampshire's Statewide GIS Clearinghouse, NH GRANIT

New Hampshire Coastal Viewer

Massachusetts
Eelgrass maps

MADMF Recommended Time of Year Restrictions Document

Massachusetts Bays National Estuary Program

Buzzards Bay National Estuary Program

Massachusetts Division of Marine Fisheries

Massachusetts Office of Coastal Zone Management

Rhode Island
Eelgrass maps

Narraganset Bay Estuary Program

Rhode Island Division of Marine Fisheries

Rhode Island Coastal Resources Management Council

Connecticut

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT Bureau of Aquaculture Shellfish

Maps CT River Watershed Council

New York

Eelgrass report

Peconic Estuary Program

NY/NJ Harbor Estuary

New Jersey

Submerged Aquatic Vegetation mapping

Barnegat Bay Partnership

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Maryland

Submerged Aquatic Vegetation mapping

MERLIN

Maryland Coastal Bays Program

Virginia

Submerged Aquatic Vegetation mapping

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The federal agency's conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review timelines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained on the HCD Consultation website and NOAA's EFH Mapper will assist you in completing this worksheet. Please note that the Mapper is currently being up-dated with new designations and EFH maps and text descriptions for many species are temporarily missing. When you open the Mapper, read the WARNING that pops up when you click on the Greater Atlantic Region. It will direct you to a document with maps and text descriptions for each of the missing New England Species and to the Mapper's Data Inventory where a data layer for all the missing species is available for downloading into GIS software. Once the Mapper is up-dated, you can do a Location Query for your project location, but until then, the only way to easily generate a list of the missing species and life stages is to use your own GIS software. Before you fill out the worksheet, we recommend that you check with the appropriate HCD staff member to ensure that your list is complete and accurate. They will be able to answer any questions that you have.

Also note that a number of new Habitat Areas of Particular Concern (HAPCs) have been designated in the Greater Atlantic Region. HAPC maps will also be added to the Mapper the next time it is up-dated. Currently, they can be viewed by following the instructions on the warning page for the region. We expect the Mapper to be fully up-dated and functional later this spring.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study (hereafter Project)

DATE: 07/25/2018

PROJECT NO.:

LOCATION (Water body, county, physical address):
Specific to the Jamaica Bay portion of the Project

PREPARER: U.S. Army Corps of Engineers, New York District

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS		
EFH Designations	**Yes**	**No**
Is the action located in or adjacent to EFH designated for eggs? List the species: Red hake, winter flounder, windowpane flounder, monkfish, long finned squid, king mackerel, Spanish mackerel, cobia. See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✔	☐
Is the action located in or adjacent to EFH designated for larvae? List the species: Red hake, winter flounder, windowpane flounder, Atlantic herring, monkfish, king mackerel, Spanish mackerel, cobia. In addition, sand tiger shark, white shark, and smoothhound shark (Atlantic stock). [The life stages of the Highly Migratory Species are broken down into neonates, juveniles, and adults. There are no 'egg' designations and neonates are assumed to correspond to the "larvae" heading.] See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✔	☐
Is the action located in or adjacent to EFH designated for juveniles? List the species: Pollock, clearnose skate, red hake, winter flounder, windowpane flounder, Atlantic herring, winter skate, bluefish, Atlantic butterfish, Atlantic mackerel, summer flounder, scup, black sea bass, spiny dogfish, king mackerel, Spanish mackerel, cobia, sandbar shark, and smoothhound shark (Atlantic Stock). See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✔	☐

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Atlantic salmon, Clearnose skate, red hake, winter flounder, windowpane flounder, Atlantic herring, little skate, winter skate, yellowtail flounder, bluefish, Atlantic butterfish, Atlantic mackerel, summer flounder, scup, black sea bass, spiny dogfish, king mackerel, Spanish mackerel, cobia, sandbar shark, and smoothhound shark (Atlantic Stock). See Tables 8 & 9 in attached EFH Assessment Report. Table is inclusive of scientific nomenclature.	✓	☐

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, sub-tidal, or water column?	The project will occur in both intertidal and sub-tidal areas. The shoreline protection features will be in the intertidal zone, where the rock sills are assumed to occur within the sub-tidal area.
What are the sediment characteristics?	The shoreline and near shore environment within the Jamaica Bay project area is best characterized as fine silts and sands. The shoreline is heavily disturbed in some areas and characteristically has a rocky, cobble substrate.
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	No.
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	Yes. The project will have temporary impacts to 0.07 acres of intertidal wetlands that will be restored in-kind and in-place. The project will have permanent impacts to 2.82 acres of intertidal wetlands.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	Yes. Shellfish are expected to occur within the project area, and likely have temporary impacts to these communities. Impacts are likely focused on burial, physical disturbance, and/or water quality (i.e., turbidity).
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	Yes. The project will have permanent impacts to 0.06 acres, and temporary impacts to 2.37 acres of mudflats. Temporary impacts are primarily the result of construction (temporary) easements associated with construction of shoreline features.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	Yes. In the most highly disturbed shorelines there is a rocky or cobble hard bottom habitat along the shoreline.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	No.
What is the typical salinity, depth and water temperature regime/range?	It is recognized that temperatures and salinity will vary throughout the Jamaica Bay portion of the project. Data was reviewed for the USGS station 01311875 at Rockaway Inlet near Floyd Bennett Field. Temperatures range from 30 to 75 Fahrenheit throughout the year. Salinities range from approximately 28 to 30 parts per thousand.
What is the normal frequency of site disturbance, both natural and man-made?	These shorelines are heavily used and are continually disturbed by both anthropogenic disturbances, as well as waves associated with large storm events.
What is the area of proposed impact (work footprint & far afield)?	The project area is described in the attached EFH Assessment Report. Maps of the project area are included.

Step 3: **This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.**

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			While the activities are further described in the attached EFH Assessment Report, the following activities will occur: 1. Construction of hardened shoreline features such as bulkheads, floodwalls, or revetments. These primarily occur in locations where they already exist. 2. Construction of NNBFs that include rock sills and wetland restoration along the intertidal, and subtidal zones.
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✓		The benthic communities will be temporarily disturbed in the project areas. This could result from temporary in water work associated with bulkhead construction, or construction of rock sills in the subtidal zone. It is recognized that there would be an indirect effect on identified EFH species due to the temporary loss of benthic food prey items. However, these effects on the benthic food-prey organisms is considered to be temporary as as benthic studies have demonstrated recolonization following dredging operations occurs within 2 to 2.5 years. Impacts to fish community assemblages are considered minor, given the large extent of Jamaica Bay compared to the project construction footprint, and recolonization rates of benthic communities. In addition, construction of rock sills will provide living spaces for shellfish and benthic communities on which fish species rely. USACE will evaluate further opportunities to include oyster and mussel restoration as part of these rock sills. In addition to potentially creating living spaces and increasing food availability of the project area, the proposed would potentially provide shelter for fish from wave attacks during large coastal storm events.
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.		✓	No.
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		Yes. The project will have temporary impacts to 0.07 acres of intertidal wetlands that will be restored in-kind and in-place. The project will have permanent impacts to 2.82 acres of intertidal wetlands. These impacts will result from construction of the proposed High Frequency Flood Risk Reduction Features (HRFRRF). It should be noted that the NNBFs that are included in this project will restore and/or create 7.65 acres of new intertidal wetlands, and an additional 0.47 acres of wetland enhancement. In addition, long-term additional wetland areas are expected to be restored as a result of rock sills. Utilizing the Evaluation of Planned Wetlands, the project will have a net benefit on ecological services provided by intertidal wetlands. This specifically includes a function identified specific to tidal fish communities. A comprehensive description of mitigation is included in Section 5 of the attached EFH Assessment Report.

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		Yes. The project will have permanent impacts to 0.06 acres, and temporary impacts to 2.37 acres of mudflats. These impacts will result from construction of the proposed HRFRRF. Temporary impacts are primarily the result of construction (temporary) easements associated with construction of shoreline features. These features will be restored to pre-existing elevation; restoring in-place and in-kind.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.	✓		Yes. It is recognized that shellfish could temporarily impacted as result of in-water construction activities associated with the HRFRRFs. Impacted areas are expected to be recolonized quickly given the limited extent of in-water construction footprint, and past results that have showed quick recolonization of disturbed intertidal areas. Overall, it is expected that with the inclusion of the NNBFs, the project will have a net-benefit on the shellfish, and overall ecological functioning, of these shorelines.
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?	✓		Yes. It is recognized that some of the most heavily disturbed shorelines have this habitat. However, due to continual disturbance in these areas, the project is expected to have little to no impact on this habitat type.
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	✓		The project is being undertaken as a coastal storm risk management project, and is specifically designed be protective from coastal flooding and wave climates. It is expected that the construction of rock sills will alter sediment transport. However, it is expected these features will promote sediment accretion and stabilize eroding shorelines. It is also recognized that hardened shorelines can have long-term impacts on bathymetry through exaggerated erosion. However, the proposed features will be constructed in areas where a hardened shoreline already exists and likely not result in significant long-term impacts beyond the existing site conditions.
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	✓		Construction activities under the Recommended Plan would employ Best Management Practices (BMPs) to reduce construction impacts with emphasis on turbidity. It is recognized that near shore construction will cause a short-term increase in turbidity. However, grain size of material is anticipated to be coarse and not create as much turbidity as fine grain sands. If eggs and larvae are present during construction, they could be affected. However defined construction windows should minimize this impact. In addition, during the construction period, it is assumed that adult and juvenile fish would leave the area of construction and move to nearby suitable locations outside the area of disturbance.

Will water depth change? What are the current and proposed depths?		✓	Not expected. Some sediment accretion is expected behind the rock sills, but this will promote the sustainability of existing intertidal wetlands.
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.		✓	
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	✓		The project is being undertaken as a coastal storm risk management project, and is specifically designed be protective from coastal flooding and wave climates. Similar to discussion relative to sediment transport, it is expected that the construction of rock sills will provide benefits to the near shore ecosystem by protecting these eroding shorelines from future coastal storms.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.	✓		Water quality will be temporarily impacted as a result of in-water construction associated with in water construction of the HRFRRFs. Water quality impacts are assumed to primarily focus on turbidity and suspended sediments. Construction activities under the Recommended Plan would employ BMPs to reduce construction impacts with emphasis on turbidity. If eggs and larvae are present during construction, they could be affected. However defined construction windows should minimize this impact. In addition, during the construction period, it is assumed that adult and juvenile fish would leave the area of construction and move to nearby suitable locations outside the area of disturbance. With the restoration of intertidal wetlands, and potential oyster and mussel restoration as part of the rock sills, the project could have a long term benefit on water quality.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.	✓		Ambient noise levels will be temporarily impacted as a result of in-water construction associated with the HRFRRFs. The type of construction proposed is not anticipated to cause sound levels that could result in mortality or injury. However, it is assumed that they could have behavioral impacts. These primarily would be focused on fish changing a course of travel and avoiding a construction area, with limited to no impact on the survival of that individual or sustainability of the population.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	✓		As discussed above, there will be temporary impacts to the benthic communities in the near shore environment. As such, it is recognized that there would be an indirect effect on identified EFH species due to the temporary loss of benthic food prey items. However, these effects on the benthic food-prey organisms is considered to be temporary as as benthic studies have demonstrated recolonization following dredging operations occurs within 2 to 2.5 years. Overall, the project will have a net benefit on EFH through the inclusions of NNBFs that strategically target wetland restoration as well as in water habitat structures.

Step 4: **This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.**

4. EFH ASSESSMENT

Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
Spawning **If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.**	✓		A number of identified EFH-designated species spawn in estuarine and coastal waters, and likely could occur in Jamaica Bay. The range of spawning times is specific to species, and varies through the year based upon list provided. While many of the listed species have buoyant eggs, it is noted that winter flounder deposit their eggs on the bottom in nearshore waters in depths of 1 to 15 feet on mud, sand, and gravel substrates along the Atlantic coast of New York during the winter (peak spawning in February and March) (Pereira et al. 1999). For other species with eggs listed as a critical life history stage protected under EFH, the impacts with proposed construction is anticipated to be minor and short term. Overall, the project will have a positive long-term impact on these species by enhancing existing spawning habitats and providing additional protection through in water habitat.
Nursery **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		It is recognized that the project will have temporary impacts to coastal wetlands, and near shore environments. There could be temporary impacts to nursery habitats. However, the NNBFs that have been included in the design will provide a net positive long-term benefit to ecological functioning. These features will provide enhanced nursery habitat to EFH designated fish by restoring intertidal wetlands, as well as providing additional protection and in water habitat structure through construction of rock sills.
Forage **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		As discussed above, there will be temporary impacts to the benthic communities and forage fish due to proposed in water construction. As such, it is recognized that there would be an indirect effect on identified EFH species due to the temporary loss of food prey items. However, these effects on the benthic food-prey organisms is considered to be temporary as as benthic studies have demonstrated recolonization following dredging operations occurs within 2 to 2.5 years. Forage fish are anticipated to return almost immediately following construction. It is also recognized that foraging fish will alter their behavior as a result of construction activities. However, it is assumed that these highly motile fish will find suitable habitat in near proximity and not have an adverse impact on either the individual or population.
Shelter **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✓	The project will not result in impacts to any habitat that provides shelter to EFH species. In fact, the construction of in water rock sills and intertidal wetlands will provide additional near-shore habitat that fish could utilize for shelter or additional foraging.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.	☐	☑	Mitigation for the overall project is described in Section 5 of the attached EFH Assessment Report to account for both temporary and permanent impacts to federal and state regulated waters and wetlands. In addition, BMPs will be employed as necessary to avoid and/or minimize impacts to sensitive species of concern. Overall, the inclusion of NNBFs as part of the project design was intended to offset any unavoidable impacts to sensitive habitat, while also providing enhanced resiliency of these shoreline ecosystems.

Step 5: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT

Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**	☐	**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	☑	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
	☐	**The adverse effect on EFH is substantial.** **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Anadromous species such as alewife (Alosa pseudoharengus), blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), and striped bass transit the inlet of the project area to reach spawning and nursery habitat in the freshwater portions of the system. Alewife and blueback herring, collectively known as river herring, spend most of their adult life at sea, but return to freshwater areas to spawn in the spring. They would be present in the project area as transients, and are likely to alter their behavior to avoid the construction area.
American eel	American eel (Anguilla rostrata) spawn in the Sargasso Sea, transit inlets as elvers and move into estuarine and freshwater habitats within coastal embayments. They inhabit these areas until they return to the sea through those inlets as adults. Given they would likely be adults within the project area, it is expected that these species will modify behavior to avoid the project area.
American shad	See discusion for alewife above.
Atlantic menhaden	Could be present within the project area, but would likely alter behavior to avoid the construction area.
blue crab	Will likely alter behavior to avoid the construction area. Construction of rock sills could provide long-term benefits to the species.
blue mussel	See discussion above for impacts to benthic and shellfish communities. Localized foot print could have temporary impacts, but project should provide long-term benefits to benthic communities including the blue mussel.
blueback herring	See alewife above.

Eastern oyster	See discussion above for impacts to benthic and shellfish communities. Localized foot print could have temporary impacts, but project should provide long-term benefits to benthic communities including the oyster populations. In fact, USACE will explore opportunities for oyster restoration as part of the rock sills.
horseshoe crab	The project is not expected to occur during breeding season. Individuals will avoid the construction area. Overall, the project could have long-term benefits to the species by further protection of near shore beach habitats.
quahog	See discussion above for impacts to benthic and shellfish communities.
soft-shell clams	See discussion above for impacts to benthic and shellfish communities. Construction of rock sills could provide long-term benefits to the species.
striped bass	Expected to avoid the construction area as adults or juveniles. No adverse impacts.
other species:	

Useful Links

National Wetland Inventory Maps

EPA's National Estuaries Program

Northeast Regional Ocean Council (NROC) Data

Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Resources by State:

Maine
Eelgrass maps

Maine Office of GIS Data Catalog

Casco Bay Estuary Partnership

Maine GIS Stream Habitat Viewer

New Hampshire
New Hampshire's Statewide GIS Clearinghouse, NH GRANIT

New Hampshire Coastal Viewer

Massachusetts
Eelgrass maps

MADMF Recommended Time of Year Restrictions Document

Massachusetts Bays National Estuary Program

Buzzards Bay National Estuary Program

Massachusetts Division of Marine Fisheries

Massachusetts Office of Coastal Zone Management

Rhode Island
Eelgrass maps

Narraganset Bay Estuary Program

Rhode Island Division of Marine Fisheries

Rhode Island Coastal Resources Management Council

Connecticut

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT Bureau of Aquaculture Shellfish

Maps CT River Watershed Council

New York

Eelgrass report

Peconic Estuary Program

NY/NJ Harbor Estuary

New Jersey

Submerged Aquatic Vegetation mapping

Barnegat Bay Partnership

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Maryland

Submerged Aquatic Vegetation mapping

MERLIN

Maryland Coastal Bays Program

Virginia

Submerged Aquatic Vegetation mapping

US Army Corps
of Engineers®
New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D4
Section 404(b)(1) Guidelines Evaluation

August 2018

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study

Draft Final General Reevaluation Report and Environmental Impact Statement

Section 404(b)(1) Guidelines Evaluation

1 INTRODUCTION

This attachment to Appendix D (Environmental Compliance) of the Revised Draft East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Integrated Hurricane Sandy General Re-evaluation Report/Environmental Impact Statement (HSGRR/EIS) presents a Section 404(b)(1) Guideline evaluation for the comprehensive evaluation of improvements to the Rockaway Atlantic Ocean Shoreline, and Jamaica Bay back bay shoreline elements of the project area. The evaluation is based on the regulations found at 40 CFR 230, Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged or Fill Material. The regulations implement Sections 404(b) and 501(a) of the Clean Water Act, which govern the disposal of dredged and fill material inside the territorial sea baseline (§230.2(b)).

As stated in Section 230.10(a)(4):

> For actions subject to NEPA, where the Corps of Engineers is the permitting agency, the analysis of alternatives required for NEPA environmental documents, including supplemental Corps NEPA documents, will in most cases provide the information for the evaluation of alternatives under these Guidelines.

The integrated Draft Hurricane Sandy General Reevaluation Report/Environmental Impact Statement (HSGRR/EIS), to which this evaluation is an appendix, provides the documentation necessary to attest that the project is fully in compliance with the Section 404(b)(1) guidelines. The HSGRR/EIS provides a full project description and location, description of existing conditions, full alternatives analysis, and description of potential impacts as a result of the project and the project's construction.

The analysis provided within the HSGRR/EIS documents that the implementation of the Recommended Plan will not cause or contribute to significant degradation of the waters of the United States, as is demonstrated in the following sections.

The following Section 404(b)(1) evaluation is presented in a format consistent with typical evaluations in the New York area and addresses all required elements of the evaluation.

2 PROJECT DESCRIPTION

a. Location: The study area consists of the Atlantic Coast of New York City between East Rockaway Inlet and Rockaway Inlet, and the water and lands within and surrounding Jamaica Bay, New York. The Recommended Plan (RP) includes physical Coastal Storm Risk Management (CSRM) elements along the oceanfront along Rockaway, and along the coastline of the Rockaway Inlet and Jamaica Bay. The study area is vulnerably located within the Federal Emergency Management Agency (FEMA) regulated 100-year floodplain. The shorefront area, which is a peninsula approximately 10 miles in length, generally referred to as Rockaway, separates the Atlantic Ocean from Jamaica Bay immediately to the north. The greater portion of Jamaica Bay lies in the Boroughs of Brooklyn and Queens, New York City, and a section at the eastern end, known as Head-of-Bay, lies in Nassau County. More than 850,000 residents, 48,000 residential and commercial structures, and scores of critical infrastructure features such as hospitals, nursing homes, wastewater treatment facilities, subway, railroad, and schools are within the study area.

b. General Description: During Hurricane Sandy in October 2012, tidal waters and waves directly impacted the Atlantic Ocean shoreline. Tidal waters amassed in Jamaica Bay by entering through Rockaway Inlet and by overtopping and flowing across the Rockaway Peninsula. Effective coastal storm risk management for communities within the study area requires reductions in risk from two sources of coastal storm damages: inundation, wave attack with overtopping along the Atlantic Ocean shorefront of the Rockaway peninsula and flood waters amassing within Jamaica Bay via the Rockaway Inlet.

The RP includes Atlantic Ocean shorefront protection (composite seawall, beach renourishment, groins) along the Atlantic Coast of the Rockaway peninsula and both structural and non-structural high frequency flooding risk reduction features (HFFRRFs) and Natural and Nature Based Features (NNBFs) along the Jamaica Bay coastline. No significant adverse impacts from construction or operation of the RP on environmental resources in the study area have been identified in the EIS. Short-term, direct, minor adverse impacts to aesthetics, noise, water quality, aquatic habitats and species, marine and terrestrial species, and recreation resources would occur during construction of the RP. These impacts would end upon completion of construction of the RP.

c. Authority and Purpose: The RP identification and analyses will be conducted by USACE under Section 1135 of the Water Resources Development Act of 1986, as amended. Under Section 1135, the USACE is authorized to review the need for modifications of existing projects for the purpose of providing measures to improve environmental quality and is authorized to address degradation of the environment caused by a past USACE project.

For many years prior to Hurricane Sandy, study area CSRM efforts have emphasized Atlantic shoreline features with the State of New York as the local sponsor. In October 2012, coastal areas in vicinity to New York City were devastated by the impacts of Hurricane Sandy. Awareness of the need for an integrated approach to CSRM opportunities in Jamaica Bay and surrounding communities has increased since Hurricane Sandy. As a result of the devastation associated with Hurricane Sandy, the USACE has been tasked to address “coastal resiliency” and “long-term sustainability” in addition to the traditional USACE planning report categories of "economics, risk, and environmental compliance" (USACE 2013).

Accordingly, USACE has prepared a Revised Draft Hurricane Sandy General Reevaluation Report/Environmental Impact Statement (HSGRR/EIS) examining coastal storm management (CSRM) problems and opportunities for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay study area. The goal of the Draft HSGRR/EIS is to identify solutions that will reduce Atlantic Ocean shoreline and Jamaica Bay vulnerability to storm damage over time, in a way that is sustainable over the long-term, both for the natural coastal ecosystem and for communities.

Consistent with current USACE planning guidance, the study team identified and screened alternatives to address CSRM, and is presenting the RP. The RP identifies the overall project features, with the acknowledgement that the specific dimensions of the plan have not been finalized. These final design components will be undertaken after review of the Revised Draft HSGRR/EIS. The Revised Draft HSGRR/EIS will undergo public review, policy review, Agency Technical Review (ATR), and Independent External Peer Review (IEPR). The USACE study team will respond to review comments, then present a recommended plan and develop a Final HSGRR/EIS.

d. General Description of Placement Material: Sand that is compatible to the existing Rockaway Atlantic Ocean shoreline will be pumped in from a proposed offshore borrow area, and rock sill is proposed for some elements of the Jamaica Bay component of the overall project.

e. Proposed Discharge Site: Under the RP, the dredged sand would be placed along the Rockaway Atlantic Ocean shoreline, and rock sill is proposed for some elements of the Jamaica Bay component of the overall project.

f. Disposal Method: Use of hydraulic dredging equipment for the initial construction and renourishment efforts, as well as for Jamaica Bay components of the overall project, is proposed.

3 FACTUAL DETERMINATIONS

a. Physical Substrate Determinations (Atlantic Coast/Jamaica Bay)

(1) The HSGRR Coastal Storm Risk Management plan for the area from East Rockaway Inlet to Rockaway Inlet and the lands within and surrounding Jamaica Bay New York consists of the following components, which are generally described for two Planning Reaches: 1) A reinforced dune and Berm Construction, in conjunction with groins in select locations along the Atlantic Ocean Shoreline; 2) a line of protection along Jamaica Bay and Rockaway Inlet comprised of CSRM features in locations surrounding Jamaica Bay (See HSGRR/EIS Section 6.2 for extensive plan details). If additional CSRM features are further developed, additional NEPA documentation and resource agency coordination would be provided, as necessary. This RP description includes the maximum footprint for

the plan, however the footprint may be revised based on public and agency comments as well as new information. Both elements (i.e., Atlantic Ocean Shoreline, Jamaica Bay/Back Bay shoreline) of the entire project are subject to evaluation under the 404(b)(1) jurisdiction.

The plan (summary provided here) along the Atlantic Ocean Shorefront consists of:

- A composite seawall with a structure crest elevation of +17 feet (NAVD88) – the dune elevation is +18 feet (NAVD88), and the design berm width is 60 feet;
- A beach berm elevation of +8 ft (NAVD88) and a depth of closure of -25 ft (NAVD88);
- A total beach fill quantity of 1.6 million cy for the initial placement, including tolerance, overfill and advanced nourishment with a 4-year renourishment cycle of 1,021,000 cy, resulting in a minimum berm width of 60 feet;
- Extension of 5 existing groins; and
  Construction of 13 new groins.
- The east beachfill taper is approximately 3,000 ft in shorefront length from Beach 19th Street east to Beach 9th Street. The taper comprises of approximately 1,000 ft of dune and beach taper including reinforced dune feature and approximately 2,000 ft of dune and beach fill without reinforced dune feature. In addition to the tapering of berm width, the dune elevation also tapers from an elevation of +18 ft (NAVD88) at 19th Street down to approximately +12 ft (NAVD88) at Beach 9th Street which will be tied into the existing grade. The west beachfill taper is approximately 5,000 ft in shorefront length from Beach 149th Street west to Beach 169th street fronting Riis Park. The beachfill taper will be beach fill only with a berm width tapered from the design width at 149th Street to the existing width and height at 169th Street. In addition to the beachfill taper, a tapered groin system comprised of three (3) rock groins is included for this section.

The plan along the Jamaica Bay/Back Bay consists of:

See RDGRR/EIS Section 6.2 for plan details, and summary.

(2) Sediment Type: Sediments similar to those present in the placement area will be utilized. No impacts are anticipated. (See "Borrow Source Investigation Appendix B," April 7, 2016; and "Draft Reformulation Study," March 26, 2015.)/ There will be no significant impact to sediment from implementation of the Jamaica Bay Recommended Plan features.

(3) Dredged Material Movement: Minor short-term movement and existing shore processes will continue/NA

(4) Physical Effects on Benthos: Minor short-term disruption at the Atlantic Ocean Shoreline, and habitat exchange due to rock sill placement at some segments of Jamaica Bay Shoreline. Creation of rock sill features provides protection for the subtidal and intertidal

habitats, as well as provide a hard bottom habitat for increased ecological production. These features provide additional opportunities for oyster and ribbed mussel habitat creation.

(5) Other Effects: None identified

(6) Action to Minimize Impacts: See Section 6.

b. Water Circulation, Fluctuations, and Salinity Determinations

(1) Water

a. Salinity: Proposed project is not expected to affect salinity because beach fill does not govern the overall water mass movements (tidal flow and river discharge) that control salinity.

b. Water Chemistry: No major impacts are expected.

c. Clarity: Temporary increase in turbidity will occur from sediment resuspension during placement of the material/ No significant effect from implementation of Jamaica Bay features.

d. Color: Minor temporary changes possible but no major short- or long-term impacts are expected/NA

e. Odor: No measurable impacts are expected/NA.

f. Taste: Not applicable/NA

g. Dissolved Gas Levels: Possible short-term variation may occur due to turbulence created by placement of the material on the beach/NA.

h. Nutrients: Temporary and localized nutrient increases may occur due to sediment resuspension during beach and rock fill activities. No long-term increase in nutrients and eutrophication will result from the Recommended Plan /NA.

i. Eutrophication: None identified/NA

j. Other: None identified

(2) Current Patterns and Circulation: No significant impacts identified

(3) Normal Water Level Fluctuations: No significant impacts identified/NA

(4) Salinity Gradients: No significant impacts expected/NA

(5) Actions to Minimize Impacts: Implement recommendations from National Marine Fisheries Service, USFWS and state and local regulatory agencies to maintain potential impacts at minor, less-than-significant adverse levels.

c. Suspended Particulate/Turbidity Determination

(1) Change at Disposal Site: Short-term, localized increases in suspended sediment/turbidity as a result of placement of fill material.

(2) Effects on Chemical and Physical Properties of the Water Column: Resuspension

impacts should be minimal since particles will settle out fairly rapidly and no toxic metals or organic compounds are anticipated to be encountered in the borrow area source material/NA.

(3) Effects on Biota: Short-term exposure due to localized sediment resuspension during placement of material. No long-term significant effects are projected/NA.

(4) Action to Minimize Impacts: Placement of material will be completed as early as possible to allow for optimum recruitment of benthic organisms within the placement area. Use of BMPs, per USFWS, NMFS and state and local regulatory agency recommendations will be utilized to minimize potential significant impacts/NA.

d. Contaminant Determination: No impacts identified.

e. Aquatic Ecosystems and Organisms Determination: Possible effects to those species that are in the immediate area of placement. No significant impacts are expected/NA.

f. Proposed Disposal Site Determination: Not applicable.

g. Determination of Cumulative Effects on the Aquatic Ecosystem: See EIS Section 7.25.

h. Determination of Secondary Effects on the Aquatic Ecosystem: None identified.

4 FINDINGS OF COMPLIANCE OR NONCOMPLIANCE

a. There are no practicable alternatives for the RP under the jurisdiction of Section 404(b)(1) Guidelines.

b. The RP does not appear to violate applicable state water quality standards or effluent standards.

c. The RP will not have significant adverse impacts on endangered species or their critical habitats. Formal coordination with the USFWS and NMFS under Section 7 of the Endangered Species Act of 1973 will be completed to ensure the safety of any transient species that may be present during construction.

d. The RP will not result in significant adverse impacts on human health or welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife and special aquatic sites.

e. All appropriate steps to minimize adverse environmental impacts will be implemented during construction and operation of the RP.

f. No significant adaptations of the guidelines were made relative to this evaluation.

5 CONCLUSIONS

Based on the above, the RP is determined to be in compliance with the Section 404(b)(1) Guidelines, subject to appropriate and reasonable conditions, to be determined on a case-by-case basis, to protect the public interest.

US Army Corps of Engineers®
New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D5
Coastal Zone Management Program
Federal Consistency Determination

August 2018

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study

Revised Draft General Reevaluation Report and Environmental Impact Statement

New York (and New York City Local Waterfront Development Plan) Coastal Zone Management Program Federal Consistency Determination

As required under the Federal Coastal Zone Management Act, the USACE reviewed the Atlantic Ocean Shorefront Coastal Storm Reduction Management Unit (CSRMU) of the Recommended Plan in relation to the applicable policies of the New York State Coastal Zone Management Program. A number of questions under Part C of the New York State Coastal Management Program (NYS CMP) Federal Consistency Assessment Form (New York State Department of State (NYSDOS), Division of Coastal Resources (DCR), 2003b) were answered in the affirmative; therefore, as stated under Part D, number two, it is necessary to analyze the Project in more detail with respect to its consistency with the *State Coastal Policies* (NYSDOS DCR, 2003c) of the NYS CMP, as well as New York City's *The New Waterfront Revitalization Program* (WRP) (New York City Department of City Planning, Consistency Assessment Form 2016). Following is a list of the State and city policies in question and a brief statement of how the Project is consistent with each of these policies. Policies that are not listed were answered in the negative with respect to this Project.

1 DEVELOPMENT POLICIES

1.1 Policy 1

Restore, revitalize, and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational, and other compatible uses. (Question 1c)

The Project will restore deteriorated waterfront areas along the Atlantic shorefront and along the Jamaica Bay / Back Bay on Rockaway peninsula. The project will protect the environment and human development around Jamaica Bay, as well as coastal resources of Kings, Queens, and Nassau counties, which will enhance existing and anticipated recreational uses in the future, namely the use of Rockaway Beach and the recently improved Rockaway Boardwalk. The Project will renourish the beachfront and improve existing groins, as well as offer flood protection to residents and enhance natural resources along the Jamaica Bay perimeter, to further reduce the type of damage to all waterfront areas (natural and residential areas), that occurred during Hurricane Sandy. Accordingly, the Project is consistent and compatible with the character of the area, will not adversely affect adjacent and upland views, will not cause further deterioration of the shoreline, and will reduce the extent of adverse impacts to the economic base of the community from potential future coastal storms similar to Hurricane Sandy.

1.2 Policy 2

Facilitate the siting of water-dependent uses and facilities on or adjacent to coastal waters. (Questions 1b and 3a)

The Project includes flood and erosion protection structures that will physically alter land along the shoreline and under coastal waters, and requires siting of water-dependent uses and facilities along the Atlantic Ocean shorefront and along the Jamaica Bay / Back Bay shoreline on the Rockaway peninsula. The Project will not preempt the reasonably foreseeable development of water-dependent uses. The Project is designed to add to the public use and enjoyment of the water's edge, as well as reducing the extent of damage to coastal resources that occurred during Hurricane Sandy. The guidelines for site choices listed under this policy apply to this Project as follows:

1. Competition for space: The Project will provide increased protection to water-dependent activities as well as to existing and reasonably foreseeable development located inland of the CSRMUs. There is no competing use for the CSRMU locations.
2. In-place facilities and services: Existing in-place facilities and service will be sufficient to support this Project.
3. Access to navigational channels: Shipping, fishing, and boating activities are not planned for the Project site. The Project will not prevent access to existing navigation channels
4. Compatibility with adjacent uses and protection of other coastal resources: The Project is compatible with adjacent properties and will enhance the surrounding community and environmental quality of Rockaway by protecting coastal resources from damaging coastal storms similar to Hurricane Sandy.
5. Preference to underutilized sites: Not applicable to the Project. However, the Project protects underutilized sites from coastal storm damage.
6. Providing for expansion: The Project does not prevent current or reasonably foreseeable future water-dependent uses. The CSRMUs are designed to provide 50-years of coastal storm protection with a minimal footprint such that long-term space needs and future demand for land are not limited.

2 FISH AND WILDLIFE POLICIES

2.1 Policy 7

Significant coastal fish and wildlife habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats. (Question 2c)

The Project will affect and be located in the NYSDEC-designated Critical Environmental Area. The Project involves dredging and excavation, physical alteration of shore area through beach renourishment and construction of flood protection and environmental enhancement features and structures The Project will protect coastal habitat and reduce damage from coastal storms similar to Hurricane Sandy, which is in direct accord with this policy, as well as the direction of *The New Waterfront Revitalization Program* regarding Special Natural Waterfront Areas

(SWNA); the western portion of the Rockaway peninsula is a proposed SNWA as of October 30, 2013. Accordingly, the Project will increase the quality and quantity of the physical, biological, and chemical parameters along the Atlantic shorefronts of the Rockaway Peninsula and Jamaica Bay Back Bay shoreline.

This policy requires that a narrative for each significant habitat be provided to aid in consistency determination. As stated above, the Project area has been identified by NYSDEC as a CEA and by NYC as a proposed SWNA. Following is a narrative for the Project site, noting the five required items.

(1) The Project is located in Kings and Queens counties, and will provide protection to coastal areas in these counties as well as southwestern Nassau County.

(2) The Jamaica Bay Ecological Restoration and Research Team reports (Tanacredi *et al*, 2002) observed many different types of vegetative, fish, bird, and other wildlife species. These species are discussed in the Revised Draft Integrated General Reevaluation Report and Environmental Impact Statement (RDGRR/EIS).

(3) Physical, biological, and chemical parameters that will be improved and/or increased by the Project include protection of coastal habitat and associated wildlife and habitat and erosion control.

(4) Dredging would be a potential activity to impact offshore coastal habitat, while beachfront renourishment, groins, and seawalls will require filling along the coastline and may impact nearshore benthic, fish and bird habitat. However, all work will utilize best management practices to limit impacts to offshore benthic and fish communities.

(5) The quantitative basis used to rate the habitat is provided in the RDGRR/EIS.

3 FLOODING AND EROSION HAZARDS POLICIES

3.1 Policy 11

Buildings and other structures will be sited in the coastal area so as to minimize damage to property and the endangering of human lives caused by flooding and erosion. (Questions 1a, 1b, and 2b)

The Project will result in physical changes to the Atlantic shorefront and the Back Bay of Jamaica Bay, Rockaway. The Project is also located in a federally-designated flood hazard area. However, the Project is designed to protect coastal resources in these areas through a combination of seawalls, groins, floodwalls, bulkheads, nature-based non-structural features and beach renourishment. Therefore, the Project will minimize damage to property and reduce the risk to human lives caused by flooding and erosion from coastal storms similar to Hurricane Sandy.

3.2 Policy 12

Activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural protective features including beaches, dunes, barrier islands and bluffs. (Question 1b and 2b)

The Project will require physical alteration of onshore and offshore coastal area; is located in flood and erosion hazard areas; and will affect beaches, dunes, and barrier islands. However, the coastal resources this policy is intended to protect will be protected by the Project, which will reduce damage to these coastal resources from coastal storms similar to Hurricane Sandy.

3.3 Policy 13

The construction or reconstruction of erosion protection structures shall be undertaken only if they have a reasonable probability of controlling erosion for at least thirty years as demonstrated in design and construction standards and/or assured maintenance or replacement programs. (Question 3c)

The Project requires construction of flood and erosion control structures (ex. seawalls, groins, beach renourishment) as well as the construction of nature-based non-structural features. The CSRMUs are designed to provide 50-years of protection from coastal storms similar to Hurricane Sandy. The Project includes procedures for scheduled maintenance to ensure the CSRMUs remain effective over this time frame. Should the magnitude of coastal storms increase above conditions predicted for the next 50 years (see RDGRR/EIS for sea level change scenarios used to calculate the 50 year projection), USACE will assess how best to upgrade the CSRMUs to provide increased protection from such coastal storm events.

3.4 Policy 14

Activities and development, including the construction or reconstruction of erosion protection structures, shall be undertaken so that there will be no measurable increase in erosion or flooding at the site of such activities or development, or at other locations. (Question 3c)

The Project requires construction of flood and erosion control structures (seawalls, groins, floodwalls, bulkheads beach renourishment), as well as the construction of nature-based non-structural features. The design of these structures accounts for subsequent changes that will occur to littoral transport of sediment to adjacent shorelines; these design elements are described in the RDGRR/EIS. Accordingly, as required, construction and operation of the Project CSRMUs will not increase erosion or flooding at the site or at other locations.

3.5 Policy 15

Mining, excavation or dredging in coastal waters shall not significantly interfere with the natural coastal processes which supply beach materials to land adjacent to such waters and shall be undertaken in a manner which will not cause an increase in erosion of such land. (Question 1h)

The Project will result in dredging from a borrow source located approximately 3-4 miles south of the Rockaway Atlantic shorefront. Dredging near this area for other borrow source material has occurred for several USACE-led beachfront renourishment projects; these prior dredging activities have not reduced the natural regenerative powers of the shoreland. Regardless, the natural regenerative powers of the subject project shoreline have decreased such that renourishment, groins, and seawalls are necessary to limit further loss of shoreline sediment due to coastal storms and normal coastal hydrodynamics, and not due to excavation or dredging in coastal waters.

3.6 Policy 16

Public funds shall only be used for erosion protective structures where necessary to protect human life, and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long term monetary and other costs including the potential for increasing erosion and adverse effects on natural protective features. (Question 3c)

The Project requires construction of flood and erosion control structures (seawalls, groins, floodwalls, bulkheads, and beach renourishment), as well as the construction of natural and nature-based non-structural features. The economic impacts associated with construction and operation of the CSRMUs are significantly lower than the cost to repair damages reasonably anticipated to occur from coastal storms similar to Hurricane Sandy. Economic models are presented in the RDGRR/EIS. Accordingly, the public benefits outweigh the cost to construct and operate the Project CSRMUs.

3.7 Policy 17

Non-structural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible. (Question 2b)

The Project will affect and will be located in flood and erosion hazard areas. The CSRMUs will provide flood and erosion control through beach renourishment, seawalls, floodwalls, bulkheads, groins and natural and nature-based non-structural features. The beach renourishment would be considered a non-structural measure. However, beach renourishment alone is not sufficient to minimize damage to nature resources and property from flooding and erosion that this policy seeks to ensure. The RDGRR/EIS includes the results of the analysis showing that non-structural measures alone are insufficient. Accordingly, as structural measures (ex. groins, seawall) are likely necessary to minimize damage to these coastal resources from coastal storms similar to Hurricane Sandy, non-structural measures are also included, where feasible, as applicable.

4 PUBLIC ACCESS POLICIES

4.1 Policy 19

Protect, maintain, and increase the level and types of access to public water-related recreation resources and facilities. (Yes to Question 2h; no to Question 1d)

The Project will affect and will be located adjacent to State, County, and local parks. The CSRMUs will protect these resources from damage caused by coastal storms similar to Hurricane Sandy. Additionally, the CSRMUs will not reduce access to public water-related recreation resources or facilities. In fact, the CSRMUs will reduce damage to the transportation systems, parking areas, and pedestrian walkways that occurred during Hurricane Sandy. Additionally, the Project will prevent a decrease in access to and use of recreational areas (e.g. Rockaway Beach and Jamaica Bay) due to flooding that would continue if the Project is not implemented.

4.2 Policy 20

Access to the publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publicly-owned shall be provided and it shall be provided in a manner compatible with adjoining uses. (Questions 1b and 2h; no to Question 1d)

The Project will physically alter land along the shoreline, land under water, and in coastal waters. These alterations are necessary for the construction of CSRMUs that will protect coastal land areas from damage caused by coastal storms similar to Hurricane Sandy. These CSRMUs will not reduce existing or potential public access to the foreshore and to lands immediately adjacent to the foreshore or the water's edge.

5 RECREATION POLICIES

5.1 Policy 21

Water-dependent and water-enhanced recreation will be encouraged and facilitated, and will be given priority over non-water-related used along the coast. (Question 3a)

The Proposed Project requires CSRMUs along the waterfront. The CSRMUs will not prohibit access to waterfront sites. Additionally, the Project will prevent a decrease in the use of waterfront recreational areas (e.g. Rockaway Beach and Jamaica Bay) that is predicted to otherwise occur if the Project is not implemented (RDGRR/EIS). Additionally, the CSRMUs will reduce damage to coastal resources from coastal storms similar to Hurricane Sandy.

5.2 Policy 22

Development, when located adjacent to the shore, will provide for water-related recreation, whenever such use is compatible with reasonably anticipated demand for such activities, and is compatible with the primary purpose of the development. (Questions 1a and 3a)

The Project will result in large physical changes within a coastal area, and the Project will require an EIS. Additionally, the Project is located along waterfront sites. The CSRMUs will not restrict passive water- related recreational uses or diminish scenic views of the coastal shoreline. The beachfront renourishment along the Atlantic shoreline provides greater area for recreational activities. Additionally, the groins and seawall reduce damage to coastal resources (e.g. Jamaica Bay) caused by coastal storms similar to Hurricane Sandy.

6 HISTORIC AND SCENIC RESOURCES POLICIES

6.1 Policy 23

Protect, enhance and restore structures, districts, areas or sites that are of significance in the history, architecture, archaeology or culture of the state, its communities, or the nation. (Question 2i)

The Project will affect and be located adjacent to National and NYC historic resources. However, the Project will have a beneficial impact on these resources by protecting them from damage caused by coastal storms similar to Hurricane Sandy. USACE has closely coordinated the project design with the NY SHPO and Federally-recognized Native American Tribes (a record of coordination is provided in the RDGRR/EIS).

6.2 Policy 25

Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area. (Question 1a)

The Project will require a large physical change to sites within the coastal area which will require the preparation of an EIS. However, by reducing damage to natural and man-made resources from coastal storms similar to Hurricane Sandy, the Project will ultimately protect and enhance the overall scenic quality of the coastal area.

7 ENERGY AND ICE MANAGEMENT POLICIES

7.1 Policy 28

Ice management practices shall not interfere with the production of hydroelectric power, damage significant fish and wildlife and their habitats, or increase shoreline erosion or flooding. (Question 1b)

The Project will physically alter land along the shoreline, land under water, and in coastal waters. These alterations are necessary for the construction of CSRMUs that will protect coastal land areas from damage caused by coastal storms similar to Hurricane Sandy. Ice management practices are not anticipated to be necessary for these CSRMUs.

8 WATER AND AIR RESOURCES POLICIES

8.1 Policy 30

Municipal, industrial, and commercial discharge of pollutants, including but not limited to, toxic and hazardous substances, into coastal waters will conform to state and national water quality standards. (Question 3d)

The Project will require State water quality permits or certifications. However, the Project is not anticipated to result in pollutant discharge during construction or operation of the CSRMUs.

8.2 Policy 32

Encourage the use of alternative or innovative sanitary waste systems in small communities where the costs of conventional facilities are unreasonably high, given the size of the existing tax base of these communities. (Question 1a)

The Project will require a large physical change to sites within the coastal area which will require the preparation of an EIS. These alterations are necessary for the construction of CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. The Project will have no impact on the use of alternative or innovative sanitary waste systems in small communities.

8.3 Policy 35

Dredging and filling in coastal waters and disposal of dredged material will be undertaken in a manner that meets existing State permit requirements, and protects significant fish and wildlife habitats, scenic resources, natural protective features, important agricultural lands, and wetlands. (Questions 1b, 1h, and 1i)

The Project will physically alter land along the shorelines, land under water, and in coastal waters. These alterations are necessary for the construction of CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. The Atlantic shorefront CSRMU will require dredging in a borrow area in coastal waters located approximately 3 miles south of the Rockaway peninsula. Additionally, beach renourishment, construction of seawalls and groins, as well as bulkheads, floodwalls and rock sills along the Jamaica bay shoreline will require placement of constructed elements in submerged coastal areas. The USACE has analyzed the impact from constructing these CSRMUs on the resources in question, and has concluded that while there will be no significant adverse impacts on these resources, the project will be constructed according to all federal, state and local permit requirements. The methods and results of these analyses are presented in the RDGRR/EIS.

8.4 Policy 37

Best management practices will be utilized to minimize the non-point discharge of excess nutrients, organics and eroded soils into coastal waters. (Question 1a)

The Project will require a large physical change to sites within the coastal area which will require the preparation of an EIS. These alterations are necessary for the construction of CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. Accordingly, the Project will reduce the non-point discharge of soils that otherwise may have been eroded and discharged into coastal waters during coastal storms.

8.5 Policy 38

The quality and quantity of surface water and groundwater supplies will be conserved and protected, particularly where such waters constitute the primary or sole source of water supply. (Questions 1a and 3d)

The Project will require a large physical change to sites within the coastal area which will require the preparation of an EIS. These alterations are necessary for the construction of CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. The Project will require State water quality permits or certifications. However, the Project CSMRUs will not encounter bedrock aquifers or surface water drinking water resources. Therefore, the Project will have no impact on surface water or groundwater supplies.

8.6 Policy 41

Land use or development in the coastal area will not cause national or state air quality standards to be violated. (Questions 1a and 3e)

The Project will require a large physical change to sites within the coastal area which will require the preparation of an EIS. These alterations are necessary for the construction of

CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. Construction of the Project will exceed the *de minimis* Air Quality Thresholds for nitrogen oxides (NOx), for which a full mitigation plan, per General Conformity Rule (GCR) of the Clean Air Act (CAA) is designed to reduce those thresholds back down to zero, as currently presented for authorization in the RDGRR/EIS.

8.7 Policy 43

Land use or development in the coastal area must not cause the generation of significant amounts of acid rain precursors: nitrates and sulfates. (Questions 1a and 3e)

The Project will require a large physical change to sites within the coastal area which will require the preparation of an EIS. These alterations are necessary for the construction of CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. Construction of the Project will exceed the *de minimis* Air Quality Thresholds for nitrogen oxides (NOx), for which a full mitigation plan, per General Conformity Rule (GCR) of the Clean Air Act (CAA) is designed to reduce those thresholds back down to zero, as currently presented for authorization in the RDGRR/EIS.

9 WETLANDS POLICY

9.1 Policy 44

Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas. (Questions 1b and 2a)

The Project will physically alter land along the shoreline, land under water, and in coastal waters. The Project will also affect and be located adjacent to tidal wetlands. These alterations are necessary for the construction of CSRMUs that will reduce damage to coastal resources caused by coastal storms similar to Hurricane Sandy. The RDGRR/EIS provides detailed analyses of impacts to fish and wildlife habitat, and any mitigation that is required to compensate for significant (permanent, extensive, long term) losses.

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Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D6
Programmatic Agreement Among:

U.S. Army Corps of Engineers
New York State Historic Preservation Office
National Park Service
Advisory Council on Historic Preservation

August 2018

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study

Revised Draft General Reevaluation Report and Environmental Impact Statement

Preliminary Draft Programmatic Agreement among

The United States Army Corps of Engineers
The New York State Historic Preservation Office
The National Park Service
The Advisory Council on Historic Preservation

WHEREAS, the US Army Corps of Engineers, New York District (District) is proposing to undertake measures to reduce coastal storm damages and minimize impact on the Rockaway Peninsula from East Rockaway Inlet to Rockaway Inlet along the Atlantic Ocean and the Jamaica Bay shorelines as well as locations within Jamaica Bay (Project); and

WHEREAS, the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York Hurricane Sandy General Re-Evaluation Study was authorized by the House of Representatives dated 27 September 1997 and Public Law 113-2 (29 Jan 13), the Disaster Relief Appropriations Act of 2013 authorized Corps projects for reducing flood and storm risks in the Hurricane Sandy affected area that have been or are under construction, which includes the Project; and

WHEREAS, the New York State Department of Environmental Conservation is the non-federal sponsor and New York City, through the New York City Mayor's Office Recovery and Resiliency is the local sponsor to New York State; and

WHEREAS, the Project consists of levee, buried seawall, new groin construction, extension of existing groins, and beach renourishment along the Atlantic Ocean shoreline of the Rockaway Peninsula, as well as residual high frequency flood risk reduction features consisting of berms, floodwalls, and bulkheads along the southeast side of Jamaica Bay (Appendices A and B); and

WHEREAS, the Area(s) of Potential Effect include the offshore borrow sites, near shore sand placement, the alignments for all of the Project features, the viewsheds associated with affected historic properties, including those from the shore to the Atlantic Ocean (Appendices A and B); and

WHEREAS, the Jacob Riis Park Historic District, and the Far Rockaway Bungalow Historic District are located within the APE along the Rockaway Peninsula (Appendices A and B); and

WHEREAS, the high frequency flood risk reduction features and other Project alignments have the potential to be sensitive for archaeological resources (Appendices A and B); and

WHEREAS, pursuant to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C 306108), the District has determined that implementation of the Project will have the potential to have an adverse effect on the Jacob Riis Park Historic District and archaeological resources located within the alignment and the high frequency flood risk reduction measures; and

WHEREAS, the National Park Service (NPS) manages and administers the Jacob Riis Historic District, which is located within the Gateway National Recreation Area; and

WHEREAS, the District will consult with the NPS, Gateway National Recreation Area, New York State Historic Preservation Office (NYSHPO), the Shinnecock Indian Nation, the Stockbridge-Munsee Band of Mohican Indians, the Delaware Tribe of Indians, the Delaware Nation (all federally-recognized Tribes), the New York state-recognized Unkecheug Indian Nation, the New York City Landmarks Preservation Commission (NYCLPC), and other appropriate consulting parties to define efficient and cost effective processes for taking into consideration the effects of the Project on historic properties; and

WHEREAS, the District will invite the NPS, NYSHPO, the Shinnecock Indian Nation, the Stockbridge-Munsee Band of the Mohican Indians, the Delaware Tribe of Indians, the Delaware Nation, the Unkechaug Indian Nation, the NYCLPC, and other relevant consulting parties to be signatories to this agreement; and

WHEREAS, the District will notify the Advisory Council on Historic Preservation (ACHP) of the potential for the Project to affect historic properties and that a programmatic agreement will be prepared; and

WHEREAS, the District will involve the general public through the National Environmental Policy Act (NEPA) process, which affords all persons, organizations, and government agencies the right to review and comment on proposed major federal actions that are evaluated by a NEPA document and participate in public meetings during the review of the feasibility report; and

NOW, THEREFORE, the District, NYSHPO, and ACHP agree that the Undertakings shall be implemented in accordance with the following stipulations in order to take into account the effects of the Undertakings on historic properties.

STIPULATIONS

I. BEACH FILL - BORROW AREA INVESTIGATIONS

A. A remote sensing (magnetometer and side scan sonar survey) of any borrow areas not previously surveyed will be conducted to identify any potential cultural resources. In addition, cores for any borrow areas not previously surveyed will be examined to determine the potential for the recovery of buried landsurfaces.

B. If a cultural resource(s), target(s), and/or anomaly(ies) are identified, the District will designate a buffer zone around each potential resource, as determined by the nature of the anomaly/return. Buffer zone(s) shall be clearly delineated on construction plans. No construction activities, including the removal of sand, anchoring, etc., that could potentially impact the wrecks will occur within the designated buffer zones.

C. If any targets and/or anomalies cannot be avoided, the District will consult with the NYSHPO and other relevant signatories and other consulting parties to consider alternatives and determine the level of additional investigations (diving, documentation, additional reconnaissance diving, Phase II survey, etc.) are required.

D. The results of any investigations will be coordinated with the NYSHPO and other signatories and consulting parties.

E. If the anomalies/targets are determined to represent a historic property, the District in coordination with the NYSHPO and other relevant signatories and interested parties will determine alternatives including avoidance, data recovery through underwater archaeological investigations, and documentation. The District will resolve adverse effects to historic properties in accordance with Stipulation IV below.

II. HIGH FREQUENCY FLOOD RISK REDUCTION FEATURES

A. The District will determine, in coordination and consultation with the NYSHPO, the federally-recognized Tribes, and other relevant signatories and interested parties, what investigations are necessary to determine if the construction of any high frequency flood risk reduction features will have an adverse effect on historic properties. The District would carry out investigations, as necessary, to identify historic properties and determine the effect of the proposed features on identified features.

B. The District will document the results of any investigations and provide them for review to the NYSHPO, the federally-recognized Tribes, and other relevant signatories and interested parties.

C. If a property is determined to be eligible for the National Register, the District will consult with the NYSHPO, federally-recognized Tribes and other relevant signatories and interested parties to resolve the adverse effects in accordance with Stipulation IV below.

III. BURIED SEAWALL AND FLOODWALLS

A. The District will determine, in coordination and consultation with the NYSHPO, the NPS, the federally-recognized Tribes, and other relevant signatories and interested parties what investigations are necessary to determine if the construction of buried seawalls, floodwalls, and other features that include subsurface disturbance will have an adverse effect on the built environment, including the beach, bulkhead, and/or groins that are contributing elements of the various historic districts, as well as on potentially sensitive areas for archaeological resources. These investigations may include, but not be limited to, construction monitoring and recordation and/or research, field investigations and analysis on the Rockaway Peninsula development to include the potential for deeply buried archaeological sites.

B. The District will document results of any investigations and provide them for review to the NYSHPO, NPS, the federally-recognized Tribes, and other relevant signatories and interested parties.

C. If a property is determined to be eligible for the National Register, the District will consult with the NYSHPO, NPS, federally-recognized Tribes and other relevant signatories and interested parties to resolve the adverse effects in accordance with Stipulation IV below.

IV. RESOLUTION OF ADVERSE EFFECTS

A. The District shall continue consultation with the NYSHPO, NPS, the federally-recognized Tribes, other signatories and consulting parties, as appropriate, pursuant to 36 CFR Part 800.6 to avoid, minimize or mitigate adverse effects to historic properties.

B. The District shall notify the NYSHPO, NPS, the federally-recognized Tribes, and other relevant signatories, property owners and consulting parties and provide documentation regarding the identification and evaluation of the historic properties. The District will work with the NYSHPO, other relevant signatories, etc. to determine how best to resolve any adverse effects and document the proposed resolution.

C. Once there is agreement on how the adverse effects will be resolved, the District shall prepare treatment plan that will identify the activities to be implemented that will resolve the adverse effects. The treatment plan will be provided for review and comment prior to implementation.

D. Should the District, NYSHPO, and the relevant signatories disagree on how the adverse effects will be resolved, the District shall seek to resolve such objection through consultation in accordance with procedures outlined in Stipulation X.C.

V. PUBLIC INVOLVEMNT AND OUTREACH

A. The District shall inform the public of the existence of this PA and the District's plan for meeting the stipulations of the PA. Copies of this agreement and relevant documentation prepared pursuant to the terms of this PA shall be made available for public inspection. Information regarding the specific locations of terrestrial and submerged archaeological sites, including potential wreck areas, will be withheld in accordance with the Freedom of Information Act and National Register Bulletin No. 29, if it appears that this information could jeopardize archaeological sites. Any comments received from the public related to the activities identified by this PA shall be taken into account by the District.

B. The District shall develop, in coordination with the NYSHPO, NPS, the federally-recognized Tribes, and other interested parties, publically accessible information about the cultural resources and historic properties investigations for the Undertaking in the form of brief publication(s), exhibit(s), or website.

VI. CURATION

A. The District shall ensure that all collections resulting from the identification and evaluation of surveys, data recovery operations, or other investigations pursuant to this PA are maintained in accordance with 36 CFR Part 79 until the collection is turned over to the NPS, New York City, or other landowner/entity. Minimally, the District will ensure that analysis is complete and the final report(s) are produced and accepted by the NYSHPO.

B. The District shall be responsible for consulting with the NPS, New York City and other landowners regarding the curation of collections resulting from archaeological surveys, data recovery operations, or other studies and activities pursuant to this agreement. The District shall coordinate the return of collections to non-federal landowners. If non-federal landowners wish to donate the collection, the District, in coordination with the NYSHPO, the NPS, the federally-recognized Tribes, and others to determine an appropriate entity to take control of the collection.

C. The District shall be responsible for the preparation of federally-owned collections and the associated records and non-federal collections donated for curation in accordance with the standards of the curation facility.

VII. UNANTICIPATED DISCOVERY

A. The following language shall be included in construction plans and specifications:

"When a previously identified cultural resource, including but not limited to archaeological sites, shipwrecks and the remains of ships and/or boats, standing structures, and properties of traditional religious and cultural significance to the federally-recognized Tribes are discovered during the execution of the Project, the individual(s) who made the discovery shall immediately secure the vicinity and make a reasonable effort to avoid or minimize harm to the resource, and notify the Project's Contracting Officer's Representative (COR) and the District. All activities shall cease within a minimum of 50 feet from the inadvertent discovery (50-foot radius 'no work' buffer) until authorized by the District and the Project COR."

B. If previously unidentified and unanticipated properties are discovered during Project activities, the District shall cease all work in the vicinity of the discovery until it can be evaluated in accordance with 36 CFR Part 800.13 "Post Review Discoveries". Upon notification of an unanticipated discovery, the District shall implement any additional reasonable measures to avoid or minimize effects to the resource. Any previously unidentified cultural resource will be treated as though it is eligible for the NRHP until such other determination may be made.

C. The District shall immediately notify the NYSHPO, the NPS, the federally-recognized Tribes, the signatories, and additional interested or consulting parties as appropriate, within 48 hours of the finding and request consultation to resolve potential adverse effects.

1. If the District, NYSHPO, the NPS, the federally-recognized Tribes, and the

signatories agree that the cultural resource is not eligible for the NRHP, then the suspension of work in the area of the discovery will end.

2. If the District, NYSHPO, the NPS, the federally-recognized Tribes, and the signatories agree that the cultural resource is eligible for the NRHP, then the suspension of work will continue, and the District, in consultation with the NYSHPO, NPS, the federally-recognized Tribes and the signatories, will determine the actions to avoid, minimize, or mitigate adverse effects to the historic property and will ensure that the appropriate actions are carried out.

3. If the District, the NYSHPO, the NPS, the federally-recognized Tribes, and the signatories cannot agree on the appropriate course of action to address an unanticipated discovery or effects situation, then the District shall initiate the dispute resolution process set forth in Stipulation X.C below.

VIII. DISCOVERY OF HUMAN REMAINS

1. If any human remains and/or grave-associated artifacts are encountered during any of the investigations, including data recovery, the District will follow the NYSHPO Human Remains Discovery Protocol (2008; Appendix C) and, as appropriate, develop a treatment plan for human remains that is responsive to the ACHP's Policy Statement on Human Remains" (September 27, 1988), the Native American Graves Protection and Repatriation Act (PL 101-601) and , US Army Corps of Engineers, Policy Guidance Letter No. 57 (1998) Indian Sovereignty and Government-to-Government Relations with Indian Tribes.

2. The following language shall be included in the construction plans and specifications:

"When human remains, suspected human remains, or indications of a burial are discovered during the execution of a Project, the individual(s) who made the discovery shall immediately notify the local law enforcement, coroner/medical examiner, and the Project COR and the District, and make a reasonable effort to protect the remains from any harm. The human remains shall not be touched, moved or further disturbed. All activities shall cease within a minimum of 50 feet from the area of the find (50-foot radius 'no work' buffer) until authorized by the District."

IX. PROFESSIONAL QUALIFICATIONS AND STANDARDS

A. The District shall ensure that qualified professionals meeting the National Park Service professional qualifications for the appropriate discipline [National Park Service Professional Qualification Standards, Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44738-39)] are used to complete all identification and evaluation plans related to this undertaking, to include remote sensing surveys, underwater investigations, historic structure inventory and documentation.

B. All archaeological investigations carried out pursuant to this PA will be undertaken in accordance with the New York State Archaeological Council's Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State (1994) and Cultural Resources Standards Handbook (2000), the NYSHPO Archaeological Report Format Requirements (2005), and the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (36 CFR Part 68).

X. X. ADMINISTRATIVE TERMS

A. REPORTING

1. Each year following the execution of this PA until it expires or is terminated, the District shall provide the NYSHPO, NPS, the federally-recognized Tribes, all signatories, and interested parties a summary report detailing work undertaken pursuant to this PA. This report will include any scheduling changes, problems encountered, project work completed, PA activities completed, and any objections and/or disputes received by the District in its efforts to carry out the terms of this PA.

2. Following authorization and appropriation, the District shall coordinate a meeting or equivalent with the signatories to be held annually on a mutually agreed upon date to evaluate the effectiveness of this PA and discuss activities carried out pursuant to this PA during the preceding year and activities scheduled for the upcoming year.

B. REVIEW PERIODS

1. The District shall ensure that all draft and final reports resulting from action pursuant to this PA will be provided to the NYSHPO, ACHP, NPS, the federally-recognized Tribes, the Unkechaug Indian Nation, and to other interested parties.

2. The NYSHPO, ACHP, NPS, the federally-recognized Tribes, the Unkechaug Indian Nation, and any other interested party shall have 30 calendar days to review and/or object to determinations, evaluations, plans, reports and other documents submitted to them by the District.

3. Any comments and/or objections resulting from a review of any District determination, evaluations, plans, reports and other documents must be provided in writing to the District.

4. If comments, objections, etc., are not received within 30 calendar days, the District will assume concurrence with the subject determination, evaluation, plan, report or other document submitted.

C. DISPUTE RESOLUTION

1. Should any signatory object in writing to the District at any time to any actions proposed or the manner in which the terms of this PA are implemented, the District and the signatories shall attempt to resolve any disagreement arising from implementation of this PA.

2. If there is a determination that the disagreement cannot be resolved, the District shall forward all documentation relevant to the dispute to the ACHP and request the ACHP's recommendations or request the comments of the Council in accordance with 36 CFR Part 800.7(c).

3. The ACHP shall provide the District with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Any ACHP recommendations or comments provided in response will be considered in accordance with 36 CFR Part 800.7(c), with reference only to the subject of the dispute. The District shall respond to ACHP recommendations or comments indicating how the District has taken the ACHP recommendations or comments into account and complied with the ACHP recommendations or comments prior to proceeding with the Undertaking activities that are the subject to dispute. Responsibility to carry out all other actions under this PA that are not the subject of the dispute will remain unchanged.

4. If the ACHP does not provide its advice regarding the dispute within the thirty (30) calendar day time period, the District may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the District shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories to the PA, and provide them and the ACHP with a copy of such written response.

D. WITHDRAWAL AND TERMINATION

1. Any signatory may withdraw its participation in this PA by providing thirty (30) days advance written notification to all other signatories. In the event of withdrawal, any signatory to this PA may terminate it by providing 30 calendar days, written notice to the signatories. In the event of withdrawal, this PA will remain in effect for the remaining signatories.

2. This agreement may be terminated in accordance with 36 CFR Part 800, provided that the signatories consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. Any signatory requesting termination of this PA will provide thirty (30) days advance written notification to all other signatories.

3. In the event of termination, the District will comply with 36 CFR 800.4 through 800.6 with regard to individual undertakings covered by this Agreement.

E. DURATION AND SUNSET CLAUSE

1. This PA shall take effect upon execution by the District, the NYSHPO, and the signatories with the date of the final signature.

2. This PA will continue in full force and effect until the construction of the Project is complete and all terms of this PA are met, unless the Project is terminated or

authorization is rescinded or a period of five years from execution of the PA has passed, at which time the agreement may be extended as written provided all signatories concur.

F. AMENDMENT

1. This PA may be amended upon agreement in writing by all signatories. Within thirty (30) days of a written request to the District, the District will facilitate consultation between the signatories regarding the proposed amendment.

2. Any amendments will be in writing and will be in effect on the date the amended PA is filed with the Council.

G. ANTI-DEFICIENCY ACT

All requirements set forth in this PA requiring expenditure of funds by the District are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 U.S.C. 1341). No obligation undertaken by the District under the terms of this PA shall require or be interpreted to require a commitment to extend funds not appropriated for a particular purpose. If the District cannot perform any obligation set forth in this PA because of unavailability of funds that obligation must be renegotiated among the District and the signatories as necessary.

Execution and implementation of this PA evidences that the District has satisfied its Section 106 responsibilities for all individual undertakings of the Project, and has afforded the NYSHPO and the Council an opportunity to comment on the undertaking and its effects on historic properties.

APPENDIX A

CULTURAL RESOURCES

Cultural Resources

"Cultural resources" is an umbrella term for many heritage-related resources, including prehistoric and historic archaeological sites, buildings, structures, districts, or certain objects. Cultural resources are discussed in terms of archaeological resources, architectural resources, or resources of traditional cultural significance. Federal cultural resources laws applicable to this project include the National Historic Preservation Act (NHPA), the Archaeological and Historic Preservation Act (1974), the American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act (1990).

The National Register of Historic Places (NRHP) is the official list of the properties in the United States that are significant in terms of prehistory, history, architecture, or engineering. The NRHP is administered by the National Park Service.

Generally, resources must be more than 50 years old to be considered eligible for the NRHP. To meet the evaluation criteria for eligibility to the NRHP, a property needs to be significant under one or more NRHP evaluation criteria (36 CFR Part 60.4), and retain historic integrity expressive of the significance. More recent structures might be eligible for listing in the NRHP if they are of exceptional importance or if they have the potential to gain significance in the future per special NRHP considerations.

The New York City landmarks law gives the New York City Landmarks Preservation Commission (NYCLPC) authority to designate City landmarks, Interior landmarks, Scenic landmarks, and Historic Districts, and to regulate any construction, reconstruction, alteration, or demolition of them. Projects that might physically affect City landmarks or are within landmark Historic Districts require review by NYCLPC. Archaeological resources also are considered by the NYCLPC. Criteria for City landmarks are different from NRHP evaluation criteria, and consider properties 30 years of age or older that meet certain criteria, compared to the NRHP evaluation of properties of at least 50 years of age or older.

Section 106 of the NHPA requires a Federal agency official to take into account the effects of its undertaking on historic properties, and afford the Advisory Council on Historic Preservation (ACHP), an independent Federal agency, an opportunity to comment. This is done in accordance with the regulations of the ACHP implementing Section 106 process, 36 CFR Part 800. Additionally, consultation with the New York State Historic Preservation Office (NYSHPO) and consulting parties including local governments is required regarding the identification and evaluation of potentially affected historic properties, determination of potential effects of an undertaking on historic properties, and resolution of any adverse effects. Under the Section 106 process, the City of New York would also be a consulting party for the proposed project.

The Section 106 review requires an assessment of the potential impact of an undertaking on historic properties that are within the proposed project's Area of Potential Effect (APE). The APE is defined as the geographic area(s) "within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist."

The APEs are based on location of each proposed project element (Appendix B) and the areal extent over which construction and operation of the element would reasonably be expected to occur. In general, the APEs for each project element are considered to be within or immediately adjacent to the element, because construction and operation of each element is not anticipated to require disturbing the ground surface beyond the immediate “footprint” of the element. A description of the APEs are provided in Section 2.

1 HISTORICAL CONTEXT

The following information for the Cultural Resources sections were excerpted from *Phase 1A Cultural Resource Documentary Study For Gerritsen’s Creek Ecosystem Restoration, Borough of Brooklyn, Kings County, New York* (2002). This information was reported in the USACE Gerritsen’s Creek Environmental Assessment (2003). The following information pertains to the area encompassing both the Rockaway and Jamaica Bay projects.

1.1 Native American and Early European History

Roughly 5,000 to 6,000 years ago (circa 3,000 to 4,000 B.C.), the Atlantic shoreline lay some 25 miles to the east; by around A.D. 500 to 1000, less than 1,500 years ago, the coastline began to roughly resemble that of the present day, and Jamaica Bay and its neighboring drainages will have been largely tidal (Hunter and Damon, 2002). Native American occupation of the Lower Hudson Valley and Long Island is likely to have followed on soon after the retreat of the last glacier, although clear cut evidence of such activity during the Paleo-Indian (circa 10,000-8,000 B.C) and Archaic (circa 8,0002,000 B.C.) periods is generally sparse (Hunter and Damon, 2002).

Throughout the Late Woodland period, circa AD 1000-1600, camp sites and shell middens were a common feature within the tidal landscape of southern Long Island and evidence of Native American occupation of this period has been recorded all around the periphery of Jamaica Bay (Hunter and Damon, 2002). Further inland on Long Island, a few larger sites, probably permanent base camps, have also been identified, including one locus in Flatlands with an Iroquois style longhouse considered to be a ceremonial center and meeting house. Both longhouses and smaller round houses have been noted on Late Woodland period sites on Long Island. The majority of the documented sites were noted in the late nineteenth and early twentieth centuries, in particular as a result of the work of Reginald Bolton (1920, 1922, and 1934), with several subsequent studies confirming their existence (Hunter and Damon, 2002).

Towards the end of the Late Woodland period, continuing into the seventh century when contact with Europeans was occurring on a regular basis, the Native American population of Long Island began to come more clearly into focus as a part of recorded history (Hunter and Damon, 2002). The Brooklyn area was inhabited by a group known as the Canarsie (or Canarsee), a branch of the Algonquian-speaking Lenape, a series of loose-knit and semi-sedentary tribes spread across much of the area between the Delaware and Lower Hudson Rivers and extending east into Long Island (Hunter and Damon, 2002).

The Jamaica Bay area supported villages of Canarsie and Rockaway American Indians, who engaged in cultivation, fishing, gathering shellfish, and possibly the manufacture of wampum from the seashells (Hunter and Damon, 2002). In the seventh century, the Canarsie participated in a complex of web of trading relationships involving the Lenape, other Native American peoples further to the west and north, the Dutch and eventually the English. The two key commodities traded by the Canarsie for European goods were furs and wampum (polished shell beads used for jewelry and as currency), the latter being of particular importance in view of the abundance of shellfish in and around Jamaica Bay. The general area (southern Long Island) was settled by the Dutch in the 1630s and 1640s (Hunter and Damon, 2002). In the 1630s and 1640s, however, the Canarsie began to lose their hold over land in southern Long Island, ceding property to Dutch farmer-settlers. By century's end, their numbers, probably never more than a few thousand, were severely reduced as a result of disease, conflict (notably Kieft's War of 1643-46) and the general dislocation visited upon them by Europeans. Over the course of the eighteenth century, the surviving Canarsie moved west and out of the Hudson Valley altogether.

A detailed and more expansive history of the transition from American Indians to European occupancy is available in *Jamaica Bay: A History, Gateway National Recreation Area, New York--New Jersey* (Black, 1981), as well as the *Cultural Resources Baseline Study, Jamaica Bay Ecosystems Restoration Project, Kings, Queens and Nassau Counties, New York* (Panamerican, July 2003).

1.2 19th and 20th Century History

The section provides a summary of development in the Rockaway and Jamaica Bay areas during the 19th and early 20th centuries.

1.2.1 Rockaway

Although a part of Queens, Rockaway was settled by Europeans separately and earlier than other areas around Jamaica Bay (NYCDEP, 2011). In 1833, the Rockaway Association purchased most of the oceanfront property on the Richard Cornell homestead to construct an oceanfront resort called the Marine Hotel in Far Rockaway. Transportation to and from Rockaway originally consisted of horses and horse-drawn carriages, but by the mid-1880s, railroad access was provided, terminating at the present Far Rockaway station of the Long Island Railroad. Land values increased and business expanded rapidly as a consequence, and the population of Far Rockaway was large enough to apply for incorporation in 1888. On July 1, 1897, the Village of Rockaway Park was incorporated into the City of Greater New York. Streets were graded and sections of Rockaway Park, Belle Harbor, and Neponsit began to be developed. Completion of the Cross Bay Bridge in 1925, further development of the beach and boardwalk in 1930, the opening of the Marine Parkway Bridge in 1937, and improvements to the railroad services in 1941 all made Rockaway more accessible, encouraging population growth, development, and urbanization (NYCDEP, 2011).

In the second half of the nineteenth century, the Rockaway Peninsula developed as a popular seaside resort for the growing middle-class New Yorkers, who filled its seaside bungalows and amusement parks (Structures of Coastal Resilience [SRC], 2014). Transportation access to the oceanfront beaches became an issue. Ferry service and deepened navigational channels were established by the Canarsie Railroad Line, and by 1887 a cross-bay train trestle was constructed by the New York, Woodhaven, and Rockaway Railroad. This line was sold in 1886 to the Long Island Railroad, which renamed it the New York and Rockaway Beach Railway. It was purchased in 1955 by the City of New York, reconstructed, and incorporated into the city's subway service as the IND Rockaway Line; it now carries the Metropolitan Transportation Authority's A and S trains across Jamaica Bay. The trestle pilings caused some obstruction of the bay's creeks and waterways, as did the development of the Flynn Cross-Bay Roadway (now the Cross Bay Boulevard) traversing the bay. Yet the Canarsie Line, the train trestle, and the Cross Bay Boulevard led to the transformed perception of the bay itself as an enjoyable place of recreation. Many believed that the waters of the bay were healthier and safer for swimming than the Atlantic beachfront of the Rockaway Peninsula (SCR, 2014).

Fort Tilden was established in 1917 and provided a coastal location from which to defend New York City and the harbor from sea and air attacks during World War I through the Cold War era, when a Nike Missile Launch Site was installed. Fort Tilden was decommissioned in 1967 and in 1974 was transferred to the National Park Service and became part of the Gateway National Recreation Area (NPS, 2014).

1.2.2 Jamaica Bay

A review of historical maps shows that the area of Brooklyn adjacent to Jamaica Bay was largely undeveloped marshland until the turn of the 20th century (NYCDEP, 2011). The neighborhoods of East New York and Flatbush were the closest developed areas of Brooklyn to Jamaica Bay, although limited development had occurred in Canarsie Landing and Bergen Beach on high ground that extended into the marshes of Jamaica Bay. Brooklyn was originally inhabited by the Lenape, American Indians who planted corn and tobacco and fished in the rivers. The Dutch settled in Manhattan in the early 1600s, and subsequently founded five villages on Long Island: Bushwick, Brooklyn, Flatbush, Flatlands, and New Utrecht. A sixth village, Gravesend, was founded in 1643 by an Englishwoman. The British captured the Dutch territory in 1674, and incorporated the six villages into Kings County, which is now part of New York City. A 1698 census counted 2,017 people in Kings County, about half of whom were Dutch (NYCDEP, 2011).

Brooklyn quickly became an important commercial port, in part due to the supply of foods grown on Long Island to New York City (NYCDEP, 2011). The Navy opened a shipyard on Wallabout Bay in 1801, and Robert Fulton began a steam-ferry service across the East River in 1814. The Village of Brooklyn was incorporated in 1816, roughly encompassing what is now known as Brooklyn Heights. By 1860, 40 percent of Brooklyn's wage earners worked in Manhattan, and ferries carried more than 32 million passengers a year. The intense pressure on ferry service led to the construction of the Brooklyn Bridge, which opened in 1883, spawning a surge in population and development. The City of Brooklyn, created in 1834, expanded to accommodate the new population, eventually encompassing all of Kings County. Brooklyn was incorporated into the City of New York in 1898 (NYCDEP, 2011).

The early 20th century saw a vast expansion in the population and urbanization of Brooklyn (NYCDEP, 2011). New bridges, trolley lines, elevated railroads, and subway lines went further into the borough. Each expansion opened new settlement and development areas. The rural character of Brooklyn quickly vanished. By the 1930s, the tributary waterbodies had been dredged, straightened, and armored, and by about 1960, most of the shoreline area was developed and expanded around Jamaica Bay (NYCDEP, 2011).

In Queens, as in Brooklyn, expansion of mass transportation system influenced growth and urbanization in Queens dramatically (NYCDEP, 2011). By 1915, most of Queens came within reach of the New York City subway. The Interborough Rapid Transit service opened to Long Island City (1915), Astoria (1917), and Queensboro Plaza (1916). Another branch extended along Queens Boulevard and Roosevelt Avenue, reaching Corona (1917) and Flushing (1928). In southern Queens, the Brooklyn Rapid Transit Company built an elevated line along Liberty Avenue through Ozone Park and Woodhaven to Richmond Hill in 1915 and along Jamaica

Avenue from the Brooklyn border through Woodhaven and Richmond Hill to Jamaica during 1917-1918 (NYCDEP, 2011).

These improvements in transportation promoted rapid growth (NYCDEP, 2011). During the 1920s, the population of Queens more than doubled, from 469,042 to 1,079,129. Farms and open areas were replaced with urban street grids aligned without regard to streams, marshes, and other waterbodies that would have to be buried or filled. While the Great Depression of the 1930s ended this boom, transportation improvements continued with new bridges (the Triborough Bridge in 1936 and the Bronx-Whitestone in 1939), roadways (the Interboro Parkway in 1935 and the Grand Central Parkway in 1936), and airports (LaGuardia Airport in 1939 and Idlewild in 1948) (NYCDEP, 2011). Floyd Bennett Field was constructed in 1928-1931 on Barren Island and served as New York City's first municipal airport. It was sold by the City to the US Navy in 1941, and became the most active Naval Air Station in the US during World War II. In 1972, it was transferred to the National Park Service and became part of the Gateway National Recreation Area (http://www.nyharborparks.org/visit/flbe.html).

Plumb Beach is located along the north shore of Rockaway Inlet in Brooklyn. It is a stretch of shoreline, tidal mudflats, low saltmarsh areas, a tidal lagoon, a dune system, and woodland thickets at the entrance to Gerritsen Creek adjacent to the Belt Parkway. Originally an island, the creek separating it from the land was filled in the 1930s. In 1924, New York City acquired the property for use as a park, but instead leased it to a contracting company, which parceled and rented the land. In 1972 it became part of Gateway National Recreation Area, though the parking lot and greenway that provide primary access to the shore are the responsibility of the New York City Department of Parks and Recreation and the New York City Department of Transportation.

The Marine Parkway-Gil Hodges Memorial Bridge was opened by the Marine Parkway Authority in 1937 to provide access to the Rockaway Peninsula, which previously could be reached only by ferry or by a circuitous route around the eastern end of Jamaica Bay (NYC MTA, 2016). The bridge is approximately 3,985 feet long, and is designed with a vertical lift-through truss. The land at both ends of the bridge is part of the Gateway National Recreation Area. In 1978, Gil Hodges' name was added to the bridge in honor of the Brooklyn Dodgers' great first baseman and Mets manager. Average daily traffic is approximately 20,000 vehicles.

2 AREAS OF POTENTIAL EFFECT

2.1 Rockaway

The APE for Rockaway consists of the ocean-side (Atlantic facing) onshore and nearshore areas. It also includes the proposed off-shore borrow area located in the Atlantic Ocean approximately two miles south of the Rockaway peninsula (see Appendix B, Figures 1-6).

The high-frequency flood risk reduction features (HFFRR) are proposed for in Hammels, Arverne, and Edgemere along the bayside of the Rockaway Peninsula (see Appendix B, Figures 9-11). These features consist of floodwalls, road raisings, berms, and vegetation plantings (salt meadow hay, etc.).

Based on the proposed alignments and construction designs of the shoreline measures and the HFFRR features, the APE is limited to a relatively narrow strip along the shoreline of the Rockaway peninsula and the defined areas of the HFFRR features on the bay (see Appendix B, Figures 1-6, 9-11). However, the APE for the offshore borrow area is approximately 20 square miles.

2.2 Jamaica Bay

The APE for Jamaica Bay includes the onshore and shoreline areas along southwest corner of the bay in Motts Basin and Cedarhurst (see Appendix B, Figures 78). The features proposed for Motts Basin and Cedarhurst includes a floodwall and floodwall, bulkhead and pump station, respectively.

3 PREVIOUS RESEARCH

This section summarizes the findings of previous research investigations for cultural resources within or in close proximity to the APEs for Rockaway and Jamaica Bay, with a primary emphasis on historic properties—those that are listed or eligible for listing—on the NRHP, followed by a secondary focus on NYCLPC landmarks not on the NRHP list. This section also describes research findings for archaeological resources (pre-contact sites) and submerged sites within the APEs.

A portion of the shoreline APE is located within the Jamaica Bay Unit of the Gateway National Recreation Area. The NPS has reported that evidence of Paleo-Indian use in Gateway is sparse. Although manifestations of Paleo-Indian use of the general region are evident, no Paleo-Indian sites have been recorded (NPS, 2014). The NPS also reported that although manifestations of human occupation of northern New Jersey and the New York Harbor during the Archaic period have been recorded, no archeological sites dating definitively to this period have been recorded in Gateway.

Several sites dating to the Woodland period have been identified within Gateway and are characterized by the presence of ceramic sherds (fragments), lithic artifacts, and shell middens indicative of the period. Several Contact period sites are known to have existed in the area around Gateway, but none have been recorded within Gateway (NPS, 2014). Contact period settlements typically include small amounts of European goods (metal kettles, glass beads, bottles, etc.) intermixed with larger amounts of indigenous-material cultural items.

3.1 Rockaway

Prior cultural resource assessments have been conducted for beach nourishment projects along sections of Rockaway (e.g. between Beach 19th Street and Beach 49th Street; (USACE, 1979; USACE, 1993; Kopper, 1979). These prior studies concluded that no existing prehistoric or historic sites and no archaeological sites were present, and that, "…cultural resources reconnaissance surveys were deemed unnecessary considering the great erosive forces…" in those specific project areas (USACE, 1979; Kopper, 1979). The USACE has also determined for similar nourishment projects that sand placement should not have an adverse effect as long as it does not interfere with any features in historic districts.

3.1.1 Historic Districts Listed on the National Register

The NPS has identified the Fort Tilden, Jacob Riis Park, and the Far Rockaway Beach Bungalow Historic District (Beach 24th, 25th, and 26th Streets) as Historic Districts on the Rockaway

Peninsula. These districts are listed on the New York State Register of Historic Places (SRHP) and the NRHP. Of these, only Jacob Riis Park is within the APE for the shoreline measure (Appendix B, Figures 2-3). The Far Rockaway Beach Bungalow Historic District is immediately adjacent to the eastern section of the APE (see Appendix B, Figure 6). Jacob Riis Park is located within the Gateway National Recreation Area and are managed by the National Park Service.

3.1.1.1 Jacob Riis Park Historic District

The Jacob Riis Park Historic District, listed in 1981, is considered an "excellent, though greatly deteriorated, example of municipal recreational planning the 1930s" (NPS, 2014) (Appendix B, Figures 2-3). Its historical significance derives from its association with New York City's Commissioner of Parks, Robert Moses, as well as it being a notable work of landscape architecture. The park was completed through the WPA (Works Progress Administration) and is associated with this important social and government program (NPS 1979). The park landscape has lost much of its integrity and has not been well maintained (NPS 2002). In 2012, Hurricane Sandy resulted in heavy wind and water damage to Jacob Riis Park facilities, including flooding; broken windows; blown out walls, sand deposition in the bathhouse; missing ceramic tiles in the bathhouse; and sand and other debris deposited in structures and across the landscape. The brick courtyard wall was destroyed and heavy erosion is evident along the boardwalk (IMT 2012h).

The 220-acre Jacob Riis Park occupies a mile-long section of the Rockaway Peninsula and provides a variety of recreational activities. The park's three significant recreational buildings were constructed between 1932 and 1937.

The original bathing pavilion—commonly known as the bathhouse—is the dominant feature of the park. The T-shaped, one-story brick masonry structure was completed in 1932. In 1936–37, it was enlarged by a long, two-story addition on the south side of the structure. The entrance to the bathhouse is located on the north wall. The front of the bathhouse is faced with a long arcade supported by pillars and topped with two octagonal turrets (NPS 1979).

The mall focuses on a crescent-shaped extension of the boardwalk. The twin central mall buildings—constructed of brick and tile masonry—face each other at the southern end of the mall. Constructed in 1936–1937, both are two-story, square buildings, flanked by one-story wings, and connected to a rectangular, single-story wing to the south by a single-story, semicircular wing. Both have flat concrete roofs, concrete cornices, and concrete floors (NPS 1979b).

In addition, a broad promenade plaza adjacent to the original bathhouse was opened in 1932. During an expansion of the original park in 1936–1937, a continuous walkway (the length of the beach) was created, connecting all areas of the park. Both the promenade and boardwalk are considered integral elements of the park and contribute to its historic significance (Lane, Frenchman, and Associates 1992). Another striking feature of the park is the 72-acre parking lot located north of the bathhouse. With a 12,000–14,000 car capacity, it was believed to be the largest in the world at that time (NPS 1979b). The parking lot still retains its original integrity and is a contributing element to the district. (Please refer to NPS 1979b; Lane, Frenchman, and Associates 1992; and the NPS 2002 for greater detail on the Jacob Riis Park Historic District.)

The proposed Rockaway shoreline measure would be constructed along the beach, just inland of the shoreline. Based on the delineation of the historic district, the shoreline is within the historic district (see Appendix B, Figure 3). This element would not intersect with any of the historic structures present within the district. The element elevation would be approximately 18 feet NAVD88 and approximately 50 feet wide. This element may have an effect on resources buried in the shoreline as well as a visual effect on the Jacob Riis historic district. Jacob Riis Park has also been defined as a cultural landscape. The historic structures' relationship to the ocean is a significant characteristic of this landscape (NPS 2015).

3.1.2 Far Rockaway Beach Bungalow Historic District

.The Far Rockaway Beach Bungalow Historic District is located along Beach 24th, 25th, and 26th Streets in Far Rockaway in Queens County. It was listed on the National Register of Historic Places in 2013 (NPS, 2013b). It includes summer beach bungalows near the oceanfront of Far Rockaway. They are smaller than the usual domestic bungalows of the 1920s. They were built in 1921 using pattern book designs incorporating uniform facades, compact interiors, integrated porches and exposed rafters. Their architect, Henry Hohauser, became better known in the 1930s as a designer of Art Deco hotels in Miami Beach. The district was hit by Hurricane Sandy in 2012, but survived without major damage.

This historic district is located adjacent to the eastern extent of the buried shoreline measure. This measure should not intersect with the historic district or the features that contribute to the integrity of the district. Given its proximity to the shoreline measure, as project plans are designed, the placement of the buried shoreline and other features will be monitored to avoid adverse effects.

3.1.3 Other Historic Districts Eligible for the National Register

There are four historic districts located to the west of the western extent of the shoreline measures. These include the Fort Tilden Historic District, The Silver Gull Beach Club, the Breezy Point Surf Club, and the Far Rockaway Coast Guard Station. The Fort Tilden Historic District is a part of the Gateway National Recreation Area and is listed on the National Register. The Silver Gull Beach Club, the Breezy Point Surf Club and the Far Rockaway Coast Guard Station have been determined eligible for the National Register by the New York State Historic Preservation Office (NPS, 2014).

3.1.4 Landmark Structures

Landmark structures include buildings and sites and may be eligible for or listed on the National Register by the NPS and the NYC Landmark Preservation Commission. There are no landmarks located within the APE. Local landmarks (not formally listed) include the American Airline Flight 587 Memorial (southern end of Beach 116th Street near the beachfront), which is adjacent to the Rockaway shoreline measure but is outside the APE.

3.2 Jamaica Bay

Prior cultural resource assessments have been conducted in the area of the Jamaica Bay APE (FERC, 2013; NPS, 2014). Documented sites in this vicinity of Barren Island include the Equendito Native American village site and the nineteenth century Rendering Plant on Dead Horse Bay. Bernstein indicated that the area around Barren Island had an "overall low sensitivity for intact prehistoric and historic period archaeological deposits…" but "The area of highest sensitivity for archaeological sites is near the southern end (the west side of Flat Bush Avenue near the entrance to Floyd Bennett Field), where historic maps indicate that former Barren Island was dry land and fill may not be as deep as elsewhere in the APE". Undisturbed portions Barren Island, if they exist, would have a moderate to high sensitivity for the presence of prehistoric resources. However, it is likely that any prehistoric deposits are now very deeply buried beneath landfill (greater than 6 feet below sediment surface). Excavation about six feet was anticipated to have relatively low potential for impact to any prehistoric resources. Jamaica Bay includes the Floyd Bennett Field Historic District, and the Gil Hodges Bridge, both properties listed or eligible for the National Register of Historic Places. These properties are outside the APE of each of the HFFRR features. There are no New York City Landmarks within or immediate adjacent to the APE.

3.3 Archeological Resources – Rockaway and Jamaica Bay

The NPS has reported that archeological resources in the Jamaica Bay Unit of the Gateway National Recreation Area date primarily to later pre-contact (Woodland period) and historical periods (NPS, 2014). Cultural manifestations include both surface and subsurface materials. However, many of the archeological resources identified in earlier studies can no longer be located, due to a combination of inaccurate data records, natural processes (e.g., erosion), and landfilling throughout the region in the late 19th and 20th centuries (NPS, 2014).

3.3.1 Pre-Contact Archeological Sites

Most of the recorded pre-contact sites in Gateway were described as lithic scatters, lithic/ceramic scatters, campsites, or shell middens (NPS, 2014). Most of these remain undated or are believed to date to the Woodland period. Isolated finds believed to date to the Paleo-Indian period have also been recovered. The NPS has stated that the potential for encountering pre-contact archeological resources in the future is dependent on the original sensitivity and later historical use of the area (NPS, 2014).

Although the APEs for Rockaway and Jamaica Bay are relatively narrow, the APEs extend for several linear miles through Gateway. Accordingly, it is possible that pre-contact archeological sites are present in the APEs. Given the depth of the elements throughout the APE, it is anticipated that additional assessment for pre-contact archeological sites is warranted with the APEs. USACE will consult with the NPS, the NYSHPO, the Tribes, and other interested parties to develop a testing program as part of the Programmatic Agreement.

3.3.2 Historical Archaeological Sites

The potential for the discovery of additional in situ archeological resources in Gateway is influenced by a variety of natural and human factors (NPS, 2014). These include ancient and historical sea-level fluctuations, erosion and sediment transport due to tidal/wave action, and land filling/land-modification activities in the 19th and 20th centuries. All these factors affect the potential for the discovery of buried archeological resources, and their influence varies by geographic location. Although many natural coastal park areas have been buried beneath deep fill deposits, there are also areas where intact soils and archeological deposits have been recorded. For these reasons, the potential for the identification of intact archeological deposits in the park is strongly dependent on the types and effects of past and ongoing natural and human processes. The potential for discovery of archeological resources in each specific area of the park should be evaluated based on each area's unique set of circumstances.

Recent and comprehensive archeological assessments that considered the issue of the potential for archeological resources in Gateway included area-specific analyses of the sensitivity for such resources (NPS, 2014). These studies have included consideration of both natural and human impacts on specific park areas, and they have speculated on where the areas of highest potential for archeological resources may be. For instance, in Fort Wadsworth (Staten Island Unit), high-potential areas include pre-contact sites on bluffs within 1,000 feet of the shoreline, 18th century structures, late 19th century batteries, pre-contact sites on bluffs and terraces in the southern and western portions of Fort Wadsworth, and others (NPS, 2014).

The sensitivity for archeological resources located within portions of Breezy Point Tip in the Jamaica Bay Unit stands in contrast to the high-sensitivity areas at Fort Wadsworth (NPS, 2014). In this second case, the recent formation of the landform and the lack of long-term historical occupation have created a situation in which the potential for archeological resources of any period is very low. The ability to predict to a limited extent the sensitivity of an area for the presence of archeological resources is an outcome of the patterned nature of human behavior. Such predictions have many uses, one of which is their use in project planning (NPS, 2014).

The depth of floodwalls, levees, and buried seawalls/dunes may have the potential to impact archaeological resources.

3.3.3 Submerged Archeological Resources (Shipwrecks and Submerged Sites)

3.3.3.1 Rockaway

The Rockaway beach nourishment and reformulation proposed action may obtain sediment from one or more off-shore borrow locations, as well as from onshore sources shipped overwater via barge to the site by one or more commercial aggregate suppliers (USACE, 2016). Accordingly, and pursuant to guidelines established by the National Historic Preservation Act of 1966 and the National Environmental Policy Act of 1969, potential impacts to any significant cultural resources in a proposed borrow area must be addressed.

Based on a borrow source investigation, USACE identified three suitable offshore borrow areas approximately 3 miles south of the Rockaway peninsula (USACE, 2016). The borrow areas are identified as Borrow Area A West, Borrow Area A East, and Borrow Area B West (see Appendix B, Figure 12). The average dredging depth would be approximately 18 feet below the seafloor.

The area for Borrow Area A-West is roughly rectangular in shape approximately 4,800 feet from east to west, and 4,000 feet from north to south. Borrow Area A-East is roughly rectangular (5,000 feet in the alongshore direction by 4,000 feet in the on-offshore direction), and is approximately 1 mile east from Borrow Area A West. Borrow Area B-West is roughly a 1,200 by 1,200 feet box, and is approximately 4 miles west of Borrow Area A-West (USACE, 2016).

Panamerican conducted a remote sensing survey at Borrow Area A-West and A-East in 2005 (Panamerican, 2005). Sixty-seven magnetic anomalies were recorded within the project area. Based on signal characteristics, three anomalies have the potential to represent significant cultural resources. Panamerican recommended avoidance of all three targets. If avoidance is not an option, additional archaeological investigations are recommended to identify the source of the magnetic anomalies. Additional work should consist of remote-sensing target refinement and diver assessment of the refined target location. Diver assessment should consist of a visual and tactile investigation of the ocean bed at the center of highest gamma deviation for each. In the event that there is no source of magnetic deflection located directly on the ocean bed, sub-ocean bed investigations should be conducted with a probe or hydroprobe to a depth sufficient to either meet proposed project requirements or to locate and delineate the anomaly source. All targets should be assessed as to historical significance, relative to NRHP criteria. The remaining anomalies represent debris deposited for fish havens along and in the western edge of the project area, as well as a pipeline that parallels the southern project area boundary (Panamerican, 2005).

A remote sensing survey has not been conducted at Borrow Area B-West. If USACE plans to use this borrow area, a remote sensing survey will be conducted prior to dredging any material. USACE will share the results with the SHPO and provide recommendations for avoidance or additional investigation, as warranted.

Previous reports suggest there is the potential for shipwrecks in the general area off of the Rockaway peninsula (e.g. Engebretsen's shipwreck inventory on the Greater New York Harbor; Engebretsen, 1982, as referenced in Panamerican Consultants, 2003b; Panamerican Consultants, 2006). Based on an analysis of shipwrecks compiled by Riess and Pickman, Panamerican concluded, "Considering the amount of vessels wrecked off of Coney Island/Ambrose Channel (west of Borrow Area 2) and the number of vessels wrecked to the east of [Borrow Area 2], it can be inferred that the potential for wrecks off of Rockaway Beach remains high" (Panamerican Consultants, 2003b).

Additionally, Panamerican reported that a diver's guide to shipwrecks within the general area of Rockaway Beach lists seven wreck sites, including: *Princess Anne, Robert A. Snow, Cornelia Soule, Rascal, Black Warrior, Mistletoe,* and *Margaret* (in Daniel Berg's Wreck Valley Vol. II, 1990) (Panamerican Consultants, 2003). USACE has previously stated that "*twenty-three vessels were known to have been wrecked or stranded off Rockaway and Rockaway Beach. No wrecks have been located in the East Rockaway channel inlet itself. Because this inlet has been dredged in the past [prior to 1993], no resources will be impacted* (Kopper, 1979)" (referenced in Appendix L in USACE, 1993).

The Rockaway APE also includes creation of groins and lengthening of existing groins along the Atlantic Ocean shoreline, on the eastern portion of the Rockaway peninsula. Based on the preliminary construction design, constructing new or extending groins will require deepening of the seafloor up to 10-12 feet below existing grade, over a width of approximately 50 feet.

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APPENDIX B

Area of Potential Effects Figures

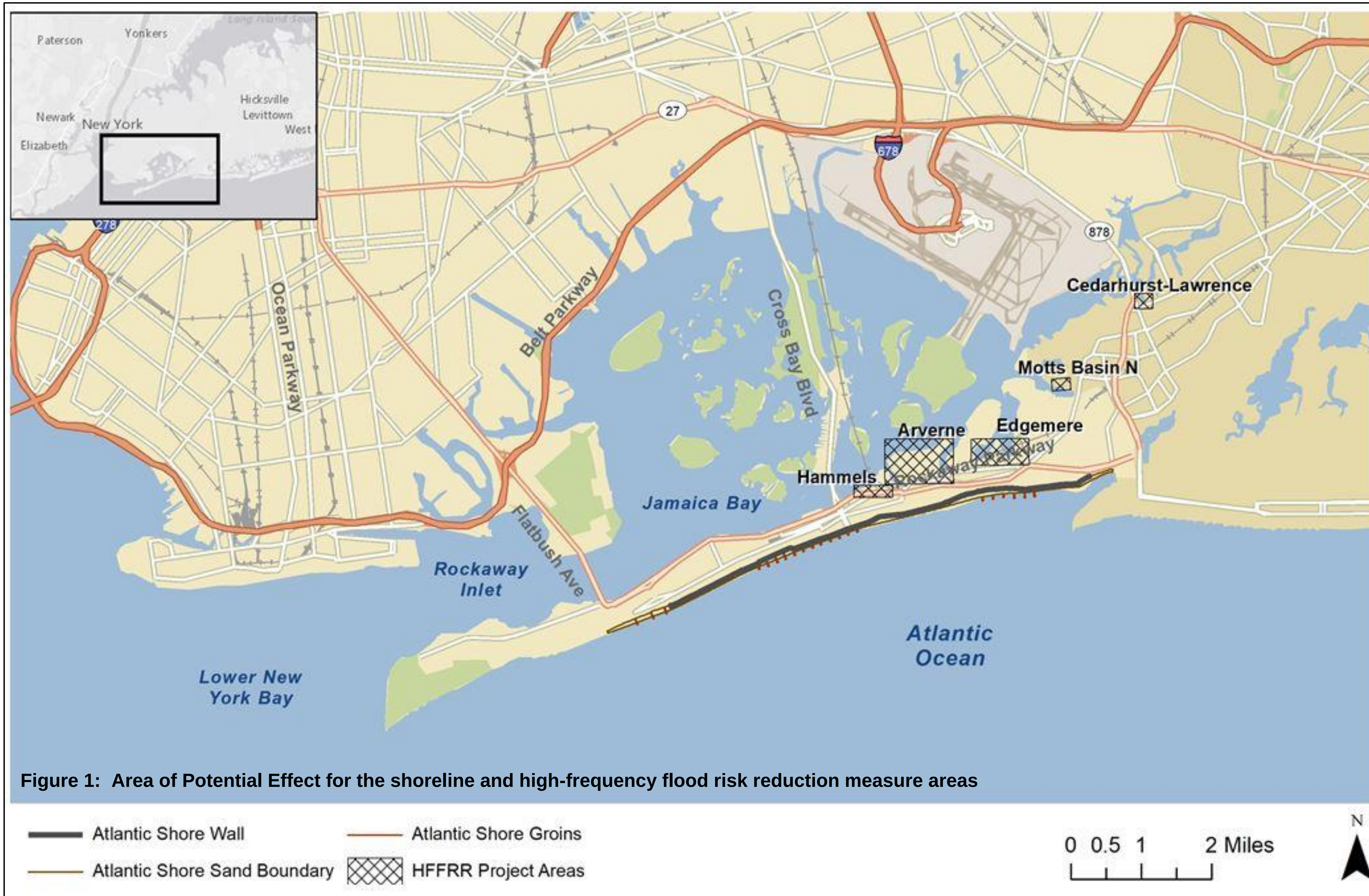


Figure 1: Area of Potential Effect for the shoreline and high-frequency flood risk reduction measure areas

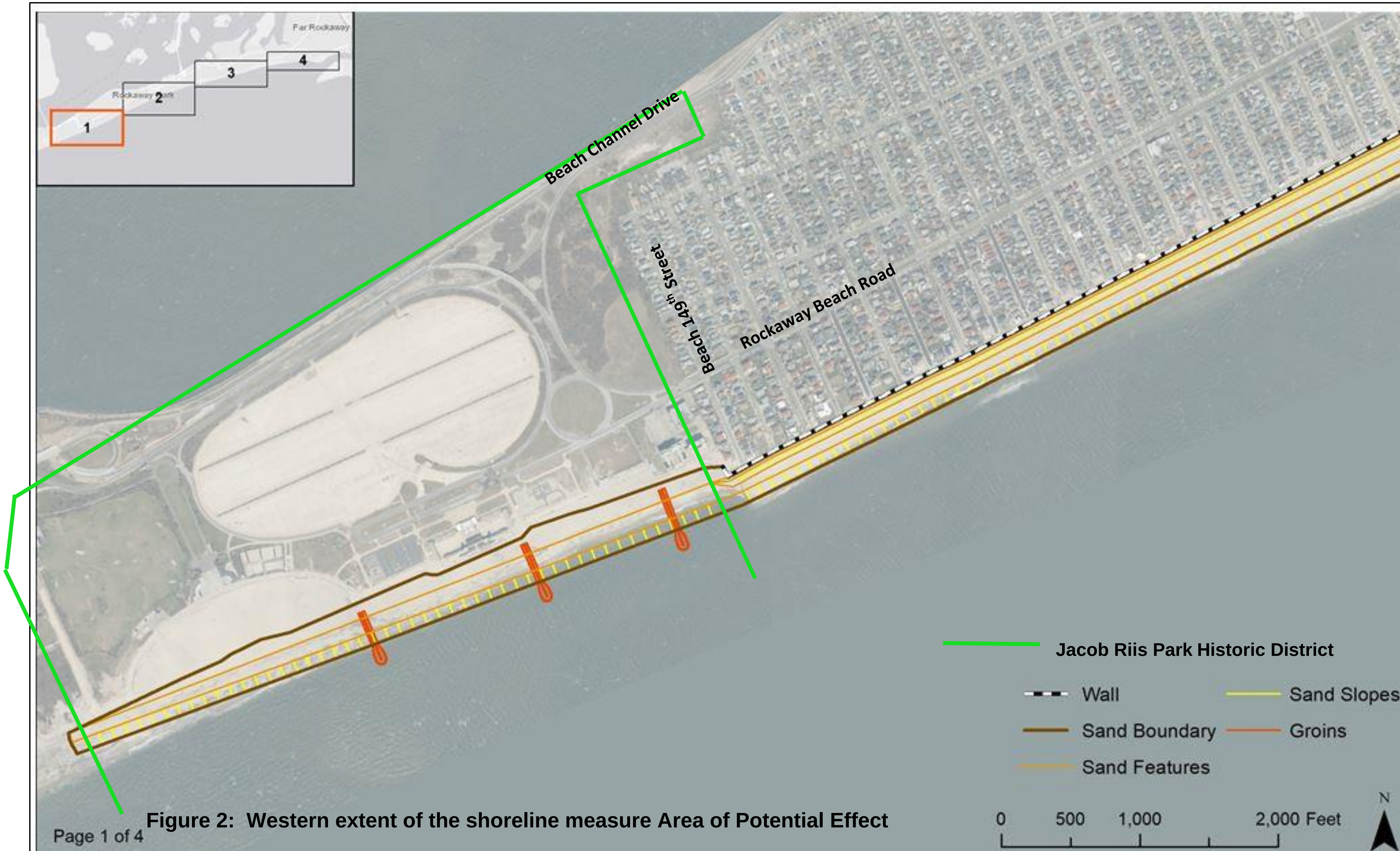


Figure 2: Western extent of the shoreline measure Area of Potential Effect

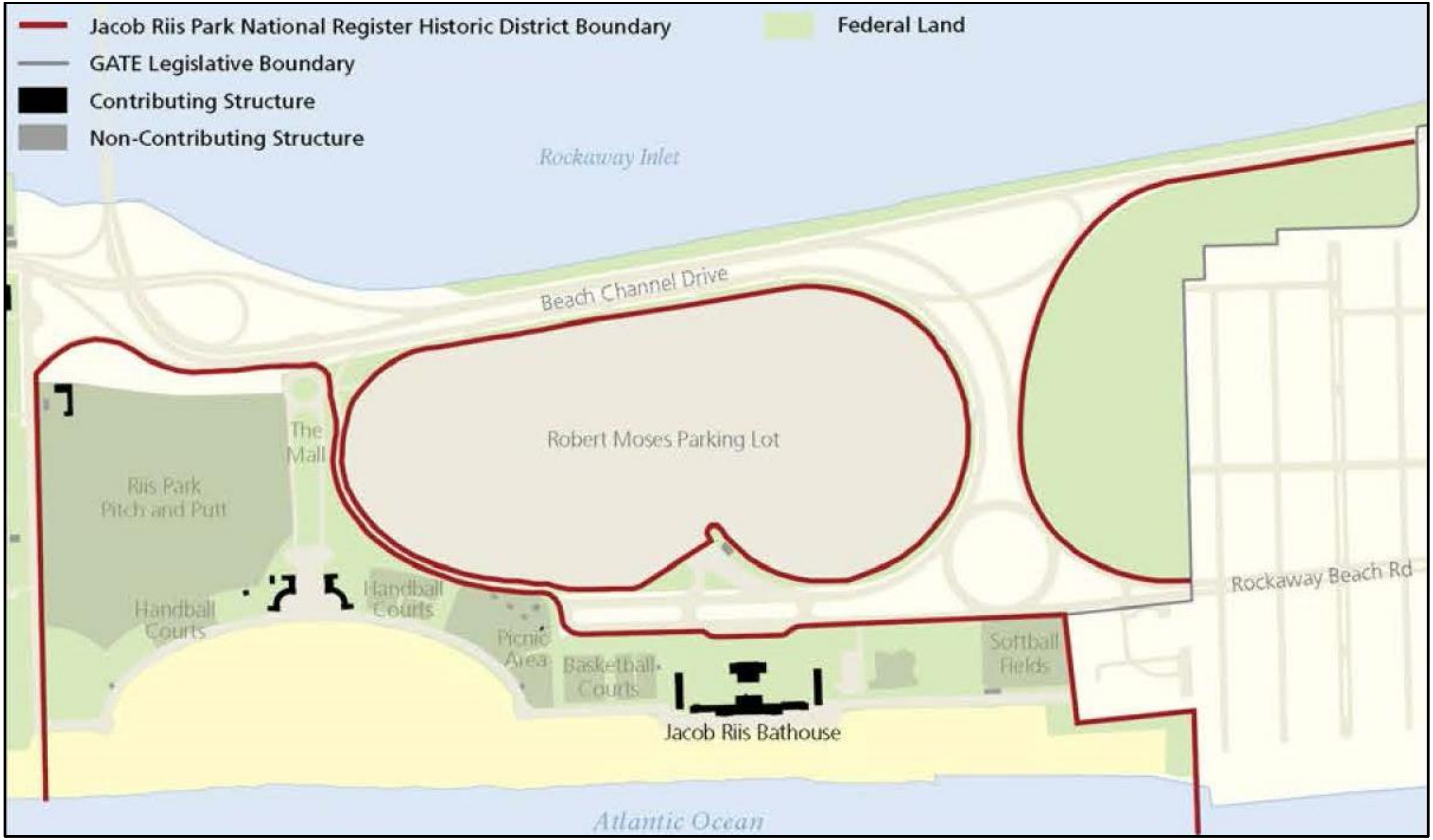


Figure 3: Jacob Riis Park Historic District

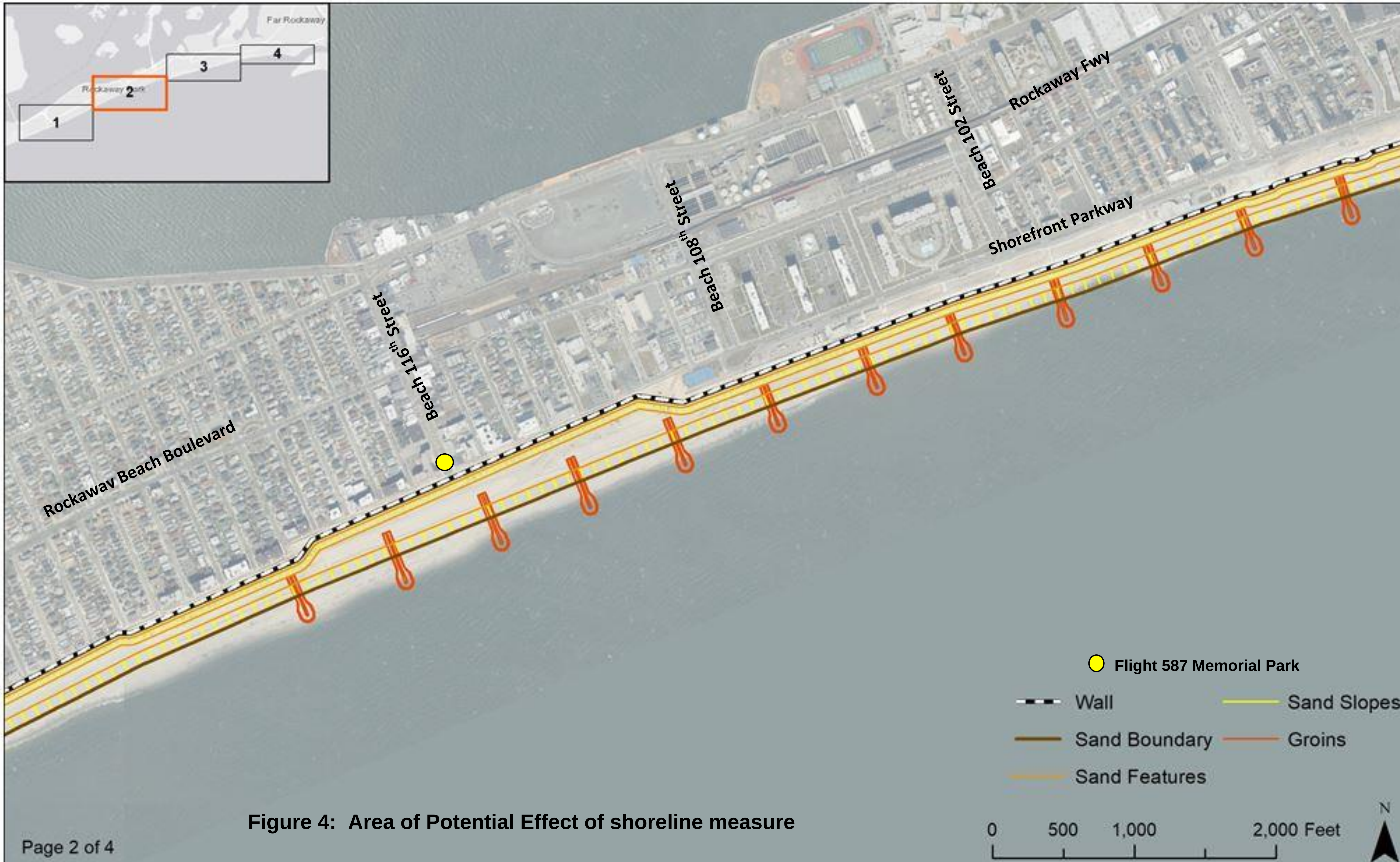


Figure 4: Area of Potential Effect of shoreline measure

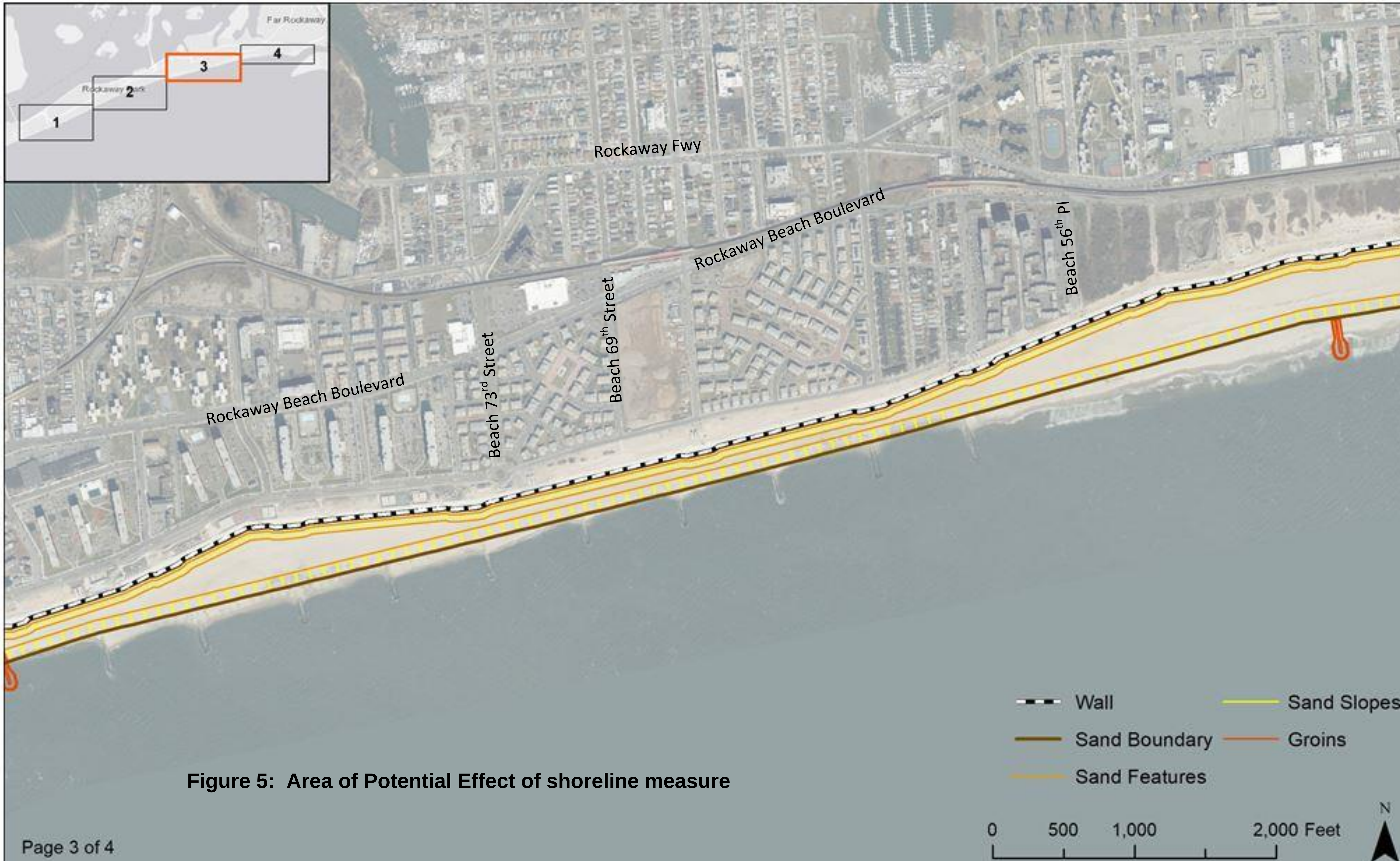


Figure 5: Area of Potential Effect of shoreline measure

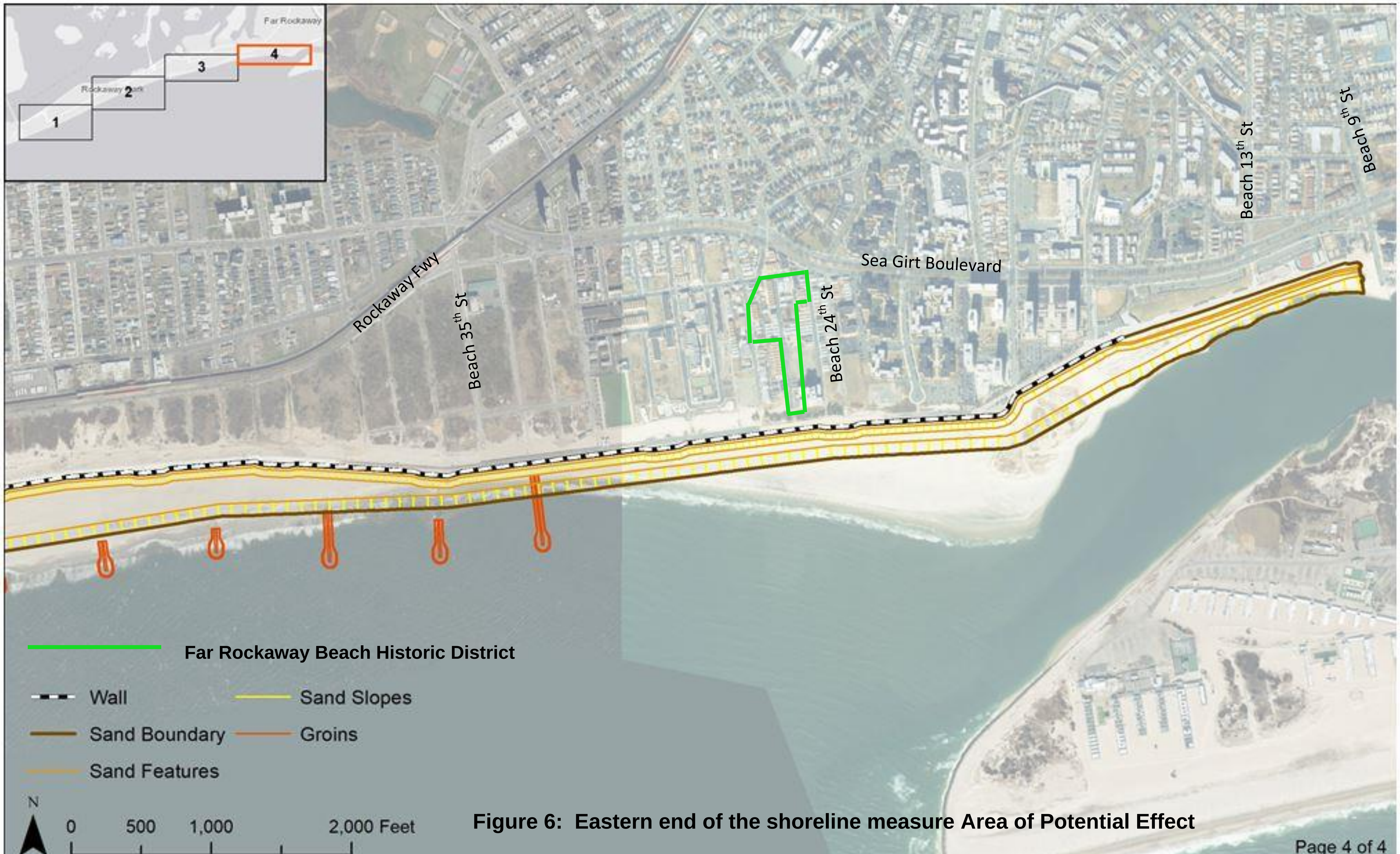


Figure 6: Eastern end of the shoreline measure Area of Potential Effect

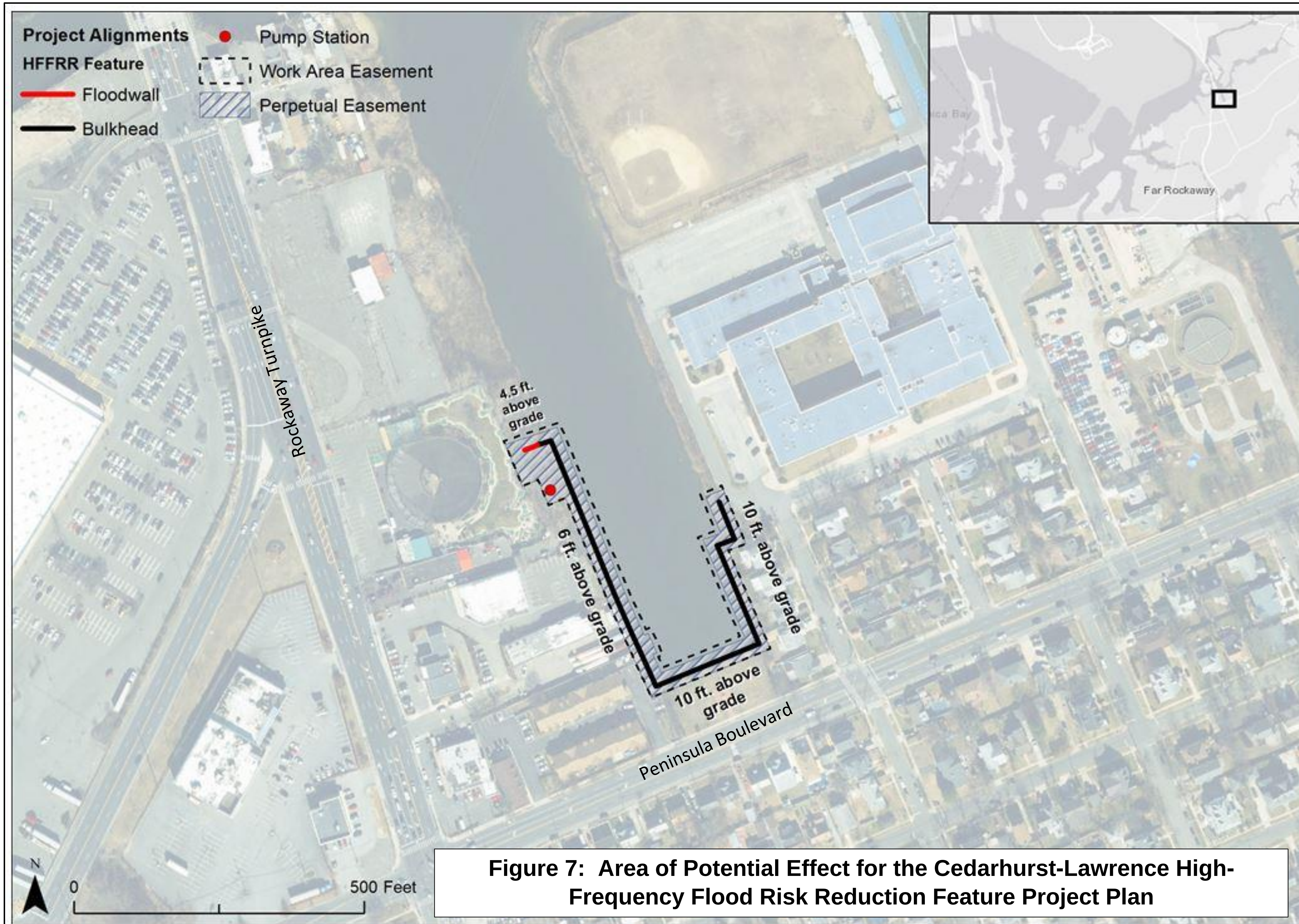


Figure 7: Area of Potential Effect for the Cedarhurst-Lawrence High-Frequency Flood Risk Reduction Feature Project Plan

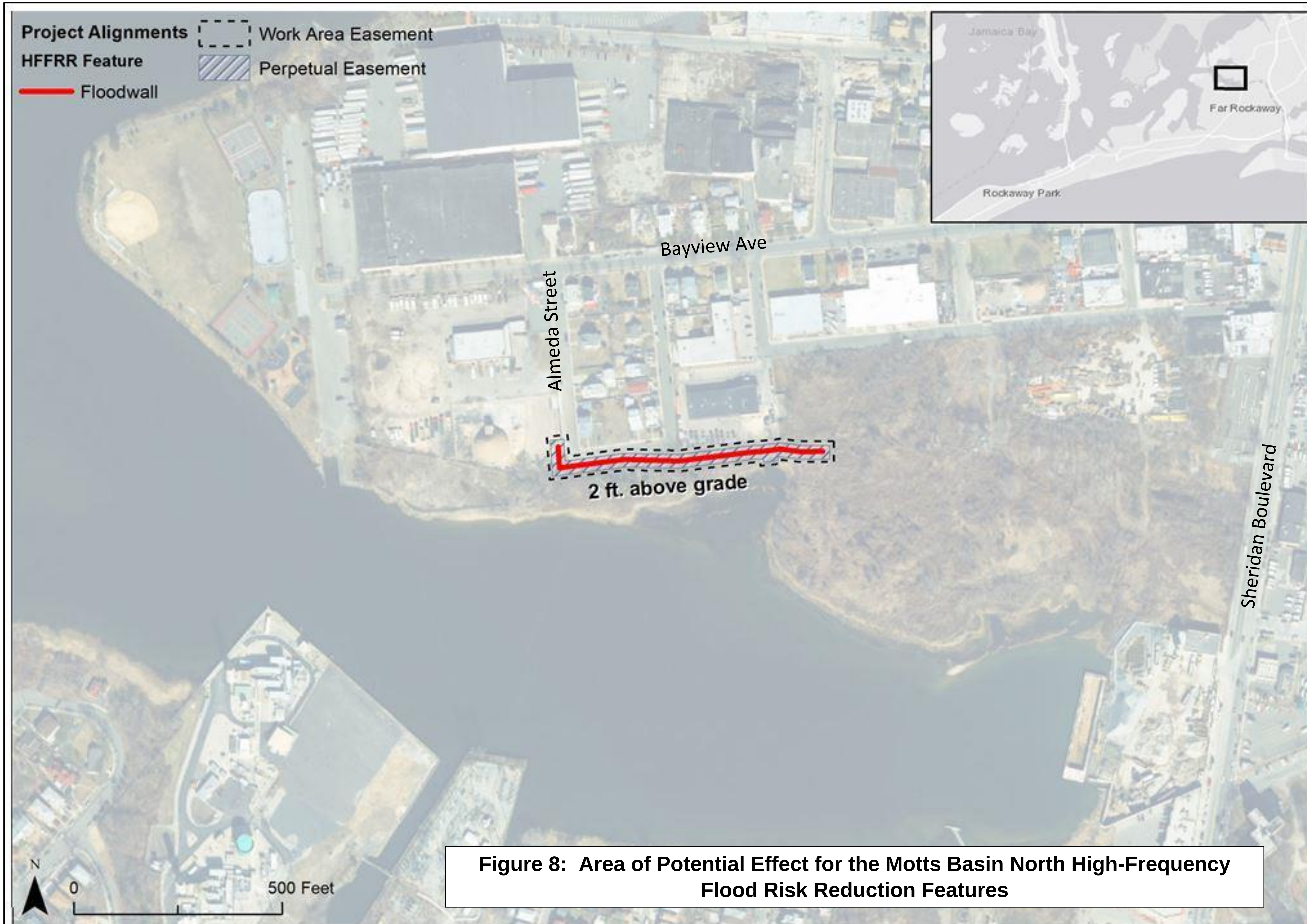


Figure 8: Area of Potential Effect for the Motts Basin North High-Frequency Flood Risk Reduction Features

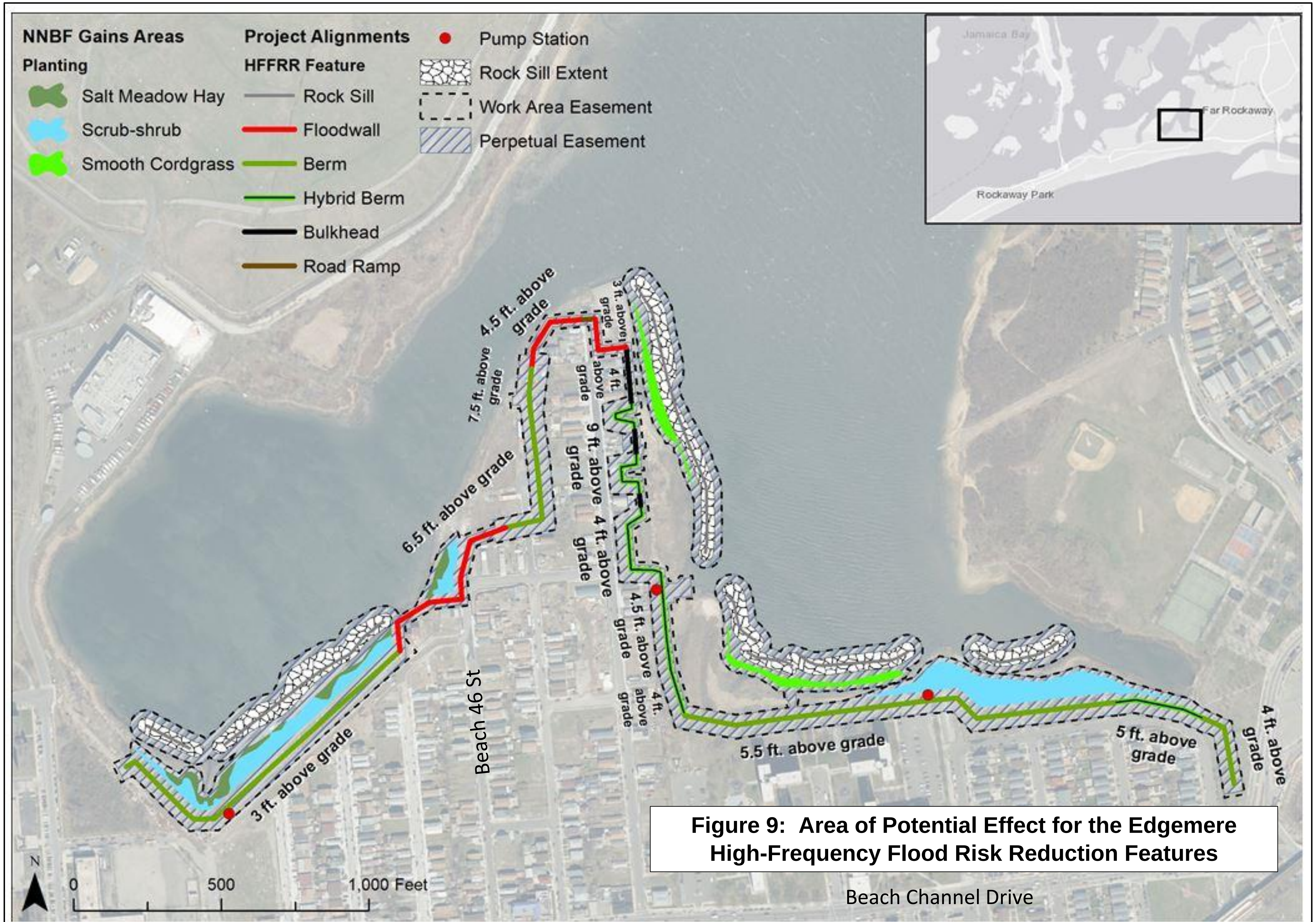


Figure 9: Area of Potential Effect for the Edgemere High-Frequency Flood Risk Reduction Features

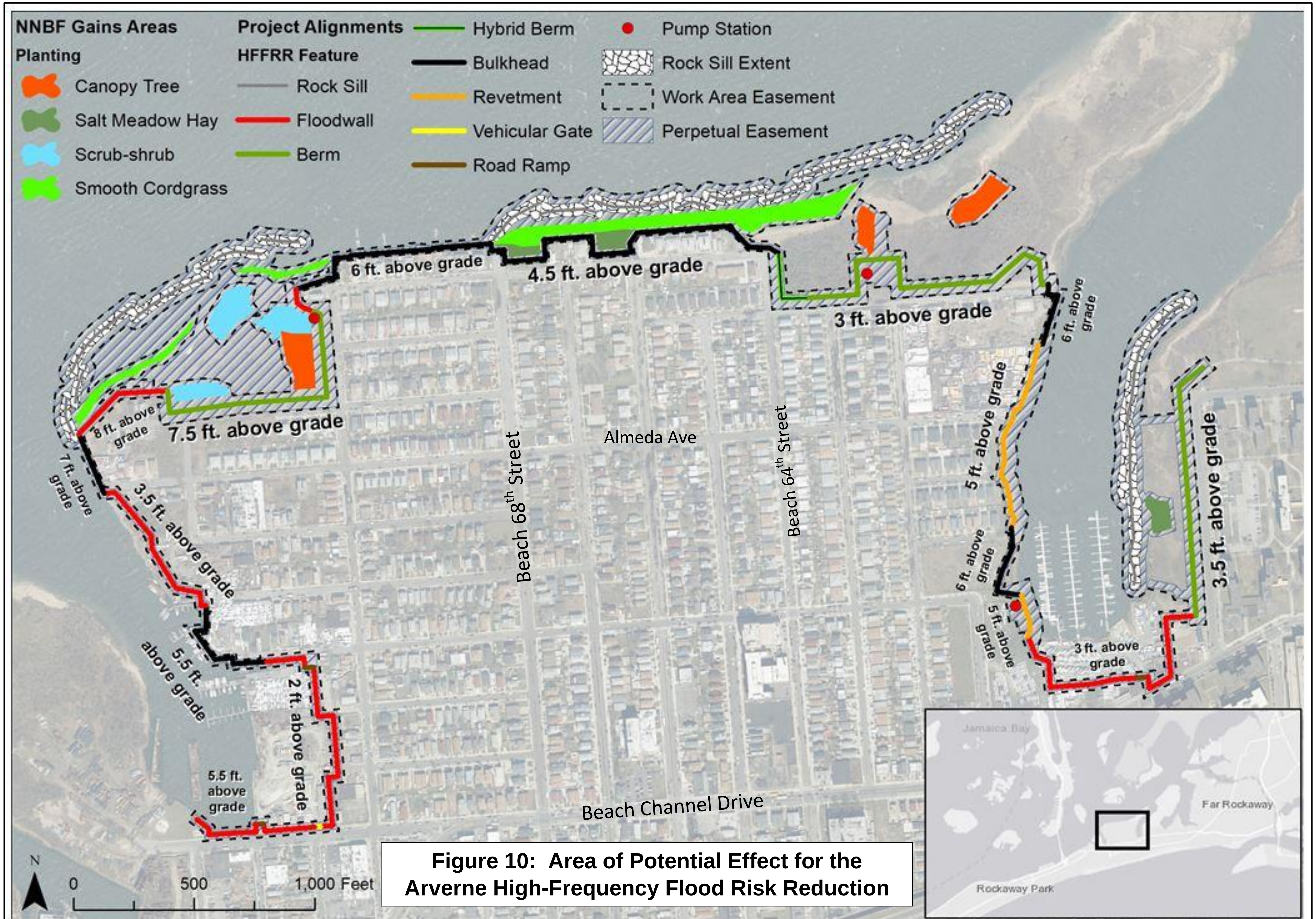


Figure 10: Area of Potential Effect for the Arverne High-Frequency Flood Risk Reduction

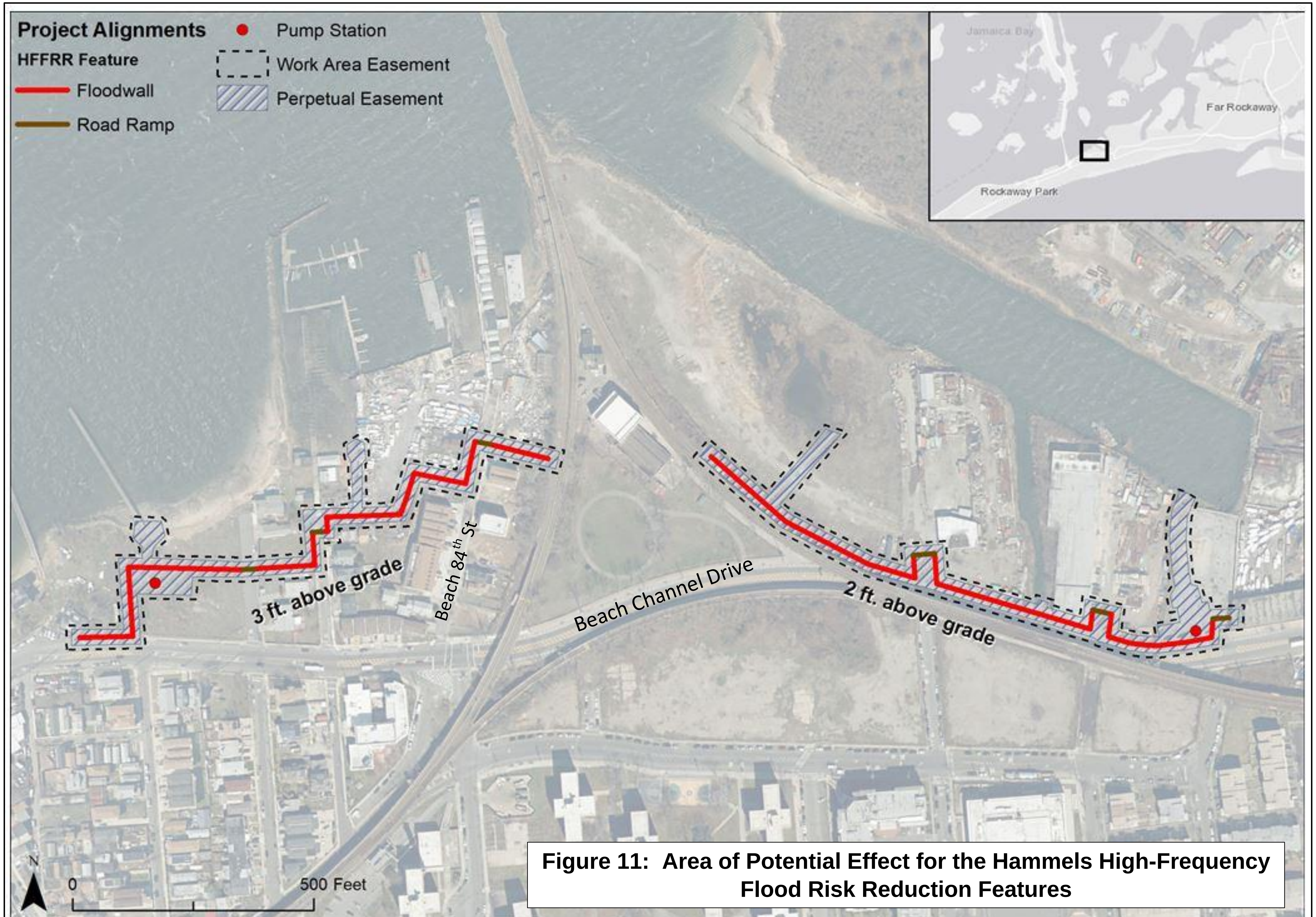


Figure 11: Area of Potential Effect for the Hammels High-Frequency Flood Risk Reduction Features

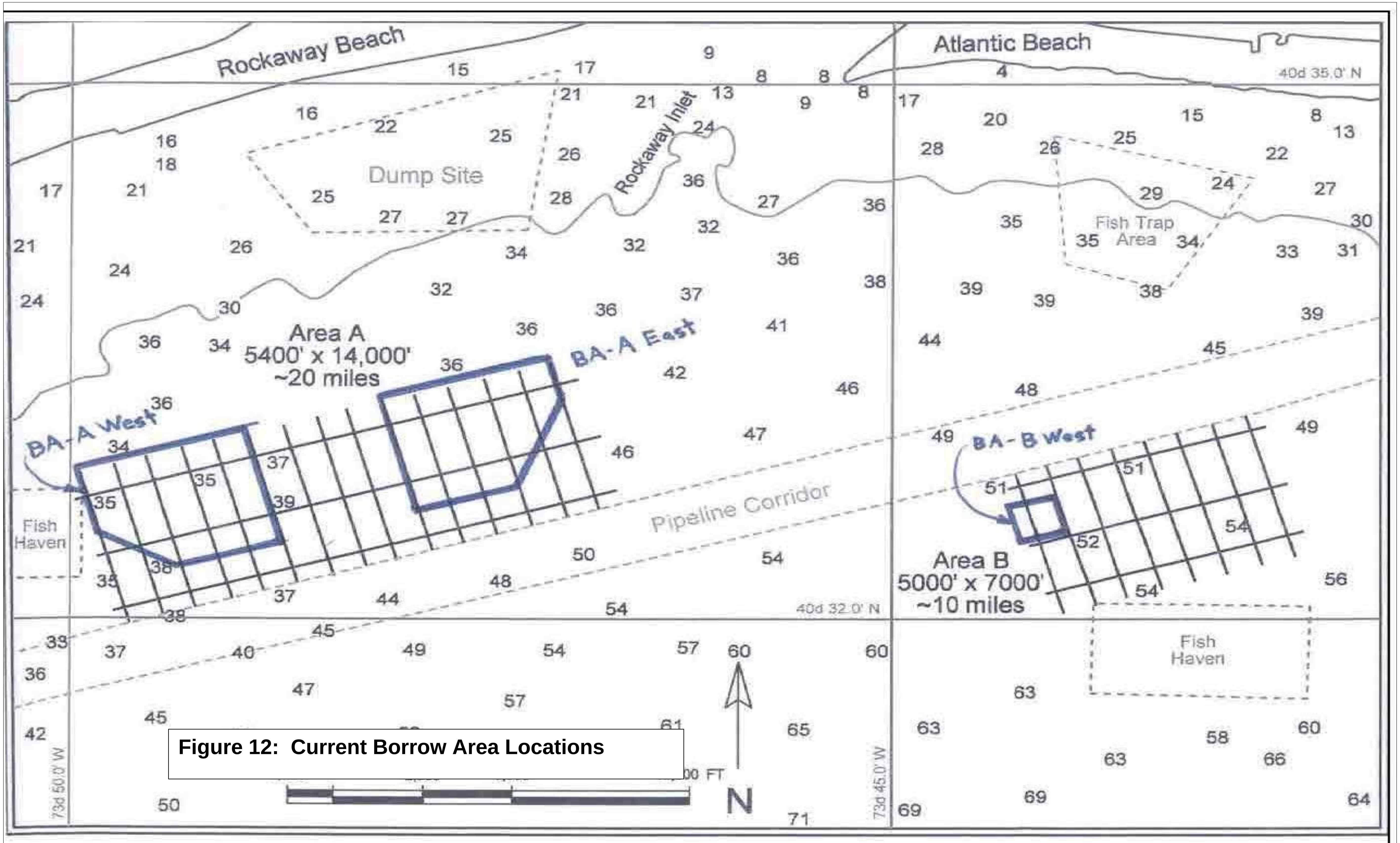


Figure 12: Current Borrow Area Locations

APPENDIX C

State Historic Preservation Office/

New York State Office of Parks, Recreation and Historic Preservation

Human Remains Discovery Protocol

(November 28, 2008)

State Historic Preservation Office/
New York State Office of Parks, Recreation and Historic Preservation
Human Remains Discovery Protocol
(November 28, 2008)

In the event that human remains are encountered during construction or archaeological investigations, the New York State Historic Preservation Office (SHPO) recommends that the following protocol is implemented:

- At all times human remains must be treated with the utmost dignity and respect. Should human remains be encountered work in the general area of the discovery will stop immediately and the location will be immediately secured and protected from damage and disturbance.

- Human remains or associated artifacts will be left in place and not disturbed. No skeletal remains or materials associated with the remains will be collected or removed until appropriate consultation has taken place and a plan of action has been developed.

- The county coroner/medical examiner, local law enforcement, the SHPO, the appropriate Indian Nations, and the involved agency will be notified immediately. The coroner and local law enforcement will make the official ruling on the nature of the remains, being either forensic or archaeological.

- If human remains are determined to be Native American, the remains will be left in place and protected from further disturbance until a plan for their avoidance or removal can be generated. Please note that avoidance is the preferred choice of the SHPO and the Indian Nations. The involved agency will consult SHPO and appropriate Indian Nations to develop a plan of action that is consistent with the Native American Graves Protection and Repatriation Act (NAGPRA) guidance.

- If human remains are determined to be non-Native American, the remains will be left in place and protected from further disturbance until a plan for their avoidance or removal can be generated. Please note that avoidance is the preferred choice of the SHPO. Consultation with the SHPO and other appropriate parties will be required to determine a plan of action.

Section 106 Coordination

NEW YORK STATE · OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION

Andrew M. Cuomo
Governor

Rose Harvey
Commissioner

New York State Office of Parks, Recreation and Historic Preservation

Division for Historic Preservation
P.O. Box 189, Waterford, New York 12188-0189
518-237-8643

May 15, 2013

Leonard Houston
U.S. Army Corps of Engineers, New York District,
Jacob K. Javits Federal Building
26 Federal Plaza
New York, New York 10278-0090

Re: CORPS
East Rockaway Beach Nourishment Project
East Rockaway Inlet
QUEENS, Queens County
13PR02248

Dear Mr. Houston:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8).

Based upon this review, it is the SHPO's opinion that your project will have No Effect upon cultural resources in or eligible for inclusion in the National Registers of Historic Places.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Deputy Commissioner for Historic Preservation

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, N.Y. 10278-0090

Reply to
Environmental Analysis Branch

May 3, 2013

Ms. Ruth L. Pierpont, Director
Historic Preservation Field Services Bureau Office
New York State Offices of Parks, Recreation and Historic Preservation
Pebbles Island – P.O. Box 189
Waterford, NY 12188-0189

RE: USACE East Rockaway Beach Nourishment Project
Dredging of East Rockaway Inlet

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (NY District) under the emergency provisions under Public Law (PL) 84-99, Flood and Coastal Storm Emergencies and PL 113-2 (Repair) and The Disaster Relief Appropriations Act – 2013 (Restore), at the request of New York State, is in the process of restoring damages to Rockaway Beach caused by Hurricane Sandy so as to restore protection to the community before the next storm season. The Atlantic Coast of Long Island New York project sustained considerable damages from Hurricane Sandy between October 28 and 30, 2012. It is critical that the rehabilitation is carried out rapidly to return protection to the affected communities and infrastructure.

For the repair and restoration activities at Rockaway Beach, the District anticipates placing approximately 3.5 Million cy/yds of sand along 6.2 miles of shoreline between Beach 19th street and Beach 149th street, all areas where we have historically placed sand in the past. The existing project constructed under the prior Section 934 effort consisted of building a 100-foot wide berm to an elevation of +10 feet National Geodetic Vertical Datum of 1929 (NGVD) (Enclosure 2-3: Proposed project scope, location and borrow area location).

The District's dredging procurement strategy is as follows:

CONTRACT 1A: The specifications will include utilization of a cutter head dredge to obtain 800,000 c/yds of East Rockaway Inlet sand. The District anticipates award of this contract can be made in Mid-May. Sand placement would be for Rockaway Beach and start early June in the vicinity of the end groin around Beach 89th, and move west to Beach 149th. This is primarily to address the most critical sand losses, and to avoid potential piping plover nesting areas in the eastern half of the project.

CONTRACT 1B: This action would be for 2.8 Million c/yds of additional sand to complete Rockaway Beach using sand from the previously used offshore borrow area via a hopper dredge, to complete the full Restoration of Rockaway Beach to design conditions. Contract award would likely not be until the June timeframe, because of additional Federal procedural reviews required when contracts near $50 Million in scope.

Federal undertakings will comply with the Archaeological and Historical Preservation Act of 1974 (16 USC 469-469c), the Abandoned Shipwreck Act of 1987 (PL 100-298; 43 USC 2101-2106), The National Historic Preservation Act of 1966, as amended (16 USC 470) and the Advisory Council on Historic Preservation's implementing regulations 36CFR800 (protection of Historic Properties). Section 106 of the National Historic Preservation Act requires Federal agencies to provide the State Historic Preservation Officer (SHPO), as agent to the Advisory Council on Historic Preservation, reasonable opportunity to evaluate and comment on any Federal undertaking.

In a letter dated August 9, 2000, the New York State Office of Parks, Recreation and Historic Preservation Office stated that it reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966 and determined that the Corps' project will have no effect upon cultural resources in or eligible for inclusion in the National Registers of Historic Places (Enclosure 1).

Extensive archaeological recordation, archival documentation and investigations have been performed in the past for this project area in accordance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations pursuant to 36 CFR 800.5. It is the NY District's opinion that the work as proposed will have no impacts to cultural resources and no further cultural resources studies will be undertaken if the plan remains as proposed.

Please review the enclosed documents that explain in further detail the scope of the emergency shoreline rehabilitation project and provide your comments in accordance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations pursuant to 36 CFR. If you or your staff require additional information or have any questions, please contact Heather Morgan, Project Archaeologist at (917) 790-8730.

Sincerely,

L. Houston

Leonard Houston
Chief, Environmental Analysis Branch

Enclosures:
1: USACE and NYSHPO coordination letter, August 2000
2: PL84-99 Project Information Report (PIR), Record of the Environment (REC) for Hurricane Sandy Response
3: FCCE Hurricane Sandy Rehab, Atlantic Coast of NYC, Rockaway and Coney Island Drawing

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

February 17, 2006

Christopher Ricciardi
Project Archaeologist
Environmental Analyst Branch
New York District
US Army Corps of Engineers
Jacobe K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Ricciardi,

Re: CORPS
Rockaway Beach Nourishment Project
Dredging of East Rockaway Inlet
Queens County, NY
05PR05274 formerly 00PR2949

Thank your for requesting the comments of the New York State Historic Preservation Office (SHPO) with regard to the potential for this project to affect significant historical/cultural resources. SHPO had previously reviewed the report *Remote Sensing Survey of the Proposed Borrow Area for the East Rockaway Reformulation Project, Queens County, New York* prepared by Panamerican Consultants, Inc. in September 2005. Based on that review, SHPO had asked for additional information to addresses the potential for submerged prehistoric sites. In response you have provided SHPO with extensive coring information that had been collected for proposed borrow Area A. Based on those logs, SHPO has no further concerns regarding this issue.

Please contact me at extension 3291, or by e-mail at douglas.mackey@oprhp.state.ny.us, if you have any questions regarding these comments.

Sincerely

Douglas P. Mackey
Historic Preservation Program Analyst
Archaeology

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, NY 10278-0090

REPLY TO
ATTENTION OF

February 15, 2006

Environmental Analysis Branch

Ms. Ruth L. Pierpont, Director
Historic Preservation Field Services Bureau
New York State Office of Parks, Recreation and Historic Preservation
Peebles Island - P.O. Box 189
Waterford, New York 12188-0189

RE: CORPS
Rockaway Beach Nourishment Project
Dredging of East Rockaway Inlet
Queens, Queens County
00PR2949

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (Corps), is pleased to furnish you with the copy of portions of the Engineering Report, *Preliminary Investigation – Borrow Area Identification and Investigation for the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York Reformulation Study*. This report details the coring samples taken within the proposed Borrow Area A for the East Rockaway Project.

As per your request for information with regard to the undertaking studies for previously buried land surfaces, according to the study report sand cores taken to a depth of twenty feet did not reveal indications of stratified levels. The samples were fairly uniform in their composition. No discernable intrusions and/or inclusions were uncovered. The lack of stratigraphy in the samples supports the notion that the removal of sand to the recommended depth of twenty feet will not disturb potentially buried stratified surfaces. The uniformity of the samples helped to make Borrow Area A the choice for sand mining for the proposed project. Based on this information, additional studies for the potential to uncover buried land surfaces were not required in our Scope of Work.

If you have further questions, please contact the Project Archaeologist, Dr. Christopher Ricciardi at (917) 790-8630 or christopher.g.ricciardi@usace.army.mil.

Sincerely,

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, NY 10278-0090

REPLY TO
ATTENTION OF

November 22, 2005

Environmental Analysis Branch

Ms. Ruth L. Pierpont, Director
Historic Preservation Field Services Bureau
New York State Office of Parks, Recreation and Historic Preservation
Peebles Island - P.O. Box 189
Waterford, New York 12188-0189

RE: CORPS
Rockaway Beach Nourishment Project
Dredging of East Rockaway Inlet
Queens, Queens County
00PR2949

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (Corps), is pleased to furnish you with the final copy of, *Remote Sensing Survey Of the Proposed Borrow Area for the East Rockaway Reformulation Project, Queens County, New York Project*.

As per your letter dated October 24, 2005, the Corps thanks you for your comments and agreement with the assessment of the report with regard to the East Rockaway Borrow Area Project. The Corps is currently preparing the supplemental data that your office requested with regard to Coring Sample Information and will provide that information shortly.

Once again, thank you for your participation in the Section 106 process with regard to the East Rockaway Reformulation Project.

Sincerely,

Leonard Houston
Chief, Environmental Analysis Branch

Enclosure

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

October 24, 2005

Christopher Ricciardi
Project Archaeologist
Environmental Analyst Branch
New York District
US Army Corps of Engineers
Jacobe K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Ricciardi,

Re: CORPS
Rockaway Beach Nourishment Project
Dredging of East Rockaway Inlet
Queens County, NY
00PR2949

Thank your for requesting the comments of the New York State Historic Preservation Office (SHPO) with regard to the potential for this project to affect significant historical/cultural resources. SHPO has reviewed the report *Remote Sensing Survey of the Proposed Borrow Area for the East Rockaway Reformulation Project, Queens County, New York* prepared by Panamerican Consultants, Inc. in September 2005. Based on this review, SHPO offers the following comments.

1. SHPO concurs with the recommendations concerning the three identified potential shipwrecks.

2. Although the report addresses the potential for submerged prehistoric sites, and discusses potential ways to identify landforms that may contain such sites, there appears to be no actual attempt to identify such landforms, or detailed discussion of why this may not be appropriate for this project. Please provide further details on this potential and why the identified survey or analysis was not completed

Please contact me at extension 3291, or by e-mail at douglas.mackey@oprhp.state.ny.us, if you have any questions regarding these comments.

Sincerely

Douglas P. Mackey
Historic Preservation Program Analyst
Archaeology

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

August 11, 2003

Nancy Brighton
US Army Corps of Engineers
Jacob Javits Federal Building
New York, NY 10278-0090

Dear Ms. Brighton:

Re: CORPS
Rockaway Beach Project
T-Groing Placements
Brooklyn, Kings County, New York
03PR03715

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) with regard to the potential for this project to affect significant cultural/historical resources. SHPO has reviewed the report "Draft Report - Cultural Resources Assessment of T-Groin Placement, Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet, and Jamaica Bay, Queens County, New York, Section 934" prepared by Panamerican Consultants, Inc. in June 2000. Based on this review, SHPO concurs with the recommendations of the report for limited Phase 1B underwater investigation .

Please contact me at extension 3291 if you have any questions regarding these comments.

Sincerely

Douglas P. Mackey
Douglas P. Mackey
Historic Preservation Program Analyst
Archaeology

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Bernadette Castro
Commissioner

October 29, 2002

Leonard Houston
Corps of Engineers
New York District
Jacob Javits Federal Building
New York, New York 10278-0090

Re: CORPS
Rockaway Beach Shoreline – Beach Renourishment Projects/Rockaway Beach, East Rockaway Inlet
Brooklyn/Queens, Kings/Queens County
02PR04702

Dear Mr. Houston:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966.

Based upon this review, it is the SHPO's opinion that your project will have No Effect upon cultural resources in or eligible for inclusion in the National Registers of Historic Places.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director

RLP:cmp

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

September 20, 2002

Environmental Analysis Branch

Ms. Ruth L. Pierpont, Director
Historic Preservation Field Services Bureau
New York State Office of Parks, Recreation and Historic Preservation
Peebles Island - P.O. Box 189
Waterford, New York 12188-0189

RE: CORPS
Rockaway Beach Project
Brooklyn, Kings County
89PR1188

CORPS
East Rockaway Inlet Channel Dredging
Queens County
92PR1171

Public Notice No. 00-ERIMDSN

CORPS
Beach Nourishment Rockaway Beach/Channel
Dredge East Rockaway Inlet
Queens, Queens County
00PR2949

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (Corps), in its continuing effort to nourish the beaches along the Rockaway Beach shoreline as part of the above referenced Beach Erosion Control and Hurricane Protection Project for the East Rockaway Inlet, Queens County, New York (89PR1188), proposes to place material dredged from Borrow Area #2 along the shoreline between Beach 19th Street and Beach 148th Street (92PR1171; Enclosure 1). This renourishment will be the final sand placement as part of the 89PR1188 Project. These proposed actions are also described in the above referenced Public Notice issued June 16, 2000, by the Corps (Enclosure 2).

As part of previous coordination efforts for the Beach Erosion Control and Hurricane Protection project, the placement of sand on the beach from Beach 19th Street to Beach 148th Street has been determined to have no effect on historic properties (Enclosures 3 and 6). In addition, the use of material from Borrow Area 2 was also determined to have no effect on historic properties (Enclosures 3, 4 and 5). The proposed sand placement will occur from October 2003 through February 2004.

Please review the enclosed materials and provide your comments in accordance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36 CFR 800, by November 1, 2002. If you have any questions or require additional information, please contact Mr. Chris Ricciardi, Project Archaeologist, at 212-264-0204. Thank you for your assistance.

Sincerely,

Nancy J. Brighton
for Leonard Houston
Chief, Environmental Analysis Branch

Enclosures

US Army Corps
of Engineers
New York District
26 Federal Plaza
New York, N.Y. 10278
ATTN: CENAN-OP-ST

Public No

Enclosure 2

In replying refer to:

Public Notice No. 00 ERIMDSN

Published: 6/16/00 Expires: 7/17/00

EAST ROCKAWAY INLET, NEW YORK FEDERAL NAVIGATION PROJECT
MAINTENANCE DREDGING
and
SUPPLEMENTAL NOURISHMENT FOR THE FEDERAL BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT FOR EAST ROCKAWAY INLET TO ROCKAWAY INLET AND JAMAICA BAY, NEW YORK

TO WHOM IT MAY CONCERN:

Pursuant to Section 404 (33 U.S.C. 1344) of the Federal Water Pollution Control Act (amended in 1977 and commonly referred to as the Clean Water Act) and Section 10 of the Rivers and Harbors Act, notice is hereby given that the U.S. Army Engineer District, New York proposes to perform maintenance dredging of the Federal Navigation Channel in East Rockaway Inlet (Attachment 1) with placement of dredged material along Rockaway beach. In addition, New York District is planning to perform a supplemental nourishment cycle for the Beach Erosion Control and Hurricane Protection Project for East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York. This would require dredging of the borrow area 2 (Attachment 2) and an intermediate area (East Rockaway Inlet Borrow area) adjacent to the western boundary of the scheduled maintenance dredging limits. The dredged material will be placed along Rockaway Beach.

FEDERAL PROJECT AUTHORIZED:

The Federal maintenance dredging project for East Rockaway Inlet Navigational channel was authorized by the Rivers and Harbors Act of 1930.

The Federal Beach Erosion Control and Hurricane Protection Project for East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York was authorized by the Flood Control Act of 1965 and subsequently modified in 1974 by the Water Resources Development Act (WRDA) and in 1986 in accordance with the authority provided by Section 934 of the WRDA.

FEDERAL PROJECT DESCRIPTION:

The existing Federal navigation project provides for a channel, 12 feet deep at mean low water, 250 feet wide from a 12 foot depth contour in the Atlantic ocean to a 12 foot depth contour in East Rockaway Inlet, and a 4,250 foot long jetty on the eastern side of the inlet. The channel is about 1.4 miles long.

It should be noted that due to the rapid shoaling nature of the East Rockaway inlet, advance maintenance measures are being considered, including: 1) maintaining a previously constructed deposition basin with a variable width of 150 - 270 feet which is directly parallel to the entire western boundary of the channel; and 2) maintaining a second deposition basin with a maximum width of 200 feet and length of about 0.4 miles directly parallel to the eastern boundary of the outer portion of the channel. Advance maintenance dredging of 14 feet plus 2 feet allowable overdepth has been performed for the entire channel during past maintenance operations and is planned for the proposed maintenance dredging.

In order to maximize the amount of sand available for beachfill, supplemental dredging and nourishment for the Beach Erosion Control and Hurricane Protection Project for East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York will be performed. The sand for the supplemental nourishment will be dredged from an intermediate area west of the western deposition basin described above, and placed on the beaches between B27th and B40th Streets. The dimensions of this area would be 300 feet by 0.4 miles long.

Additionally, to provide beachfill in the vicinity of Beach 90th Street, the Beach Erosion Control and Hurricane Protection Project authority would be utilized to dredge a 0.22 square mile portion of a borrow area approximately 1 mile offshore (identified as borrow area number 2) to a depth of no greater than 20 feet below existing grade. This material would be placed onto the beaches between B96th and B110th Streets.

DESCRIPTION OF PROPOSED FEDERAL ACTION:

The first proposed action by the U. S. Army Engineer District, New York is the future maintenance dredging of the Federal Navigation Channel and deposition basins in East Rockaway Inlet. Approximately 210,000 cubic yards of sand will be dredged from the inlet and used in a beneficial manner as beachfill, placed along severely eroded areas of the Rockaway beach shoreline. Maintenance dredging of the channel is generally accomplished by hydraulic or similar plant. The entire channel will generally not require maintenance dredging; only areas where shoaling has reduced the depth of the channel will require dredging. The project was last dredged in 1998, with the removal of about 218,000 cubic yards with placement along the shoreline (Rockaway Beach) west of the inlet. The currently proposed action is intended to provide a safe navigation route through the inlet and to utilize the sand dredged from the inlet in a beneficial manner as replenishment for the nearby shoreline.

The second proposed action by the New York District is the supplemental nourishment which requires dredging an intermediate area west of the western deposition basin and the borrow area 2 and placing the material as beach erosion control and hurricane protection along severely eroded areas of the Rockaway Beach shoreline. This action was last performed in 1996 when a total of about 2,700,000 cubic yards were dredged from an offshore borrow site and placed along Rockaway beach shoreline. For the currently proposed action a combined total of approximately 700,000 cubic yards of sand is expected to be dredged with about 300,000 cubic yards being removed from the intermediate area adjacent to the navigation channel and deposition basins, and the remaining quantity coming from the borrow area 2.

PLACEMENT SITE:

The dredged material from the proposed actions shall be placed along the beaches west of the inlet. Specifically, material dredged from East Rockaway Inlet, including the intermediate area, shall be placed on the beaches between B27th and B40th Streets; material dredged from the offshore borrow area shall be placed between B96th and B110th Streets. Between maintenance operations the bypassed sand placed at the feeder beach would be carried by littoral drift to feed down-drift beaches. The maintenance dredging operation would thus serve to place sand trapped in the channel back into the normal littoral movement that naturally replenishes the western beaches, while maintaining a safe channel for navigation. The beach nourishment operation would serve as replenishment to severely eroded areas of the Rockaway Beach shoreline.

ENVIRONMENTAL IMPACT ASSESSMENT:

The New York District has done a review of the Environmental Assessment (EA) for the maintenance dredging of East Rockaway Inlet project, dated October 1998, which updated an EA prepared in 1993. The EA prepared in 1993 had updated an Environmental Impact Statement that was prepared in September 1973 for maintenance dredging of East Rockaway Inlet Federal Navigation channel. It was determined that maintenance dredging of East Rockaway Inlet with placement of the sand as nourishment along the nearby shoreline of the designated beach would have no significant adverse environmental impact on water quality, marine resources, wildlife, endangered species, recreation, aesthetics and flood protection of the area.

An update of the 1998 EA and an update of Section 404(b)(1) of the Clean Water Act 40 CFR 230 will be prepared.

In addition, New York District has also done a review of the Environmental Assessment for borrow area dredging and beach nourishment, dated 1993, which updated an EA prepared in 1973. It was determined that borrow area dredging with placement of sand as nourishment along the nearby shoreline of the designated beach would have no significant adverse environmental impact on water quality, marine resources, wildlife, endangered species, recreation, aesthetics and flood protection of the area.

An update of the 1993 EA and an update of Section 404(b)(1) of the Clean Water Act 40 CFR 230 will be prepared.

ALTERNATIVES TO THE PROPOSED ACTION:

a. No Dredging - The no dredge alternative would result in the continued shoaling of the inlet, which will eventually lead to the loss of accessibility for those activities that depend upon the inlet for water transportation.

b. USEPA designated East Rockaway Inlet Placement Site - The inlet placement site is located within a short distance from the inlet. The Corps has used this inlet placement site in the past for placement of sand dredged from the East Rockaway Inlet Federal Channel. While this alternative will potentially provide littoral drift to feed the local beaches, its action would not provide the direct benefit of placing the material on the nearby shoreline of a designated beach.

c. No Beach Nourishment - The no nourishment alternative would result in continued erosion of the Rockaway Beach shoreline, which will eventually undermine the structures of the State property and increase the potential for storm damage due to wave action and flooding.

d. Alternative to Borrow Area 2 - Utilization of the Borrow Areas 1A or 1B, which are described in the May 1993, "East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York, Final Reevaluation Report (Section 934 of WRDA 1986)," is not economically feasible for this supplemental nourishment action due to the lack of access to Borrow Area 1A (dredging would be required to provide access) and availability of an adequate quantity of material at Borrow Area 1B. In addition, the location of both sites would establish a higher unit price per cubic yard due to the greater pumping distance.

GRAIN SIZE ANALYSES:

Results of grain size analyses performed on samples collected within the project area have indicated that the material to be deposited is predominantly sand (greater than 90% sand). Therefore, the proposed dredged material would be physically compatible for beach placement, and placement on the beach would be consistent with existing laws and regulations.

MISCELLANEOUS INFORMATION:

Pursuant to Section 7 of the Endangered Species Act (16 U.S.C. (531)) and based upon a review of the latest published version of the threatened and endangered species listing, a preliminary determination is that the activity under consideration will not affect those species listed (piping plover), or proposed for listing (roseate tern) or their critical habitat, if the work is performed after 15 September and before 1 April. This will avoid the critical time frame for piping plover nesting, as determined by the U.S. Fish and Wildlife Service.

There are no known sites within the surrounding area that are eligible for or included in the National Register of Historic Places. Presently no known archaeological, scientific, prehistorical or historical data are expected to be lost by work accomplished under the required dredging.

Water Quality Certifications (WQC) have been obtained from the New York State Department of Environmental Conservation in accordance with Section 401 of the Clean Water Act, for maintenance dredging of East Rockaway Inlet and beach nourishment involving dredging of borrow area 2, with material from both operations being placed at Rockaway Beach. An amendment to the beach nourishment WQC will be obtained prior to dredging of the intermediate area (East Rockaway Inlet borrow area) with placement of dredged material at Rockaway Beach.

Pursuant to Section 307 of the Coastal Zone Management Act of 1972 as amended [16 USC 1456(C)], for activities conducted or supported by a federal agency in a state which has a federally approved coastal Zone Management (CZM) program, the Corps will submit a determination that the proposed project is consistent with the State CZM program to the maximum extent practicable. The Corps will request the State's concurrence with that determination. For activities within the coastal zone of the State of New York, project information is available from the Consistency Coordinator, New York State Department of State, Division of Coastal Resources and Waterfront Revitalization, Coastal Zone Management Program, 41 State Street, Albany, New York 12231, Telephone (518) 474-3642.

In compliance with Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (1996 amendments), an Essential Habitat Assessment will be prepared and submitted to the National Marine Fisheries Service for review and comments.

The proposed work is being coordinated with the following Federal, State and Local Agencies:

U. S. Environmental Protection Agency

U. S. Department of Commerce, National Marine Fisheries Service

U. S. Department of the Interior, Fish and Wildlife Service

U. S. Coast Guard, Third Coast Guard District

New York State Department of Environmental Conservation

New York State Department of State

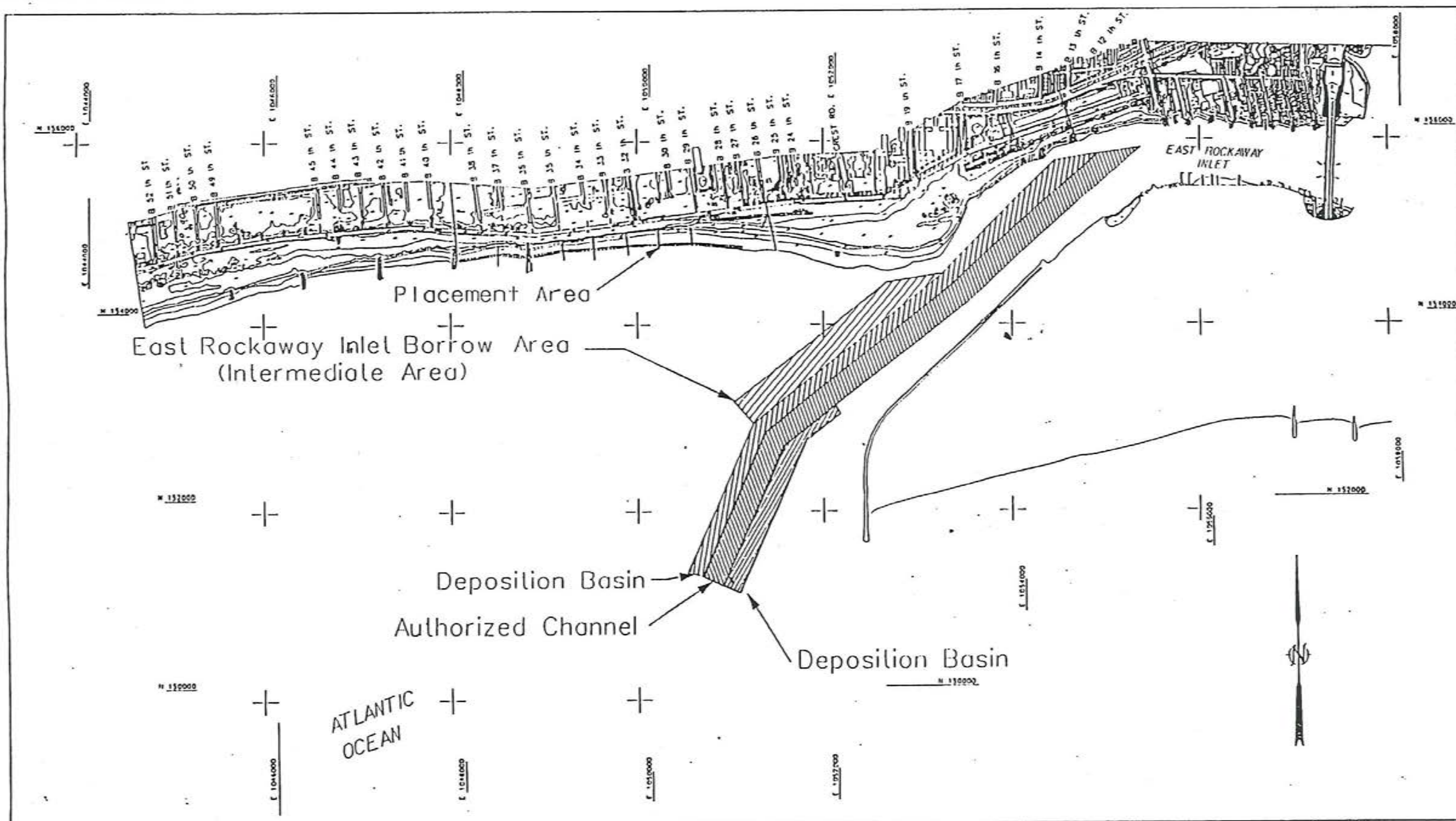
ALL COMMENTS REGARDING THIS ACTIVITY MUST BE PREPARED IN WRITING AND MAILED TO REACH THIS OFFICE AT THE ADDRESS ON THE FRONT PAGE BEFORE THE EXPIRATION DATE OF THIS NOTICE, otherwise, it will be presumed that there are no objections to the activity.

Any person who has an interest which may be affected by the placement of this dredged material may request a public hearing. The request must be submitted in writing to the District Engineer within the comment period of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by the activity. It should be noted that information submitted by mail is considered just as carefully in the process and bears the same weight as that furnished at a public hearing.

It is requested that you communicate the foregoing information concerning the proposed work to any persons known by you to be interested and who have not received a copy of this notice. If you have any questions, please do not hesitate to contact Mr. William Vanterpool of this office at (212) 264-9032.

JOHN R. HARTMANN
Chief, Operations Division

Enclosure
1. East Rockaway Inlet
2. Borrow Area 2



DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS

SURVEY OF: EAST ROCKAWAY INLET

FAR ROCKAWAY NEW YORK

ATTACHMENT 1

OFFICE OF PARKS, RECREATION, HISTORIC PRESERVATION
NEW YORK STATE

Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

August 9, 2000

Leonard Houston
Acting Chief, Environmental Analyst Branch
U.S. Army Corps of Engineers
New York District
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Houston:

Re: CORPS
Beach Nourishment Rockaway Beach/Channel
Dredge East Rockaway Inlet
Queens, Queens County
00PR2949

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966.

Based upon our review, it is the SHPO's opinion that your project will have No Effect upon cultural resources in or eligible for inclusion in the National Register of Historic Places.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director

RLP:bsd

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO ATTENTION OF

July 17, 2000

Environmental Analysis Branch
Environmental Assessment Section

Ms. Ruth L. Pierpont
Director
Historic Preservation Field Services Bureau
New York State Office of Parks, Recreation and
Historic Preservation
Peebles Island
P.O. Box 189
Waterford, New York 12188-0189

RE: CORPS
Rockaway Beach Project
Brooklyn, Kings County
89PR1188

CORPS
East Rockaway Inlet Channel Dredging
Queens County
92PR1171

Public Notice No. 00-ERIMDSN

Dear Ms. Pierpont;

The U.S. Army Corps of Engineers, New York District (New York District), in its continuing effort to nourish the beaches along the Rockaway Beach shoreline as part of the above referenced Beach Erosion Control and Hurricane Protection Project for East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Queens County, New York (89PR1188), proposes to place material dredged from the nearby East Rockaway Inlet Federal channel and a borrow area adjacent to the Federal channel along the shoreline between Beach 27th Street and Beach 40th Street (92PR1171; Enclosure 1). These proposed actions are also described in the above referenced Public Notice issued June 16, 2000, by the New York District (Enclosure 2).

As part of previous coordination efforts for the Beach Erosion Control and Hurricane Protection project, the placement of sand on the beach from Beach 19th Street to Beach 149th Street has been determined to have no effect on historic properties (Enclosure 3). In addition, the use of material from the Federal channel, Borrow Area 2 and portions of Borrow Area 1A and 1B were also determined to have no effect on historic properties (Enclosures 4, 5 and see Enclosure 3). As part of the current renourishment effort, an additional source of sand, the East Rockaway Inlet Borrow Area, located along the west side of the Federal channel will be utilized, in association with sand from the Federal channel and Borrow Area 2.

The East Rockaway Inlet Borrow Area is located in a very active inlet with continuous scouring and shoaling of sand on the inlet bottom. The inlet borrow area is about 300 feet wide and approximately 2120 feet long (Enclosure 6). The New York District proposes to remove approximately 300,000 cubic yards from the inlet borrow area for placement on the shoreline between Beach 27th Street and Beach 40th Street. The inlet borrow area and the adjacent channel would be dredged to about 14 feet below mean low water plus 2 feet allowable over-dredge. According to a sample of soundings taken since 1985, the East Rockaway Inlet Borrow Area has varied in depths from 12.5 –19 feet below MLW in 1985 to 8 – 15 feet MLW in 1996 to between 1 – 14 feet MLW in May 2000 (Enclosures 7 and 8; see also Enclosure 6).

According to the Cultural Resources Reconnaissance Report prepared for the Atlantic Coast of Long Island from East Rockaway Inlet to Jones Inlet (Pickman 1993), East Rockaway Inlet and the west end of Long Beach Island were situated in their current locations by the beginning of the 20th century (Enclosure 9). According to maps from the 19th century, the present location of East Rockaway Inlet was once the location of the western end of the former "Far Rockaway Beach", which had extended east toward Long Beach Island (Pickman 1993:23-24). By 1931, the inlet's position became fixed with the construction of seven timber groins and a timber bulkhead built on the east side of the inlet. Two years later, the East Rockaway Inlet jetty was built by the U.S. Army Corps of Engineers and the sand captured by the new jetty buried the earlier structures. A stone seawall that extended along the east shore of the inlet and connected to the landward end of the jetty was built in 1952 (Pickman 1993:32).

Although the area of the inlet was once a part of Rockaway Beach, the subsequent erosion of the area to a depth several feet below mean low water and continued scouring of the inlet would indicate there is no potential for the identification of significant cultural resources that are eligible for the National Register. It is also likely that the initial dredging and periodic maintenance of the Federal channel may have impacted sections of the borrow area adjacent to the channel. The New York District has determined that the dredging of the East Rockaway Inlet Borrow Area will have no effect on historic properties.

Please review the enclosed materials and provide your comments in accordance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36 CFR 800, by August 7, 2000. If you have any questions or require additional information, please contact Ms. Nancy Brighton, Project Archaeologist, at 212-264-2198. Thank you for your assistance.

Sincerely,

P. Houston

Leonard Houston
Acting Chief, Environmental Analysis Branch

Enclosures

Nancy

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE

Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

May 10, 2000

Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
New York District
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Santomauro:

Re: CORPS
Rockaway Inlet to Norton's Point Reconaissance
Brooklyn, Kings County
89PR1188

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966.

Based upon our review, it is the SHPO's opinion that your project will have No Effect upon cultural resources in or eligible for inclusion in the National Register of Historic Places.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director

RLP:bsd

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

April 27, 2000

Environmental Analysis Branch
Environmental Assessment Section

J. Winthrop Aldrich
New York State Office of Parks, Recreation
and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island
P.O. Box 189
Waterford, New York 12188-0189

RE: CORPS
Rockaway Beach Project
Brooklyn, Kings County
89PR1188

Dear Mr. Aldrich;

Reference is made to the remote sensing survey conducted in 1993 by WCH Industries, Inc., in association with the Darling Marine Center, for the U.S. Army Corps of Engineers, New York District (New York District), within Borrow Area 2 as part of the above referenced project (Enclosure 1). The survey identified 34 side scan sonar targets and magnetometer anomalies throughout the borrow site. At the time of the survey, the New York District determined that the anomalies and targets would be avoided during sand removal and no further work was undertaken. Borrow Area 2 was not used as part of the initial beach fill activities for the project..

In an effort to identify enough suitable material for subsequent renourishment of the beach, the New York District has re-evaluated Borrow Area 2 and has determined that all of the borrow site must be used to provide the amount of material needed for beach placement. The New York District instructed Panamerican Consultants, Inc. (PCI), to relocate and investigate each of the targets and anomalies identified in the 1993 survey. Enclosed is the report entitled "Underwater Inspection of Targets, Borrow Area 2, Atlantic Coast of Long Island, East Rockaway Inlet to Rockaway Inlet, Queens County, New York, Storm Damage Reduction Project" that provides a description and the results of this investigation (Enclosure 2).

PCI was able to relocate 18 of the 34 targets originally recorded in 1993. All of the 18 relocated targets were identified as modern debris, specifically wire cable and concrete/rebar "bridge spans", that may have been intended for placement in the Rockaway Beach Artificial Reef located to the southwest of the borrow site. None of the targets are considered to be potentially significant submerged cultural resources. The 16 targets that are no longer present at their recorded locations were likely redeposited to other locations by either trawling activities, surf clam dredging, surge and/or current activity, or their identification was erroneous due to the lack of contouring in the original survey. It has been determined that activities related to the dredging of Borrow Area 2 will not have an impact on any historically significant watercraft.

Please review the enclosed report and provide comments on this project to the New York District by May 31, 2000, in accordance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation, 36 CFR 800. If you have any questions or require additional information, please contact Nancy Brighton at 212-264-2198. Thank you for your assistance.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

GAHAGAN & BRYANT ASSOCIATES, INC.
5803 KENNETT PIKE, SUITE D
CENTREVILLE SQUARE
WILMINGTON, DELAWARE 19807-1195
TEL. (302)652-4948 FAX. (302)655-9218
GBAWILMINGTON@GBA-INC.COM

GBA
ENGINEERS ★ SURVEYORS

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, N.Y. 10278-0090

SURVEY OF: EAST ROCKAWAY, NY
CONDITION SURVEY
ECHO SOUNDINGS

100 0 50 100 200 400

SCALE: 1 INCH - 100 FEET

PLOTTED BY:	*J. DRAKE*	DATE OF SURVEY:	*27 - 30 APRIL 2000*
SUBMITTED BY:	*R. ROMAN*	FIELD BOOKS:	*NY-08-2000*
APPROVED:			
DATE:	*17 MAY 2000*	SHEET 3 OF 4	

N 153000

REQ. NO. 2044

Enclosure 6

N 131000

System.

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, N. Y. 10007

SURVEY OF: EAST ROCKAWAY INLET, N.Y.
FINAL AFTER DREDGING
ECHO SOUNDINGS

SCALE ONE INCH = 100 FEET

BAR SCALE

PLOTTED BY: P.P., WAM II

SUBMITTED BY: [signature]
CHIEF OF PARTY

APPROVED: [signature]
CHIEF, SURVEY BRANCH

DATE 23 October 85

DATE OF SURVEY: AS SHOWN

FIELD BOOKS: 13829, 13830, 13843, 13844

SHEET 1 OF 1

FIL

Enclosure 7

E 2068500

PROJECT CODE		
PROJECT MAINTENANCE DREDGING EAST ROCKAWAY INLET		
DRAWING TITLE CONDITIONAL SURVEY		
DRAWING NUMBER GLDD / RZF1		
PHASE		SHEET
SCALE 1in.= 100ft.	DRAWN J.L.H.	DESIGNED
DATE 27-OCT-1996	CHECKED	APPROVED

E 2070500

GREAT LAKES
DREDGE & DOCK
COMPANY

PROJECT CODE	
PROJECT MAINTENANCE DREDGING EAST ROCKAWAY INLET	
DRAWING TITLE CONDITIONAL SURVEY	
DRAWING NUMBER GLDD / RZF1	
PHASE date 27 Oct 86	SHEET
SCALE 1in.= 100ft.	DRAWN J.L.H
	DESIGNED
DATE	CHECKED
	APPROVED

Enclosure 8   2 of 2

Enclosure 9

CULTURAL RESOURCES RECONNAISSANCE
ATLANTIC COAST OF LONG ISLAND
JONES INLET TO EAST ROCKAWAY INLET
CITY OF LONG BEACH, VILLAGE OF ATLANTIC BEACH,
LIDO BEACH AND POINT LOOKOUT AREAS, TOWN OF HEMPSTEAD
LONG BEACH ISLAND
NASSAU COUNTY, NEW YORK

92PR2416

by
Arnold Pickman

Submitted to:
U.S. Army Corps of Engineers
New York District

June 1993

Work Performed Under Contract No. DACW51-92-M-0636

Arnold Pickman
Principal Investigator

years of the twentieth, the buildings associated with the U.S. Life Saving Stations and the Long Beach and Point Lookout Hotels and cottages continued to be the only structures on Long Beach Island. A second life saving station, not shown on the 1873 map was opened in the Point Lookout section of Long Beach Island. It is shown on maps dating to 1878 (Figure 20) and 1886 (Figure 25a) located near the shoreline in what is now the Lido Beach area.

By the 1890's both the Long Beach and Point Lookout lifesaving stations had been moved from their original locations. The Point Lookout station was apparently moved from its original location on or near the beach to a site on the northern portion of the island (see Figures 27a and 27c) approximately opposite the western portion of Alder Island.

The Long Beach life saving station was apparently moved twice from its location as shown in 1873 (Figures 18b and 18d). The 1896 Hyde map (Figure 31a and 31b) shows both an "old" and relocated position of this station. However, the "old" location shown on the map apparently refers to a ca. 1880's site. As noted above, in 1873 the station was located in the Edwards/Riverside Boulevard area. It was probably relocated when the Long Beach Hotel was constructed on the original site in 1880. This ca. 1880 site was located in the vicinity of the present Neptune Avenue, which at that time would have been near the west side of Luce's inlet. The station was subsequently moved again to the "new" location as shown on the 1896 map (Figures 27a and 27b), which was on the west end of Long Beach, near the present location of New York Avenue. It should be noted that an 1898 coastal survey chart (Figures 28a and 28b) continues to show the life saving station west of Luces' Inlet. However, this location is most likely uncorrected from an earlier edition of this chart. The location of the site as shown on subsequent maps (e.g. Figures 29 and 30) is the same as the "new" site as shown on the 1896 map.

4. Long Beach Island Morphology - Late Nineteenth/Early Twentieth Century Changes

Prior to 1886 Luce's Inlet had been partially closed by a strip of beach, but still existed as a shallow cove extending southward from Hempstead Bay (see Figure 25a). As noted above, through the third quarter of the 19th century, Rockaway Beach extended eastward to Hog Island Inlet. A body of water known as the "Bay of Far Rockaway" separated Far Rockaway beach from the mainland. This configuration is shown on maps as late as 1886 (see Figure 25b).

It would appear that after 1886 a new inlet had formed near the present location of East Rockaway inlet, creating a new island between this inlet and Hog Island Inlet (see Figure 26a). An 1898 map (see Figure 28a) indicates this new inlet as "Little Inlet and the new island as "Shelter Island", with Far Rockaway beach extending westward from "Little Inlet." After 1898 Hog Island Inlet closed, effectively extending Long Beach Island westward to East Rockaway Inlet. Thus by the first decade of the 20th century (see Figures 29 - 31) the configuration of the western portion of Long Beach Island was close to that which now exists.

One source (Chief of Engineers 1929) states that the present East Rockaway inlet "is located at approximately the middle of the former long and narrow Bay of Far Rockaway", with the eastern end of the former Far Rockaway Beach now being incorporated into the present Long Beach Island. However, examination of the late 19th and early 20th century maps indicates that the present East Rockaway inlet is actually at the western end of the former "Far Rockaway Beach", with the present Reynolds Channel at the location of the former "Bay of Far Rockaway." Thus all of the late 19th century "Far Rockaway Beach", with the exception of its extreme western end, which was at the present location of the inlet, has apparently been incorporated into the present Long Beach Island.

On the eastern end of Long Beach Island, the 1851 Coastal Survey and 1859 Walling Maps (Figures 16 and 17a) had shown the west side of Jones Inlet aligned approximately with the east side of Alder Island. The 1873 Beers map (Figure 18a), reflects an apparent eastward shift of the eastern end of Long Beach Island and shows the western side of Jones Inlet aligned with the western portion of Meadow Island. However, a Coastal Survey map (Figure 20) indicates that by 1878 the Island's eastern end had once more retreated westward. This map also includes dashed lines which reflect shoreline changes occurring between 1878 and 1886. The northern portion of the eastern tip of Long Beach Island had evidently been eroded during this period with a narrow strip of land remaining on the southern shoreline. This strip extended eastward to once again approximately align with the western side of Meadow Island. This approximate configuration is also shown on the 1886 Beers map (Figure 25a).

Maps dating to to the 1890's and the first decade of the 20th century (Figures 26-31) show a similar configuration of the Point Lookout area to that shown on the ca. 1880's maps, with some minor changes, including an increase in the width of the Island.

At present the eastern end of Point Lookout is located some 2000-2500 feet further to the west than at the beginning of the twentieth century and is now aligned with the eastern portion of Alder Island (see Figure 71).

G. <u>Early Twentieth Century Development</u>

In 1898 a suit was brought by several individuals claiming ownership of Long Beach Island by virtue of a chain of purchases originating with John Hicks, who had purchased the land from a group of Hempstead freeholders in 1725. As noted above, a similar suit had been brought at the end of the 18th century. In 1902 the court again ruled that the ocean beach property was owned by the Town of Hempstead. This ruling cleared the way for the sale of Long Beach to private developers (Hazelton 1925:II:880).

steamboat dock. The dock on the north side of Point Lookout which was noted above also is not shown on any of the 20th century maps.

In 1939 a fishing pier was built at the foot of Magnolia Boulevard in Long Beach. This pier was destroyed during a hurricane in 1960 (Graf 1972:50). Graf (1972) notes that a new pier was built at this location. However, this pier has since been removed and no traces of either pier were noted during the reconnaissance.

J. Shore Protection Structures

The first shore protection structures on Long Beach were 51 wooden groins constructed in 1926 (Tolins 1956:110). These were extensively damaged by a severe storm in 1927, and extensive repairs were required (Tolins 1956:27). The ca. 1920's groins apparently were located only in the central portion of Long Beach. Graf (1972:25) indicates that the west end of Long Beach was not fully protected by groins until the 1940's.

Taney (1961:Table 4) indicates the dates of construction of shore protection structures in and near the study area as follows:

Long Beach	Groins and Bulkheads	1927
Long Beach	Groins	1937
Long Beach	Groins	1947
Lido Beach	Groins and Bulkheads	1930
Point Lookout	Groins and Bulkheads	1940
Atlantic Beach	Groins and Bulkheads	Before 1928
East Rockaway Inlet	Jetty	1934

Additional data as to shore protection structures in the project area were presented by the U.S. Army Corps of Engineers (1965) and summarized as follows:

Point Lookout - Four timber groins were constructed by the Town of Hempstead in 1949. They were subsequently destroyed and replaced by three stone groins in 1953.

Lido Beach - A total of four stone groins were build by Long Beach on the Ocean Inc. This construction took place in 1930 (as indicated above) and also in 1933.

Long Beach - In addition to the construction noted above four timber groins were constructed in 1944. These were subsequently destroyed.

Atlantic Beach - 28 timber and 5 stone filled timber groins were constructed between 1928 and 1933. It is uncertain if these include the groins listed above as constructed pre-1928. Two additional stone-filled timber groins were constructed in 1947. All of these groins have either been replaced, removed, destroyed or buried.

The existing groins within the study area were constructed beginning in 1945 (U.S. Army Corps of Engineers 1989). Nyman (1985) noted that remains of at least some of the earlier wooden groins are apparently still present in the Long Beach area and are periodically uncovered as a result of wave action. Remains of a number of these groins were noted in the City of Long Beach portion of the study area during the reconnaissance (see Figures 53a and 53b).

The remains of a timber groin were also noted in the eastern portion of the Silver Point Park section of Atlantic Beach (Figure 53c). Two other timber groins and a timber bulkhead were noted a short distance to the east (Figure 53d). The latter are apparently associated with one of the beach clubs located immediately east of the Silver Point Park section (see Figure 56).

The first shore protection structures on the west shore of Jones Inlet were constructed in 1939. During the 1940's the Town of Hempstead constructed a stone seawall and 12 stone groins in the area.

Seven timber groins and a timber bulkhead were constructed on the east side of East Rockaway Inlet in 1931. In 1933-1934 The East Rockaway Inlet jetty was constructed by the U.S. Army Corps of Engineers. The earlier structures were buried beneath the sand trapped to the east of this jetty. A stone seawall built in 1952 extends along the east shore of the Inlet, connected to the landward end of the jetty.

K. Significant Standing Structures

Two existing Long Beach structures, the Granada Towers and the U.S. Post Office, are listed on the National Register of Historic Places (U.S. Army Corps of Engineers 1992). An additional structure is listed in the historic structures inventory maintained by the New York State Division of Parks, Recreation, and Historic Preservation. This is a private residence at 116 Washington Boulevard which supposedly dates to the late 19th century and is considered to be one of the first private homes built in Long Beach (Mintz 1979, included in Bouchard and Hartgen 1985). None of these structures will be affected by the proposed project.

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Orin Lehman
Commissioner

March 18, 1993

Mr. Bruce A. Bergmann
Chief, Planning Division
Department of the Army
Corps of Engineers
New York District Office
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Bergmann:

Re: CORPS
Rockaway Beach Project
Brooklyn, Kings County
89PR1188

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Section 934 Project in accordance with Section 106 of the National Historic Preservation Act of 1966 and the relevant implementing regulations.

Based upon this review, it is the SHPO's opinion that this project will have No Effect upon cultural resources in or eligible for inclusion in the National Register of Historic Places. This determination is based on the condition that all potential cultural resources in Borrow Area 1A and 1B are avoided according to the recommendations of the Remote Sensing Survey report. This No Effect determination does not extend to the use of Borrow Area 2, which has not been surveyed.

We look forward to receiving and commenting on the results of the Remote Sensing Survey for Borrow Area 2 when that study has been completed.

If you have any questions, please call Robert Kuhn of our Project Review Unit at (518) 237-8643 Ext. 281.

Sincerely,

Julia S. Stokes
Deputy Commissioner for
Historic Preservation

JSS/RDK/JPW:gc

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

March 1, 1993

Environmental Analysis Branch
Environmental Assessment Section

Ms. Julia S. Stokes
Deputy Commissioner for Historic Preservation
New York State Office of Parks, Recreation, and
Historic Preservation
Agency Building 1
Empire State Plaza
Albany, New York 12238

Dear Ms. Stokes:

The New York District, Army Corps of Engineers (Corps) is conducting a study to determine Federal interest in participating in the cost of placing material (sand) dredged from two offshore borrow areas onto nearby Rockaway Beach, Queens, New York (Attachment 1). This work is part of a plan to prevent long term beach erosion along Rockaway Beach from Beach 19th to 149th Streets. The study has been authorized under Section 934 of the Water Resources Development Act of 1986.

Current project plans call for the restoration of Rockaway Beach from Beach 19th to Beach 149th Streets and for future nourishment of two feeder beaches, (Beach 25th Street to Beach 39th Street and Beach 86th Street to Beach 110th Street), at three 3-year intervals. Sand for the construction of the project and subsequent nourishment cycles will be dredged from two offshore borrow areas (Attachment 1).

The National Register of Historic Places lists no properties within the project area that are currently on the Register or that are eligible for inclusion. A cultural resource study, prepared as part of a maintenance dredging project, entitled "Cultural Resources Reconnaissance Dredging Project, East Rockaway Inlet, New York" was written by J. Stephen Kopper (Attachment 2). This report found that there were no prehistoric or historic archaeological sites within the beachfront area bounded by Beach 19th Street and Beach 149th Street.

In addition, the Corps has coordinated with your office regarding a project authorized by Section 933 of the Water Resources Development Act of 1986 that involved dredging sand from the East Rockaway Inlet navigation channel and placing it on two sections of Rockaway Beach (Attachment 3). After a copy of the aforementioned cultural resource survey report was forwarded to your office on June 25, 1992, the Corps received your response, dated July 7, 1992, of no concern with regards to the Section 933 project (Attachment 4).

The Corps has plans to utilize two offshore borrow sites during the initial and subsequent nourishment phases of the project. The first borrow area, Borrow Area 1A and 1B, is located offshore Coney Island, New York and to the west of Rockaway Inlet (Attachment 1). In November 1992, Dr. Warren Reiss and Ocean Surveys, Inc. conducted a remote sensing survey of this area using side scan sonar and a magnetometer (Attachment 5). This investigation identified 10 "potential cultural resources" and 1 "probable significant cultural resource" based upon magnetometer and side scan sonar data. The "probable significant cultural resource" may be one or more shipwrecks, possibly a wooden hulled vessel(s) with associated large ferrous objects, such as an engine or anchor. According to current project plans, all potential resources identified by this survey will be avoided during dredging.

Borrow area 2 (Attachment 1) is located offshore of the sand placement area. Parts of this borrow site may have been used to nourish the beach during the original project in the late 1970s and early 1980s. Dredging records, however, have not indicated which areas may or may not have been impacted. As a result, the Corps has plans to conduct a remote sensing survey of the entire borrow site. The results of this investigation will be coordinated with your office upon completion of this survey.

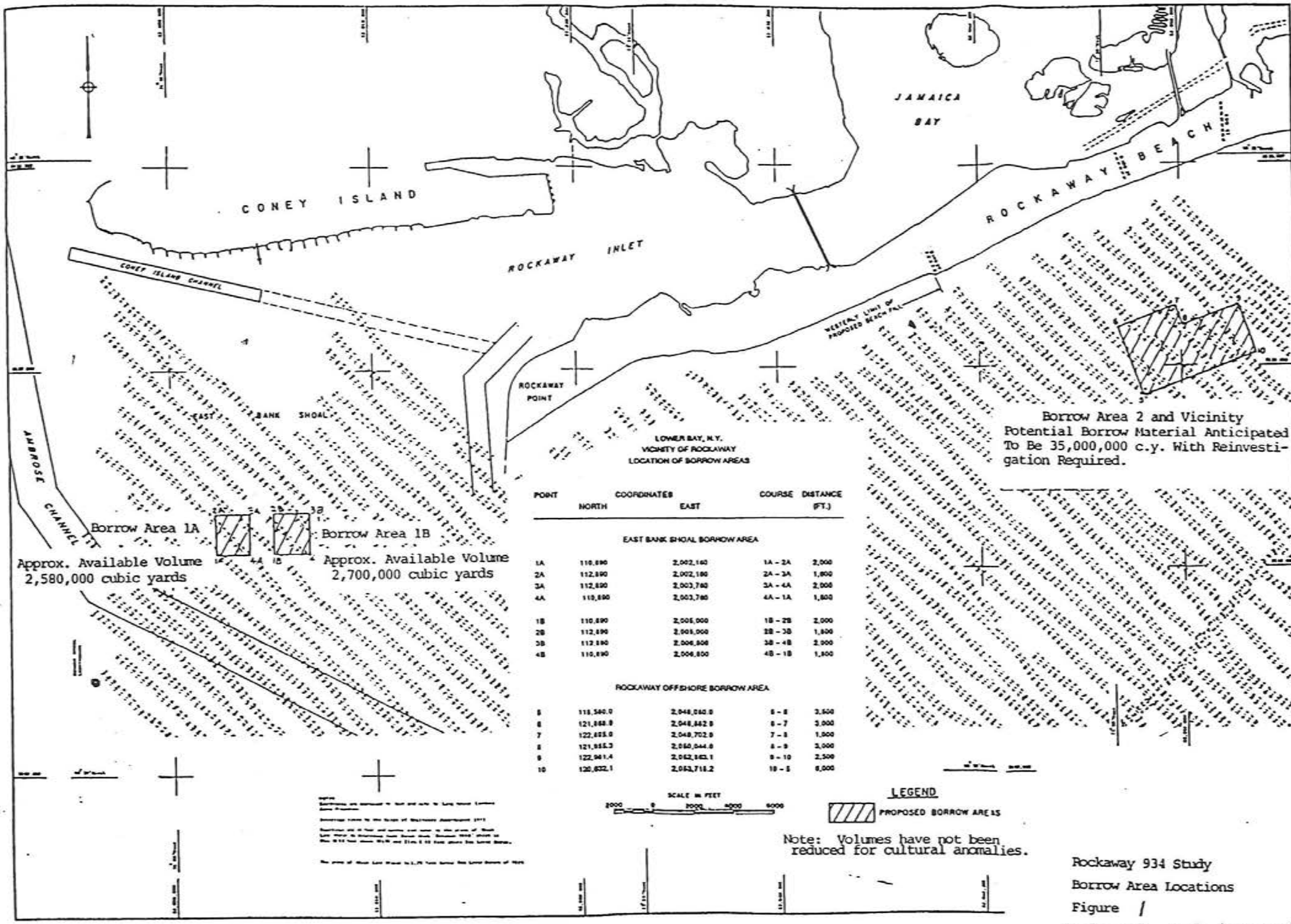
On the basis of current project plans and pending review by your office, the Corps is of the opinion that the Atlantic Coast of New York City, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York, Section 934 Project will have no effect on historic properties located on Rockaway Beach, from Beach 19th to 149th Streets, or within Borrow Areas 1A and 1B. Please provide us with Section 106 comments as pursuant to 36 CFR 800.5.

If you or your staff have any questions or require additional information, please contact Nancy Brighton, Project Archaeologist, (212)264-4663. Thank you for your assistance.

Sincerely,

Bruce A. Bergmann
Chief, Planning Division

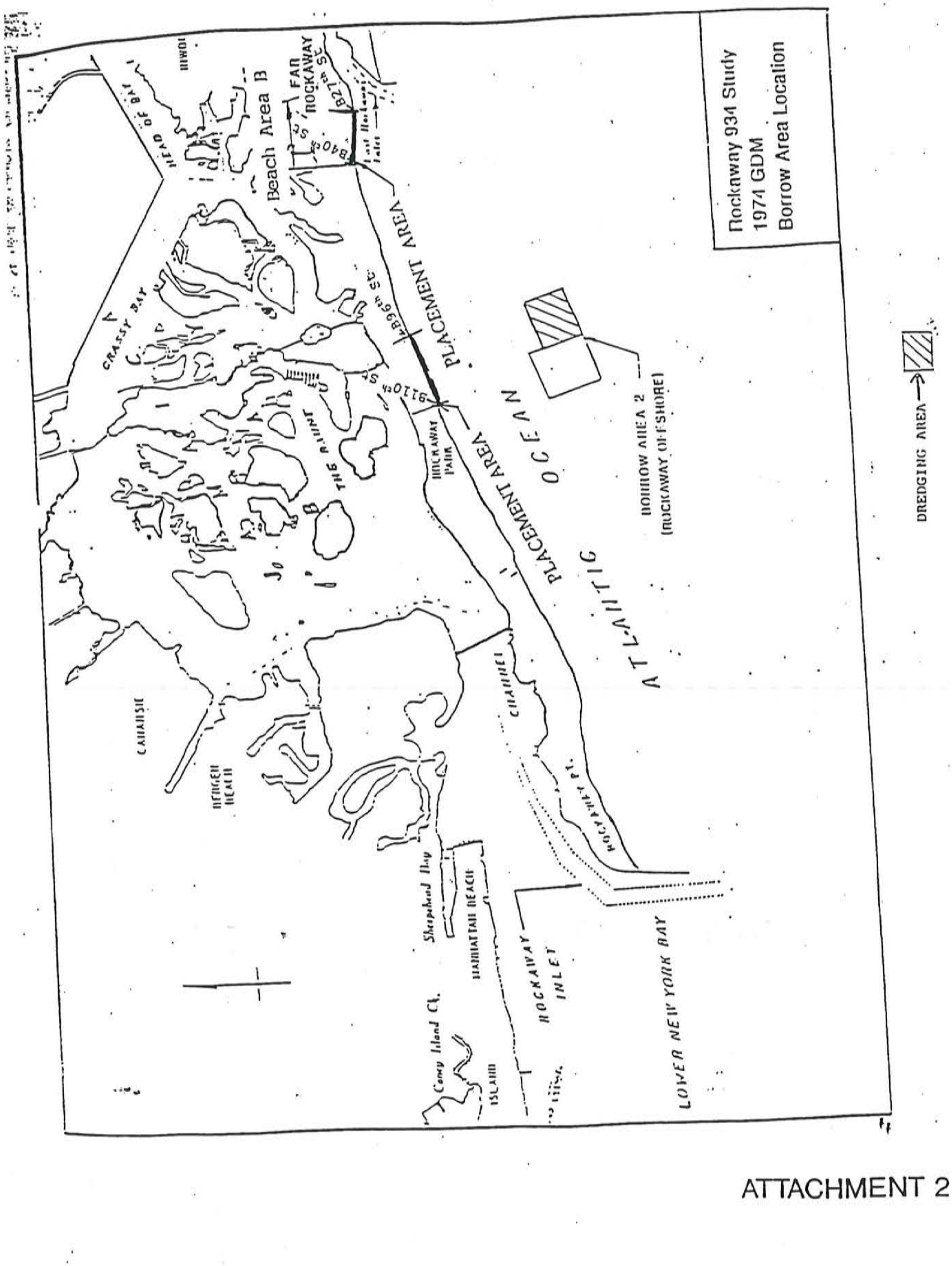
Attachments



LOWER BAY, N.Y.
VICINITY OF ROCKAWAY
LOCATION OF BORROW AREAS

POINT	COORDINATES NORTH	EAST	COURSE	DISTANCE (FT.)
EAST BANK SHOAL BORROW AREA				
1A	110,890	2,002,160	1A – 2A	2,000
2A	112,890	2,002,160	2A – 3A	1,600
3A	112,890	2,003,760	3A – 4A	2,000
4A	110,890	2,003,760	4A – 1A	1,600
1B	110,890	2,005,000	1B – 2B	2,000
2B	112,890	2,005,000	2B – 3B	1,600
3B	112,890	2,006,600	3B – 4B	2,000
4B	110,890	2,006,600	4B – 1B	1,600
ROCKAWAY OFFSHORE BORROW AREA				
5	118,560.0	2,048,060.0	5 – 6	3,500
6	121,868.8	2,048,842.8	6 – 7	3,000
7	122,655.0	2,049,702.0	7 – 8	1,000
8	121,955.3	2,050,044.8	8 – 9	3,000
9	122,961.4	2,052,583.1	9 – 10	2,500
10	120,632.1	2,053,718.2	10 – 5	6,000

Rockaway 934 Study
Borrow Area Locations
Figure 1
Reduced, not to scale



ATTACHMENT 2

Attachment 2

CULTURAL RESOURCES RECONNAISSANCE

DREDGING PROJECT
EAST ROCKAWAY INLET, NEW YORK

by

J. Stephen Kopper
Department of Anthropology, C.W. Post Center
Long Island University, Greenvale, NY 11548

May 10, 1979

Funded by the Department of the Army,
New York District Corps of Engineers,
26 Federal Plaza, New York, NY 10007

Prepared Under the Supervision of J. Stephen Kopper,
Principal Investigator

J. Stephen Kopper
J. Stephen Kopper
Principal Investigator

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

June 3, 1992

Environmental Assessment Section
Environmental Analysis Branch

Ms. Julia S. Stokes
Deputy Commissioner for Historic Preservation
New York State Office of Parks, Recreation, and Historic
Preservation
Agency Building 1
Empire State Plaza
Albany, New York 12238

Dear Ms. Stokes:

The New York District, Army Corps of Engineers (Corps) is conducting a study to determine Federal interest in participating in the cost of placing material (sand) dredged from the East Rockaway Inlet navigation channel, located in Queens County, New York, onto nearby Rockaway Beach (Attachment 1). This work is part of a scheduled maintenance dredging operation of the channel as well as an attempt to prevent long term beach erosion on a portion of Long Beach Island. The study has been authorized under Section 933 of the Water Resources Development Act of 1986.

The Federal portion of the navigation channel begins to the southwest of Atlantic Beach, Long Beach Island, and proceeds in a north to northeasterly direction towards Rockaway where it terminates offshore, southwest of Beach 20th Street (Attachment 2). Maintenance dredging is necessary to prevent the build-up of shoals in the channel which create shallow depths and hazardous navigation conditions for local mariners. The area of the proposed placement of dredged material will be at one of two sections of Rockaway Beach in the Town of Far Rockaway. These sections are Beach 32nd Street to Beach 36th Street and Beach 56th to Beach 60th Street. Both are areas of intense erosion. Sand will be used to build up the existing beach to withstand wave and storm action (Attachment 3).

The National Register of Historic Places lists no properties within the project areas that are currently on the Register or that are eligible for inclusion. A cultural resource study, prepared as part of a similar maintenance dredging project, entitled "Cultural Resources Reconnaissance Dredging Project, East Rockaway Inlet, New York" was written by J. Stephen Kopper (Attachment 4). This report found that there were no prehistoric or historic archaeological sites within the beachfront area bounded by Beach 19th Street and Beach 149th Street, which includes both proposed nourishment areas.

On the basis of current project plans and pending review by your office, the Corps is of the opinion that the Section 933, East Rockaway Inlet, New York Project will have no effect on historic properties. Please provide us with Section 106 comments as pursuant to 36 CFR 800.5.

If you or your staff have any questions or require further information on this project, please contact Nancy Brighton (212)246-4663. Thank you for your assistance.

Bruce A. Bergmann
Chief, Planning Division

Attachments

Attachment 4

New York State Office of Parks, Recreation and Historic Preservation
The Governor Nelson A. Rockefeller Empire State Plaza
Agency Building 1, Albany, New York 12238-0001

Orin Lehman
Commissioner

July 7, 1992

Mr. Bruce A. Bergmann
Chief, Planning Division
Department of the Army
Environmental Analysis Branch
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Bergmann:

Re: CORPS
East Rockaway Inlet Channel
Dredging
Queens County
92PR1171

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) concerning the property referenced above. The information which you submitted has been reviewed in accordance with Section 106 of the National Historic Preservation Act of 1966 and the relevant implementing regulations.

Based upon this review, the SHPO has no concerns regarding this project's impact on archeological resources.

If you have any questions, please call Vic DiSanto of our Project Review Unit at (518) 474-0479.

Sincerely,

David S. Gillespie
Director
Field Services Bureau

DSG/VJD:gc

ATLANTIC COAST OF NEW YORK CITY
EAST ROCKAWAY INLET TO ROCKAWAY INLET
AND JAMAICA BAY, NEW YORK
SECTION 934 STUDY
BORROW AREAS 1A AND B
REMOTE SENSING SURVEY

Prepared For:

NEW YORK DISTRICT
CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, NY 10278

Under Contract Number
DACW51-92-D-0003

Principal Investigator:

Warren C. Riess

Warren C. Riess, Ph.D.

February 11, 1993

Prepared By:
WCH Industries, Inc., 14 Felton Street, Waltham, Massachusetts 02154

In Association With
Boston Affiliates, Inc., 156 Milk Street, Boston, Massachusetts 02109

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Orin Lehman
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
The Governor Nelson A. Rockefeller Empire State Plaza
Agency Building 1, Albany, New York 12238-0001

July 7, 1992

Mr. Bruce A. Bergmann
Chief, Planning Division
Department of the Army
Environmental Analysis Branch
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Bergmann:

Re: CORPS
East Rockaway Inlet Channel
Dredging
Queens County
92PR1171

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) concerning the property referenced above. The information which you submitted has been reviewed in accordance with Section 106 of the National Historic Preservation Act of 1966 and the relevant implementing regulations.

Based upon this review, the SHPO has no concerns regarding this project's impact on archeological resources.

If you have any questions, please call Vic DiSanto of our Project Review Unit at (518) 474-0479.

Sincerely,

David S. Gillespie
Director
Field Services Bureau

DSG/VJD:gc

Historic Preservation Field Services Bureau • 518-474-0479
Urban Cultural Parks • 518-473-2375

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Orin Lehman
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
The Governor Nelson A. Rockefeller Empire State Plaza
Agency Building 1, Albany, New York 12238-0001

June 19, 1992

Mr. Bruce A. Bergmann
Chief, Planning Division
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Bergmann:

Re: CORPS
East Rockaway Inlet Channel Dredging
Queens County
92PR1171

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) concerning the property referenced above. The information which you submitted has been reviewed in accordance with Section 106 of the National Historic Preservation Act of 1966 and the relevant implementing regulations.

Please submit the cultural resource management report cited in your letter to the SHPO for review. If you have any questions, please call Vic DiSanto at (518) 474-0479.

Sincerely yours,

David S. Gillespie
Director
Field Services Bureau

DSG/VJD:tr

received 6/25/92
ED YY

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

June 3, 1992

Environmental Assessment Section
Environmental Analysis Branch

Ms. Julia S. Stokes
Deputy Commissioner for Historic Preservation
New York State Office of Parks, Recreation, and Historic Preservation
Agency Building 1
Empire State Plaza
Albany, New York 12238

Dear Ms. Stokes:

The New York District, Army Corps of Engineers (Corps) is conducting a study to determine Federal interest in participating in the cost of placing material (sand) dredged from the East Rockaway Inlet navigation channel, located in Queens County, New York, onto nearby Rockaway Beach (Attachment 1). This work is part of a scheduled maintenance dredging operation of the channel as well as an attempt to prevent long term beach erosion on a portion of Long Beach Island. The study has been authorized under Section 933 of the Water Resources Development Act of 1986.

The Federal portion of the navigation channel begins to the southwest of Atlantic Beach, Long Beach Island, and proceeds in a north to northeasterly direction towards Rockaway where it terminates offshore, southwest of Beach 20th Street (Attachment 2). Maintenance dredging is necessary to prevent the build-up of shoals in the channel which create shallow depths and hazardous navigation conditions for local mariners. The area of the proposed placement of dredged material will be at one of two sections of Rockaway Beach in the Town of Far Rockaway. These sections are Beach 32nd Street to Beach 36th Street and Beach 56th to Beach 60th Street. Both are areas of intense erosion. Sand will be used to build up the existing beach to withstand wave and storm action (Attachment 3).

The National Register of Historic Places lists no properties within the project areas that are currently on the Register or that are eligible for inclusion. A cultural resource study, prepared as part of a similar maintenance dredging project, entitled "Cultural Resources Reconnaissance Dredging Project, East Rockaway Inlet, New York" was written by J. Stephen Kopper (Attachment 4). This report found that there were no prehistoric or historic archaeological sites within the beachfront area bounded by Beach 19th Street and Beach 149th Street, which includes both proposed nourishment areas.

On the basis of current project plans and pending review by your office, the Corps is of the opinion that the Section 933, East Rockaway Inlet, New York Project will have no effect on historic properties. Please provide us with Section 106 comments as pursuant to 36 CFR 800.5.

If you or your staff have any questions or require further information on this project, please contact Nancy Brighton (212)246-4663. Thank you for your assistance.

Bruce A. Bergmann
Chief, Planning Division

Attachments

US Army Corps of Engineers®
New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D7
Draft General Conformity Determination Notice

August 2018

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study

Revised Draft General Reevaluation Report and Environmental Impact Statement

Draft General Conformity Determination Notice

United States Army Corps of Engineers, New York District
DRAFT General Conformity Determination Notice

On October 30, 2012, New York State (DR-4085) and New Jersey State (DR-4086) declared Super Storm Sandy a Major Disaster. In response to the unprecedented breadth and scope of the damages sustained along the New York and New Jersey coastlines, the U.S. Congress passed Public Law (PL) 113-2 "Disaster Relief Appropriations Act 2013", also known as House Resolution (H.R.) 152-2 Title II which was signed into law on January 29, 2013. PL 113-2, which states "That the amounts... are designated by the Congress as being for an emergency requirement pursuant to section 251(b)(2)(A)(i) of the Balanced Budget and Emergency Deficit Control Act of 1985", provides funding for numerous projects to repair, restore and fortify the coastline in both states as a result of the continuing emergency as people and property along the coast remain in a vulnerable condition until the coastline is restored and fortified. To protect the investments by the Federal, State, local governments and individuals to rebuild damaged sites, it is imperative that these emergency disaster relief projects proceed as expeditiously as possible.

The Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay (Rockaway) study is called a General Reformulation Report, because it seeks to reexamine the Project that was originally authorized by the House of Representatives, dated 27 September 1997, as stated within the Congressional Record for the US House of Representatives. Subsequent to the original authorization, is the new authorization under Public Law 113-2 (29Jan13), The Disaster Relief Appropriations Act of 2013 (the Act), was enacted in part to "improve and streamline disaster assistance for Hurricane Sandy, and for other purposes". The Act directed the Corps of Engineers to: "…reduce future flood risk in ways that will support the long-term sustainability of the coastal ecosystem and communities and reduce the economic costs and risks associated with large-scale flood and storm events in areas along the Atlantic Coast within the boundaries of the North Atlantic Division of the Corps that were affected by Hurricane Sandy" (PL 113-2).

East Rockaway is a Reformulation Study project that is anticipated to start construction during or after January 2019, and this document represents the General Conformity Determination required under 40CFR§93.154 by the United States Army Corps of Engineers (USACE). USACE is the lead Federal agency that will contract, oversee, approve, and fund the project's work, and thus is responsible for making the General Conformity determination for this project.

USACE has coordinated this determination with the New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (EPA) Region 2. Based on the National Ambient Air Quality Standards (NAAQS), Queens, King, and Nassau County are currently classified as 'marginal' nonattainment for the 2008 8-hour ozone standard and 'maintenance' for both the 2006 particulate matter less than 2.5 microns ($PM_{2.5}$) and the 1971 carbon monoxide standards (40CFR§81.333). The counties are part of the Ozone Transport Region. Ozone is controlled through the regulation of its precursor emissions, which include oxides of nitrogen (NO_x) and volatile organic compounds (VOC). Sulfur dioxide (SO_2) is a precursor for $PM_{2.5}$.

The equipment associated with this project that is evaluated under General Conformity (40CFR§93.153) includes direct and indirect nonroad diesel sources, such as dredging equipment and support vessels operating in the back bay. The primary pollutant of concern with this type of equipment is NO_x, as VOCs, $PM_{2.5}$, SO_2, and CO are generated at significantly lower rates. The NO_x emissions associated with the project are estimated to be approximately 158 tons per calendar year for 2019 through 2024, (see emissions estimates provided as Attachment A). The project exceeds the NO_x trigger level of 100 tons in any calendar year and as a result, the USACE is required to fully offset the NO_x emissions of this project. The project does not exceed the ozone related VOC trigger level of 50 tons (for areas in an ozone transport region) in any calendar year, nor the $PM_{2.5}$, SO_2, CO maintenance areas' related trigger levels of 100 tons in any calendar year, per pollutant.

The USACE is committed to fully offsetting the emissions generated as a result of the disaster relief and coastal protection work associated with this project. USACE recognizes that the feasibility and cost-effectiveness of each offset option is influenced by whether the emission reductions can be achieved without introducing delay to the construction schedule that would prevent timely implementation of the project to protect the coastline from future storm events.

USACE will demonstrate conformity with the New York State Implementation Plan by utilizing the emission offset options listed below. The demonstration can consist of any combination of options, and is not required to include all or any single options to meet conformity. The options for meeting general conformity requirements include the following:

a. Emission reductions from project and/or non-project related sources in an appropriately close vicinity to the project location. In assessing the potential impact of this offset option, USACE recognizes the possibility of lengthening the time period in which offsets can be generated as appropriate and allowable under the general conformity rule (40CFR§93.163 and §93.165).

b. Use of Surplus NOx Emission Offsets (SNEOs) generated under the Harbor Deepening Project (HDP). As part of the mitigation of the HDP, USACE and the Port Authority of New York & New Jersey developed emission reduction programs coordinated through the Regional Air Team (RAT). The RAT is comprised of the USACE, NYSDEC, New Jersey Department of Environmental Protection, United States Environmental Protection Agency (EPA) Region 2, and other stakeholders. SNEOs will be applied in concurrence with the agreed upon SNEO Protocols to ensure the offsets are real, surplus, and not double counted.

c. Development of a Marine Vessel Engine Repower Program (MVERP) which replaces older, more polluting marine engines with cleaner engines, the delta in emissions being used to offset project emissions. The MVERP approach worked successfully for offsetting the HDP's construction emissions. The details of the MVERP, its implementation, and tracking would be coordinated with the RAT.

d. Use of Cross-State Air Pollution Rule (CSAPR) ozone season NO_x Allowances with a distance ratio applied to allowances, similar to the one used by stationary sources.

e. Rescheduling the project by elongating the construction schedule so as not to exceed the 100 tons per year threshold for NOx in any one calendar year.

Due to the unpredictable nature of dredge-related construction and the preliminary estimates of sand required to restore the integrity of the coastlines, the project emissions will be monitored as appropriate and regularly reported to the RAT to assist the USACE in ensuring that the project is fully offset.

In summary, USACE will achieve conformity for NO_x using the options outlined above, as coordinated with the NYSDEC and coordinated through the RAT.

Signature Block (TBD)

Attachment A

General Conformity Related Emission Estimates

Emissions have been estimated using project planning information developed by the New York District, consisting of anticipated equipment types and estimates of the horsepower and operating hours of the diesel engines powering the equipment. In addition to this planning information, conservative factors have been used to represent the average level of engine load of operating engines (load factors) and the average emissions of typical engines used to power the equipment (emission factors). The basic emission estimating equation is the following:

$$E = hrs \times LF \times EF$$

Where:

E = Emissions per period of time such as a year or the entire project.
hrs = Number of operating hours in the period of time (e.g., hours per year, hours per project).
LF = Load factor, an estimate of the average percentage of full load an engine is run at in its usual operating mode.
EF = Emission factor, an estimate of the amount of a pollutant (such as NO_x) that an engine emits while performing a defined amount of work.

In these estimates, the emission factors are in units of grams of pollutant per horsepower hour (g/hphr). For each piece of equipment, the number of horsepower hours (hphr) is calculated by multiplying the engine's horsepower by the load factor assigned to the type of equipment and the number of hours that piece of equipment is anticipated to work during the year or during the project. For example, a crane with a 250-horsepower engine would have a load factor of 0.43 (meaning on average the crane's engine operates at 43% of its maximum rated power output). If the crane were anticipated to operate 1,000 hours during the course of the project, the horsepower hours would be calculated by:

$$250 \text{ horsepower} \times 0.43 \times 1{,}000 \text{ hours} = 107{,}500 \text{ hphr}$$

The emissions from diesel engines vary with the age of an engine and, most importantly, with when it was built. Newer engines of a given size and function typically emit lower levels of most pollutants than older engines. The emission factors used in these calculations assume that the equipment pre-dates most emission control requirements (known as Tier 0 engines in most cases), to provide a reasonable "upper bound" to the emission estimates. If newer engines are actually used in the work, then emissions will be lower than estimated for the same amount of work. In the example of the crane engine, a NO_x emission factor of 9.5 g/hphr would be used to estimate emissions from this crane on the project by the following equation:

$$\frac{107{,}500 \text{ hphr} \times 9.5 \text{ g } NO_x\text{/hphr}}{453.59 \text{ g/lb} \times 2{,}000 \text{ lbs/ton}} = 1.1 \text{ tons of } NO_x$$

As noted above, information on the equipment types, horsepower, and hours of operation associated with the project have been obtained from the project's plans and represent current best estimates of the equipment and work that will be required. Load factors have been obtained from various sources depending on the type of equipment. Land-side nonroad equipment load factors are from the documentation for EPA's NONROAD emission estimating model, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, EPA420-P-04-005, April 2004."

Emission factors have also been sourced from a variety of documents and other sources depending on engine type and pollutant. Nonroad equipment NOx and other emission factors have been derived from EPA emission standards and documentation. On-road vehicle emission factors have also been developed from the EPA model MOVES2014a run for 15-year-old single-unit short-haul trucks operating in CY 2017.

As noted above, the emission factors have been chosen to be moderately conservative so as not to underestimate project emissions.

The following pages summarize the estimated emissions in sum for the project including the anticipated equipment and engine information developed by the New York District, the load factors and emission factors as discussed above, and the estimated emissions for the project.

USACE - New York District

NAN - GRR East Rockaway

General Conformity-Related Emission Estimates

Emission Estimates, East Rockaway to Rockaway Inlet **8/22/2018**

DRAFT

General Conformity-applicable emissions per calendar year based on project duration

Total project emissions (assumes all components proceed concurrently)

	Estimated Emissions, tons per year								
Pollutant	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
NO_x	158.3	158.3	158.3	158.3	158.3	0.0	0.0	0.0	0.0
VOC	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0
$PM_{2.5}$	8.2	8.2	8.2	8.2	8.2	0.0	0.0	0.0	0.0
SO_2	0.08	0.08	0.08	0.08	0.08	0.0	0.0	0.0	0.0
CO	17.7	17.7	17.7	17.7	17.7	0.0	0.0	0.0	0.0

Project Duration and Working Months per Year

Activity	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**Total Construction Months**
Dredging	6	6	6	6	6	0	0	0	0	30

2,617,000 cubic yards dredging (initial placement and renousishment on 4-year cycle)

Due to environmental and ozone season windows in place for the NY projects, there will be a maximum of 6 months of dredging per year for the NY projects

Shore-side work proceeds when dredging occurs. Combination of environmental and ozone season windows results in no dredging during April through September each year.

USACE - New York District

NAN - GRR East Rockaway
General Conformity-Related Emission Estimates
Supporting Information, East Rockaway to Rockaway Inlet
DRAFT
8/22/2018

						grams per hp-hr					tons				
Description, dredges and vessels	**Category**	**Horsepower (approx.)**	**Load Factor**	**Hours**	**hphrs**	**NOx**	**VOC**	**PM2.5**	**SOx**	**CO**	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_x**	**CO**
Cutter suction dredge main engine	CSD primary engine	9,000	0.66	8,463	50,269,836	9.7	0.37	0.51	0.005	1.06	537.51	20.503	28.261	0.277	58.738
Cutter suction dredge secondary engine	CSD secondary engi	3,310	0.66	8,463	18,488,129	9.7	0.37	0.51	0.005	1.06	197.68	7.541	10.394	0.102	21.603
Dredge auxiliry engine	CSD aux engine	830	0.40	8,463	2,809,695	7.3	0.2	0.29	0.005	1.27	22.61	0.619	0.898	0.015	3.933
Work tug main engine	Tug main	250	0.68	8,463	1,438,699	9.7	0.37	0.51	0.005	1.06	15.38	0.587	0.809	0.008	1.681
Work tug aux engine	Tug aux	50	0.40	8,463	169,259	7.3	0.2	0.29	0.005	1.27	1.36	0.037	0.054	0.001	0.237
Crew/survey boat main engine	Tug main	100	0.68	8,463	575,480	9.7	0.37	0.51	0.005	1.06	6.15	0.235	0.324	0.003	0.672
Crew/survey boat main engine	Tug aux	40	0.40	8,463	135,407	7.3	0.2	0.29	0.005	1.27	1.09	0.030	0.043	0.001	0.190
Derrick barge main	Crane	200	0.43	8,463	727,812	9.5	0.183	0.16	0.005	1.21	7.62	0.147	0.128	0.004	0.971
Derrick barge aux	Generator	40	0.43	8,463	145,562	9.5	0.183	0.16	0.005	1.21	1.52	0.029	0.026	0.001	0.194
Tug Boat, 1950 hp	Tug main	1,950	0.68	15	19,890	9.7	0.37	0.51	0.005	1.06	0.21	0.008	0.011	0.000	0.023
Tug auxiliary engine	Tug aux	150	0.40	15	900	7.3	0.2	0.29	0.005	1.27	0.01	0.000	0.000	0.000	0.001
Barge Mounted Crane, 100 ton	Crane	200	0.43	25	2,150	9.5	0.183	0.16	0.005	1.21	0.02	0.000	0.000	0.000	0.003
Tug Boat, 1950 hp	Tug main	1,950	0.68	25	33,150	9.7	0.37	0.51	0.005	1.06	0.35	0.014	0.019	0.000	0.039
Tug auxiliary engine	Tug aux	150	0.40	25	1,500	7.3	0.2	0.29	0.005	1.27	0.01	0.000	0.000	0.000	0.002
Barge Mounted Crane, 100 ton	Crane	200	0.43	3	258	9.5	0.183	0.16	0.005	1.21	0.00	0.000	0.000	0.000	0.000
Tug Boat, 1950 hp	Tug main	1,950	0.68	3	3,978	9.7	0.37	0.51	0.005	1.06	0.04	0.002	0.002	0.000	0.005
Tug auxiliary engine	Tug aux	150	0.40	3	180	7.3	0.2	0.29	0.005	1.27	0.00	0.000	0.000	0.000	0.000
Barge Mounted Crane, 100 ton	Crane	200	0.43	5	430	9.5	0.183	0.16	0.005	1.21	0.00	0.000	0.000	0.000	0.001
Tug Boat, 1950 hp	Tug main	1,950	0.68	5	6,630	9.7	0.37	0.51	0.005	1.06	0.07	0.003	0.004	0.000	0.008
Tug auxiliary engine	Tug aux	150	0.40	5	300	7.3	0.2	0.29	0.005	1.27	0.00	0.000	0.000	0.000	0.000
Totals											**791.7**	**29.8**	**41.0**	**0.4**	**88.3**

US Army Corps of Engineers®
New York District

REVISED DRAFT

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

East Rockaway Inlet to Rockaway Inlet and Jamaica Bay

Appendix D

Environmental Compliance

Attachment D8
Monitoring Plan

August 2018

APPENDIX CURRENTLY UNDER DEVELOPMENT