BIOLOGICAL ASSESSMENT

APPENDIX

NASSAU COUNTY BACK BAYS
COASTAL STORM RISK MANAGEMENT
FEASIBILITY STUDY

PHILADELPHIA, PENNSYLVANIA

APPENDIX G2

August 2021

NCBB
Nassau County Back Bays Study

U.S. Army Corps of Engineers
Philadelphia District

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1.0 Introduction

1.1 Purpose

This biological assessment was prepared to fulfill the U.S. Army Corp of Engineers (USACE), Philadelphia District requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The Nassau Back Bays Coastal Storm Risk Management Feasibility Study (the NCBB Study) is being conducted by the USACE and the non-federal sponsors, the New York State Department of Environmental Conservation (NYSDEC) in partnership with Nassau County, NY.

The proposed Federal action (also referred to as the Tentatively Selected Plan or TSP) consists of nonstructural measures (e.g., elevation and floodproofing of buildings and structures) within the NCBB Study Area. This BA evaluates the potential impacts the NCBB Study TSP and options that have not been eliminated, may have on federally listed threatened and endangered species identified by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) within the NCBB Study Area.

The NCBB Study Area (study area) includes all of the tidally influenced bays and estuaries within Nassau County, New York, located on Long Island, NY, that are hydraulically connected to the south shore of Nassau County, directly east of Queens County and west of Suffolk County for approximately 98 square miles. The back bay area of Nassau County has hydraulic connections to areas to the west in Queens County, NY, and Suffolk County, NY to the east. In addition, these areas experienced significant adverse effects from Hurricane Sandy. Vulnerable areas in Queens and Suffolk Counties are being addressed under other study authorities (Jamaica Bay-Rockaway, NY and Fire Island to Montauk Point, NY, respectively), and have construction capability as part of the Sandy Appropriation; therefore, the east-west boundary of this feasibility study will be limited to the east-west extent of Nassau County (Figure 1).

The northern study area boundary along the mainland of Long Island was established using NACCS water level statistics for the 500-year return period (0.2% annual exceedance probability, or "AEP") at 13 locations. The vertical datum used in the NACCS water level calculations is local mean sea level (LMSL) in meters. The NACCS water surface elevations were converted to units of feet relative to NAVD88 using the application known as VDatum, developed and maintained by the National Oceanic and Atmospheric Administration (NOAA). This conversion was necessary because the North American Vertical Datum of 1988 (NAVD88), is the standard vertical datum used for topographic (elevation) surveying and mapping. Three feet was added to the NACCS water surface elevations to account for potential future relative sea level change (RSLC), then each value was rounded to the nearest whole foot. The resulting elevation contour selected as the northern study area boundary was thus +19 feet NAVD88. The boundary line was smoothed using engineering judgment so that it did not cut through real estate parcels. The typical distance from the northern study area boundary to the ocean shoreline of Long Beach, Jones, and Fire Islands is between 5 and 7 miles.

The southern boundary corresponded to the Atlantic Ocean offshore of Long Beach, Jones, and Fire Islands.

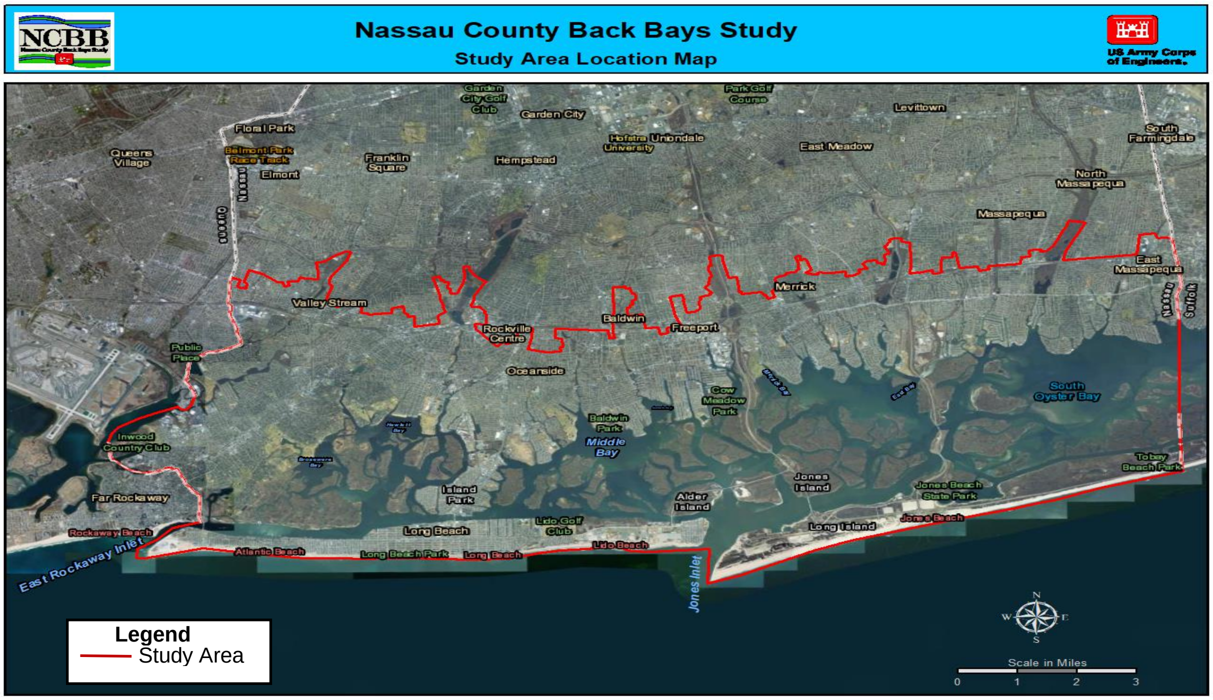


Figure 1: NCBB Study Area

1.2 Species and Critical Habitat Considered

The USFWS Information for Planning and Conservation and NMFS ESA mapper databases were queried on May 2021 to determine which species protected under the ESA have the potential to occur in the NCBB Study Area (Attachment 1). Table 1 and Table 2 provide an initial screening of the threatened and endangered species that have the potential to occur in the study area based on a suitable habitat. Species potentially affected were carried forward in the biological assessment for consideration. The initial screening indicates that the following species would not be affected by the project because of they would not occur in the action area based on a lack of habitat or known occurrences or their habitat would not be disturbed by the project.

- Shortnose sturgeon (*Acipenser brevirostrum*)
- Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis*)
- Piping plover (*Charadrius melodus*)
- Seabeach amaranth (*Amaranthus pumilus*)

These species are eliminated from further consideration in this biological assessment. All other species were carried forward for a detailed assessment. Additionally, saltmarsh sparrow (*Ammospiza caudacuta*) is a USFWS species of concern, also considered in this assessment; however, this species is not federally-listed under ESA. New York State-listed species, that are not listed in under ESA are considered in the Environmental Impact Statement.

Table 1. Potential Impacts of the TSP and Options on Threatened and Endangered Species

Species	Status	Habitat in NCBB	Potential for Impact	Carried Forward for Consideration
Northern Long-Eared Bat (*Myotis septentrionalis*)	FT, ST	Summertime roosts beneath the bark of live and dead trees.	Impacts to occupied habitat would be avoided to the maximum extent practicable.	Yes
Piping plover* (*Charadrius melodus*)	FT, SE	Ocean beaches, inlets, washover areas, tidal flats	No expected disturbance to nests/foraging areas on beaches and inlet dunes or disruptions in food chain.	No
Eastern Black Rail *(Laterallus jamaicensis spp. Jamaicensis)*	FT, SE	Salt and freshwater marshes	Direct habitat impacts/losses are likely on breeding in higher saltmarshes. Indirect impacts through disruptions in food chain (NYSDEC 2007a and b).	Yes
Roseate Tern (*Sterna dougallii*)	FE, SE	Beaches w/ vegetated dunes	Not expected to breed in the study area (NYSDEC 20007a and b). Potential disturbance to foraging areas. Indirect impacts through disruptions in food chain.	Yes
Red Knot (*Calidris canutus*)	FT, ST	Foraging and resting habitat on gently sloping, sandy beaches.	Potential disturbance to foraging areas. Indirect impacts through disruptions in food chain.	Yes
Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis*)	FT, ST	Coastal beaches. Extirpated from the study area.	No expected disturbance to beach habitat.	No

Species	Status	Habitat in NCBB	Potential for Impact	Carried Forward for Consideration
Sandplain gerardia (*Agalinis acuta)*	FT, SE	Grassland habitat along the coastal plain. This species is only known to occur in Nassau County at Hempstead Plains, which is not in the study area.	Not expected in the study area.	No
Seabeach amaranth* (*Amaranthus pumilus*)	FT, ST	Upper sandy beaches, accreting ends of inlets	No expected disturbance to habitat on beaches and inlet dunes.	No

Notes: FE=Federally Endangered, FT=Federally Threatened, PFT=Proposed Federally Threatened, SE=State Endangered, ST=State Threatened. Saltmarsh sparrow is considered in this biological assessment, but not included in this table because it is not federally listed.

Table 2. Potential Impacts of TSP and Options on Threatened and Endangered Species under NMFS Jurisdiction

Species	Status	Habitat in NCBB	Potential for Impact	Carried Forward for Consideration
Fin Whale (*Balaenoptera physalus*)	FE, SE	Marine pelagic	There is no marine construction proposed in or adjacent to open ocean waters.	No
North Atlantic Right Whale (*Eubalaena glacialis*)	FE, SE	Marine pelagic	There is no marine construction proposed in or adjacent to open ocean waters.	No
Atlantic Loggerhead (*Caretta caretta*)	FT, ST	Marine/Estuarine Pelagic	Potential disturbance of adults and juveniles in open estuarine waters.	Yes
Kemp's Ridley (*Lepidochelys kempii*)	FE, SE	Marine/Estuarine Pelagic	Potential disturbance of adults and juveniles in open estuarine waters.	Yes
Atlantic Green Sea Turtle *(Chelonia mydas*)	FT, ST	Marine/Estuarine Pelagic	Potential disturbance of adults and juveniles in open estuarine waters.	Yes
Leatherback Sea Turtle (*Dermochelys coriacea*)	FT, SE	Marine/Estuarine Pelagic	Potential disturbance of adults and juveniles in open estuarine waters.	Yes
Atlantic Sturgeon*	FT, FE, SE	Anadromous, marine/estuarine Demersal/pelagic	Potential disturbance of adults and juveniles	Yes

(*Acipenser oxyrinchus oxyrinchus*)			in open estuarine waters.	
Shortnose Sturgeon (*Acipenser brevirostrum*)	FE, SE	Amphimodrous, freshwater/brackish tidal Demersal/pelagic	This species is not expected to occur in the action area.	No

Notes: FE=Federally Endangered, FT=Federally Threatened, PFT=Proposed Federally Threatened, SE=State Endangered, ST=State Threatened.

1.3 Consultation History

Informal consultation was initiated on 6 October2017, when U.S. Army Corps of Engineers (USACE), New York District sent letters inviting U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to be cooperating agencies for the Nassau County Back Bays (NCBB) Coastal Storm Risk Management (CSRM) Feasibility Study. Table 3 a summary of formal and informal correspondences and interagency meetings held during the course of the NCBB Study.

Table 3: Summary of Relevant Agency Correspondence

Date	Summary of Agency Correspondence
April 21, 2017	Publication of Notice of Intent to prepare an EIS in Federal Register
May 2 and 3, 2017	USACE New York District held scoping meetings.
October 6, 2017	USACE New York District sent letters inviting USFWS, /NOAANMFS, FEMA, EPA, and USCG to be cooperating agencies.
April 1, 2019	NCBB Status Report published.
July 2, 2019	USACE Philadelphia District sent emails to USFWS, NOAA/NMFS, FEMA, and EPA indicating that Philadelphia District was leading the NCBB study; requesting a meeting to discuss the study and confirmation of the agency's intent to continute to serve as cooperating agencies; initiate ESA and EFH consultation; and to request coordination under Executive Order (E.O.) 13807 (One Federal Decision (OFD))
July 26, 2019	Letter received from NOAA/NMFS accepting invitation to serve as a cooperating agency.
June 8, 2020	Publication of Withdrawal of April 21, 2017 NOI in Federal Register
July 21, 2020	Agency Coordination/One Federal Decision Concurrence Point #1 Meeting
August 4, 2020	Email from USACE to resource agency partners requesting concurrence with OFD Concurrence Point #1: Purpose and Need
August 10, 2020	Letter received from USFWS providing comments on the purpose and need statement.
August 11, 2020	Email received from NMFS stating concurrence with the Purpose and Need.
September 10, 2020	Publication of (second) Notice of Intent to prepare an EIS in Federal Register
October 1, 2020	Letter received from USFWS providing comments in response to NOI.
October 5, 2020	Email from USACE to resource agency partners providing revised Purpose and Need and requesting concurrence.
October 13, 2020	Email from NMFS confirming concurrence with revised Purpose and Need
October 23, 2020	Email to resource agency partners requesting review of draft Permitting Timetable.

October 23, 2020	Email from NFMS providing comments on the draft Permitting Timetable.
November 12, 2020	Emails to FWS and NMFS from USACE requesting confirmation that USACE is working with the correct threatened and endangered species list for Endangered Species Act coordination.
November 12, 2020	Email to NMFS from USACE requesting confirmation that USACE is working with the correct Essential Fish Habitat (EFH) species list for the Magnuson-Stevens Act coordination.
November 17, 2020	Agency Coordination/One Federal Decision Concurrence Point #2/Permitting Dashboard Meeting
November 17, 2020	Email from NFMS providing feedback on the endangered and threatened species list.
November 18, 2020	Email from USFWS providing feedback on the endangered and threatened species list.
November 30, 2020	Permitting Timetable published on One Federal Decision
December 1, 2020	Email to resource agency partners requesting concurrence with OFD Concurrence Point #2: Alternatives Analysis, and review of the Permitting Timetable.
December 1, 2020	Email from NFMS providing feedback on the EFH species list.
December 10, 2020	Email from NMFS stating concurrence with the Alternatives Analysis.
December 15, 2020	Letter from USFWS providing comments on the alternatives array.
February 1, 2021	Email from USACE to resource agency partners providing a study update and communicating revocation of EO 13807,and delay of the dEIS until later in 2021.
May 18, 2021	Meeting with USFWS and South Shore Estuary Reserve to discuss NNBF measures.
May 3, 2021	Email to resource agency partners stating that a TSP milestone meeting has been set and initiating planning for an agency coordination meeting.
June 10, 2021	Revised Permitting Timetable provided for review.
June 14, 2021	Agency Coordination Meeting to present the Tentatively Selected Plan.
June 14, 2021	Email from NMFS providing comments on the revised Permitting Timetable.
June 16, 2021	Email from NMFS providing confirmation that the updated Permitting Timetable including their June 14 comments has been approved by NMFS HQ.

2.0 Project Description

2.1 Tentatively Selected Plan

The *Non-Structural Countywide Plan* (NS plan) was selected as the TSP for the Nassau County Back Bays Coastal Storm Risk Management Feasibility Study. The NS plan includes elevating 14,183 residential structures to the modeled 1% AEP non-structural design water surface elevation, which includes intermediate sea level change projected to 2080 (Figure 2). In addition, 2,667 industrial/commercial structures will be floodproofed with an assumed vertical construction of 3 feet for floodproofing measures (Figure 3 and Figure 4).

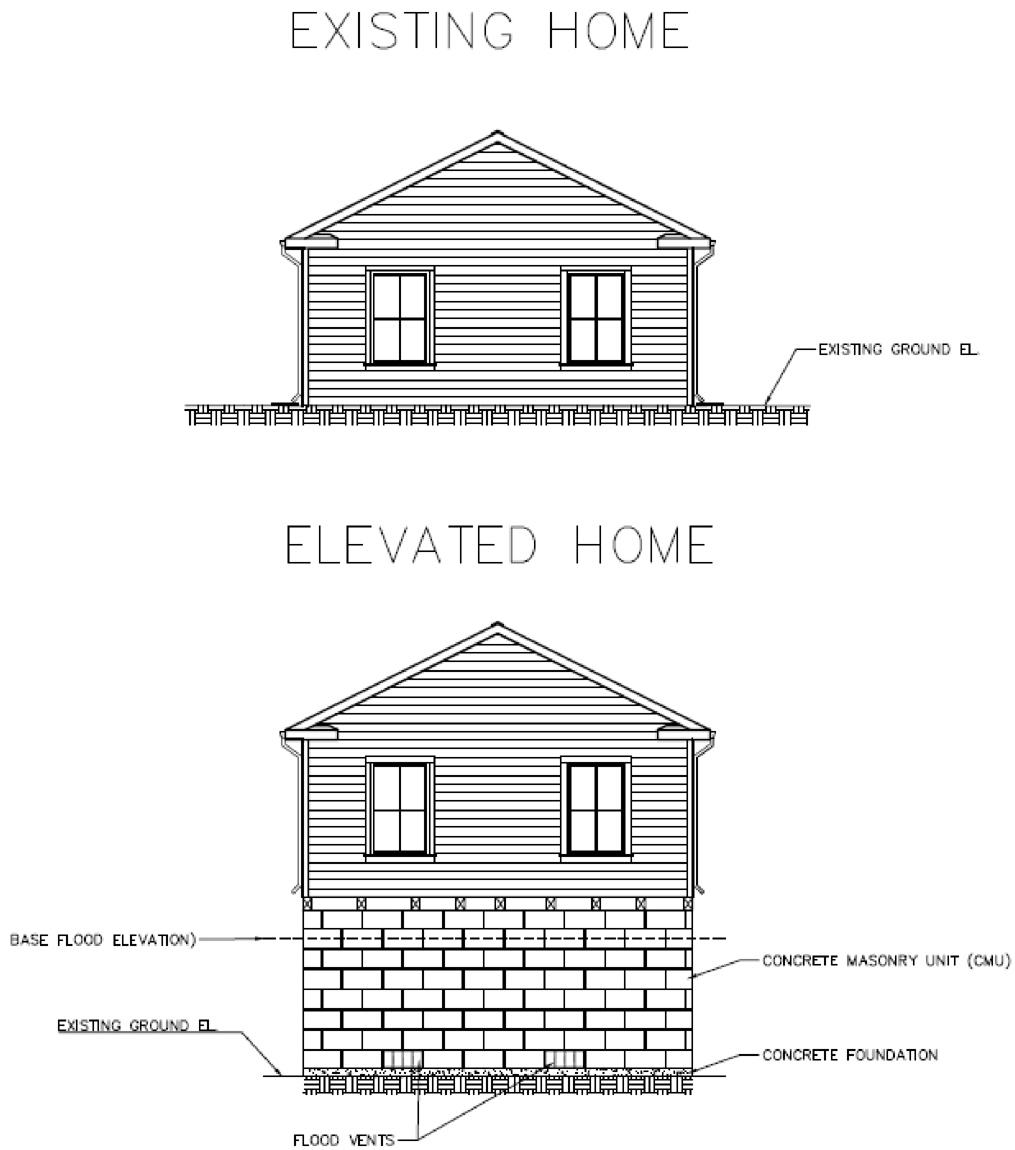


Figure 2: Example of Residential Elevation

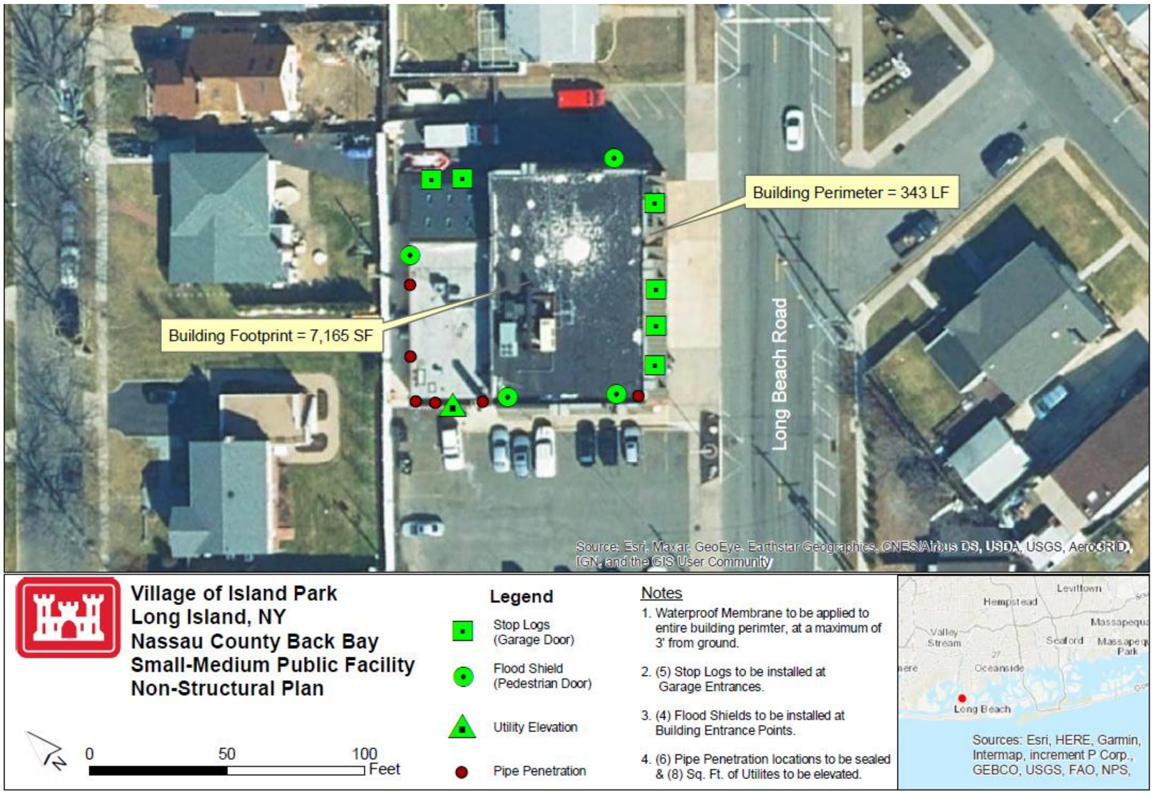


Figure 3: Plan View Example of Dry Flood Proofing

Figure 4: Street View Example of Dry Flood Proofing

Pre-construction. Prior to construction a detailed investigation of the eligibility of individual structures for non-structural measures would be conducted.

Construction. Nonstructural measures involve a significant construction effort whether it be from building retrofits such as elevation (including raising a structure on fill or foundation elements such as solid perimeter walls, pier, posts, columns, or pilings) or buyout/relocations that are likely to involve demolition, grading, and soil stabilization/revegetation. Most of the construction would occur within the footprint of the existing structure and would most likely be in upland urbanized settings.

Operations and Maintenance. It is assumed that required maintenance would be similar to construction methods, but on a smaller scale.

2.2 Alternatives with Further Analysis Warranted

While the TSP is the NS plan (i.e., the Proposed Action), USACE will also continue to evaluate impacts of the complementary infrastructure measures, which would be included in the *Localized Structural Critical Infrastructure & Non-Structural Plan* (CI & NS Plan) because of its high potential to increase community resilience and minimize environmental degradation by more effectively reducing damages and/or disruption to large-scale critical infrastructure. Specific components of the CI & NS Plan are outlined below. Additionally, Natural and Nature Based Features (NNBF) measures are being considered as complementary measures to the chosen plan. NNBF measures include natural coastal features and engineered nature-based features intended to mimic natural features and provide flood risk management.

2.2.1 Localized Structural Critical Infrastructure & Non-Structural Plan

The non-structural portion of the CI & NS Plan includes elevating and floodproofing structures as described above in the TSP. The structural portion of the CI & NS Plan includes localized floodwalls around large-scale critical infrastructure, sluice gates, railroad closure gates, and road closure gates. Specific measures and locations are described in the following sections.

Pre-construction. Prior to construction investigations may include, wetland delineation, a subsurface geotechnical investigation, and HTRW sampling. These investigations are being developed.

Construction. In-water construction activities for the construction of floodwalls, miter and sluice gates, and railroad and road closures include:

- **Type B (Freeport only):** installation and removal of sheetpile (likely vibratory driving)
- **Type C (all other locations):** temporary excavations, fill and rock placement, concrete work.

Type B floodwalls would be constructed in temporary cofferdams constructed from sheet pile. Type C floodwalls would be constructed from shore. All pile driving would occur on land or in a dewatered coffer dam. On land construction activities include clearing, grading, excavations, backfilling, movement of construction equipment, concrete work, pile driving, and soil stockpiles.

Operations and Maintenance. Miter gates would be installed and operated across smaller channels that require navigable access. These gates would remain open during normal conditions and would be closed during significant storm events. Regular maintenance is performed on the gates to keep the system running as designed.

2.2.1.1 Far Rockaway

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Far Rockaway (Figure 5) include the following to protect Evacuation Route No. 1:

- 7,000 linear feet of floodwall construction at elevation +16 feet North Atlantic Vertical Datum of 1988 (NAVD88) of a Floodwall Type C
- 4 road closure gates at elevation +16 feet NAVD88
- 1 sluice gate at elevation +16 feet NAVD88

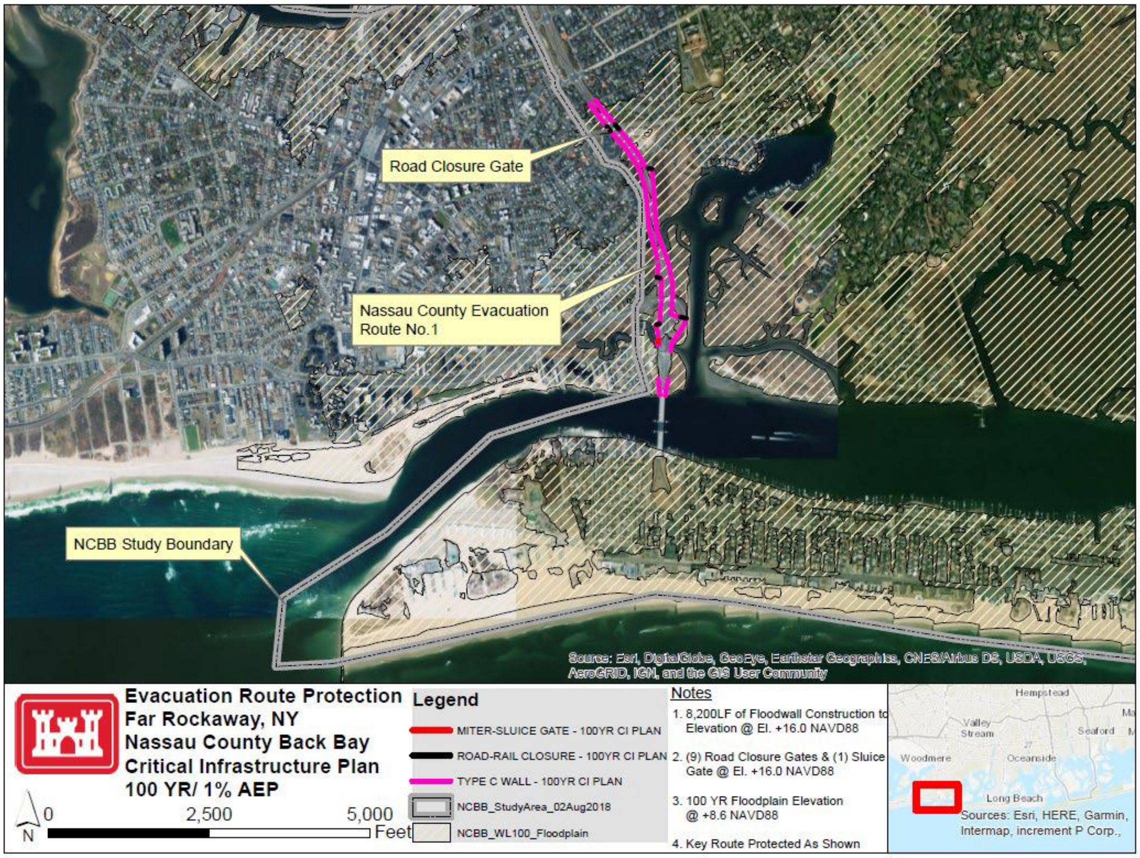


Figure 5: Evacuation Route (1) Protection in Far Rockaway

2.2.1.2 Freeport

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Freeport (Figure 6) include the following:

- 12,250 linear feet of floodwall construction at elevation +16 feet NAVD88
- 2 road closure gates at elevation +16 feet NAVD88

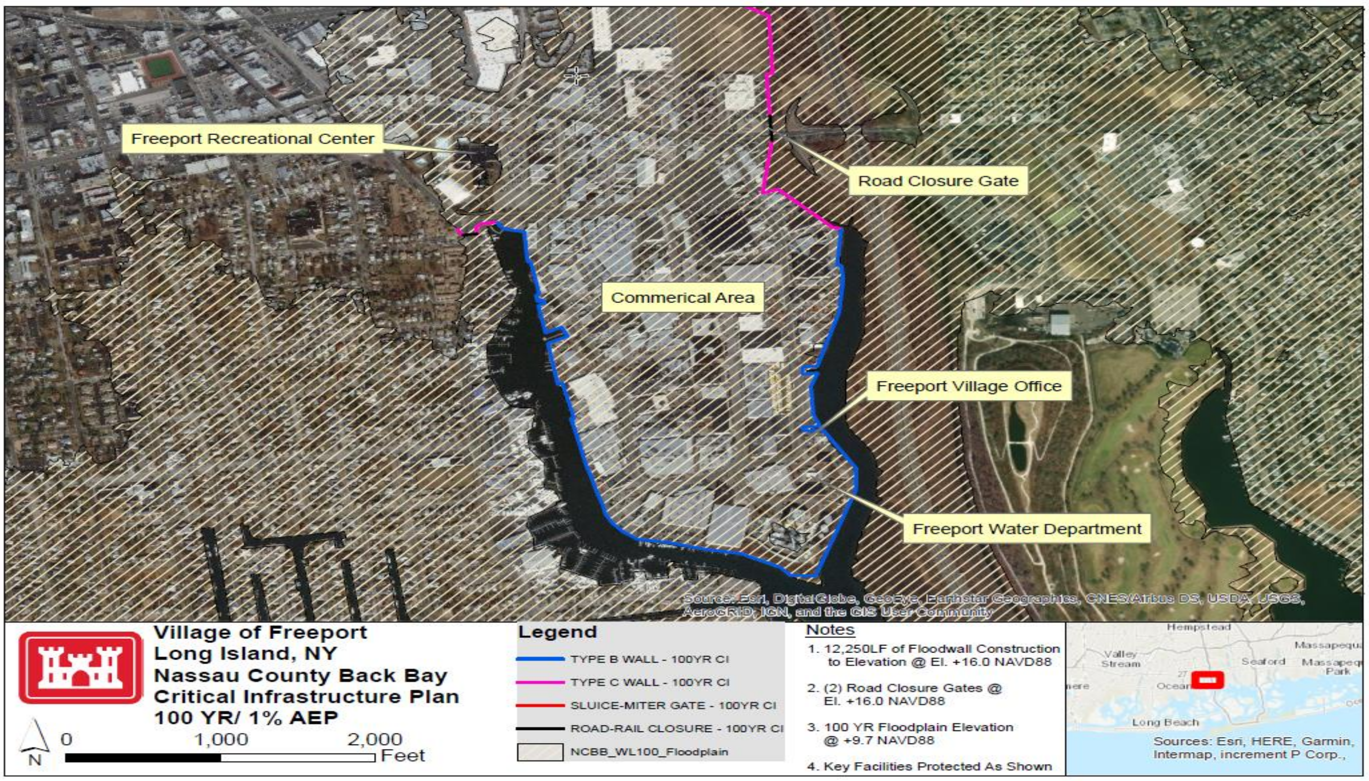


Figure 6: Local Floodwall in Village of Freeport

2.2.1.3 Island Park

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Island Park (Figure 7) include the following:

- 6,950 linear feet of floodwall construction at elevation +16 feet NAVD88
- 2 sluice gates at elevation +16 feet NAVD88
- 2 road closure gates at elevation +16 feet NAVD88

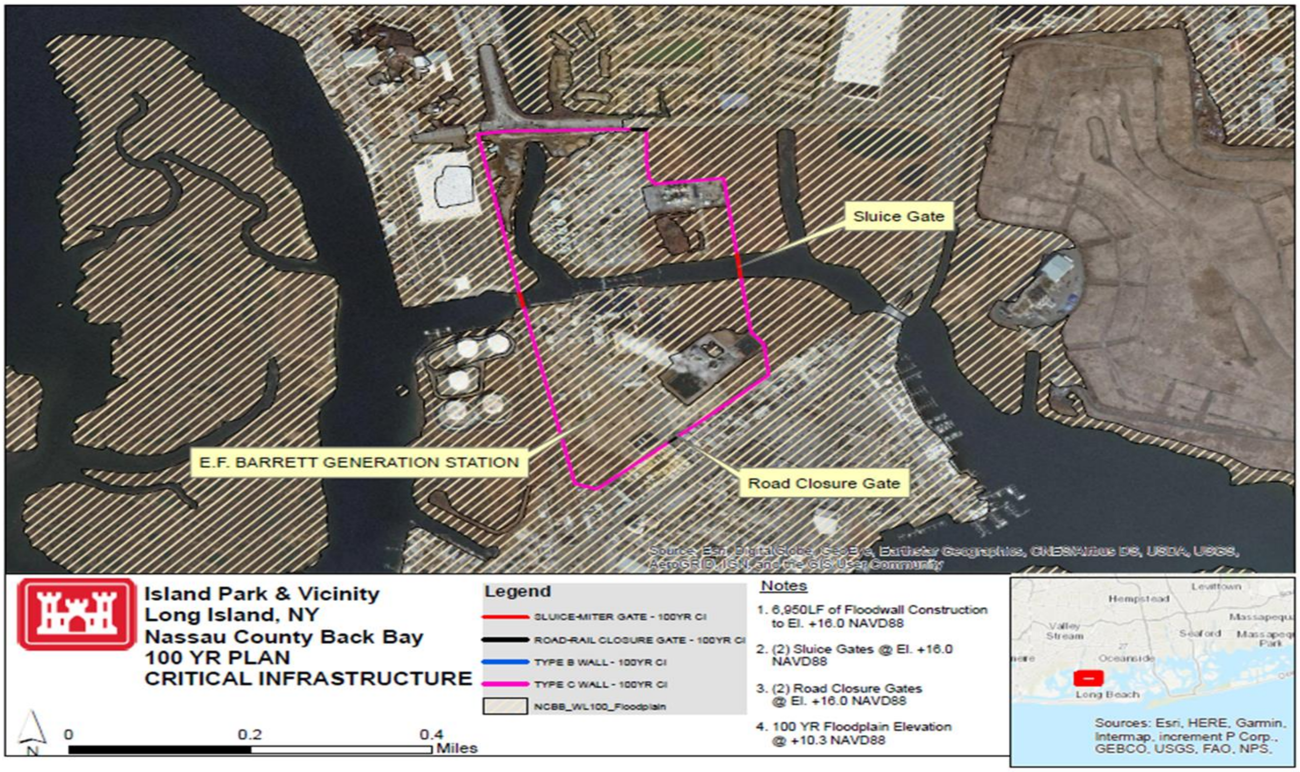


Figure 7: Local Floodwall in Island Park & Vicinity

2.2.1.4 Long Beach

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Long Beach (Figure 8) include the following:

- 10,260 linear feet of floodwall construction at +16 feet NAVD88
  - 3 road and 1 railroad closure gates at +16 feet NAVD88

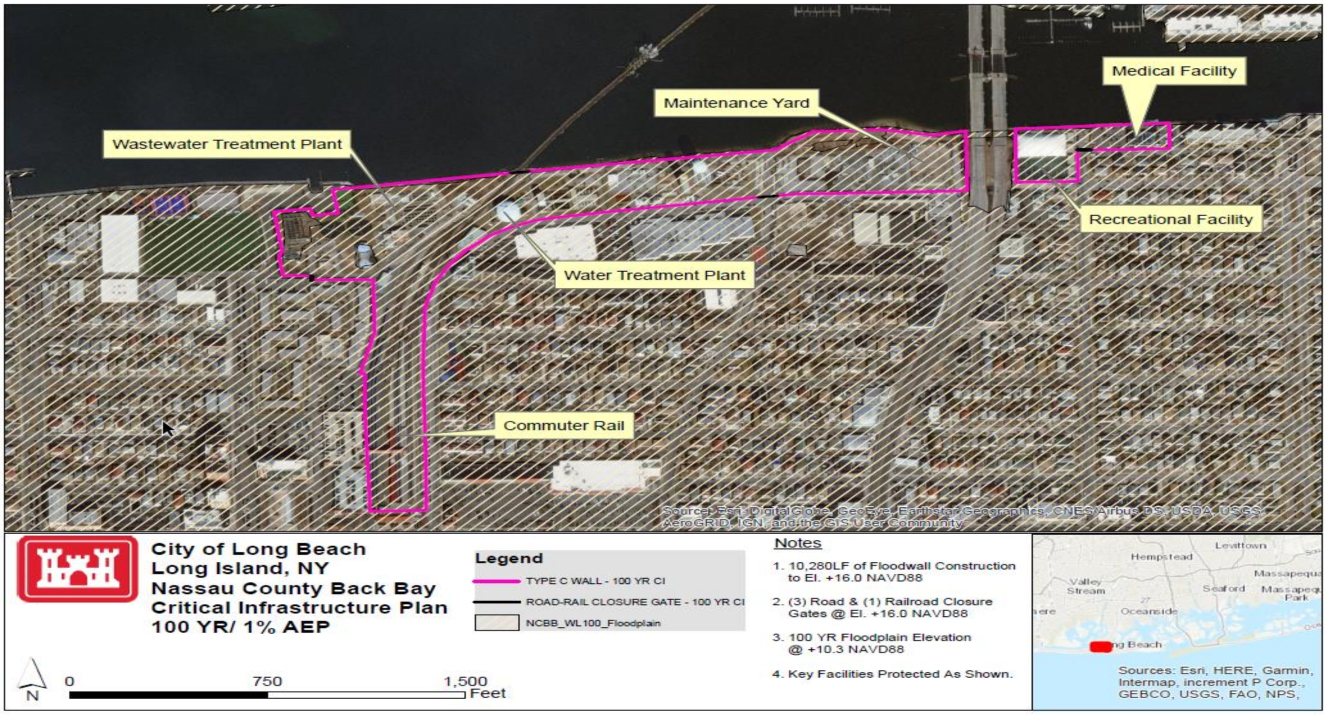


Figure 8: Local Floodwall in the City of Long Beach

2.2.1.5 Wantagh

Structural measures that are being considered in order to protect critical infrastructure in the vicinity of Wantagh (Figures 9 and 10) include the following:

Protection of Cedar Creek Wastewater Treatment Plant (WWTP) -

- 6,000 linear feet of floodwall construction at elevation +16 feet NAVD88
- 1 road closure gate at elevation +16 feet NAVD88

Protection of Evacuation Route No. 4 -

- 800 linear feet of floodwall construction at elevation +16 feet NAVD88
- Floodwall Type – Type C

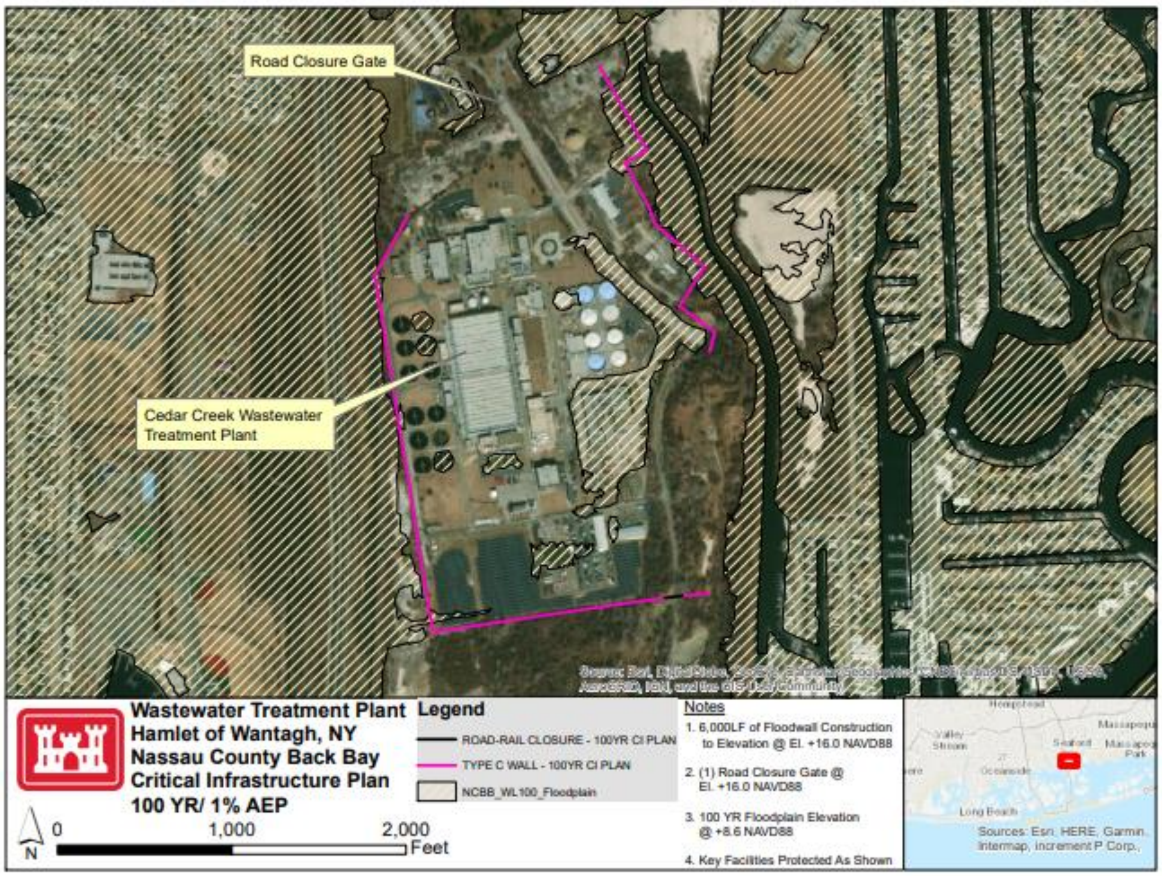


Figure 9: Local Floodwall in the Hamlet of Wantagh

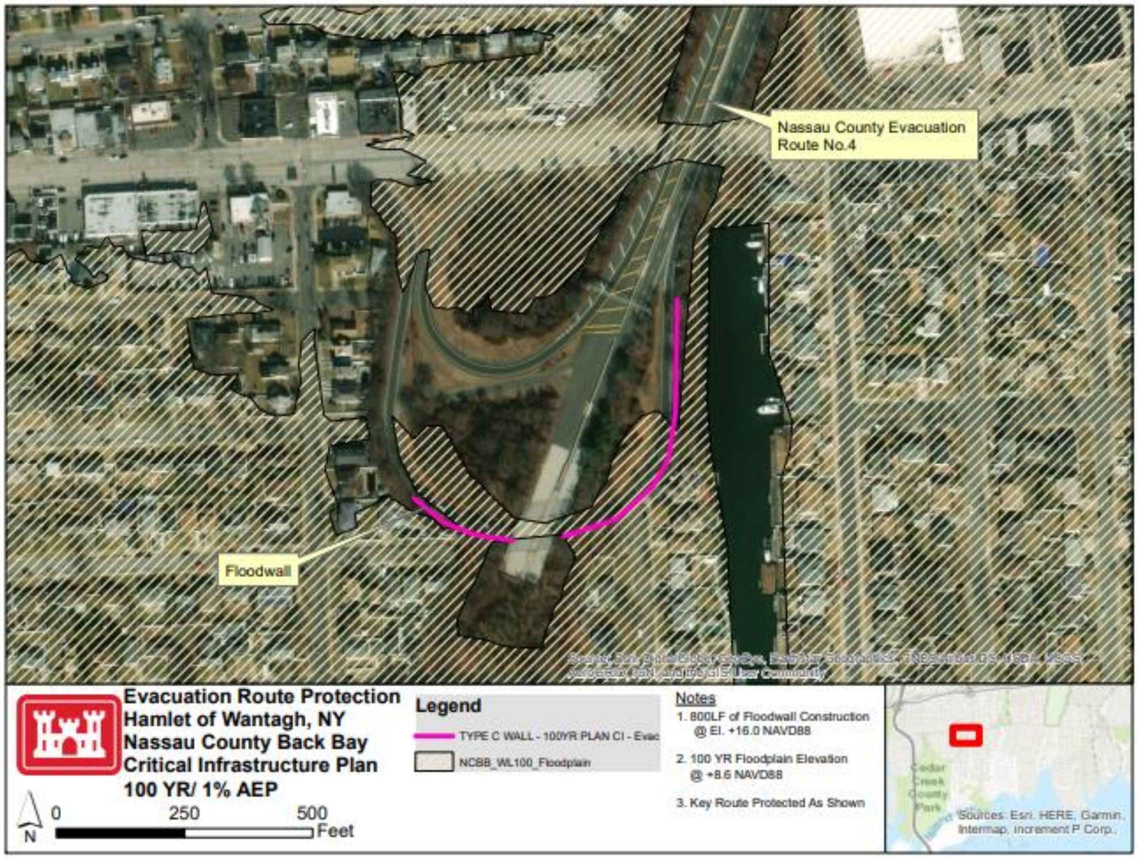


Figure 10. Evacuation Route (4) Protection in Wantagh

2.2.2 Natural and Nature-based Features (NNBF)

Based on lessons learned from the New Jersey Back Bays (NJBB) CSRM Study's modeling efforts, NNBF measures have the potential to attenuate surge and waves by increasing both elevation and roughness. NNBF measures will be evaluated in greater detail during feasibility-level design and plan optimization. Thus far, opportunities for wetland restoration and conservation have been considered through an identification of at-risk wetlands. Specific NNBF measures may include living shorelines, reefs, and wetland and submerged aquatic vegetation (SAV) Restoration.

Initial target locations for NNBF are based on marshes prioritized for conservation and restoration. The USACE approach for prioritizing marshes for protection and restoration is described in Section 4.5.3 of the EIS. This analysis highlights marshes concentrated in central study area, between where Meadowbrook State Parkway and Wantagh State Parkway cross the bay to Jones Beach, as a potential target area for NNBF measures (Figure 11 – *Marsh Conservation/Restoration Priority,*

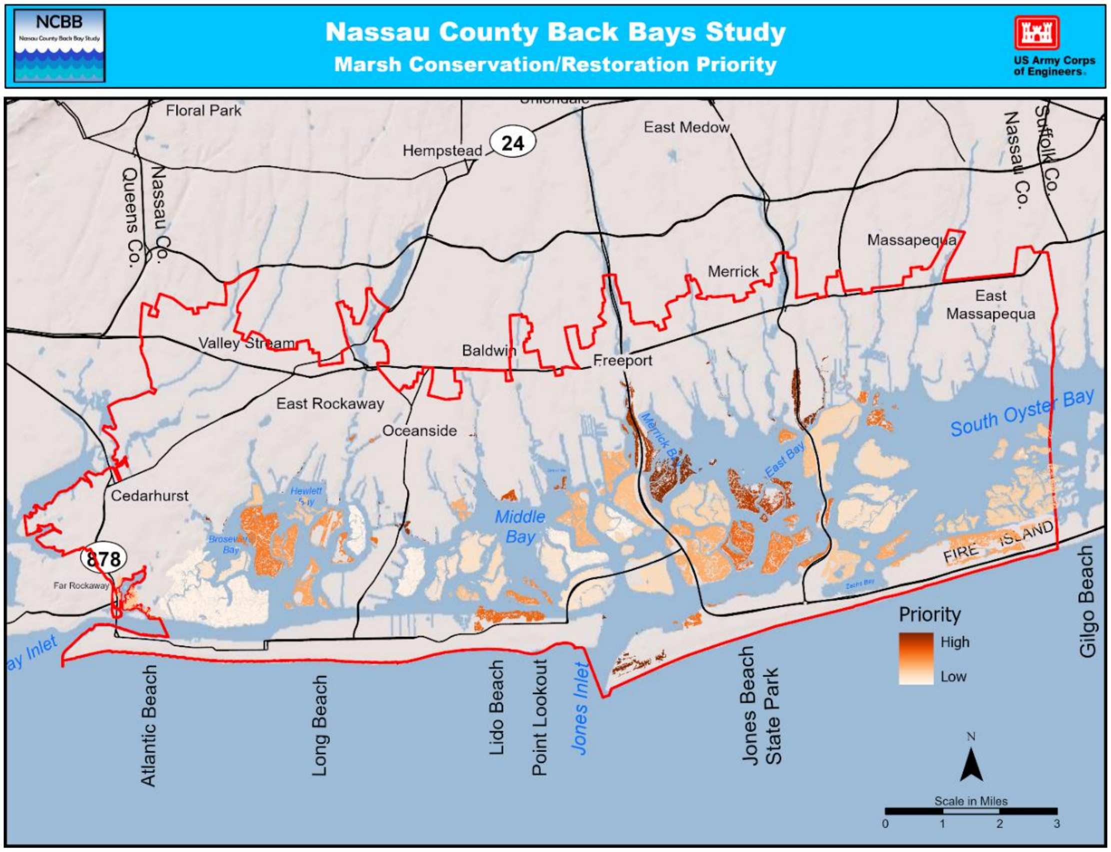


Figure 11 – Marsh Conservation/Restoration Priority,

Preconstruction. Prior to construction investigations may include, wetland delineation, a subsurface geotechnical investigation, and HTRW sampling. These investigations are being developed.

Construction. In-water construction activities for the construction of NNBF include installation and removal of temporary cofferdams, temporary excavations, dredging and filling and rock placement, and wetland/upland vegetation planting. On land construction activities include clearing, grading, excavations, backfilling, movement of construction equipment, and temporary roads.

Operation and Maintenance. It is assumed that NNBF would require period maintenance or repair and that maintenance would be similar to construction, but on a much smaller scale.

2.3 Measures to Avoid and Minimize Effects on Listed species

The following are examples of measures that would be implemented, to the maximum extent practicable, to avoid effects on threatened and endangered species.

- Develop a sediment and erosion control plan.
- Avoid removal of northern long-eared bat potential roost trees to the maximum extent practicable.

- Avoid construction in high marsh during black rail nesting and breeding season (April 1 – Aug 15) or saltmarsh sparrow nesting and breeding season (May through early September). If construction activities during the nesting season cannot be avoided (due to quantity of sand required, weather constraints, etc.) the USACE would attempt to survey for nests and mark avoidance buffers around them and schedule activities in such a way as to avoid areas within the action area with active nests until nesting is complete.
- Construction of the structural measures associated with the CI & NS Pan from land or within a dewatered cofferdam.
- Conduct impact pile driving from land or a dewatered cofferdam.
- If pile driving cannot occur on land or within a dewatered cofferdam, develop additional Best Management Practices (BMPs) to avoid impacts on protected marine species. This may include a protected marine species monitoring and shut down plan, if in-water pile driving is required.
- Shallow draft vessels that maximize the navigational clearance between the vessel and the river bottom should be used where possible.
- Vessels should operate at speeds of less than 10 knots. Whenever operating in areas where whales or sea turtles are present, a look out should be posted and measures taken to slow down and avoid any whales or sea turtles spotted.

3.0 Action Area

The action area is defined as all areas that may be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. It encompasses the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that will result directly and indirectly from the action. The action area is a subset of the NCBB Study Area.

For the NCBB Study, the action area is all areas directly and indirect affected by the TSP. The TSP includes Non-structural measures including 14,183 structures eligible for elevation and 2,667 structures eligible for floodproofing.

Additionally, the action area considers the effects of floodwalls, sluice/miter gates, and railroad/road closures to protect critical infrastructure (referred to as the CI Plan) and potential target areas for NNBF measures, which have not yet been eliminated. See Figure 6, Figure 7, Figure 8, Figure 9, Figure 10, and Figure 11.

4.0 Status of Listed Species

4.1 Eastern Black Rail

The subspecies, eastern black rail (*Laterallus jamaicensis jamaicensis*) was listed as a threatened species on November 2020. The species black rail (*Laterallus jamaicensis)* is listed as endangered by the state of New York. Threats for eastern black rail include habitat fragmentation, altered hydrology, effects of climate change and sea level rise, disease, altered food webs, and oil and chemical spills, as well as other environmental contaminants.

4.1.1 Range and Habitat

The eastern black rail occupies portions of the eastern United States (east of the Rocky Mountains), Mexico, Central America, the Caribbean, and occasionally in Brazil. In the United States, eastern black rails are primarily from coastal sites, but can also be found in inland areas. The eastern black rail has been historically present during breeding months from Virginia to Massachusetts, with 70 percent of historical observations (773 records from 1836 to 2010) in Maryland, Delaware, and New Jersey (Watts 2016).

The eastern black rail can typically be found in salt and brackish marshes with dense cover but can also be found in upland areas of these marshes. The habitat can be tidally or non-tidally influenced, and with a wide range in salinity (salt to brackish to fresh), tidal range, and tidal volume (USFWS 2020).

4.1.2 Presence within the Study Area

In New York, black rails occur in high salt marsh habitat and have only known to breed on the south shore of Long Island in Suffolk County (NYSDEC 2007a and b, NYNHP 2021a). There are only two known breeding records of black rails in Nassau County, NY in 1937 and 1940 (NYNHP 2021a). The breeding bird atlas does not show any observations in Nassau County (NYSDEC 2007a and b).

4.2 Roseate Tern

The northeastern breeding population of the roseate tern was designated as endangered in Northeastern North America in the Federal Register on 2 November 1987. Threats to roseate terns include habitat loss, climate change, collisions, and predation.

4.2.1 Range and Habitat

The roseate tern is a coastal species that occurs in both temperate and tropical areas throughout the world. The North Atlantic breeding population is located from Nova Scotia to Long Island, New York, with historic nesting records south to Virginia (USFWS 1998).

Roseate tern is nest on barrier islands and salt marshes and forage over shallow coastal waters, inlets, and offshore seas. Nesting colonies are located above the high-tide line, often within vegetated dunes (USFWS 1998).

4.2.2 Presence within the Study Area

The roseate tern is not known to breed in the study area but has been observed in Nassau County (NYSDEC 2007 a and b, NYNHP 2021b, ebird 2021).

4.3 Red Knot

The red knot was listed as threatened under ESA on 12 January 2015 (Federal Register, 11 December 2014). Threats to red knot include beach stabilization (beach armoring, sand fences, sea walls, groins, jetties, and riprap); habitat loss; and intensive recreational use (USFWS pers. com.).

4.3.1 Range and Habitat

Red knots fly up to 9,300 miles from south to north every spring and reverse the trip every autumn, making the red knot one of the long-distance migrating animals. Migrating birds break their spring migration into non-stop segments of 1,500 miles or more, ending at stopover sites called staging areas (USFWS 2021).

Red knots winter at the southern tip of South America, northern Brazil, the Caribbean, and the southeastern and Gulf coasts of the U.S. and breed in the tundra of the central Canadian Arctic (USFWS 2021).

Red knots prefer unimproved tidal inlets for nonbreeding habitat. Dynamic and ephemeral (lasting only briefly) features are important red knot habitats along the Atlantic Coast; these include sand spits, islets, shoals, and sandbars, features often associated with inlets (several authors cited in 86 FR 37415). In New York, the red knots occur along the salt meadows and mudflat of the South Shore of Long Island in both spring and fall, numbering more than 1,000 individuals (NYSDEC 2014).

4.3.2 Presence within the Study Area

Red knot migrants are common in Long Island in the spring and fall and some may be observed in the winter as well (NYSDEC 2014). Red knots congregate at Far Rockaway, Long Beach, and Jones Beach (NYSDEC 2014).

4.4 Saltmarsh Sparrow

While not federally listed the saltmarsh sparrow or saltmarsh or sharp-tailed sparrow (*Ammospiza caudacuta*) is a USFWS species of concern because it is the only species that exclusively lives in saltmarsh. USFWS has been participating in protection of saltmarsh sparrow and its habitat to avoid extinction (USFWS 2021).

4.4.1 Range and Habitat

The breeding range of salt marsh sparrow habitat is Maine through Virginia and the winter range is North Carolina through Florida (USFWS 2021a). Salt marsh sparrow requires saltmarsh habitat for all activities. The species nests from May through early September in the highest elevations of saltmarsh where it floods less frequently (USFWS 2021b). While saltmarsh sparrows use other parts of the marsh for foraging and other activities, in New York, they are known to remain in high marsh. Additionally, marsh size (larger than 1-2 acres) and lack of adjacent urban landcover may also be important habitat characteristics (NYSDEC 2014).

4.4.2 Presence with Study Area

Saltmarsh sparrow could occur within the study area.

4.5 Northern Long-eared Bat

The northern long-eared bat (NLEB) was listed as threatened by the USFWS on 16 February 2016 (Federal Register, 14 January 2016). The primary threat to this species is the disease white-nose syndrome.

4.5.1 Range and Habitat

The northern long-eared bat occurs in the midwest and northeast of the United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia.

During the summer, NLEB typically roost singly or in colonies underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥ 3 inches diameter at breast height [dbh]). The NLEB bat is opportunistic in selecting roosts, selecting varying roost tree species throughout its range. During the winter, NLEBs predominately hibernate in caves and abandoned mine portals. Maternity colonies generally consist of 30 to 60 females and young. Males and non-reproductive females may occur within the breeding and foraging range of maternity colonies, but some individuals are solitary in the summer and may roost in cooler places such as caves and mines. Roosting NLEBs have also been observed in man-made structures, such as buildings, barns, sheds, cabins, under eaves of buildings, and in bat houses (USFWS pers. com.).

4.5.2 Presence within the Study Area

The proposed Study Area is located within the summer range of the northern long-eared bat. There are no known hibernacula in Nassau County (USFWS 2019). While known maternity roosts occur in Nassau County in the municipalities of Brookville, Muttontown, Oyster Bay, Oyster Bay Cove, and Upper Brookville, these are outside of the study area (USFWS Undated).

4.6 Atlantic Loggerhead

The loggerhead turtle was first listed under the ESA as threatened throughout its range in 1978. In 2011, NOAA Fisheries and the USFWS determined that the loggerhead sea turtle was composed of nine distinct population segments (DPS). A DPS is the smallest division of a species permitted to be protected under the ESA. On 24 October 2011, the Western North Atlantic DPS of loggerhead turtles was listed as threatened (Federal Register, 22 September 2011). Threats to loggerhead turtles include bycatch in fishing gear, intentional killing, and entanglement in marine debris.

4.6.1 Range and Habitat

Loggerhead turtles inhabit continental shelves, bays, lagoons, and estuaries in the temperate, subtropical and tropical waters of the Atlantic, Pacific and Indian Oceans (Dodd 1988, Mager 1985). In the western Atlantic Ocean, loggerhead turtles occur from Argentina northward to Nova Scotia, including the Gulf of Mexico and the Caribbean Sea (Carr 1952, Dodd 1988, Mager 1985, Nelson 1988).

The foraging range of the loggerhead sea turtle extends throughout the warm waters of the U.S. continental shelf (Shoop et al. 1981). Loggerhead turtles are common as far north as the Canadian portions of the Gulf of Maine on a seasonal basis (Lazell 1980), but during cooler months of the year, distributions shift to the south (Shoop et al. 1981).

Sporadic nesting is reported throughout the tropical and warmer temperate range of distribution, but the majority of the nesting areas are the Atlantic coast of Florida, Georgia and South Carolina (Hopkins and Richardson 1984). The Florida nesting population of loggerheads has been estimated to be the second largest in the world (Ross 1982).

Hatchling loggerheads emerge from the nest as a group at night, orient themselves seaward, and rapidly move towards the water (Richardson 1984). Many hatchlings fall prey to sea birds and other predators following emergence. Those hatchlings that reach the water quickly move offshore and exist in pelagic ocean waters (Carr 1986).

Loggerheads frequently forage around coral reefs, rocky places and old boat wrecks; they commonly enter bays, lagoons and estuaries (Dodd 1988). Aerial surveys of loggerhead turtles at sea indicate that they are most common in waters less than 50-meters in depth (Shoop et al. 1981), but they occur in pelagic ocean waters as well (Carr 1986).

4.6.2 Presence within the Study Area

Loggerhead turtles forage in the New York coastal, usually from May through October (NYSDEC Undated-a, NYSDEC 2020). Typically, juveniles are found in Long Island Sound and bays, while adults are found offshore with immature turtles (NYSDDEC 2013).

4.7 Kemp's Ridley

The Kemp's ridley sea turtle has been listed as endangered since 1970 (Federal Register, December 2, 1970).

4.7.1 Range and Habitat

Kemp's ridley turtles inhabit sheltered coastal areas and frequent larger estuaries, bays and lagoons in the temperate, subtropical and tropical waters of the Atlantic Ocean and Gulf of Mexico (Mager 1985). The foraging range of the adult Kemp's ridley sea turtle appears to be restricted to the Gulf of Mexico. However, juveniles and subadults occur throughout the warm coastal waters of the U.S. Atlantic coast (Hopkins and Richardson 1984, Pritchard and Marquez 1973). On a seasonal basis, Kemp ridleys are common as far north as the Canadian portions of the Gulf of Maine (Lazell 1980), but during cooler months of the year they shift to the south (Morreale et al. 1988).

Kemp's ridley nesting is mainly restricted to a stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Pritchard and Marquez 1973, Hopkins and Richardson 1984). Occasional nesting has been reported on Padre Island, Texas and Veracruz, Mexico (Mager 1985). Hatchlings emerge from the nest as a group at night, orient themselves seaward, and rapidly move towards the water (Hopkins and Richardson 1984). Following emergence, many hatchlings fall prey to sea birds, raccoons and crabs. Those hatchlings that reach the water quickly move offshore. Their existence after emerging is not well understood but is probably pelagic (Carr 1986). Kemp's ridleys are omnivorous and feed on crustaceans, swimming crabs, fish, jellyfish and mollusks (Pritchard and Marquez 1973).

4.7.2 Presence within the Study Area

New York coastal waters provide seasonal foraging habitat for Kemp's ridley turtles from late May until November. Juveniles are typically found in nearshore shallow waters and typically occur in Long Island Sound, Block Island Sound, Gardiners Bay and the Peconic Estuary, but have also been observed in Jamaica Bay, lower New York harbor and Great South Bay (NYSDEC 2013b).

4.8 Atlantic Green Sea Turtle

The green turtle was listed under the ESA in the Federal Register on 28 July 1978. Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico were listed as endangered; all other populations were listed as threatened.

4.8.1 Range and Habitat

Green turtles are circumglobally distributed mainly in waters between the northern and southern 20° C isotherm (Mager 1985). In the continental U.S. green turtles are only known to nest on the Atlantic coast of Florida, from June to September (Mager 1985, Hopkins and Richardson 1984). Hatchlings emerge, mostly at night, travel quickly to the water, and swim out to sea. At this point, they enter a period which is poorly understood but is likely spent pelagic ocean waters in areas where currents concentrate debris and floating vegetation such as sargassum (Carr 1986).

4.8.2 Presence within the Study Area

New York coastal waters provide important seasonal foraging habitat for green sea turtles from late May until November. Green sea turtles may enter Nassau County back bays to forage and have been sighted in sea grass beds and in open waters (NYSDEC Undated-b).

4.9 Leatherback Sea Turtle

The leatherback turtle was listed as endangered on 2 June 1970 in the Federal Register.

4.9.1 Range and Habitat

Leatherbacks have a circumglobal distribution and occur in the Atlantic, Indian and Pacific Oceans. They range as far north as Labrador and Alaska, to as far south as Chile and the Cape of Good Hope. They are found farther north than other sea turtle species, probably because of their ability to maintain a warmer body temperature over a longer period.

Leatherback turtle nesting occurs on the mid-Atlantic coast of Florida from March to September (Hopkins and Richardson 1984). Hatchlings emerge, mostly at night, travel quickly to the water, and swim out to sea. The early history of leatherbacks is poorly understood since juvenile turtles are rarely observed.

4.9.2 Presence within the Study Area

Leatherbacks are often seen foraging on the south shore of Long Island (NYSDEC Undated).

4.10 Atlantic Sturgeon

Five Atlantic sturgeon DPSs were listed as endangered or threatened under the ESA on (Federal Register, 6 February 2012). These are the endangered New York Bight, Chesapeake Bay, South Atlantic, and Carolina DPSs, and the threatened Gulf of Maine DPS. The primary threats to Atlantic sturgeon include bycatch in some commercial fisheries, dams that block access to spawning areas, poor water quality (which harms the development of sturgeon offspring), dredging of spawning areas, water withdrawals from rivers, and vessel strikes (NMFS 2020).

4.10.1 Range and Habitat

Atlantic sturgeon are anadromous, spending the majority of their adult phase in marine waters, migrating up rivers to spawn and hatch in freshwater and migrating to brackish waters in juvenile growth phases. Atlantic sturgeon initially emigrate to sea as subadults (at a size of 30-36 inches) (NMFS 2020). After emigration from the natal estuary, subadults and adults travel within the marine environment, typically in waters less than 40 m in depth, using coastal bays, sounds, and ocean waters (Vladykov and Greeley, 1963; Murawski and Pacheco, 1977; Dovel and Berggren, 1983; Smith, 1985; Collins and Smith, 1997; Savoy and Pacileo, 2003; Stein et al., 2004; Laney et al., 2007; Dunton et al., 2010; Erickson et al., 2011; D. Fox, pers. comm.; T. Savoy, pers. comm.).

The historical and current range of Atlantic sturgeon includes major estuaries and river systems from Canada to Florida. While still found throughout their historical range, Atlantic sturgeon spawning is known to occur in only 22 of 38 historical spawning rivers (NMFS 2020). While most Atlantic sturgeon may migrate back to natal rivers to spawn, there is some Atlantic sturgeon that enter non-natal rivers to spawn.

In New York, Atlantic sturgeon migrate into the Hudson River in the spring to spawn. The adults return to the Atlantic Ocean while the juveniles remain in the Hudson River estuary for at least two years before emigrating to the ocean to mature (NMFS pers. comm., NYSDEC Undated-b).

The use of marine habitat by Atlantic sturgeon larger subadults and adults is not completely understood. Depth is considered a primary environmental characteristic defining the Atlantic sturgeon distribution in marine habitat (Dunton, et al. 2010). Essential habitat for sub-adult marine migrant Atlantic sturgeon as coastal waters <20m deep, concentrated in areas adjacent to estuaries such as the Hudson River-NY Bight, Delaware Bay, Chesapeake Bay, Cape Hatteras, and Kennebec River (Dunton et al. 2010). Bycatch records also suggest a preference for relatively shallow (<50m) habitat composed of a sand substrate (Stein et al., 2004). Depth distribution appears seasonal, with sturgeon inhabiting the deepest waters during the winter and the shallowest waters during summer and early fall (Erickson, et al., 2011). Marine bycatch tends to be the heaviest during the fall, winter and spring months, when spawning sturgeon undergo their migration upstream (Bain, 1997). Since spawning does not generally occur in successive years, juveniles and adults may remain in marine foraging areas in high numbers from the fall through spring (Dadswell, 1979: Kieffer and Kynard, 1993; Moser and Ross, 1995; Kynard, 1997; Auer, 1999).

4.10.2 Presence within the Study Area

Sub-adult and adult individuals from all five Atlantic sturgeon DPSs could occur within the study area during the winter marine phase, although they are expected further offshore as described in Section 3.10.1. Early (eggs, larvae, young-of-year) and juvenile life stages are found in large rivers and are not tolerant of saline waters; therefore, will not be present in the study area (NMFS pers. com.).

5.0 Environmental Setting

The NCBB study area is composed of narrow, sandy islands and peninsulas separated from the mainland by shallow bays. From Rockaway to Long Beach, the sandy shorelines are highly developed areas with several erosion control structures, few dunes and sparsely vegetated communities. The area is an important nesting ground for beach nesting shore birds.

In general, the size of the dunes increases from west to east on Long Island. In the western urban areas, most of the natural dunes have been heavily impacted by human activities. In some areas, they have been entirely removed or replaced by development along the shoreline (Rockaway and Jones Island). Most of the dunes found along these heavily used areas have been artificially created or maintained, such as the dune fields on Long Beach in the Town of Hempstead (Tanski 2007).

The majority of the backbay beaches are located along the bay side of the barrier islands (approximately 100 miles). Most of the mainland backbay beaches are bulkheaded with sporadic community beaches.

Tidal inlets which separate the barriers and connect the bays with the ocean include Rockaway, East Rockaway, and Jones Inlets. The inlets are artificially stabilized with structures and are dredged to allow for navigation by commercial and recreational boats (Tanski 2007). The inlets are an especially significant component of the habitat; as a corridor for fish migrations, as a source for the exchange and circulation of bay waters, and as an area where feeding by many fish and wildlife species is concentrated (including adult striped bass and bluefish).

The large back-barrier bays of the south shore contain 173 square miles of shallow bays behind them. Hempstead Bay, South Oyster Bay, and part of Great South Bay occur within eh NCBB study area. These bays contain regionally significant habitats for fish, shellfish, and birds. A great deal is known about their ecology and habitat needs.

There are extensive salt marshes to the west of Great South Bay in southern Nassau County. These marshes are particularly notable because much of the historically large area of marsh on the mainland shoreline of southern Nassau County has been lost to development and shoreline armoring, including the mainland marshes of South Oyster Bay and the Hempstead Bay–South Oyster Bay habitat complex. To the east of Jones Inlet, there are extensive back-barrier and fringing salt marshes surrounding Great South Bay.

South Oyster Bay comprises one of the largest, undeveloped, coastal wetland ecosystems in New York. The entire bay provides fish and wildlife habitat with extensive areas of undeveloped salt marsh, tidal flats, dredged material islands, and open water. It is an integral part of an interconnected marsh complex that also includes the three Hempstead bays. A healthy subsystem of sensitive estuarine intertidal areas exists in the bay. Characteristic communities of the estuarine intertidal subsystem include high and low salt marshes and salt pannes dominated by smooth cordgrass (*Spartina alterniflora*), common glasswort *(Salicornia europea*), salt hay grass (*Spartina patens*), spike grass (*Distichlis spicata*), and perennial salt marsh aster (*Aster tenuifolius*). Water depths in South Oyster Bay are generally less than 6 feet below mean low water, except in Zach's Bay and in portions of some dredged navigation channels. Most of South Oyster Bay is owned by the Towns of Hempstead and is managed as a wetland conservation area.

Habitat for threatened and endangered species in in the action area (based on the footprint of the proposed measures) are provided in *Table 4*.

Table 4. Presence of Threatened and Endangered Species Habitat within the Action Area Based on the Footprint of Measures Proposed in Each Region

Threatened and Endangered Species Habitat	**Species that Use the Habitat**	**Habitat Present within Footprint**	
		TSP/Nonstructural Countywide	**CI & NSA Plan**
Woodlands/Trees: Live and dead trees and/or snags (typically ≥ 3 inches dbh)	Northern long-eared bats	Yes	Yes
Unvegetated Estuarine Intertidal Benthic Habitats: Tidal inlets, sand spits, islets, shoals, sandbars, intertidal sand or mudflats	Red knots (resting foraging), roseate terns (resting and foraging),	No	Yes
Vegetated Wetlands: Salt, brackish, and freshwater marshes	Black rail	No	Yes

Threatened and Endangered Species Habitat	Species that Use the Habitat	Habitat Present within Footprint	
		TSP/Nonstructural Countywide	CI & NSA Plan
Estuarine open waters	Atlantic sturgeon, sea turtles	No	Yes
SAV	Sea turtles	No	Yes
Unvegetated Subtidal Benthic Habitats: Benthic and demersal habitat such shellfish beds or structure	Atlantic sturgeon, sea turtles	No	Yes

Climate change and natural variability have been resulting in changes in the Northeast Shelf Ecosystem over the past 30-40 years and are expected to continue (NMFS 2016). These changes include increases in air and ocean temperatures, and associated ocean acidification and decreases in dissolved oxygen. These changes can impact organisms such as fish, invertebrates, marine mammals, sea turtles, and marine plants and their habitats. Populations of marine organisms are changing as a result of indirect effects of climate change such as ocean acidification, predator-prey relationships, and shifts in distributions of a large number of species. Specifically, climate change may result in changes such as:

- distribution of sea turtle nesting habitat,
- marine mammal distribution in response to prey distribution
- changes in distribution of diadromous fish benthic and prey habitat,
- changes in the timing of migration cues and streamflow on the migration of diadromous fish and associated effect of the conditions on early life stages
- changes in fish and shellfish productivity (NMFS 2016).

Climate change is also expected to affect habitat within the study area. *Table 5* shows changes in habitat types associated with Low, Intermediate or High RSLC scenarios within the study area during the 2030 – 2080 study period if the project is not implemented.

Table 5. Changes in Land Covers Based on Low, Intermediate, and High RSLC Scenarios

	Low/ Baseline[1]	**Intermediate**	**High**
Land Cover Type	***Acres***	***Change in Acres***	
High Salt Marsh (Irregularly Flooded)	7,461	-2,349	-7,388
Low Salt Marsh (Regularly Flooded)	612	2,087	2,610
Transitional Salt Marsh	124	735	1,546
Tidal Fresh Marsh	22	-2	-10
Inland Fresh Marsh	138	-36	-124
Tidal Flat	916	-696	2,370
Estuarine Beach	419	-216	-344
Tidal Swamp	12	-5	-11
Ocean Beach	628	42	309
Swamp	256	-26	-67

	Low/ Baseline[1]	Intermediate	High
Land Cover Type	***Acres***	***Change in Acres***	
Inland Open Water	333	-46	-105
Estuarine Open Water	15,715	1,715	6,196
Open Ocean	87	37	105
Undeveloped Dry Land	15,130	-1,241	-5,087
Developed Dry Land	16,408	-719	-4,193
Flooded Developed Land	0	719	4,193

Source: Clough et al. 2014

[1] The low scenario assumes that salt marsh accretion keeps pace with SLC and wetland area would be similar to existing conditions. This is used as the baseline to determine losses under the intermediate and high SLC scenarios.

In general, in the future without the project, these project habitats will be subject to more stress resulting from human population increases, climate change, and sea level rise. In the NCBB study area, upland habitats, coastal wetlands, and tidal mudflats are highly susceptible to the effects of sea level rise. As surface water elevations increase, upland categories may transition into freshwater marsh, and freshwater marsh areas may transition into brackish, salt marsh, or unconsolidated shore habitats, based on changes tidal thresholds. Appendix B provides additional detail on the habitat changes that could occur in response to intermediated and high sea level rise scenarios during the NCBB Study Period between 2030 and 2080.

5.1 Woodlands/Trees

Woodlands provide habitat for northern long-eared bats and includes forested wetlands and deciduous forest. These habitat types are not common in the study area. Northern long-eared bat roost trees can also be found in urbanized areas and in maritime forests. There are no maritime forests within the footprint of the proposed measures. Landscape trees can occur within the footprints of the TSP and CI & NS Plan.

In the future without the project, approximately 1,241 acres of undeveloped dry land and 31 acres of swamp will be lost under an intermediate sea level rise scenario and 5,087of undeveloped dry land and 77 acres of swamp would be lost under a high sea level rise scenario during the 2030 - 2080 study period (see Appendix B). Some of this is likely to be suitable habitat for northern long-eared bats.

5.2 Vegetated Wetland Habitats

Wetlands data from different agencies with various classifications, were grouped into the broad category of "Wetland Habitats". The “Wetland Habitats” category includes the following vegetated categories:

- High Salt Marsh (Irregularly Flooded)
- Low Salt Marsh (Regularly Flooded)
- Transitional Salt Marsh
- Tidal Fresh Marsh
- Inland Fresh Marsh

- Estuarine Beach
- Tidal Swamp
- Swamp

Vegetated wetlands provide habitat for the eastern black rail and saltmarsh habitat. These habitats occur within the footprint of the critical infrastructure measures.

Coastal wetlands can adapt and keep pace with sea level rise through vertical accretion and inland migration but must remain at the same elevation relative to the tidal range and have a stable source of sediment. Under intermediate and high sea level rise scenarios, marsh accretion at a rate of 4 mm per year would not keep pace with sea level rise. Estuarine wetlands may transition to another habitat type such as brackish wetlands, palustrine emergent wetlands, unconsolidated shore, or open water.

In the future without the project during the 2030 – 2080 study period, vegetated in the NCBB Study Area are projected to increase by approximately 404 acres under the intermediate scenario and decrease by 3,444 acres under the high sea level rise scenario. High marsh will experience the most significant changes with a loss of 2,349 under the intermediate RSLC scenario and 7,388 under the high RSLC scenario. Impacts on how high marsh could have from RSLC could have significant effects on black rail and saltmarsh sparrow.

5.3 Unvegetated Estuarine Intertidal and Subtidal Benthic Habitats

Intertidal benthic habitat occurs between the high and low tide lines and is subject to daily tidal fluctuations. Intertidal substrates within the study area are primarily sand and mud. Subtidal benthic habitat includes the waters seaward of the low tide, meaning the substrate, primarily sand and mud, is constantly inundated. Intertidal and subtidal benthic habitats occur within the footprints of critical infrastructure measures.

Intertidal habitats including tidal inlets, sand spits, islets, shoals, sandbars, intertidal sand or mudflats provide foraging habitat for roseate terns and red knots. Rip rap and other hardened manmade structures can also provide intertidal habitat, but natural hard structures are uncommon in the study area. Intertidal mudflats or sand flats often border saltmarsh habitats, pocket beaches along developed shorelines, or locations where either erosion or marsh dieback has removed vegetation or depositional shoals have formed in areas that were previously subtidal. Natural structure habitat (such as rocky outcrops and boulders) is expected to be uncommon in the action area. Riprap and other hardened manmade structures occur in intertidal zone. Intertidal habitats are often rich in benthic food sources available to wading birds and shorebirds that forage at low tide.

Subtidal habitats are always inundated and subtidal substrates within the study area are primarily sand and mud. Other than SAV, natural structure habitat (such as rocky outcrops and boulders) is expected to be uncommon in the study area. Rip rap and other hardened manmade structures occur in subtidal zone. Nearshore waters are strongly influenced by weather and the adjacent high-energy sandy beach which influence sediment transport. Along beach areas, shifting sands and pounding surf affect the available habitat.

The coastal habitats along Long Island including the back bays are home to a wide variety of both benthic and free swimming and floating invertebrates. Marine benthic invertebrates are bottom-dwelling species that can be grouped into two categories: infaunal, or benthic invertebrates that live within the substrate, and epifaunal or epibenthic invertebrates, which live on the surface of the substrate. Benthic invertebrates make up the primary food source for both juvenile and adult fish species in shallow water environments found in estuarine habitats. Benthic invertebrate communities vary spatially and temporally as a result of factors such as sediment type, water quality, depth, temperature, predation, competition, and season. Thus, benthic invertebrate communities differ between habitat types. For example, the community within fine grain sediment found in deep water, low energy environment is likely to be dominated by a higher percentage of sessile organisms, while a shallow, high energy environment consisting of larger grain sediment may contain a higher percentage of mobile filter feeding invertebrates. Other invertebrates discussed in this section include pelagic forms of invertebrates, or those that swim and move freely within the water column, and commercial and recreationally important invertebrates that occur within the marine offshore habitat of the study area. Commercial shellfish include beds containing hard clams (*Mercenaria mercenaria*), soft clams (*Mya arenaria*), and eastern oysters (*Crassostrea virginica*).

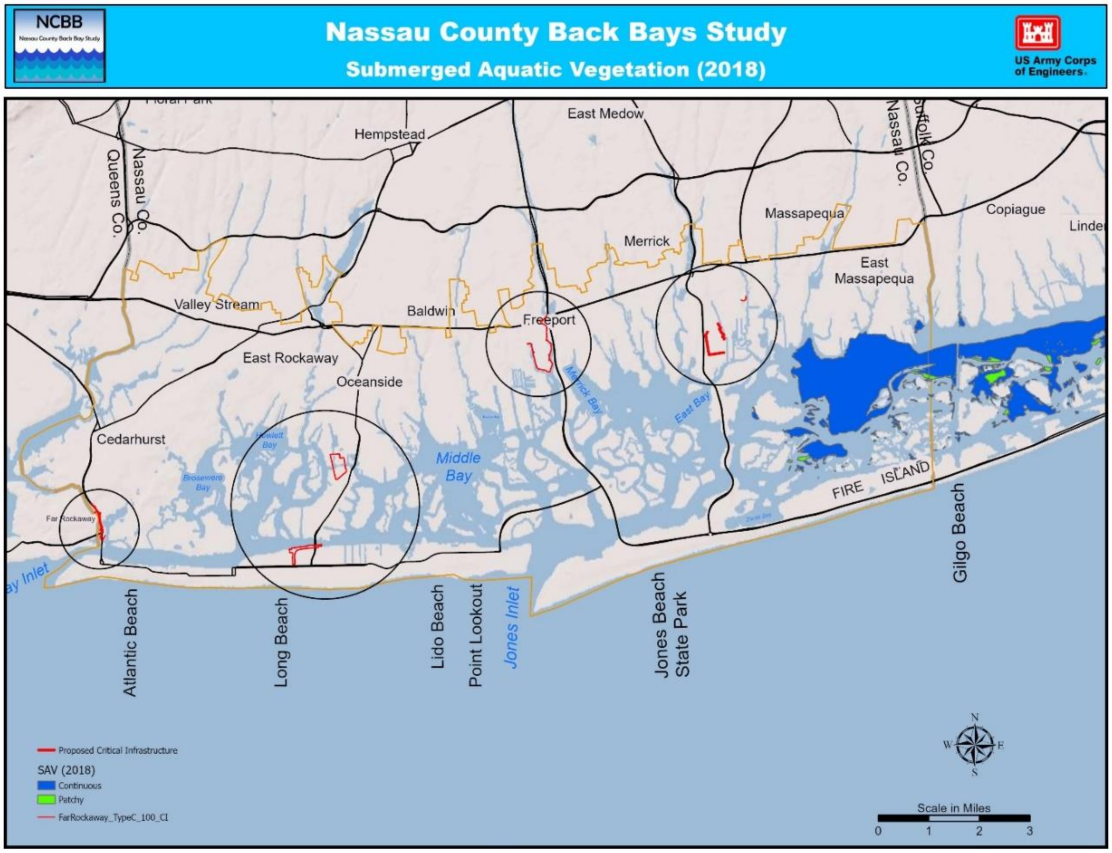
In response to sea level rise, intertidal habitats could experience increased inundation and/or their tidal regimes could change from intertidal to subtidal. Some habitats may transition to unconsolidated shoreline. Distributions of intertidal and subtidal shellfish beds could change in response to changing sea levels and habitats.

5.4 Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) or "seagrass" beds provide important habitat for foraging sea turtles, as well as for small fish, shellfish, and other invertebrates that serve as prey for other threatened and endangered species. SAV are rooted vascular flowering plants that exist within the photic zone of shallow bays, ponds, and rivers.

SAV beds provide an important direct food source via the grazing chain, indirect food source via the detritus chain, a substrate for epiphytes, and cover and protective habitat. Large numbers of fish are also typically associated with eelgrass beds, although most do not feed directly on the plants (Good, et al., 1978). Additionally, eelgrass beds have been recognized as an important habitat for juvenile and adult blue crabs, and the leaves are used by the bay scallop (*Argopecten irradians)* as a setting substrate and are also associated with hard clam (*Mercenaria mercenaria*) beds. SAV beds provide important habitat for foraging sea turtles in Nassau County waters.

Submerged aquatic vegetation (SAV) and/or "seagrass" beds exist in the eastern portion of the back bay estuarine system. Based on 2018 surveys, there are 2,177 ac of SAV habitat within the study area. These beds consist of rooted plants, primarily by eelgrass (*Zostera marina*) with some widgeon grass (*Ruppia maritima*), as well as unattached macrophytes, growing in shallow, quiet waters below the spring low tide level (NYS DOS Assessment Form South Oyster Bay). Based on the distribution of seagrass in the study area, no seagrass is expected in within the footprint of the critical infrastructure measures (Figure 12).



Source: New York State Seagrass Task Force 2009.

Figure 12. Available SAV Mapping in NCBB Study Area

5.5 Estuarine Open Waters

The estuarine open waters of the Nassau County back bays potentially provide habitat for Atlantic sturgeon, sea turtles, and roseate terns. Water quality is a primary determinant of habitat quality for fish and wildlife. Water quality within the coastal waters of the Nassau County was comparable to that of similar coastal water bodies along the New York Bight and was indicative of similar coastal tidal river and estuary complexes along the Mid-Atlantic coast (USFWS, 1997).

6.0 Direct, Indirect, and Cumulative Effects

6.1 Tentatively Selected Plan: Countywide Non-structural

The nonstructural measures associated with the TSP involve a significant construction effort whether it be from building retrofits such as elevation (including raising a structure on fill or foundation elements such as solid perimeter walls, pier, posts, columns, or pilings) or buyout/ relocations that are likely to involve demolition, grading, and soil stabilization/ revegetation. Most of the construction would occur within the footprint of the existing structure and would most likely be in upland urbanized settings.

6.1.1 Woodlands/Tree

Nonstructural measures have the potential impact individual landscape trees. These are not expected to have high value for northern long-eared bat summer roost habitat. In order to avoid direct effects, such as injury, on northern long-eared bats, removal of potential roost trees would be avoided to the extent practicable. If potential roost trees cannot be avoided, the USFWS would be consulted as appropriate under the ESA 4(d) rule.

6.1.2 Vegetated Wetland Habitats

Nonstructural measures would have no direct or indirect effects on wetlands, including saltwater and brackish water marshes and associated upland habitats. Therefore, the eastern black rail and saltmarsh sparrow, which are associated with these habitats, would not be affected by nonstructural measures.

6.1.3 Unvegetated Estuarine Intertidal and Subtidal Benthic Habitats

Nonstructural measures would have no direct or indirect effects on intertidal and subtidal habitats. Foraging red knots and roseate terns, which are associated with intertidal habitats, would not be affected by nonstructural measures. Sea turtles and Atlantic sturgeon, which are associated with subtidal habitats would not be affected by nonstructural measures.

6.1.4 Submerged Aquatic Vegetation

Nonstructural measures would not have direct or indirect effects on SAV. Therefore, sea turtles, which are associated with this habitat would not be affected by nonstructural measures.

6.1.5 Estuarine Open Waters

Nonstructural measures would not have direct or indirect effects on saltwater and brackish water marshes. Therefore, Atlantic sturgeon, roseate terns, and sea turtles, which are associated with this habitat would not be affected by nonstructural measures.

6.2 CI & NS Plan

Most of the action area affected by the CI & NS Plan are urbanized or industrialized areas, with bulkheads lining the back bays and lagoons. Most of the floodwalls associated with the CI & NS Plan are being constructed on existing bulkheads and hardened shorelines.

Table 6 and Table 7 provide preliminary estimates of permanent and temporary habitat impacts of the CI & NS Plan, respectively. Figure 13, provides an overview of the footprint of the critical infrastructure measures relative to habitat impacts.

The footprints of the critical infrastructure floodwalls pass through subtidal, intertidal, and upland habitats. Most are encountered as small pockets along heavily developed residential or industrialized areas (see Table 6). Most of the permanent impacts are split between subtidal habitat in Freeport, trees/woodland habitat in Island Park, and undeveloped grasslands and shrubs in Far Rockaway and Island Park.

No jurisdictional wetland delineations have been conducted along. Therefore, these impact estimates may be modified and refined based on a higher level of design detail that include surveyed wetland jurisdictional lines, and mitigation measures that first employ avoidance and minimization. It is assumed that for unavoidable wetland and aquatic habitats, compensatory mitigation will be required.

Table 6. Nassau County Back Bay Wetlands and Undeveloped Uplands Permanent Impacts under the CI &NS Plan (Acres)

Location	Estuarine Beach	Unvegetated Estuarine Subtidal Benthic Habitat (LZ)	Unvegetated Estuarine Intertidal Benthic Habitat (Shoals, Bars, and Mudflats - SM)	Vegetated Wetland Habitat (Intertidal Marsh - IM, E2EM1P, FC)	Palustrine Forested (PFO1Ad)	Undeveloped Upland: Trees	Undeveloped Upland: Grassland and Shrubs
Long Beach	0.00	0.09	0.41	0.00	0.00	0.00	0.00
Island Park	0.00	0.19	0.04	0.07	0.00	0.00	3.54
Freeport	0.00	2.64	0.00	0.04	0.00	0.00	0.00
Far Rockaway	0.00	0.03	0.01	0.06	0.00	0.00	3.45
Wantagh	0.00	0.00	0.00	0.00	0.00	0.41	0.00
Total Impacts	**0.00**	**2.97**	**0.46**	**0.17**	**0.00**	**0.41**	**6.99**

Table 7. Nassau County Back Bay Wetlands and Undeveloped Uplands Temporary Impacts under the CI & NS Plan (Acres)

Location	Beach	Unvegetated Estuarine Subtidal Benthic Habitat (LZ)	Unvegetated Estuarine Intertidal Benthic Habitat (Shoals, Bars, and Mudflats - SM)	Vegetated Wetland Habitat (Intertidal Marsh - IM, E2EM1P, FC)	Palustrine Forested (PFO1Ad)	Undeveloped Upland: Trees	Undeveloped Upland: Grassland and Shrubs
Long Beach	0.00	0.17	0.70	0.00	0.00	0.00	0.00
Island Park	0.00	0.11	0.04	0.06	0.00	0.00	4.15
Freeport	0.00	2.64	0.00	0.08	0.01	0.00	0.00
Far Rockaway	0.00	0.02	0.01	0.11	0.00	0.00	4.05
Wantagh	0.00	0.00	0.00	0.00	0.00	0.43	0.00
Total Impacts	**0.00**	**2.94**	**0.75**	**0.25**	**0.01**	0.43	8.2

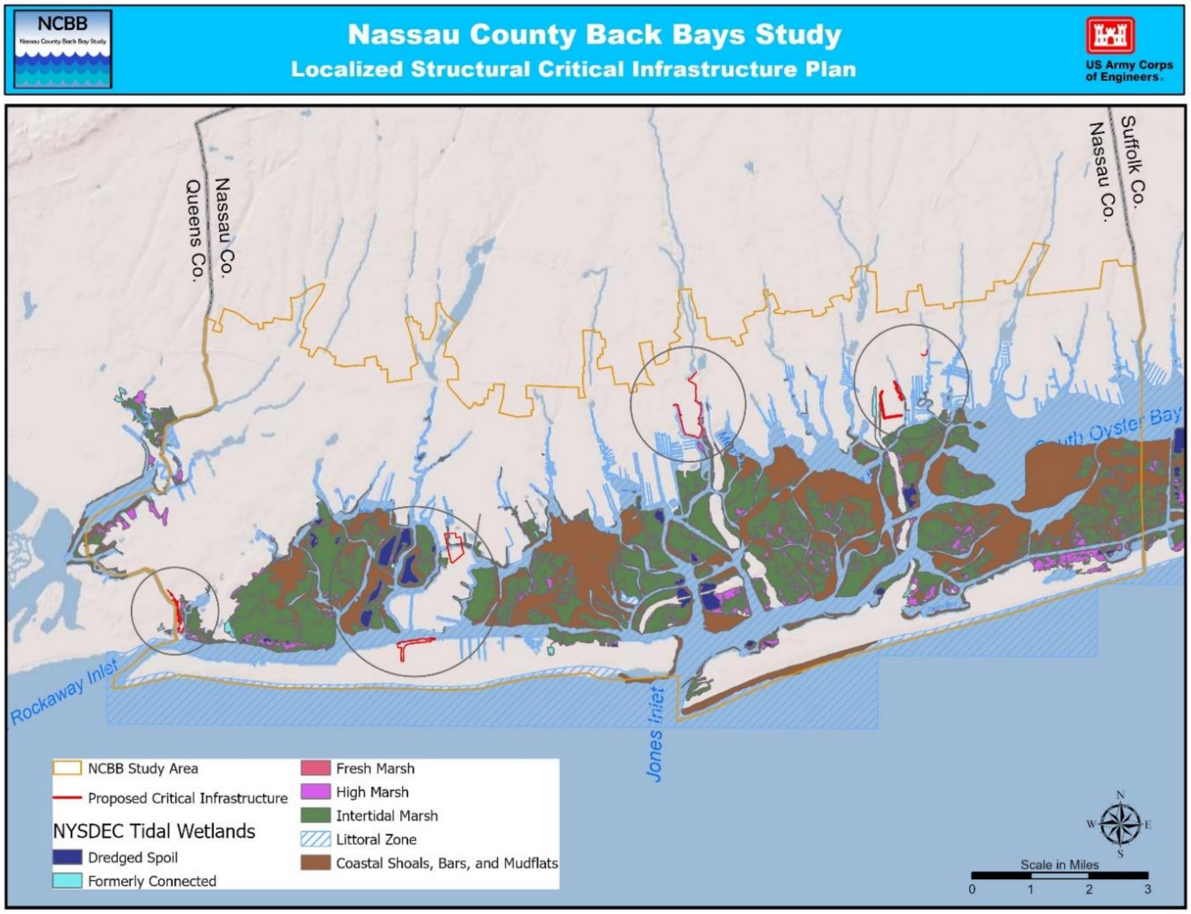


Figure 13: Locations of Critical Infrastructure Measures and Wetlands

6.2.1 Woodlands

The Critical Infrastructure would result in approximately 0.41 acre of permanent impacts and less than an acre of temporary impacts of wooded edge habitat. The trees/woodland at island park are at the edge of an industrialized area. The undeveloped habitat at Far Rockaway is edge habitat along the State Route 878. Although design details are limited at this time, removal of potential roost trees would be avoided to the extent practicable. If potential roost trees cannot be avoided, the USFWS would be consulted as appropriate under the ESA 4(d) rule.

6.2.2 Vegetated Wetlands

Small pockets of vegetated wetlands are scattered throughout the industrial/residential areas throughout the action area. Construction of the floodwalls, miter/sluice gates, and railroad/road closures within coastal wetlands and shallow bay waters result in the loss of these habitats within the footprint of the structures. Because these are small patches of habitat in highly developed locations, they are not expected to provide high quality habitat for sensitive species such as black rail and saltmarsh sparrow.

The structural measures under the CI & NS Plan would result in the permanent impact of 0.17 acre of intertidal marsh across all 5 sites. This loss would result from either their removal from excavations or burial from fill placement. Additionally, a temporary impact to 0.25 acres of intertidal marsh would result from the placement of de-watering structures and either temporary fills or excavations for temporary access points to the work segment across the 5 sites. Preliminary estimates of the affected wetland and shallow water habitats are based on existing mapping (NYSDEC 1974), the current (preliminary) alignments and an assumed width of the disturbance offset from the structure.

Temporary indirect impacts from construction of the structural measures under the CI & NS Plan on vegetated wetlands are expected to be minimal to moderate and are related to impacts such as sedimentation during construction. Long-term indirect impacts are related to hardened structures potential halting landward migration of marshes, particularly with sea level rise. However, this effect is not expected to be significant since the majority of the shorelines along the back bays already are hardened with bulkheads, concrete revetments and riprap.

Climate change and sea level rise also could compound these changes as evidenced in the SLAMM modeling where significant shifts in wetland types are predicted (see Section 4). Interactions of these types of structures with the existing tidal conditions and sea level rise are complex.

Direct and indirect impacts on vegetated wetland habitat could affect black rail and saltmarsh sparrows, but it is not anticipated. Further, high marsh impacts are not expected; therefore, direct impacts are projected to be negligible to these species when considering the changes expected due to sea level rise during the study period.

6.2.3 Unvegetated Estuarine Intertidal and Subtidal Benthic Habitats

The footprints of the critical infrastructure components occur in intertidal and subtidal habitat. These would result in 0.46 acres of shoals, bars and mudflats, and 2.95 acres of subtidal habitat. The unvegetated subtidal habitat is in Emory Creek/Stadium Park Canal in an industrialized area along what appears to be a hardened shoreline. Most of the unvegetated intertidal benthic habitat that would be affected is along the back bay shoreline of Long Beach. This is the only section that is directly adjacent to estuarine open water.

Permanent losses would result from excavation or fill. Temporary impacts on intertidal and subtidal habitats may be experienced through the placement of de-watering structures and either temporary fills or excavations for temporary access points to the work segment.

Temporary, indirect impacts from construction of the perimeter plan components would be minimal to moderate and are related to impacts such as sedimentation during construction. Long-term, indirect impacts are related to hardened structures potential halting landward migration of marshes, particularly with sea level rise. However, this effect is not expected to be significant since most of the shorelines along the back bays already are hardened with bulkheads, concrete revetments, and riprap.

Direct and indirect impacts on intertidal habitats have the potential to adversely affect foraging roseate terns and red knots. Direct and indirect impacts on subtidal habitats have the potential to adversely affect foraging sea turtles and to a less extent, Atlantic sturgeon, which are expected to occur further offshore.

6.2.4 Submerged Aquatic Vegetation

Construction of critical infrastructure components are not expected to have direct or indirect impacts on SAV. SAV only occurs on the eastern side. Surveys have been completed as recently as 2018 and no SAV occurs near critical infrastructure (Figure 12).

Effects on SAV beds could adversely affect sea turtles, which forage in this habitat. However, because of the distance of the critical infrastructure floodwalls from SAV, indirect effects on sea turtles foraging in SAV are not expected. SAV distributions are seasonal and can change from year to year; therefore, SAV distribution should be reconsidered prior to construction in 2030.

6.2.5 Estuarine Open Water

Most construction would occur from onshore. Type B floodwall in Freeport would occur within temporary cofferdams. Long Beach floodwall associated with the CI & NS Plan is the only critical infrastructure components in open waters. Excavation, fill, and installation, removal, and dewatering of temporary cofferdam have the potential to affect water quality with turbidity and decreases in dissolved oxygen. Other activities such as earth disturbances resulting from construction access activities, staging/storage areas and upland excavations and soil stockpiles have the potential to generate turbidity as a non-point source. In accordance with Section 402 of the Clean Water Act, an erosion and sediment control plan will be submitted to the county conservation districts for their review and approval. The plan will include measures to avoid these effects, such as rock entrances, silt fencing, physical runoff control, as well as other best management practices. Compliance with the approved erosion and sediment control plan/earth disturbance permit will result in minimal sedimentation/turbidity. Areas disturbed during construction would be subsequently stabilized upon completion of construction activities and turbidity is expected to return to normal levels.

Vessels transiting open estuarine waters (although expected to be uncommon since most construction will occur from onshore) and noise and vibrations during the sheet pile driving have the potential for direct effects on sea turtles. No in-water impact pile driving is planned; impact pile driving would occur onshore or from dewatered cofferdams. Measures would also be employed to avoid impacts from noise and collision with construction equipment during construction, if necessary.

The CI & NS Plan will require pump stations to collect interior drainage from significant precipitation events. These pump stations would generally receive urban run-off from impermeable surfaces such as buildings, streets, and parking lots that may contain typical urban non-point source pollutants such as sediments, bacteria, nutrients, and oil and grease. The pumps would not necessarily increase these stormwater discharge but might focus stormwater at fewer locations based on the pump station location, rather than the current stormwater drainage systems. Currently, stormwater drainage systems might discharge directly into the bays at the street ends or through combined sewers. Stormwater drainage systems vary by community and would require further investigation to determine the appropriate locations and design for the interior drainage pumps and outfalls.

Miter gates will be installed and operated across smaller channels. These gates would remain open during normal conditions and would be closed during significant storm events. Some temporary, localized, but minor changes in hydrodynamics around the gates are expected, however, no significant changes in water quality are expected while the gates are open. Miter gate closures during storms may temporarily affect water quality in a localized area by inhibiting circulation and mixing. No direct effects on sea turtles or Atlantic sturgeon are expected from the operation of miter gates because they are located in smaller intertidal channels.

Measures would be implemented to avoid direct impacts with sea turtles during construction of the Long Beach floodwall in open estuarine waters. Atlantic sturgeon are generally expected to occur offshore and are not likely to be adversely affected. These marine protected species highly mobile species and should be expected to avoid the effects of turbidity, if necessary. Additionally, the action area is in the highly energetic, nearshore area and increases in suspended sediments are expected to be in the range of normal variability, which these marine species would regularly experience.

6.3 Natural and Nature Based Features

6.3.1 Woodlands

Design details are limited for natural and nature-based features at this time, removal of potential roost trees would be avoided to the extent practicable. If potential roost trees cannot be avoided, the USFWS would be consulted as appropriate under the ESA 4(d) rule.

6.3.2 Vegetated Wetlands

To date, opportunities for wetland restoration and conservation have been considered through an identification of at-risk wetlands. NNBFs would have beneficial effects on species such as black rail and saltmarsh sparrow by protecting and restoring saltmarsh habitat.

6.3.3 Unvegetated Estuarine Intertidal and Subtidal Benthic Habitats

Impacts on subtidal and intertidal habitat would depend on the NNBF feature and method of construction. As discussed above, wetland restoration may require the aquatic placement of fill materials in aquatic habitats that would disturb existing substrates such as subtidal soft bottoms or intertidal mud or sand flats. These would result in localized, but temporary, turbidity in the water column. These effects would end after construction is complete and the areas become stabilized with vegetation or other biogenic processes. While the installation of NNBFs could also result in conversion of habitat, for example, a subtidal soft-bottom habitat may be changed to an intertidal saltmarsh, a restoration or ecological uplift is expected. Therefore, the installation of NNBFs would have beneficial effects on the overall health of the Nassau County Back Bay ecosystem.

6.3.4 Submerged Aquatic Vegetation

One of the criteria for choosing NNBF locations would be the avoidance of important SAV; therefore, no adverse effects on SAVs are expected. As discussed, SAVs can be utilized as an NNBF measure in the form of restoration. Restoring SAVs would provide ecological services such as stabilizing substrates, resulting in less turbidity, nutrient uptake, providing suitable habitat for filter feeders (shellfish) in order to capture phytoplankton and suspended particles, and providing structure for various life stages of finfish.

6.3.5 Estuarine Open Waters

Construction of NNBFs may require the aquatic placement of fill materials that would disturb existing substrates (soil or sediments), and generate localized, but temporary, turbidity in the water column. These effects are expected to be temporary and would cease after construction is complete and the areas become stabilized with vegetation and/or other biogenic processes. NNBFs are expected to have long-term beneficial impacts on water quality by providing services such as sediment stabilization with reduced turbidity, nutrient uptake, and by providing habitat for filter feeders that can capture phytoplankton and suspended particles.

7.0 Effects Analysis

7.1 Tentatively Selected Plan/Nonstructural Countywide

The TSP would not affect listed species or their habitat. The TSP would not affect the following habitat types:

- Woodlands
- Vegetated wetlands
- Intertidal and subtidal benthic habitat
- Submerged aquatic vegetation
- Open estuarine waters.

7.2 Critical Infrastructure Measures

7.2.1 Eastern Black Rail

Eastern black rails have the potential to forage, rest, and migrate through the Action Area. Construction of floodwalls directly adjacent to vegetated marshes has the potential to affect eastern black rails. Construction of floodwalls would result in the total loss of 0.17 acres of intertidal marsh. Construction would take place in small patches of habitat within industrial or developed areas, it is not expected to provide optimal habitat for eastern black rail. Additionally, nesting is not expected; the last known breeding record in Nassau County was in 1940. Therefore, impacts on black rail are not expected.

Cumulative impacts to Eastern black rail include the loss of habitat from development and sea level rise. The impact of the critical infrastructure is expected to be negligible relative to past, present, and future development and sea level rise. The CI & NS Plan is not predicted to cumulatively or synergistically interact with other past, present, or future projects in such a way that would significantly adversely the Eastern black rail.

7.2.2 Roseate Tern

Roseate terns have the potential to forage, rest, and migrate through the Action Area. Noise associated with construction and maintenance of floodwalls has the potential to result in minor impacts on roseate flight and foraging behaviors, including flushing from these activities. These disturbances could occur from upland or aquatic construction or maintenance activities. These impacts are expected to be temporary and localized. The only floodwall adjacent to estuarine open waters is the floodwall. Because this is a residential/industrialized area, impacts are expected to be minimal.

Cumulative impacts to the roseate tern could include a change in distribution of species related to indirect impacts from storm surge barriers and from sea level rise, although the level of impact is relatively uncertain. The impact of the CI & NS Plan is expected to be negligible relative to the impacts from sea level rise. The CI & NS Plan is not predicted to cumulatively or synergistically interact with other past, present, or future projects in such a way that would significantly adversely affect the roseate tern.

7.2.3 Red Knot

Red knots have the potential to forage, rest, and migrate through the Action Area. Noise associated with construction and maintenance of floodwalls has the potential to result in minor impacts on red knot flight and foraging behaviors, including flushing from these activities. Noise and sediment disturbances caused by aquatic construction activities have the potential to indirectly affect red knot by disturbing prey (i.e., benthic invertebrates) in intertidal habitat. Because this is a residential/industrialized area, impacts are expected to be minimal.

Cumulative impacts to the red knot could include a change in distribution of species related to indirect impacts from storm surge barriers and from sea level rise, although the level of impact is relatively uncertain. The impact of the CI & NS Plan is expected to be negligible relative to the impacts from sea level rise. The CI & NS Plan is not predicted to cumulatively or synergistically interact with other past, present, or future projects in such a way that would significantly, adversely affect the red knot.

7.2.4 Saltmarsh Sparrow

Saltmarsh sparrow have the potential to forage, rest, and migrate through the Action Area. Construction of floodwalls directly adjacent to vegetated marshes has the potential to impact saltmarsh sparrows. Construction of floodwalls would result in the total loss of 0.17 acres of intertidal marsh across the 5 sites, and effects on high marsh are not expected. Construction would take place in small patches of habitat within industrial or developed areas, it is not expected to provide optimal habitat for this species. Therefore, impacts on saltmarsh sparrow are not expected.

Cumulative impacts to Eastern black rail and saltmarsh sparrow include the loss of habitat from development and sea level rise. The impact of the critical infrastructure is expected to be negligible relative to past, present, and future development and sea level rise. The CI & NS Plan is not predicted to cumulatively or synergistically interact with other past, present, or future projects in such a way that would significantly, adversely impact the Eastern black rail.

7.2.5 Atlantic Loggerhead, Kemp's Ridley, Atlantic Green, and Leatherback Sea Turtle

Construction, operation, and maintenance of the floodwalls have the potential to result in negligible direct and indirect effects on sea turtles. Atlantic Loggerhead, Kemp's Ridley, Atlantic Green, and leatherback sea turtles have the potential to occur in the action area, typically from May through November. Leatherback sea turtles generally occur further offshore than the other sea turtles. Construction of the Long Beach floodwall have would temporary, direct impacts on estuarine open waters and unvegetated intertidal and subtidal benthic habitat, where sea turtles may occur. Construction of floodwalls is not expected to impact SAV, which serves as sea turtle forging habitat.

Minor and temporary increases in turbidity and noise from construction activities such as the installation and removal of temporary cofferdams, temporary excavations, and fill and rock placement could disturb sea turtles. Temporary disturbances of unvegetated intertidal and subtidal habitats (potential sea turtle forage habitat) may be experienced through the placement of de-watering structures, temporary fills or excavations for temporary access points to the work segment, and sedimentation. Benthic habitats are expected to recover quickly. Because these impacts are temporary and localized, impacts on sea turtles are expected to be insignificant.

Turbidity and noise associated with construction, maintenance, and operation of the Long Beach structures could disturb sea turtles foraging and in the adjacent open water, causing them to move away from these activities. However, because this is already an industrial residential area, sea turtles may be habituated to noise in the area or avoid the area. Interactions with mechanical equipment could also result in injury to sea turtles. If possible, construction of the Long Beach floodwall would be scheduled to avoid times when sea turtles are present in the action area. If construction cannot be avoided when sea turtles are present in the action area, BMPs would be implemented to avoid and minimize impacts on sea turtles. Examples of BMPs include:

- Construction structural components of the CI & NS Plan from land or within a dewatered cofferdam.
- Conduct impact pile driving from land or a dewatered cofferdam.
- If pile driving cannot occur on land or within a dewatered cofferdam, develop additional BMPs to avoid impacts on protected marine species. This may include a protected marine species monitoring and shut down plan, if in-water pile driving is required.

A risk of a vessel strike would be low because of the very limited amount of time construction or maintenance barges or vessels that would be in the water associated with construction and maintenance of features and likely due to the limited speed of the vessels. Additionally, NMFS vessel operation BMPs would be implemented to the maximum extent practicable to avoid and minimize impacts. These include:

- Shallow draft vessels that maximize the navigational clearance between the vessel and the river bottom should be used where possible.
- Vessels should operate at speeds of less than 10 knots. Whenever operating in areas where whales or sea turtles are present, a look out should be posted and measures taken to slow down and avoid any whales or sea turtles spotted.

The impact of the critical infrastructure measures on sea turtles is expected to be negligible relative to past, present, and future development and sea level rise. The CI & NS Plan is not predicted to cumulatively or synergistically interact with other past, present, or future projects in such a way that would significantly, adversely impact sea turtles.

The impact of the structural components is of the CI & NS Plan expected to be negligible.

7.2.6 Atlantic Sturgeon

Atlantic sturgeon might use the Nassau County Back Bay and the nearshore coastal waters off Nassau County, NY during their adult marine life stage, but typically occur further offshore than the action area. While this species have the potential to be affected by noise and vessel operations associated with construction, operation, and maintenance of the Long Beach floodwall for the CI & NS Plan, because it is expected to occur further offshore than the extent of these impacts, the potential for these impacts is negligible.

7.3 Natural and Nature Based Features

It is possible that any wetland restoration work that may occur as a part of the complementary NNBF measures may generate localized, temporary turbidity in open estuarine waters and adjacent tidal streams. These impacts would also be minimized through use of sediment control BMPs. Additionally, wetland restoration could result in conversion of unvegetated intertidal and subtidal habitat to wetlands. This could result in negligible impacts on species that use estuarine open waters and unvegetated benthic habitat, such as sea turtles and Atlantic sturgeon. Overall, NNBF measures are expected to result in beneficial effects in the overall Nassau County Back Bay ecosystem and specifically on black rail and saltmarsh sparrow habitat.

8.0 Conclusion and Determination of Effects

8.1 Tentatively Selected Plan/Nonstructural Countywide Plan

Based on the analysis presented in the previous sections of this Biological Assessment, the USACE has determined that the TSP would have no effect on the following listed species.

- Shortnose sturgeon
- Northeastern Beach Tiger Beetle
- Piping plover
- Seabeach amaranth
- Northern long-eared bat
- Eastern black rail
- Roseate tern
- Red knot
- Atlantic loggerhead
- Kemp's ridley
- Atlantic green sea turtle
- Leatherback sea turtle
- Atlantic Sturgeon

8.2 CI &NS Plan

Based on the analysis presented in the previous sections of this Biological Assessment, the USACE has determined that the CI & NS Plan would have no effect on the following listed species.

- Shortnose sturgeon
- Northeastern Beach Tiger Beetle
- Piping plover
- Seabeach amaranth
- Eastern black rail
- Atlantic Sturgeon

Based on the analysis presented in the previous sections of this Biological Assessment, the USACE has determined that the CI & NS Plan is not likely to adversely affect the following listed species.

- Northern longeared bat
- Roseate tern
- Red knot
- Atlantic loggerhead
- Kemp's ridley
- Atlantic green sea turtle
- Leatherback sea turtle

8.3 Natural and Nature-Based Features

Based on the analysis presented in the previous sections of this Biological Assessment, the USACE has determined that the complementary NNBF features would have no effect on the following listed species.

- Shortnose sturgeon
- Northeastern Beach Tiger Beetle
- Piping plover
- Seabeach amaranth
- Atlantic Sturgeon
- Northern long-eared bat

Based on the analysis presented in the previous sections of this Biological Assessment, the USACE has determined that complementary NNBF features may affect but are not likely to adversely affect the following listed species.

- Eastern black rail
- Roseate tern
- Red knot
- Atlantic loggerhead
- Kemp's ridley
- Atlantic green sea turtle
- Leatherback sea turtle

Additionally, NNBFs may have beneficial effects on black rail and saltmarsh sparrows.

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